Kansas Forest Action Plan

KANSAS FOREST SERVICE
KANSAS STATE UNIVERSITY

K-STATE
Research and Extension

FOREST SERVICE
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INTRODUCTION

As part of the 2008 Farm Bill and as an integral component of the USDA Forest Service State and Private Forestry (S&PF) Redesign, each state is required to conduct a statewide assessment of forest resource conditions, threats, and priorities to receive future federal forestry assistance funds. Increased pressures on the health of the nation's forest resources from pests, diseases, and nonnative species, as well as a rapid increase in the conversion of forestlands to non-forest uses, have required a new approach for identifying areas at most risk. Once identified, this new approach will help prioritize and allocate funds and resources that will produce the highest returns with respect to the ecological, social, and economic benefits derived from our nation's forests.

In order to achieve this goal, each state has been asked to analyze the condition and trend of its forest resources, as well as to identify priority forest resource areas where resources will be best utilized. Upon identifying those priority areas, each state will be required to provide a resource strategy, or response plan, that will provide a long-term, comprehensive strategy for directing resources to address those forest resources and threats identified within its priority resource areas. Finally, an annual report will be required to describe how the state used all State and Private Forestry program funding to address the assessment and strategy developed, including detailing any funds leveraged through partnerships. To be eligible for funds received under the Cooperative Forestry Assistant Act (CFAA), states must have completed their assessment and strategy within two years of the enactment of the 2008 Farm Bill (June 18, 2008).

Thousand cankers disease could be economically and environmentally devastating to Kansas.

Direction for the assessment of Kansas forest resources and strategy for their protection and management comes from the Redesign Implementation Council[1] and the 2008 Farm Bill. The final guidance (Appendix A), adopted in October 2008, includes three national themes with 11 underlying objectives and language requiring, at a minimum: analysis of present and future forest conditions, trends, and threats; identification of priority landscape areas; identification of multi-state/regional issues; proposal of resource allocation; and the creation of a timeline for project and program implementation.

The Kansas approach has combined the results of assessment and strategy into one document, which includes the Assessment of Needs required by the Forest Legacy Program[2].

1.1 Kansas' Approach and Timeline

1.1.1 Procedures, Stakeholders, and Public Involvement

In early 2009, the Kansas Forest Service approached the Geographic Information Systems Spatial Analysis Laboratory (GISSAL) of the Department of Geography at Kansas State University to provide technical assistance and support related to the geospatial component of the Kansas Forest Action Plan. Initially, the project was seen as a direct continuation of the previous Forest Stewardship Program Spatial Analysis Project (SAP)[3] that the two had collaborated on (Hutchinson et al., 2008). To meet the requirements of this plan, forest resources were evaluated spatially, using a 30-meter cell-size weighted raster analysis, similar to the process followed with SAP. This project differed somewhat to SAP in that it would include all Cooperative Forestry Programs and all of Kansas would be evaluated – SAP did not consider those lands under federal or state ownership (such as the Cimarron

1 *This committee has representatives from NASF and USDA Forest Service SP&F. Their purpose was to create the final guidance for statewide asssessment strategy.*

2 *For more information about the Forest Legacy Program, see http://www.fs.fed.us/spfcoop/programs/loa/flp.shtml*

3 *Full text of this report is available at: http://www.kansasforests.org/rural/foreststewardship/SAP/SAPMethodRep.pdf*

National Grasslands), urban areas, those areas within the boundaries of incorporated places as defined by the 2000 U.S. Census, and those areas considered open water.

Table 1.1. *Kansas Forest Action Plan Time Line.*

Discussion of approach	Jan-Feb 2009
Data collection and evaluation	Feb-Aug 2009
Initial presentation to Kansas Forest Service staff	Aug 2009
Data weighting and initial draft Assessment Map	Sep 2009
Presentation of Draft to Kansas Technical Committee and State Forest Stewardship Coordinating Committee	Oct 2009
National Statewide Assessment and Strategy Meetings	Nov 2009
Presentation of second draft to Kansas Forest Service staff (reweighting)	Dec 2009
Posting and review of final report draft	May 18 - Jun 4 2010
Final report due to Secretary of Agriculture	Jun 18 2010

Initial efforts on the Kansas Forest Action Plan focused on collecting data that best characterized the forest resource in Kansas as it pertained to the three national themes and 11 objectives as outlined in *Farm Bill Requirements & Redesign Components: State Assessments & Resource Strategies* (Appendix A). Data collection and evaluation continued throughout much of the spring and summer of 2009 (Table 1.1). Data sets were evaluated and, if necessary, combined with other data sets to better represent the goals of each of the 11 objectives. Oversight in the data evaluation and selection process was provided by the Rural Forestry Program Coordinator, the Community Forest Coordinator, the Fire Management Coordinator, and the State Forester.

Upon completion of the data collection period, these data sets were presented to the staff of the Kansas Forest Service in late August 2009 for further input and evaluation. Staff were then asked to rank the data sets with respect to their value in assessing forest resources within the state. This initial set of weights were incorporated into the first draft statewide resource assessment analysis that was subsequently presented to the Kansas Technical Committee, State Forest Stewardship Coordinating Committee, and invited partners in late October 2009 (minutes from this meeting are provided in Appendix B). Input received at this meeting, as well as several additional data sets that had been obtained in the interim, was then incorporated into a second draft statewide resource assessment, which was reviewed internally at a Kansas Forest Service staff meeting in late December 2009. This initial set of weights were incorporated into the first draft statewide resource assessment analysis.

The public and stakeholder participation process began in September 2009 in preparation for the Kansas Technical Committee and State Forest Stewardship Coordinating Committee meeting on October 27 where the first draft was presented and public input received. A draft was also posted on the Web at the Kansas Forest Service homepage[4] at that time. Public comment was then solicited through radio, news releases, and newsletters.

In preparation for the October meeting, paper copies of the draft were mailed to all 95 members of Kansas Technical Committee, which represents 67 different stakeholder groups including the state wildlife agency, tribes, and federal land management agencies. The State Forest Stewardship Coordinating Committee also was mailed paper copies of the draft as were representatives of the stakeholders in the Fire Management and Urban and Community Forestry Programs. Forty-three people attended the October 27 meeting and provided helpful input, which can be found in the meeting minutes (Appendix B).

Given that several new data sets had been incorporated and others had been eliminated, the December meeting of Kansas Forest Service staff provided an opportunity to have staff re-weight data inputs. These final weights were then included in what would become the final draft of the statewide resource assessment map and associated priority areas.

The December 2009 meeting also represented a significant shift in the structure of the resource assessment and associated strategy. Until then, the approach had focused on the three national themes and 11 objectives as outlined in the guidelines. However, given that there was an inadequate amount of data to effectively address objective 11 (Manage and restore trees and forests to mitigate and adapt to global climate change), a decision was made to restructure the assessment and strategy into two primary focus areas (Forest Resource Threats and Forest Resource Benefits) and seven issues (Table 1.2). This new approach better encapsulated the work of the Kansas Forest Service, while not requiring the collection of a whole new set of data – all existing data and associated weights could be incorporated without compromising the validity or integrity of the data or GIS methodology chosen.

On May 12, 2010, the final draft was posted on the Kansas Forest Service website. Again public comment was solicited through radio, news releases, and newsletters. Paper copies of the Kansas Forest Resource Assessment and Strategy were mailed to all members of the Kansas Technical Committee;

4 http://www.kansasforests.org/

Table 1.2. *Major Kansas Forest Resource Issues.*

Threats	Benefits
1. Wildfire risk	1. Sustaining water quality and quantity
2. Issues that threaten Kansas forest health	2. Protecting and restoring forest biodiversity and wildlife habitat
3. Loss of Kansas forestland	3. Sustaining and protecting forest and agroforestry ecosystems
	4. Maintaining and protecting the economic benefits of woodlands

State Forest Stewardship Coordinating Committee; representatives of Fire Management and Urban and Community Forestry Programs; and USDA Forest Service, State and Private Forestry partners. Input was solicited from stakeholders through June 4, 2010 and a final document submitted to the Secretary of Agriculture for approval on June 18, 2010 (minor revisions October 2011 and September 2015).

1.1.2 The Structure of the Kansas Forest Action Plan

The organizing structure presented in Table 1.2 provides the general structure to this report. A brief introduction to the geography of Kansas (Section 1.2) is followed by a more in-depth discussion of the composition and spatial distribution of forest resources within Kansas, including a look at the current conditions, trends and future conditions of forest resources (Chapter 2). Chapter 3 addresses the seven major forest resource issues identified through public input. These issues are categorized as threats or benefits to Kansas forest resources. The chapter introduces each issue, the data incorporated into the GIS analysis, and strategies to address the issues. It also includes the final methodology; delineation of priority resource areas; and multi-state or regional issues and areas. Chapter 4 defines and describes priority areas for protection with an assessment of needs required by the Forest Legacy Program.[5]

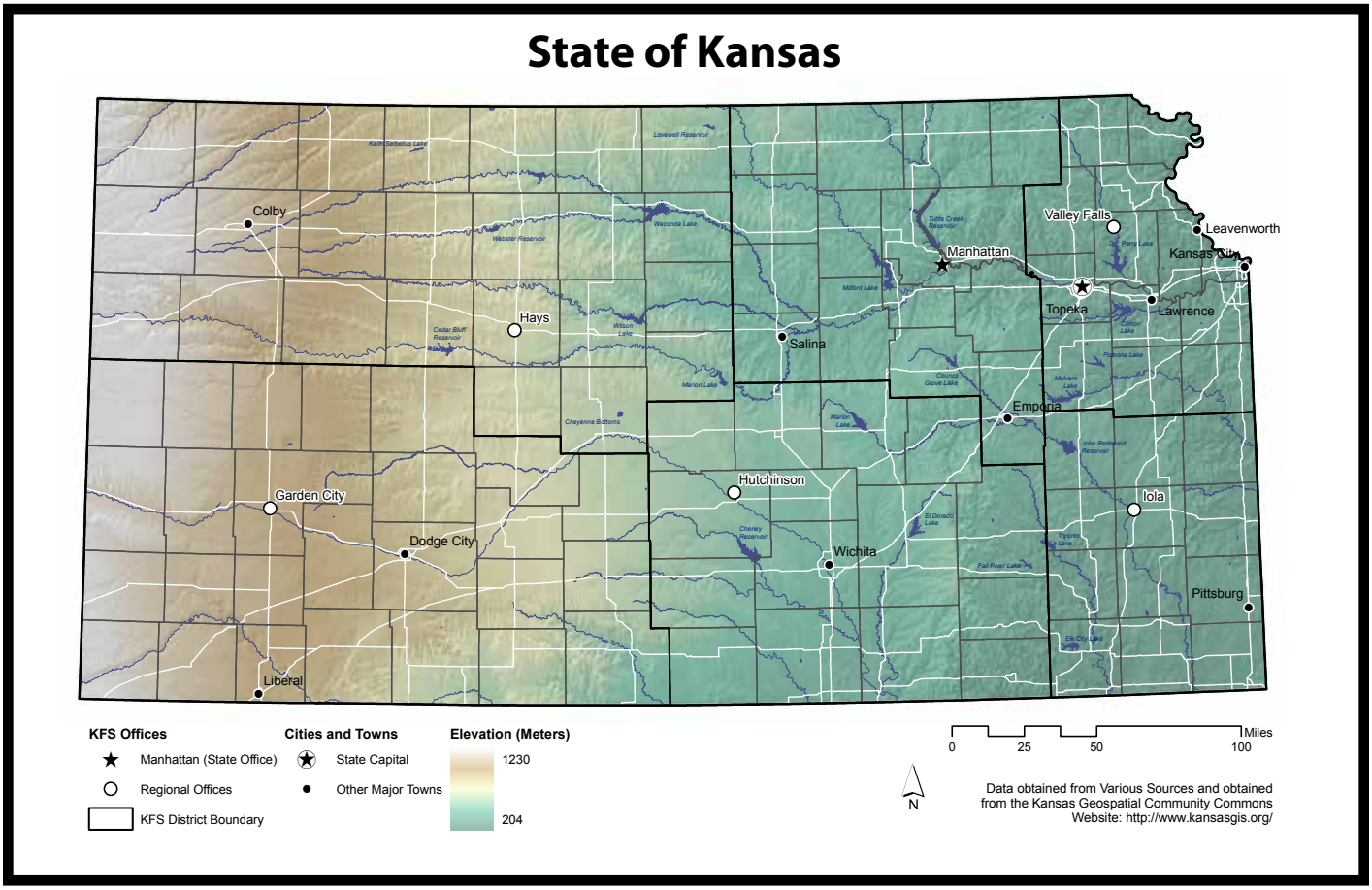


Figure 1.1. *Kansas. For a map of county names, see Appendix G.*

5 *The Forestry Legacy Program is a USDA Forest Service program that uses conservation easements to protect privately owned, at-risk forestlands from development.*

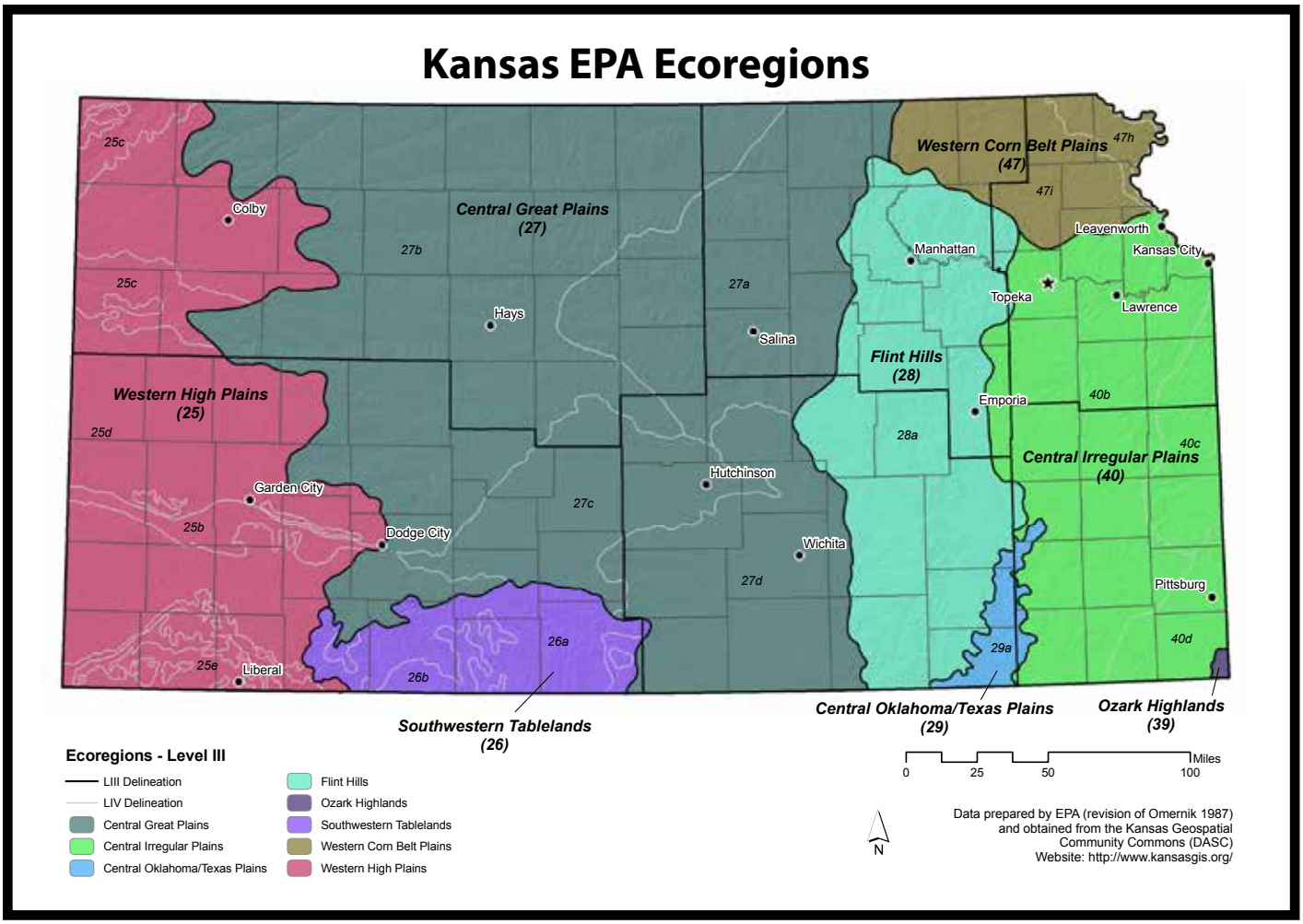


Figure 1.2. *Kansas ecoregions.*

1.2 The Geography of Kansas

1.2.1 Ecoregions

From the western reaches of the Eastern Deciduous Forest, through the tallgrass prairies of the Flint Hills, across the central Great Plains to the open High Plains of western Kansas, the state of Kansas (Figure 1.1) represents several ecoregions (Figure 1.2). Grasslands, cropland, or livestock-based agriculture dominate its land cover (Figure 1.3).

The eastern third of the state is dominated by regions either historically or currently under tallgrass prairie, or a mosaic of tallgrass prairie and either oak-hickory or oak-savanna. The most prominent is the Flint Hills – the largest remaining intact tallgrass prairie in the Great Plains, and represents its western limit. The eastern third of the state receives ample precipitation and cropland is most prominent along river valleys and glaciated plains where soils are fertile and rich. The expansive grassland in this region also provides forage and seasonal pasture for livestock. To the west, shortgrass prairies are the prominent natural vegetative cover, however, rainfed and irrigated agriculture play an increasing role, and in some areas dominate the landscape, especially in the wheat-growing regions of the Central Great Plains. These western ecoregions contain little to no natural woodland. Where natural woodlands occur, they tend to be in narrow riparian areas in the eastern third of the state, where there is sufficient moisture to sustain trees.

The following Level III ecoregion descriptions are provided by the United States Environmental Protection Agency (Chapman et al., 2001) and based on the original map compilation by Omernik (1987). The numbers in parentheses in the following descriptions refer to their EPA Ecoregions (Figure 1.2).

Western Corn Belt Plains (47)
Once covered with tallgrass prairie, more than 90 percent of the Western Corn Belt Plains ecoregion is now used for cropland agriculture and much of the remainder is in forage for livestock. A combination of nearly level to gently rolling glaciated till plains and hilly loess plains; ample precipitation, mainly in the growing season; and fertile, warm, moist soils make this one of the most productive corn and soybeans regions in the world. Agricultural practices have contributed

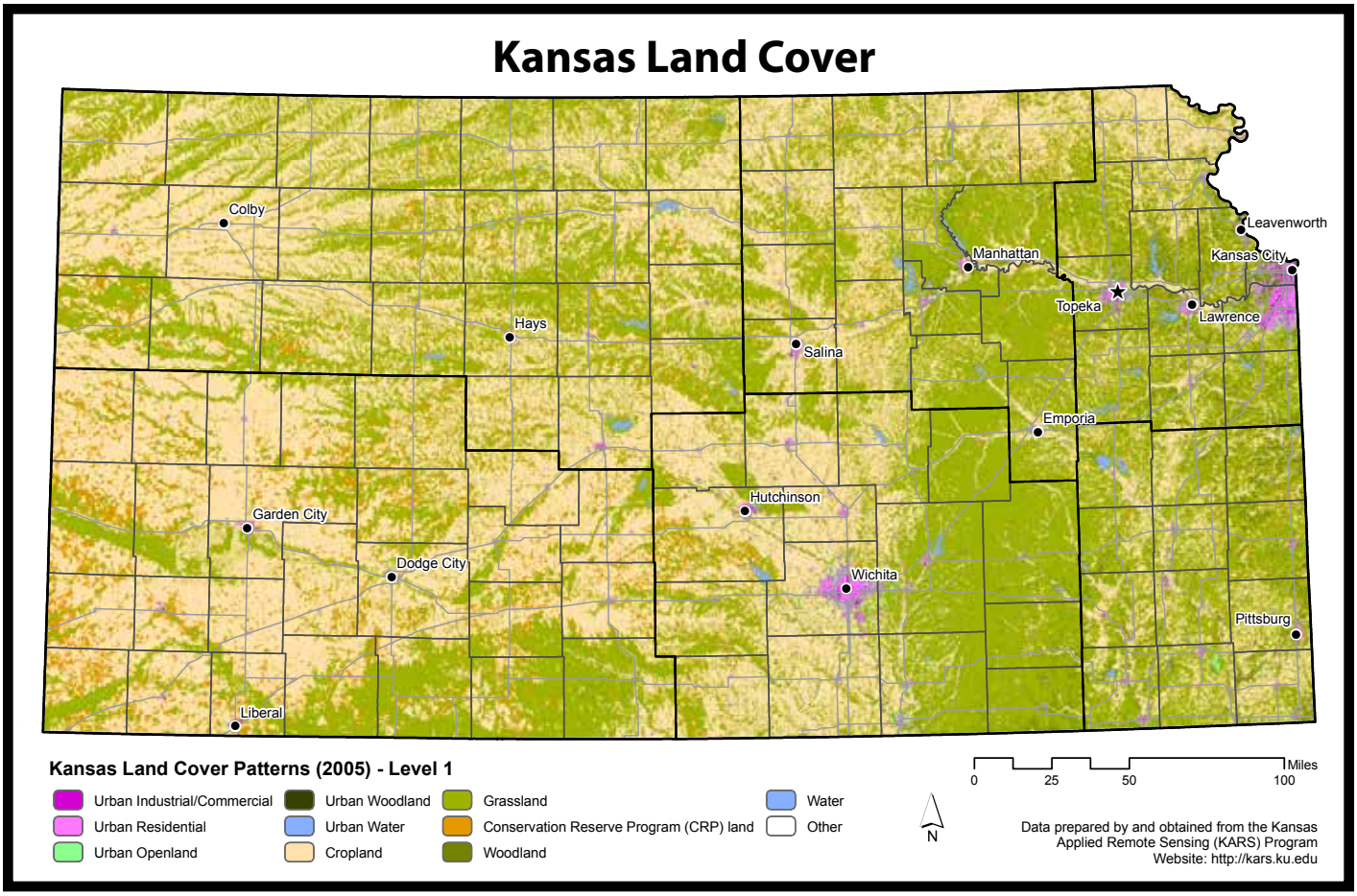


Figure 1.3. *Kansas land cover.*

to environmental concerns, including surface and groundwater contamination from soil erosion, fertilizer and pesticide applications, as well as livestock concentrations.

Central Irregular Plains (40)

The Central Irregular Plains ecoregion has a variety of land use types and tends to be topographically more irregular than the Western Corn Belt Plains (47) to the north, where most of the land is in crops. The natural vegetation of the region is a mosaic of tallgrass prairie and oak-hickory forest, with more forested areas than the Western Corn Belt Plains. The climate is humid with rainfall averaging 28 to 40 inches per year, most of it falling during the growing season. Soils also differ from the Western Corn Belt Plains (47) mainly by the relative absence of glacial drift and a thinner loess mantle. The Pennsylvanian surface rock strata provide material for building stone and the manufacturing of cement and ceramics. Oil and gas fields are extensive in Kansas and Oklahoma and coal has been mined in numerous locations in the region.

Flint Hills (28)

The Flint Hills ecoregion is the largest remaining intact tallgrass prairie in the Great Plains. This region is characterized by rolling hills composed of shale and cherty limestone, rocky soils, and by humid, wet summers. Average annual

Oak-hickory forests make up 53 percent of Kansas forestland and occur in the eastern third of the state.

Kansas forests are often linear in nature and are interspersed between grassland and croplands.

precipitation ranges from 28 to 35 inches. The Flint Hills marks the western edge of the tallgrass prairie. Erosion of the softer Permian limestone has left the more resistant chert (or flint) deposits, producing the hilly topography and coarse soils of the area. This rocky surface is difficult to plow; consequently, the region has historically supported very little cropland agriculture. The natural tallgrass prairie still exists in most areas and is used for range and pasture land. However, some cropland exists in river valleys and along the periphery of the Flint Hills, especially in the northwest corner where the topography is more level. This northwest edge is transitional between the cherty, rocky soils of the Flint Hills (28) and the silty, loamy, loess-formed soils of the Smoky Hills (27a).

Central Oklahoma/Texas Plains (29)
The Central Oklahoma/Texas Plains ecoregion is a transitional area between prairie vegetation to the west and forested regions to the south. Kansas contains the northern extent of the region. Oak savanna and forests are common on the sandy, dry soils. The thick Pennsylvanian-aged sandstone has been eroded into a series of hills that exhibit more relief than the surrounding Osage Cuestas (40b) but less relief than the larger hills of the Flint Hills (28).

Central Great Plains (27)
The Central Great Plains are slightly lower, receive more precipitation, and are somewhat more irregular than the western High Plains (25) to the west. Once a grassland, dominated by mixed-grass prairie with scattered low trees and shrubs in the south, much of this region is now in cropland, with the eastern boundary of the region marking the eastern limit of the major winter wheat growing area of the United States. Subsurface salt deposits and leaching contribute to the high salinity found in some streams.

Southwestern Tablelands (26)
During the Permian Period several thousand feet of brick-red shales, siltstone, sandstones, and gypsum were deposited in this region. Erosion has exposed these deposits giving the region its characteristic red butte and mesa appearance.

Unlike most adjacent Great Plains ecoregions, little of this region is in cropland and much of its elevated tableland area is in sub-humid grassland and semiarid rangeland. The region has many spring-fed streams, and stream bottoms tend to be sandy, and the water is more mineralized than in adjacent regions.

Western High Plains (25)
In the rain shadow of the Rocky Mountains, the Western High Plains ecoregion is characterized by a semi-arid to arid climate, with annual precipitation ranging from 13 to 20 inches. Higher and drier than the Central Great Plains to the east, much of the Western High Plains comprises a smooth to slightly irregular plain having a high percentage of dryland agriculture. Potential natural vegetation is dominated by drought-tolerant shortgrass prairie and large areas of mixed grass prairie in the northwest. Center-pivot irrigation, relying on groundwater from the High Plains Aquifer, has increased dramatically in recent decades. Natural gas deposits, found in the south, yield a majority of natural gas produced in the Midwest.

1.3 Climate

As evidenced by the preceding ecoregion descriptions, climate plays an important role in the distribution and composition of natural vegetative cover, as well as the extent and intensification of agriculture throughout Kansas. Both temperature and precipitation patterns tend to follow a general gradient from southeast to west/northwest (Figures 1.4 and 1.5).

According to the Koppen climate classification, Kansas is represented by three climate types: humid continental (eastern third), the humid subtropical (south-central and south-eastern), and semi-arid steppe (western High Plains). The humid continental areas are characterized by cool to cold winters and hot, often humid summers where the majority of precipitation tends to fall in the spring and summer, with moderate amounts of winter snowfall (15 to 25 inches). Those humid subtropical areas of Kansas tend to experience hotter, more humid summers, milder winters and more precipitation than the rest of the state. However, they are not immune to snowfall, averaging around 10 to 15 inches per year. Finally, the semi-arid steppe regions that tend to cover the western third of the state of Kansas can be characterized as having summers that are hot and generally less humid than the rest of the state, in some areas receiving as little as 16 inches of rainfall

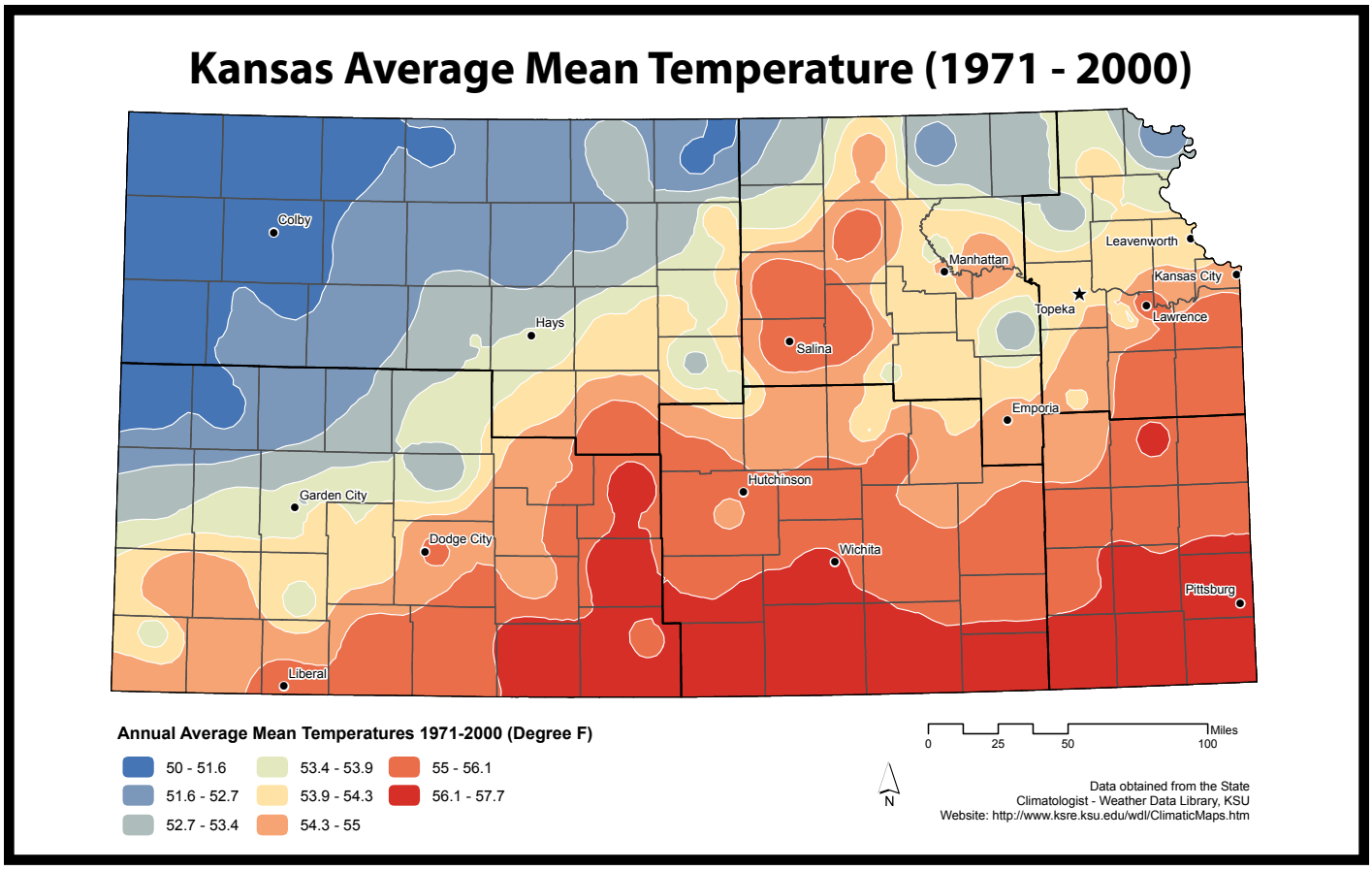


Figure 1.4. *Kansas average annual mean temperature 1971-2000.*

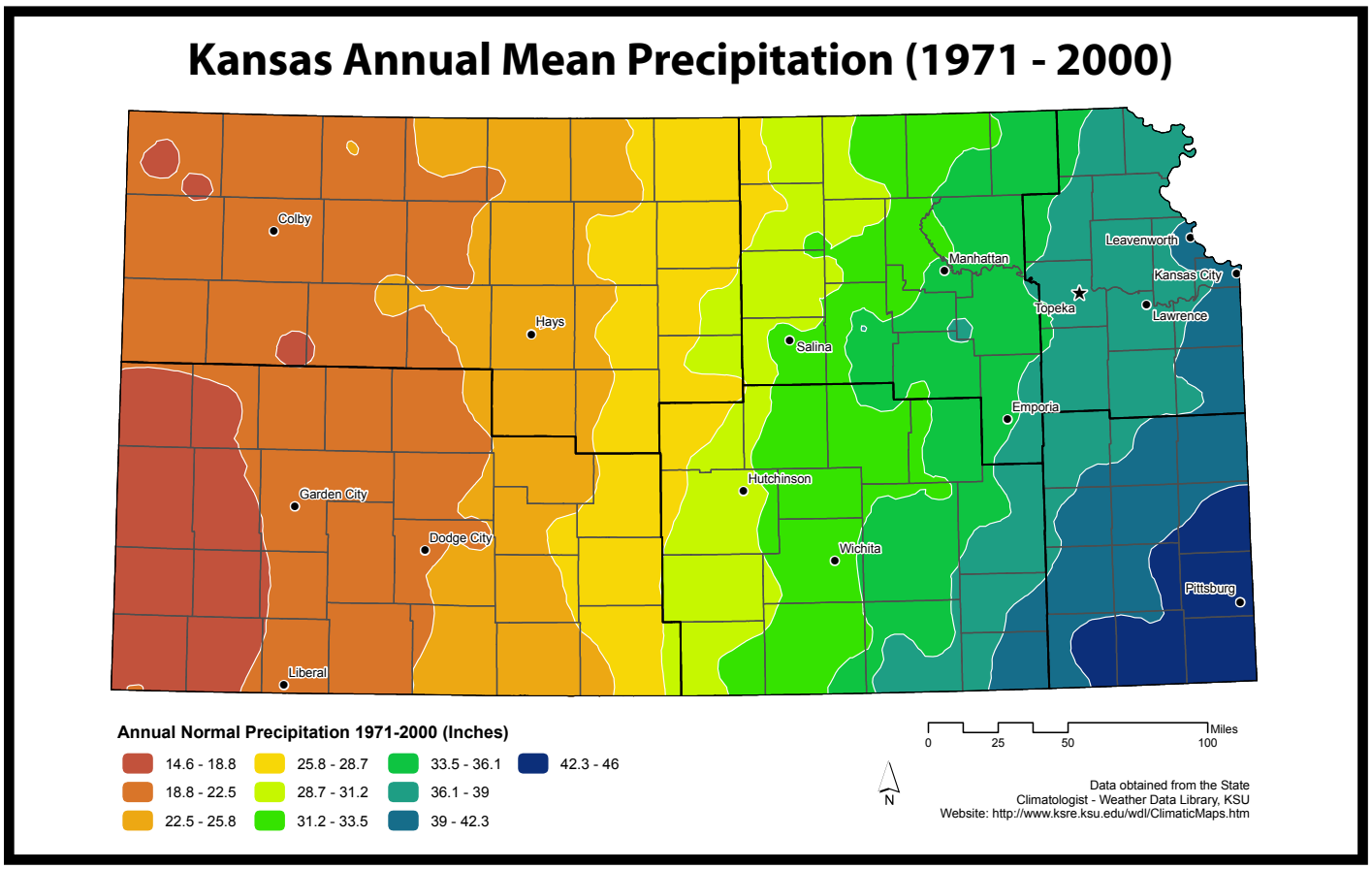


Figure 1.5. *Annual mean precipitation 1971-2000.*

per year. Further exacerbating either low or moderate rainfall totals across portions of the state is the sometimes sporadic and intense nature of rainfall events that occur during the spring and summer months, thus necessitating the irrigation of many crops from aquifer sources in much of southwestern Kansas.

1.4 Population

Kansas, geographically the 13th largest state in the nation covering an area of around 82,000 square miles, was estimated by the U.S. Census Bureau to have a population of 2,904,021 in 2014, making Kansas the 33rd most populous state. Since 2000, Kansas has experienced an increase in population of some 4.8 percent, considerably less than the national average of 9.0 percent.

The majority of Kansans reside in the eastern third of the state, primarily centered in, and emanating from, the cities and towns of Kansas City, Lawrence, Topeka, Manhattan, and Wichita, and to a lesser degree Salina and Hutchinson (Figure 1.6a). Outside of these population centers and their respective counties, population densities are less than 100 people per square mile and in vast tracts of the state as low as 1 person per square mile (Figure 1.6b).

As a whole, since 2000, population growth in Kansas has been primarily an urban and suburban phenomenon, while areas outside of the metropolitan areas have generally seen a decrease in population (Figure 1.6c). According to the Institute for Policy and Social Research (2009), and based on data from the Center for Economic Development and Business Research at Wichita State University, this trend will continue, and possibly even intensify based on population projections, through 2030. During this time, Kansas as a whole will grow by more than 16º percent between 2000 and 2030, adding some 435,000 people to the state. This growth will be marked by a stark rural-urban contrast, with significant growth expected in the suburban areas surrounding the largest cities and town of eastern Kansas, as well as within those smaller urban centers in the central and western portions of the state, but a considerable depopulation of rural counties throughout the state is expected(Figure 1.6d).

Some counties surrounding the Kansas City metro area are expected to grow at a rate close to or exceeding 50 percent between 2000 and 2030. Given the high demand for land that this growth will stimulate, and that the majority of the forests in Kansas exist in the eastern third of the state, this trend will place enormous pressures on the state's limited forest resources, as well as other natural resources.

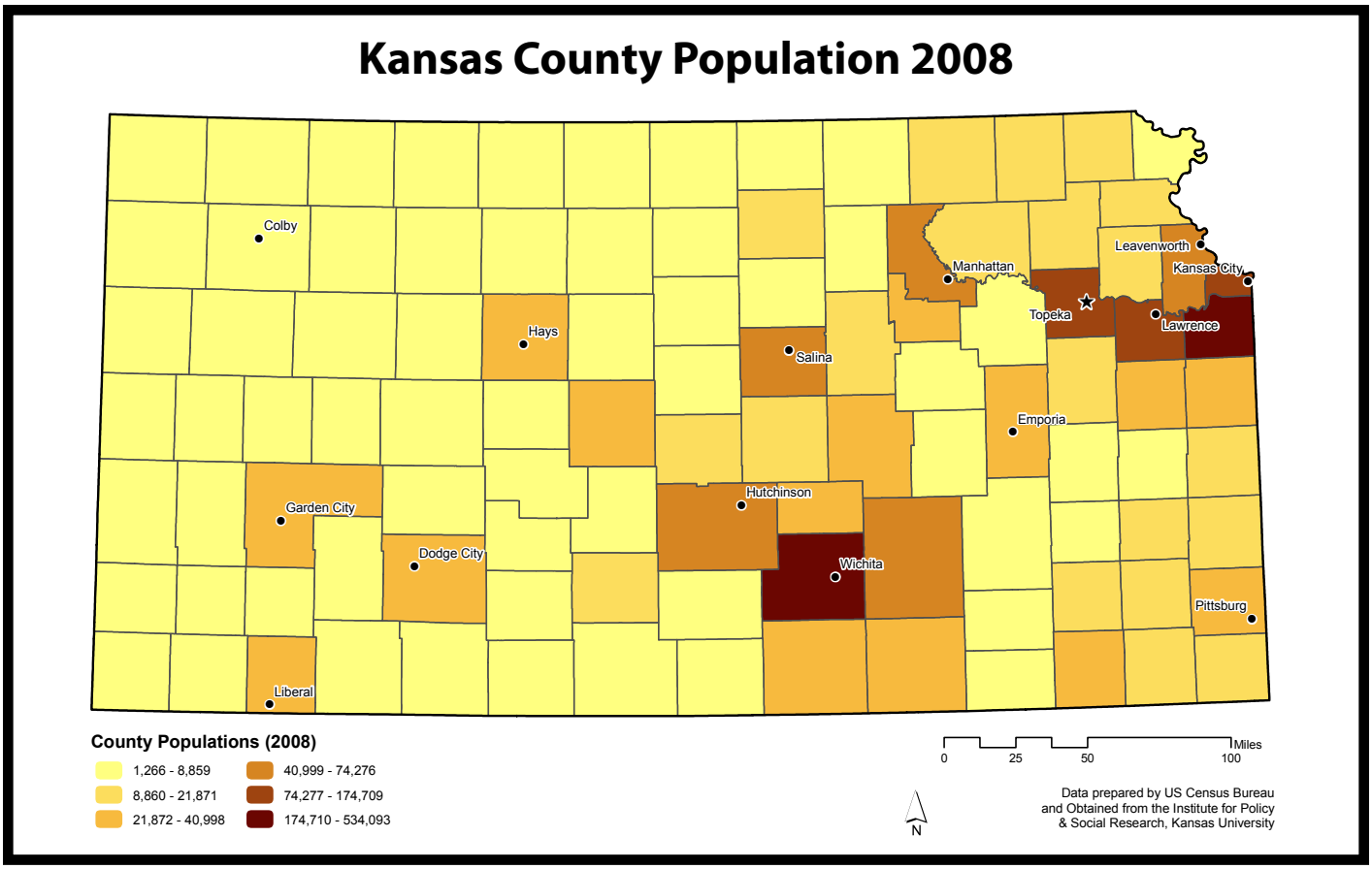


Figure 1.6a. *Kansas population characteristics.*

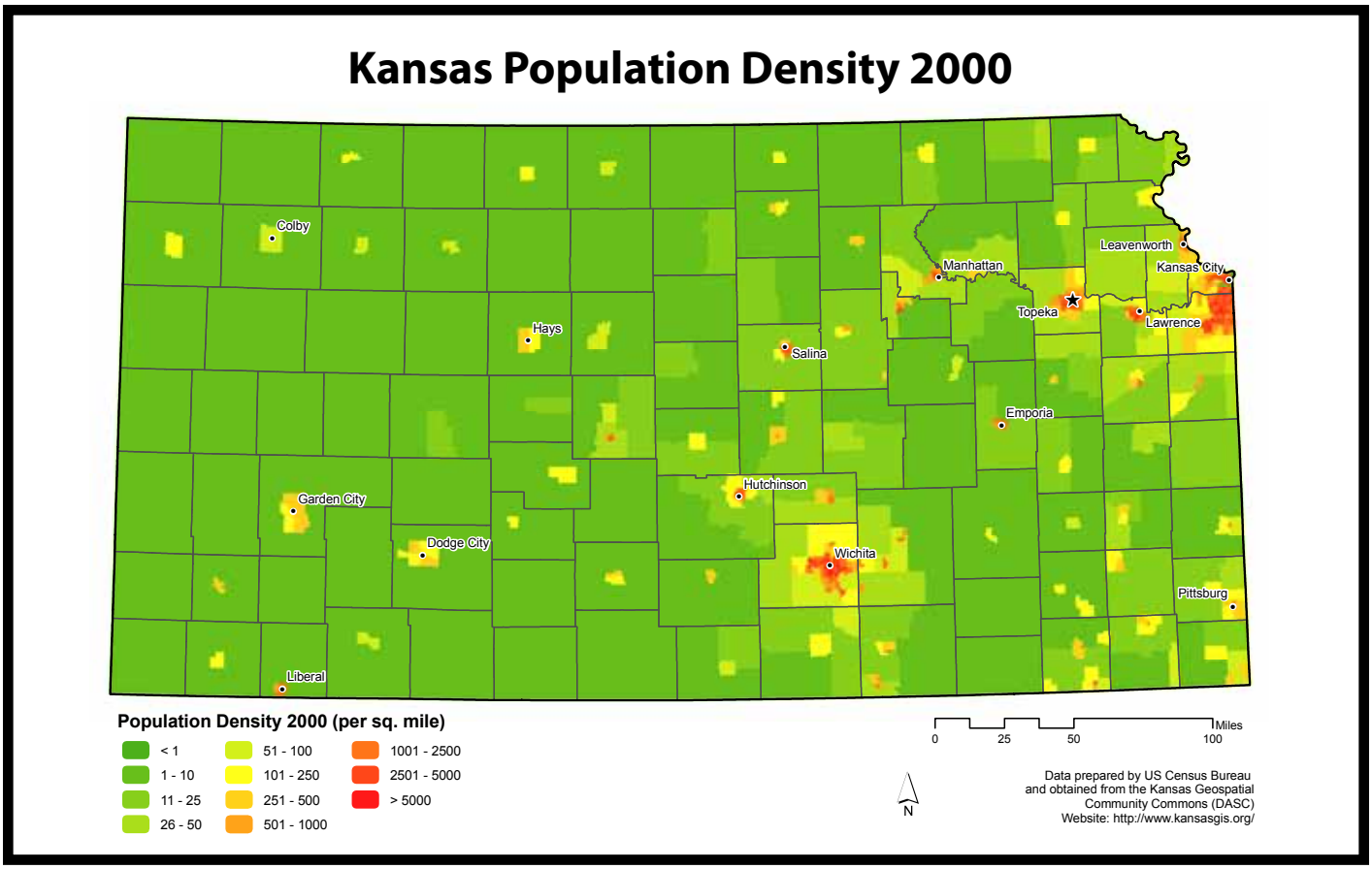


Figure 1.6b. *Kansas population characteristics.*

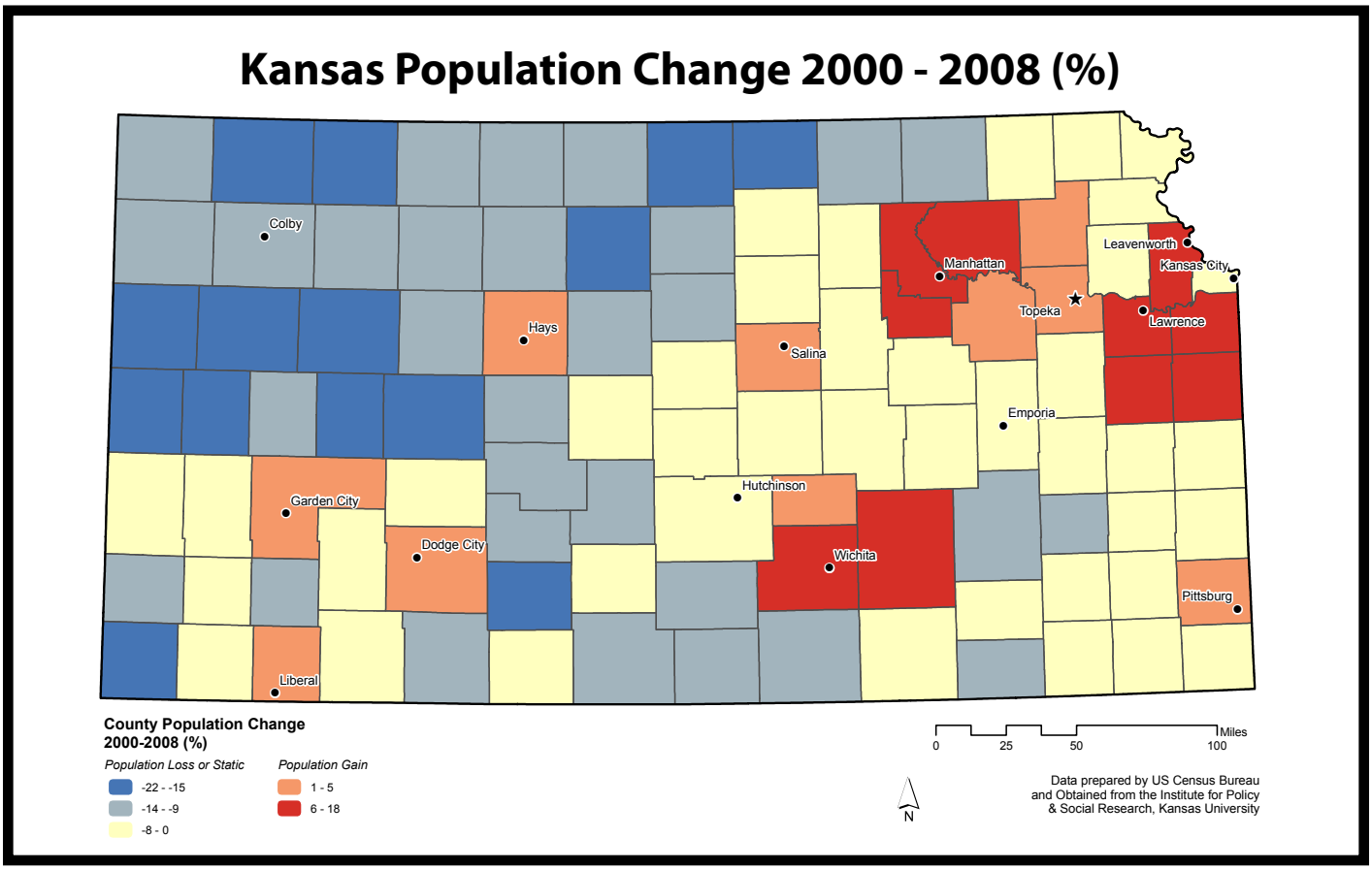


Figure 1.6c. *Kansas population characteristics.*

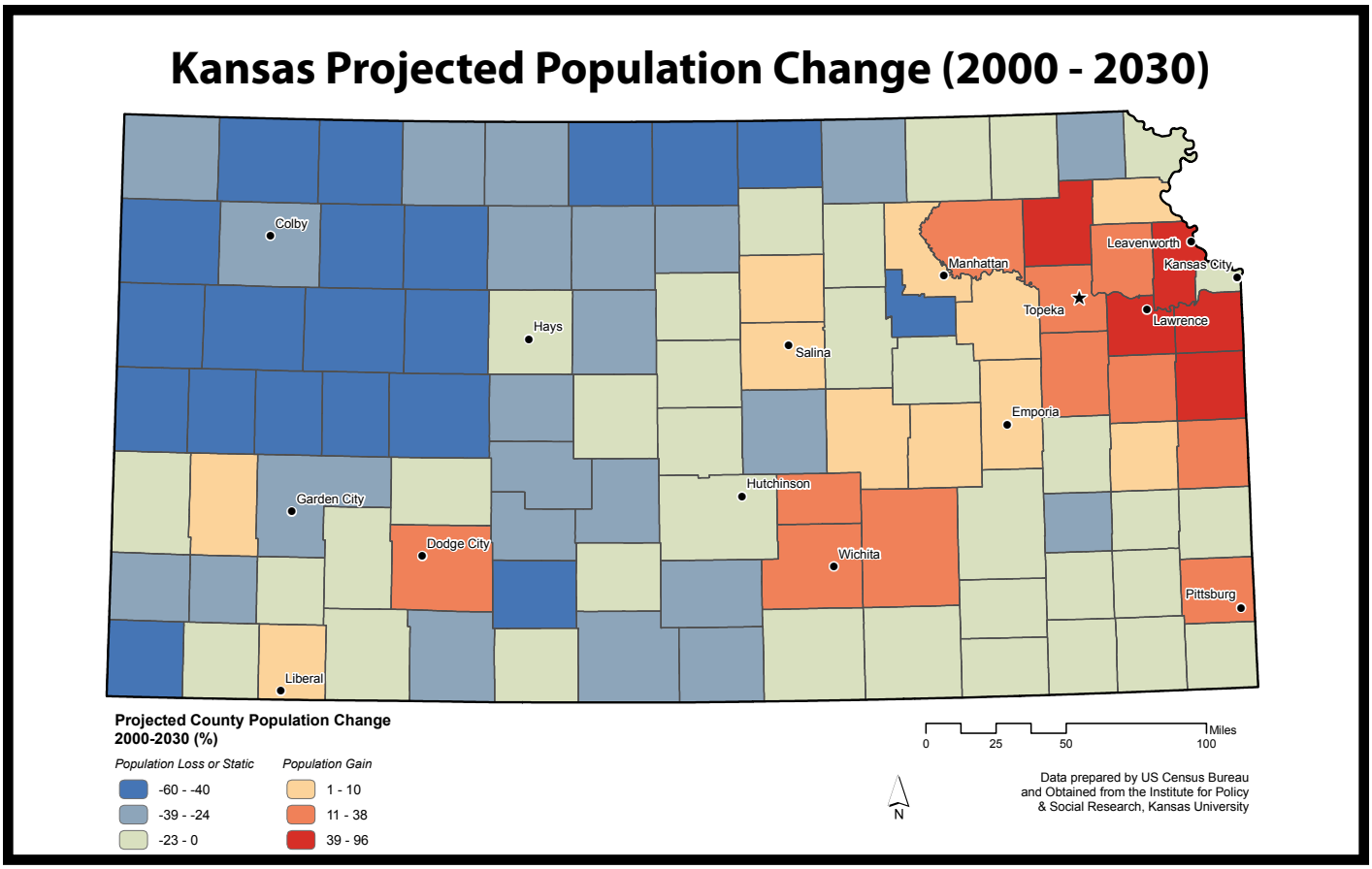


Figure 1.6d. *Kansas population characteristics.*

Chapter 2

KANSAS FORESTS AND RELATED RESOURCES

Conserving and sustaining the productivity and benefits of Kansas forests, woodlands, and agroforestry resources is at the heart of the *Kansas Forest Action Plan*. International measures of sustainability have been developed by 12 countries including the United States through the Montreal Process. These measures focus on 1) conservation of biological diversity, 2) maintenance of productive capacity of forest ecosystems, 3) maintenance of forest ecosystem health and vitality, 4) conservation and maintenance of soil and water resources, 5) maintenance of forest contribution to global carbon cycles, 6) maintenance and enhancement of long-term multiple socioeconomic benefits to meet the needs of societies, and 7) legal, institutional, and economic framework for forest conservation and sustainable management. Using available data, these criterion and their respective indicators have been integrated into this report.

There are 5.5 million acres of forests, woodlands, and trees in Kansas that occupy 10 percent of the state's total land area (Figure 2.1). These forests resources can be described as agroforests, rural forests, and community forests. Agroforestry includes windbreaks, riparian forests, and isolated trees that do not meet minimum USDA Forest Service Forest Inventory and Analysis definition of forestland (1 acre, 120 feet wide and 10 percent stocked). Agroforesty data were obtained from statewide forest inventories in 2008 and 2009 as part of the Great Plains Initiative.[1] Rural forestland exceeds the minimum definition of the USDA Forest Service Inventory and Analysis definition of forestland. Rural forestland data were obtained from the 2008 Kansas Annual Inventory, USDA Forest Service Forest Inventory and Analysis. Urban and community forests are represented by acres of canopy cover in Kansas urban and community areas as defined in the USDA Forest Service report, *Urban & Community Forests of the North Central West Region*. Nationally, it is assumed that the urban and community canopy estimates are 10 percent lower than actual acreage.

2.1 Rural Forests

2.1.1 Current Conditions and Trends

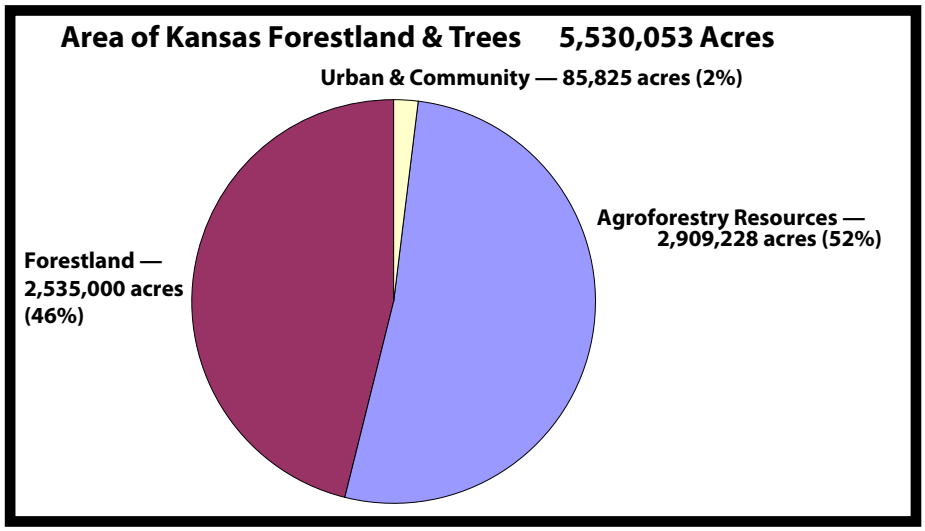
Rural forests are forests that are not included within municipal jurisdictional boundaries or "community" as defined by U.S. Census Bureau definitions. The majority of information in this section is taken from *Kansas Forests 2005* (Moser et al. 2008) and the *National Woodland Owner Survey* (Butler 2008). Collectively, 95 percent of Kansas rural forestland is privately owned. Public agencies control 5 percent of forestland. An estimated 117,000 families and individuals own the bulk of Kansas forests.

Although 65 percent of family forest owners hold fewer than 10 acres of forestland, 65 percent of family forestland is owned by people with land holdings between 10 to 99 acres and an additional 25 percent by people with 100 acres or more.

Most people own forestland as part of their farm and family legacy for aesthetics and to protect nature. The most common use is for private recreation. Trespassing and undesirable plants are the two greatest concerns of landowners (Table 2.1).

Kansas is located in an ecotone where the central hardwood forests of the United States transition into the grasslands of

Figure 2.1. *Total Area of Kansas Forests and Trees*



1 *A regional initiative including Kansas, Nebraska, North Dakota, and South Dakota to prepare for the arrival of invasive pests.*

the Great Plains. Because of this, there will always be on-going debate regarding the appropriate location of forests, woodlands, and windbreaks depending on cultural and societal values.

Before European settlement, forests may have covered up to 8 percent of the state's land area (Ware and Smith 1939). A. T. Andreas's *History of the State of Kansas* presents 1883 government land office survey records suggesting only 4.1 percent of the state was forested. Regardless, presettlement forests were located predominately in the eastern third of Kansas on rich alluvial bottomlands and on moist upland sites. Today's rural forests comprise an estimated 10 percent of the state (5.1 million acres). In Kansas, 2.2 million acres qualify as forestland by the USDA Forest Service Forest Inventory and Analysis (FIA) definition (1 acre in size, 120 feet wide and 10 percent stocked). These forestlands are primarily located in the eastern third of the state (Figure 2.2, page 13). Although, 2.9 million acres do not meet that definition and could be described as riparian forests, windbreaks, and isolated trees.

Kansas forests are steadily increasing in area. Since the first official inventory in 1936, Kansas forests have increased by 3.9 million acres (includes non-FIA forestland). Although it is speculative, the majority of the increase in area has probably occurred in uplands and as woody encroachment into grasslands. Conversely, loss of forestland occurs in riparian areas that compete with valuable agricultural crops and from urban and other forms of development.

Table 2.1. *Top concerns of Kansas forestland owners represented by forestland ownership acres.*

	Area	
Concern [a]	Acres (thousands) [b]	Sampling error (percent)
Undesirable plants	1,017	13
Trespassing	991	14
Family legacy	813	17
Dumping	788	17
Property taxes	737	18
Lawsuits	635	20
Fire	635	20
Air or water pollution	610	21
Storms	559	23
Land development	534	24
Insects/diseases	534	24
Harvesting regulations	457	27
Timber theft	432	28
Endangered species	330	35
Noise pollution	330	35
Wild animals	330	35
Regeneration	254	43
Domestic animals	229	46

[a] Categories are not exclusive.

[b] Landowner's concerns ranked by number of acres as: 1) very important, or 2) important on a 7-point Likert scale, USDA Forest Service, NRS, NWOS.

Although eastern redcedar makes up less than 4 percent of forest types, it has increased in volume by 23,000 percent since 1965 and is the primary species of concern in grasslands. Oak/hickory forests make up 53 percent of forest types and are located primarily in eastern Kansas (Figure 2.3). The elm/ash/cottonwood forest type dominates the central-western parts of the state where precipitation is less abundant. Kansas forests tend to be linear in shape following streams and rivers (Figure 2.4).

Forests have increased in volume by a billion cubic feet and in density by 106 percent since 1965 with an estimated 74 million dry tons of total biomass. Growing stock volume has been increasing steadily for the past 40 years. The average age of Kansas forests is getting younger with the majority of volume and trees occurring between 30 and 59 years of age.

The top 10 tree species by volume include cottonwood (461.9 million cubic feet), hackberry (441.4 million cubic feet), green ash (256 million cubic feet), American elm (251.1 million cubic feet), Osage orange (237.7 million cubic feet), black walnut (204.4

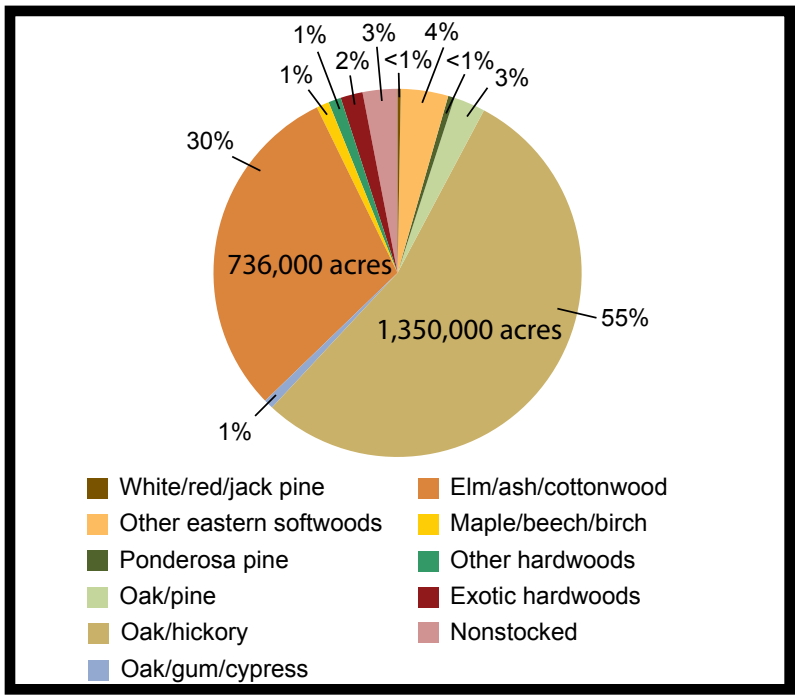


Figure 2.3. *Area of timberland by forest type, according to FIA definitions, in thousands of acres and percent area, (oak-pine is primarily eastern redcedar/hardwood), USDA Forest Service, NRS, FIA.*

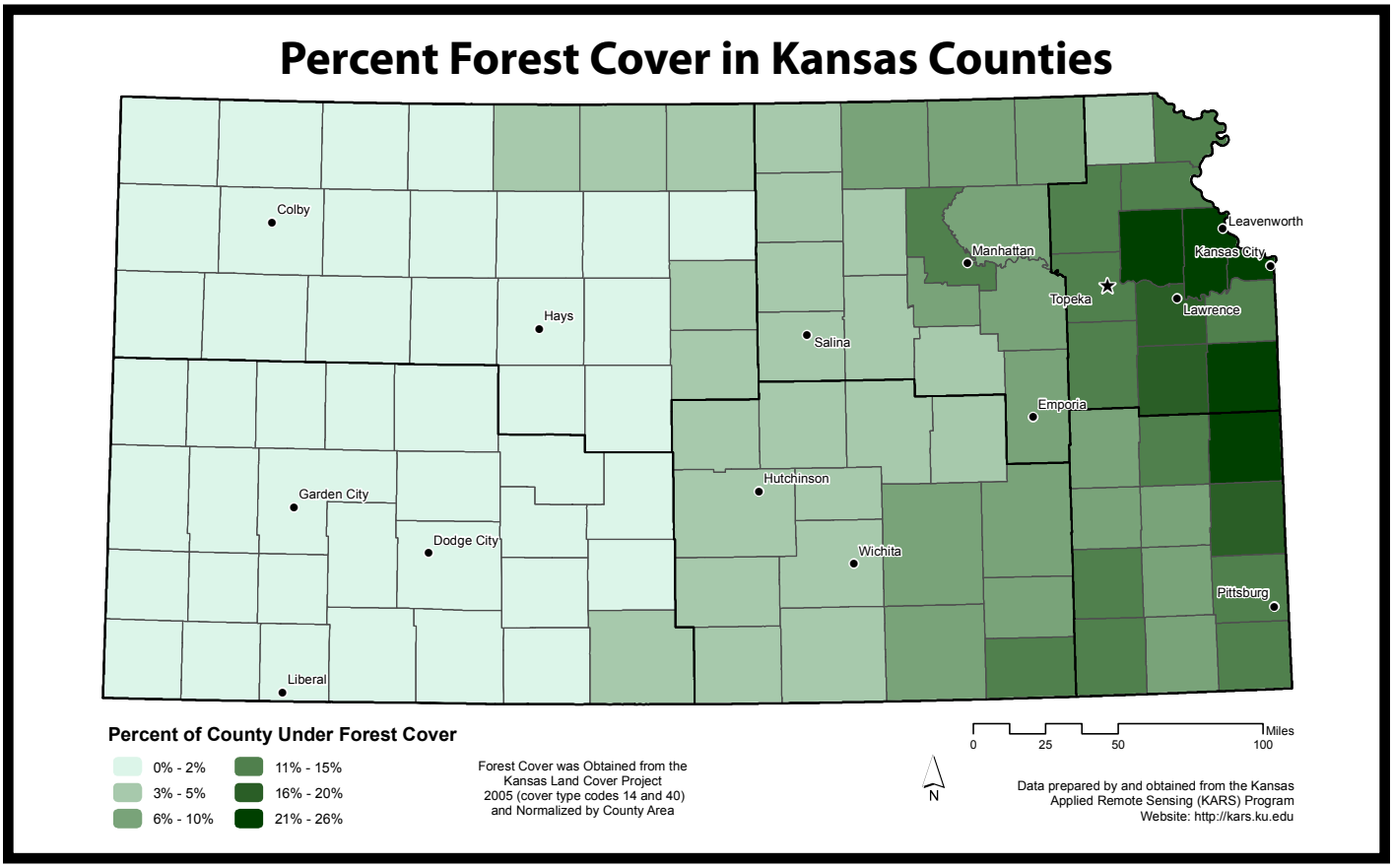


Figure 2.2. *Percent of Kansas Counties under Forest Cover.*

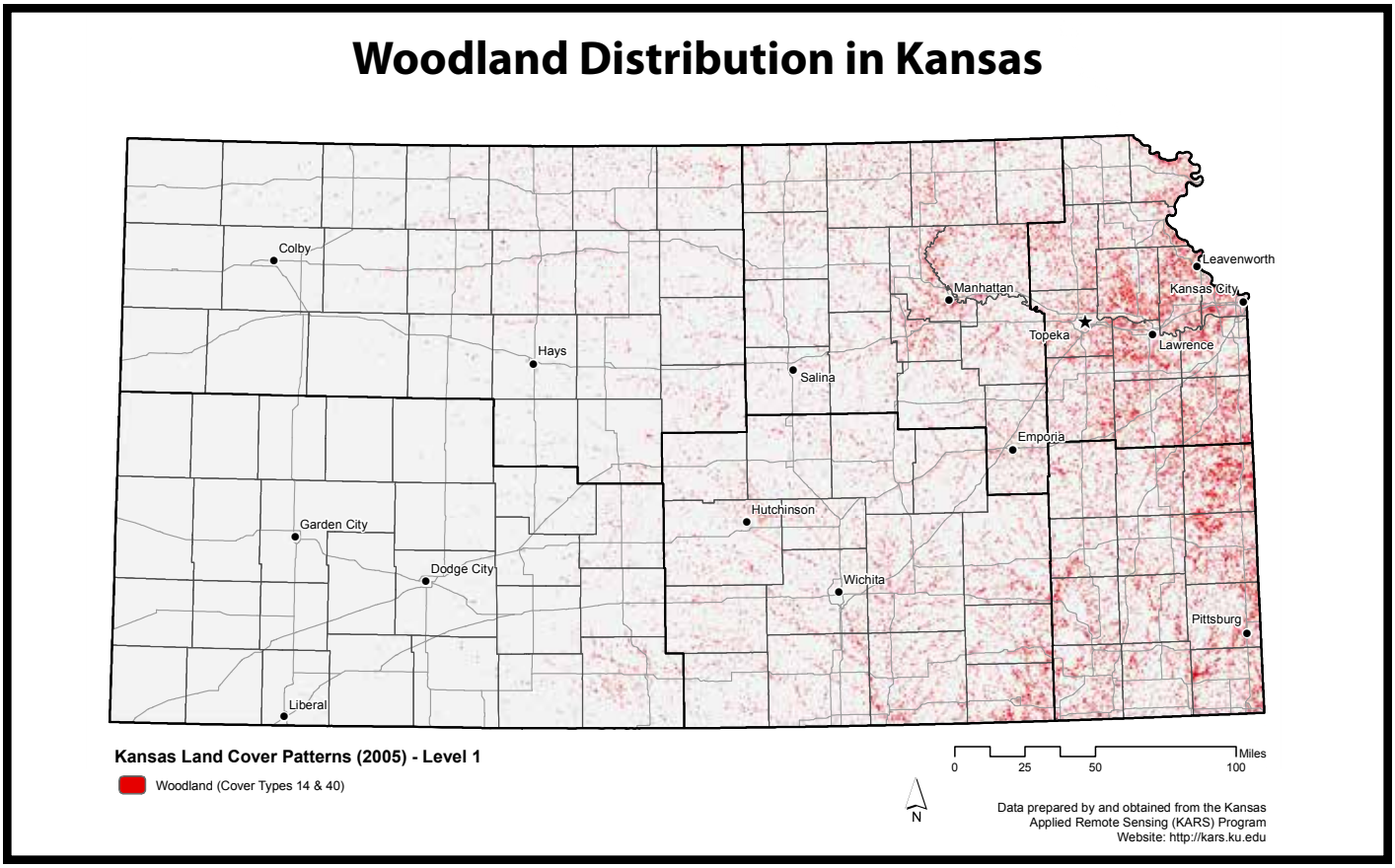


Figure 2.4. *Kansas 'Woodland" as identified by the Kansas Applied Remote Sensing Program's 2005 Kansas landcover dataset (Peterson et al., 2005).*

million cubic feet), bur oak (149 million cubic feet), mulberry (162.3 million cubic feet), American sycamore (98.5 million cubic feet), and honeylocust (131.1 million cubic feet). Increases in volume and tree numbers of shade tolerant species like hackberry will continue to suppress oak regeneration, which has limited tolerance to shade. Although black walnut ranks sixth in net volume it is the most economically valuable tree species in Kansas. Half of the volume of black walnut occurs in fully stocked stands, which does not bode well for a species that requires full sunlight to regenerate. Since 1981, cottonwood, the state tree of Kansas, has not been regenerating in sufficient quantities to maintain the forest type, although growing stock volume has increased. In 2008 annual mortality and removals of live trees were at 61 million cubic feet. Even so, there was still a net increase of growth of 53.5 million cubic feet (Figure 2.5).

Kansas forests and forest industry are an important part of the Kansas economy. The Kansas Forest Service maintains lists of more than 50 timber buyers and sawmills. An estimated 3.3 million cubic feet is harvested from Kansas forests annually, enough lumber to build 3,300 average-sized homes (Reading and Bruton, 2007) *USDA Forest Service Timber Products Output Survey*, 2007).

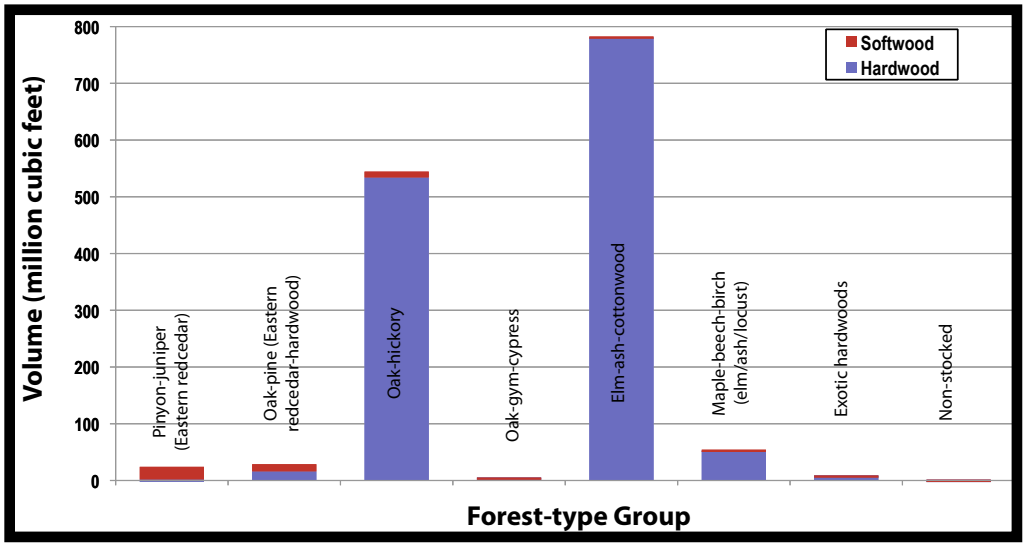


Figure 2.5. *Volume of growing stock trees by forest type on timberland, USDA Forest Service, NRS, FIA.*

Most of our local timber, however, is used for pallets, boxes, and dunnage, although black walnut is sold as veneer and lumber. A recent analysis showed the forest product industry contributes $1.3 billion annually to the Kansas economy in 2010 dollars.[2] However, Kansas forest industry is just starting to recover from the worst global recession since the Dust Bowl. Lack of kiln drying facilities and consistent sources of local wood prevent the increased use of native Kansas timber. Additionally, riparian forests, tree windbreaks, and urban and community forests all provide valuable ecosystem services to Kansans in the form of energy savings, water quality, carbon sequestration, biodiversity, and recreation.

2.1.2 Future Conditions

Forest expansion into grasslands and related factors have been indirectly responsible for population declines in grassland obligate species such as greater and lesser prairie chicken, and Henslow's sparrow due primarily to predation. The Comprehensive Wildlife Conservation Plan describes a complete list of Species of Greater Conservation Need by region. If forest expansion into grasslands is not abated, grassland obligates will continue to decline in numbers as the prairie ecosystem succeeds to woody plants. Forest succession will provide habitat for other species such as white tail deer, turkey and a variety of mammals. However, dense stands of eastern redcedar will limit understory diversity and plant growth and increase the danger of wildfire.

The overall increase in tree volume and density of Kansas forests suggests that forest health problems are on the horizon along with increased opportunities for utilization of forest products. Use of woody biomass as an alternative energy source is one example. Overstocking, combined with a high volume of cull, suggests additional opportunity for forest stand improvement practices through programs like the Environmental Quality Incentives Program for Forestland Health.

However, 47 percent of timberland acreage falls in large diameter classes that may be more difficult to remove due to size and the fact that an estimated 51.5 percent of Kansas hardwood forests are classified as cull, which is unusable for merchantable products. On the flip side large diameter cull trees provide wildlife habitat. Without altering the density of forest stands through timber harvest, prescribed fire, or forest stand improvement practices, regeneration of desirable species like black walnut and oaks will be reduced potentially changing forest composition to more shade-loving species. Declines in water tables as a result of irrigation, drought and

2 *This information was provided by Tom Treiman, natural resource economist, Missouri Department of Conservation.*

changes in flood regimes will all continue to contribute to the reduction of cottonwood regeneration.[3]

According to the National Woodland Owner Survey, although most Kansas family `forest owners plan to do little with their land in the next five years, many will consider selling since 39 percent is owned by people 65 years or older. This large-scale intergenerational shift must be considered in encouraging and promoting the management and protection of forestland.

The economic value of Kansas forest products will continue to grow along with size, quality and volume of forests and as the world recession abates. A recent inventory of woody biomass sources in Kansas suggests that 282,724 green tons of wood waste is produced annually with almost 66 percent already processed (187,000 tons) and potentially available as wood energy feedstocks. Additionally, 67,822 green tons are received at waste disposal sites each year with only 14 percent being utilized. This suggests tremendous potential for conversion of some 300 gas fired boilers to wood that are 40 years of age or older (Camas Creek Enterprises, 2009). Although increasing biomass markets will provide benefits, care must be taken if wood waste supplies dwindle to the point that it becomes economically feasible to utilize high-quality standing timber for wood energy feedstocks. These timber stands could include environmentally important areas such as riparian buffers. At that point sustainable forest management should focus on utilization of over-mature cull timber and woody species encroaching on grasslands.

Ecosystem services are non-priced amenities or market goods. They may include water quality and quantity, carbon sequestration, forest certification, or recreation. With population growth anticipated to increase in the United States by 150 million in the next 50 years, ecosystem services will become more relevant to Kansans.

2.2 Agroforestry

2.2.1 Current Conditions and Trends

Agroforestry is the integration of trees and shrubs into agricultural systems to maximize economic and conservation benefits. Windbreaks and riparian forests are an important resource to Kansans and the most common examples of agroforestry. Yet, most do not meet the traditional inventory definition for forestland and therefore we know less about the agroforestry resources of the state.

Recent inventories associated with the Great Plains Initiative, however have established a much needed baseline on the size and condition of windbreaks, wildlife plantings, and isolated trees. Of this 2.9 million acres, 84 percent is described as "isolated trees" that provide no primary function or service.

However, there are an estimated 289,577 acres of windbreaks stretching a total length of 43,436 miles (Figure 2.6). These windbreaks provide wind protection to 1.2 million acres of land with 59 percent protecting fields, 28 percent surrounding farmsteads and homes, and 12 percent protecting livestock. Kansas field windbreaks provide wind protection to an estimated 579,221 acres. In addition to environmental values, such as reduction in wind erosion, these windbreaks can increase winter wheat yields by an average of 23 percent. Research suggests a 23 percent yield increase (8.74 bushels) in winter wheat above a 38-bushel per acre average. Assuming a $4.50 per bushel price multiplied by an 8.74 bushel increase and based on an estimated 265,594 acres of winter wheat protected, Kansas wheat farmers collectively receive $10.4 million benefit from windbreaks annually.

Additionally, Kansas windbreaks also protect an estimated 65,187 farmsteads providing 20 percent annual savings in energy bills. Based on an annual average of $2,000 for heating costs per farmstead, windbreaks potentially save Kansans more than $26 million each year. An estimated 56 percent of these windbreaks are in good condition and 44 percent fair to poor (Figure 2.6). The inventory also found 20 percent less than 25 years old, 59 percent between 25 to 50 years and 21 percent older than 50 years. The most common species found included Osage orange (17 million trees), hackberry (15 million trees), eastern redcedar (8 million trees), American elm (5 million trees), Siberian elm (4 million trees) and green ash (1 million trees).

Windbreaks in Kansas provide economic benefits ranchers, farmers, and homeowners.

3 The report on the status of cottonwood forests along the Missouri River is available at: http://www.moriverrecovery.org/mrrp/f?p=136:134:3591667163164289::NO:::

Condition of riparian forests is largely unknown, though current efforts are underway to capture this important information. What is known is that significant portions of riparian corridors are incised, unstable and in need of riparian forest restoration, management and protection. There are an estimated 562,000 acres of riparian forests that border 23,731 miles of perennial streams and rivers nearly 27 percent of total timberland area. It has been speculated that windbreaks and riparian forests have been in decline since the 1970s due to the introduction of pivot irrigation, conversion to cropland and various forms of development. It is expected that this trend will continue.

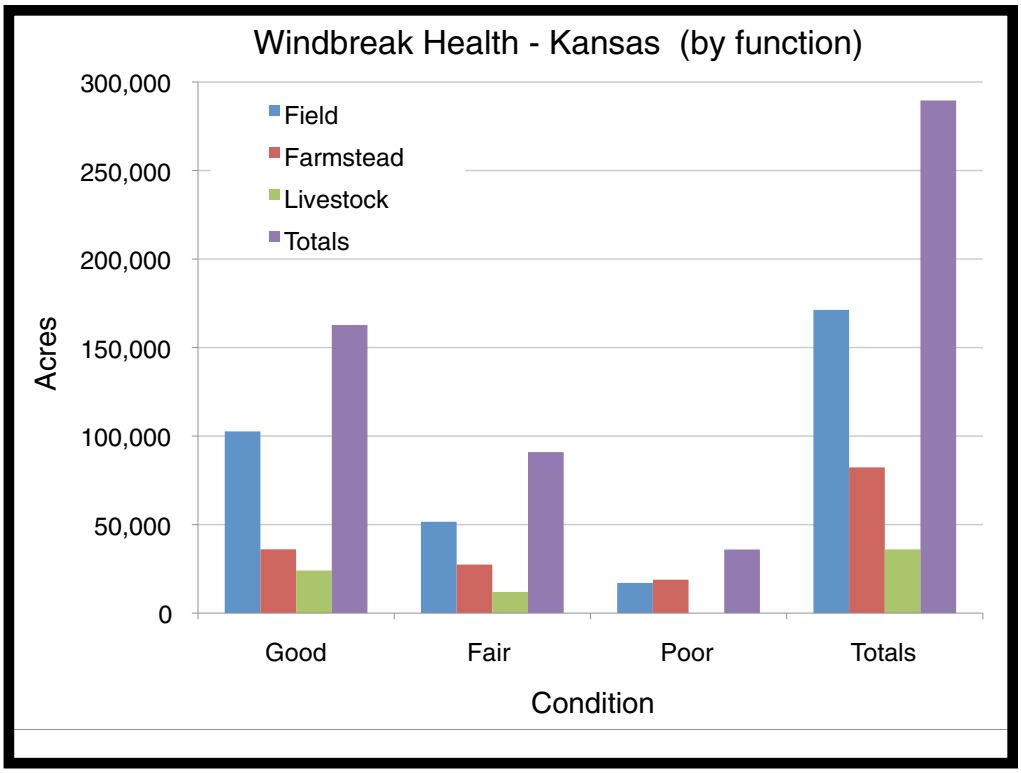


Figure 2.6. *Kansas windbreak health by function.*

2.2.2 Future Conditions

According to NRCS, 2.9 million acres (12 percent) of the 24.6 million acres of cultivated cropland is eroded by water and wind exceeding "tolerable limits" This erosion does not include the phenomenal amounts of soil erosion coming directly from streambanks. For example on the mainstem of a 210 mile stretch of the Cottonwood River and Neosho River an estimated 162,800 tons of sediment is transported annually into John Redmon Reservoir. Research clearly supports that riparian forests and windbreaks continue offer important and relevant public benefits to Kansans to address these issues.

Livestock and farmstead windbreaks are the most commonly planted windbreaks, but there is a need to promote the establishment and renovation of field windbreaks and the crop yield benefits. These benefits have been documented by James Brandle's research at the University of Nebraska.[4] The issue of woody encroachment into grasslands, the incredible expansion of eastern redcedar, and water quantity issues have caused an "anti-tree" mentality throughout the state that must be overcome with good policy, aggressive prescribed burning and educational programs. Without changes in current trends (almost half of Kansas windbreaks are in fair to poor condition), one could expect to see a continued decline in the quality and area of windbreaks and riparian forests as both compete with valuable agricultural croplands.

2.3 Urban and Community Forests

2.3.1 Current Conditions and Trends

Kansas urban communities cover an estimated 1,071,900 acres of land area according to the 2003 Natural Resource Inventory (NRI). A recent USDA Forest Service report[5] suggests about 943,127 acres of urban or community land area with 9.1 percent in canopy or tree cover (85,825 acres) well below the national average of 27 percent (Nowak and Greenfield, 2010). Impervious surface (developed hardscape) covers 22.6 percent and forested green space comprises about 11.6 percent of the urban or community area. There is an estimated 16.5 million trees in community or urban areas that provide valuable ecosystem services to Kansans storing 3.2 million metric tons of carbon valued at $73 million, annually removing 104,000 metric tons of carbon ($2.4 million), along with 2,690 metric tons of air pollution ($21.3 million).

On a local level, community forestry inventory data can identify specific environmental service benefits provided by trees when inputted into the i-Tree Streets program. For example, 9,412 street, park, and island trees in Prairie Village, Kansas sequester 9,003,611 pounds of carbon dioxide (net total) annually. These same trees reduce heating and cooling needs, which in turn lower carbon dioxide output from power plants by 3,588,869 pounds. Additionally, 25,451 pounds

4 *Additional information available at http://snr.unl.edu/aboutus/who/people/faculty-member.asp?pid=17#tab2*

5 *This report is available at: http://www.treesearch.fs.fed.us/pubs/34757*

of air pollutants (ozone, nitrogen oxide, particulate matter, and sulfur dioxide) are captured annually through leaf surface absorption. These trees offset the annual release of 22,814 pounds of the same pollutants from power plants and store 91,831,584 pounds of carbon dioxide.

Population and urban or community areas continue to expand with 71 percent to 81 percent of the 2.8 million living in these areas. The NRI found an increase of close to 170,000 acres since 1992 in urban communities and they are projected to increase by 3.2 percent by 2050. Average tree cover in urban or community areas statewide ranges from 8.7 percent to 9.1 percent respectively with 73 percent – 77 percent in total green space. Comparative tree canopy values based on percent cover and population density were rated for Kansas communities in the same ecoregions. This rating suggests that out of the 631 Kansas communities, nine have excellent canopy cover and 518 poor (Figure 2.7). This suggests tremendous tree planting opportunity with priority areas occurring in Johnson, Douglas, Shawnee, and Sedgwick counties based on low tree canopy coverage and population density (Figure 2.8). Detailed forest inventories of Kansas communities have been occurring since 1972, and until recently statewide data on size and condition of Kansas community forests has been lacking. Similar to other Great Plains states, Kansas community forests are dominated by mature to over-mature trees, which have been further degraded by repetitive storms. The number of defective and hazardous trees continues to increase. Diversity of community tree populations continues to be an issue with an overabundance of hackberry, elms, and maples.

2.3.2 Future Conditions

The 118 percent increase in urban community area over the last 18 years (9,444 acres annually) is emblematic of the current issues including Loss of Kansas Forestland, protection of green infrastructure, and smart growth. The Kansas City metro area alone is projected to grow by 350,000 people in the next 20 years consuming an estimated 400,000 acres of land. Without changes in current policy and development protocol, Kansas will do its share to contribute to the 1 million acres of forestland lost annually in the United States to development (Alig, 2006). The significant number of over-mature trees combined with the same species comprising more than 10 percent of any community forest would suggest significant forest health and hazard tree issues on the horizon.

2.4 Climate Change and Greenhouse Gas Emission Conditions and Trends

As indicated in Section 1.1.1 not enough good data exists to incorporate the affect climate change will have on the forest resources of Kansas. However, relevant information has been documented by the Center for Climate Strategies in the Draft Kansas Green House Gas Inventory and Reference Case Projection report.[6] The report estimates green house gas emissions and anthropogenic sinks (carbon storage) from 1990 – 2025 and suggests activities in Kansas accounted for 103 million metric tons of gross CO_2 emissions (consumption) in 2005. Green house gas emissions are increasing at a slower rate in Kansas than the national average (8 percent from 1990 – 2005 compared to 16 percent nationally). Gross green house gas emissions are projected to increase by 33 percent above 1990 levels by 2025 (126 million metric tons of CO_2 emissions). Electricity consumption is projected to be the largest contributor followed by transportation, industrial processes, residential and commercial.

Estimates of carbon sinks within Kansas' forests suggest that about 10 million metric tons of CO_2 emissions were stored in Kansas forests and agricultural biomass in 2005 leading to net emissions of 93 million metric tons of CO_2 emissions. Of particular interest in the report is Appendix H. Forestry and Land Use, which suggests that between 1990 and 2005 Kansas forests sequestered an estimated 6.07 million metric tons of CO_2 (Table 2.2).

Clearly Kansas forests have an important role to play in reducing the impact of increasing green house gas emissions.

Table 2.2. *USDA Forest Service Annual Forest Carbon Fluxes for Kansas. Totals may not sum exactly due to independent rounding. Data source: Smith, James, et al. US Forest Carbon Calculation Tool: Forest-Land Carbon Stocks and Net Annual Stock Change (http://www.nrs.fs.fed.us/pubs/2394), USFS, December 2007.*

Forest Pool	1981-1994 Flux ($MMtCO_2$)	1994-2005 Flux ($MMtCO_2$)
Forest Carbon Pools (non-soil)	-4.08	-6.05
Soil Organic Carbon	-3.00	-5.59
Harvested Wood Products	-0.02	-0.02
Totals	-7.09	-11.7
Totals (excluding soil carbon)	**-4.10**	**-6.07**

6 *The report is available at: http://www.ksclimatechange.us/ewebeditpro/items/O1F17410.pdf*

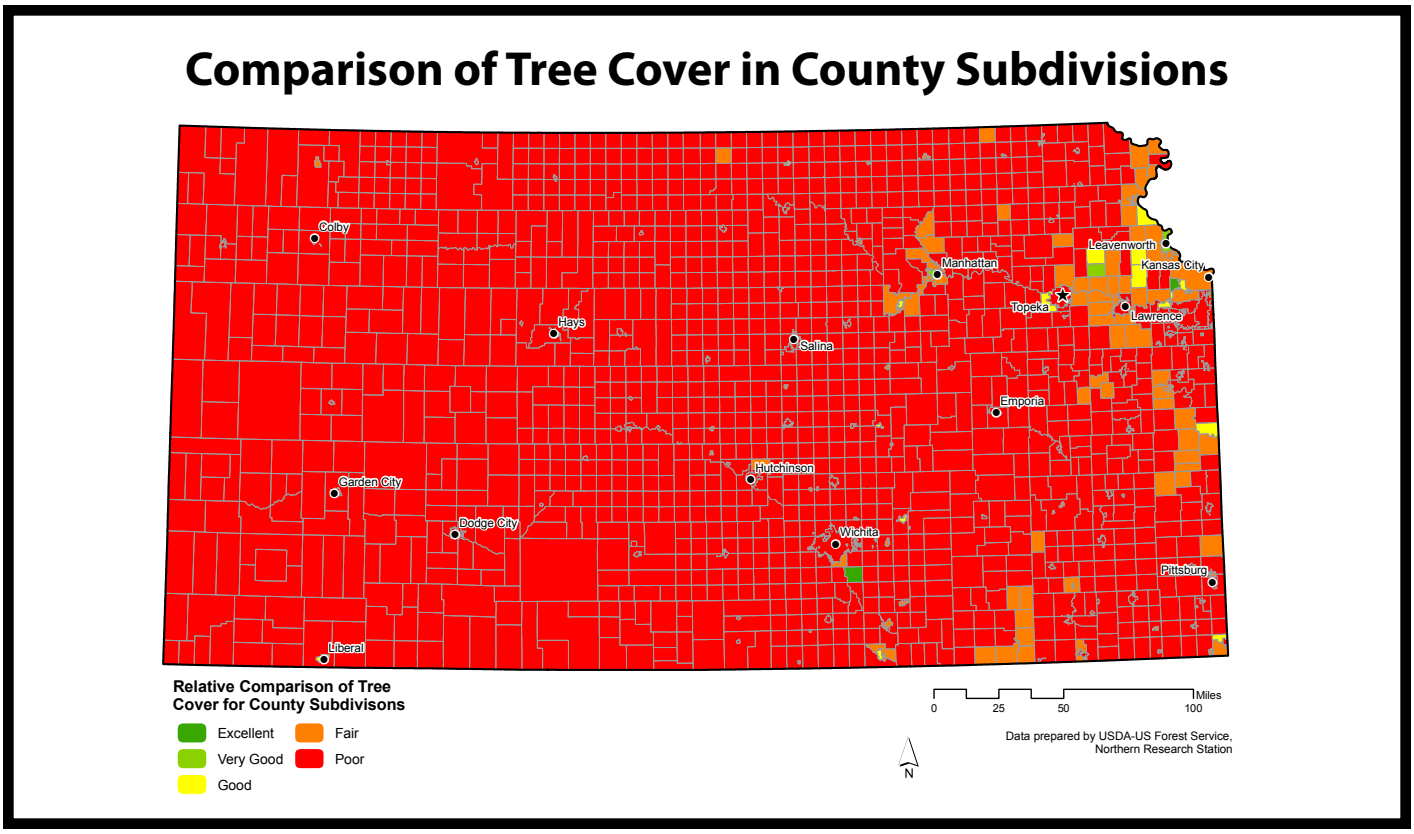


Figure 2.7. *Relative comparisons of tree cover for county subdivisions (Nowak and Greenfield, 2010).*

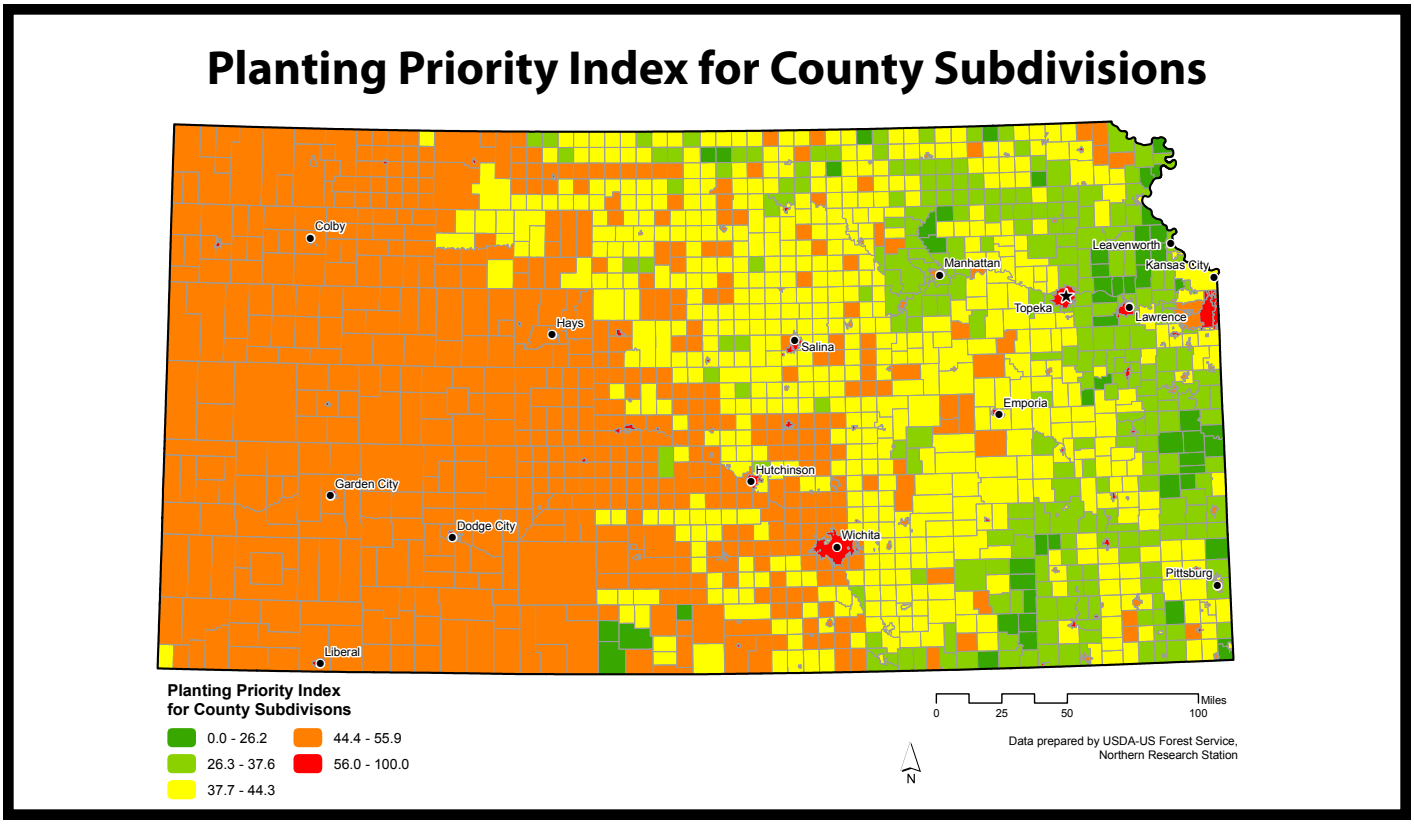


Figure 2.8. *Planting priority index for county subdivisions. The higher the index value, the greater priority for planting (Nowak and Greenfield, 2010).*

According to the Forest Stewardship Spatial Analysis Project, Kansas has close to 21 million non-forested acres that have high potential for tree planting, which can help ameliorate projected increases in green house gas emissions. An additional 17.4 million acres of forestland has high potential to benefit from sustainable forest management, which serves as a valuable sink for carbon.

Unlike Kansas, several states have active forest carbon offset trading programs. However, until the carbon market becomes regulated in the United States it will be difficult for Kansas forestland owners to enjoy much economic benefit from carbon trading due to the low market values and the smaller size of forestland holdings and tree plantings.

Unable to be included in this report is the projected impact of climate change on the top 10 most important tree species in Kansas. Working with Kansas Biological Survey and specifically the RL McGregor Herbarium, the location/occurrence of tree species is being developed into a GIS layer. Using "Niche" models created by A. Townsend Peterson, Distinguished Professor of Ecology and Evolutionary Biology, University of Kansas, the effect of climate change on the location and occurrence of species like cottonwood, eastern redcedar, and black walnut will be ascertained.

Community trees in Kansas sequester million of pounds of CO_2 each year.

ASSESSMENTS AND STRATEGIES

The *Kansas Forest Action Plan* helps focus and leverage limited financial resources to address priority issues that threaten or benefit the forest and agroforestry resources of Kansas. The specific economic and environmental benefits of these resources are described in detail throughout this chapter along with the issues that threaten them.

This chapter is organized by the major threats and benefits facing Kansas forest resources and seven priority issues categorized under them. Each section explains why each issue has been selected. This is followed by a description of GIS methods used to identify priority areas. Composite maps, which may include multiple layers, have been created for each of the seven issues. The three issues under threats and the four issues under benefits are used to create summary composite maps for threats and benefits. Strategies of how each issue will be addressed follow the GIS methodology. Each strategy identifies priority landscapes where the issue will be addressed; national objectives associated with the issue; applicable USDA Forest Service S&PF Programs; necessary resources; and performance measures to determine success.

The next section includes an assessment and strategy summary that describes how the threats and benefits composite maps are combined into a final map identifying priority areas. These priority areas have been further grouped into priority landscapes and named (Figure 3.16). Summary threats and benefits matrices for each issue have been included in Appendix D for quick reference.

The chapter ends with a map of seven multi-state areas of regional priority and a description of each area. This information will facilitate project collaboration across state boundaries.

GIS Methodology

Several environmental settings and procedural processes were applied throughout the data creation process and are described below. The data analysis input layers and composite layers described and depicted in the 'Forest Resource Threats,' 'Forest Resource Benefits and Services,' and 'Final Statewide Composite Methods' sections follow the general procedure used in the Kansas Forest Stewardship Program Spatial Analysis Project (Hutchinson et al. 2008), and observe the suggestions put forth in the *State Assessments & Resource Strategies: Final Guidance* (Appendix A). Data was processed to, and analysis was performed at, a 30 square meter resolution using ESRI ArcGIS ModelBuilder and several geoprocessing tools. ModelBuilder provides an environment in which several processes, incorporating numerous data layers, can be performed under the same specified constraints. For this analysis, the 'Extent,' 'Snap Raster,' and 'Cell Size' environments were set to the same values for each model used. The 'Extent' setting allows you to set the dimensions of process output data layers. The 'Snap Raster' parameter allows you to use a raster dataset as a base layer that all other raster data layers will be aligned with, so that when running analyses, cells from each raster layer will align. The 'Cell Size' environment setting allows you to define the cell resolution of output raster data layers. A Kansas State boundary raster dataset, which had been converted from a 2000 Census Bureau Tiger/Line shapefile, was set as the value for the 'Extent' and 'Snap Raster' parameters. The 'Cell Size' parameter was set to 30 meters; the analysis resolution.

Kansas forests provide many valuable ecosytsem services.

Raw data layers – or those initial datasets obtained to create the described analysis input data layers – were first projected to the North American Datum 1983, Universal Transverse Mercator Zone 14 North, projected coordinate system. In the process of projecting the data layers, data obtained at a coarser resolution than required for the analysis were resampled to the requisite 30-meter resolution.

All polygon data layers that were converted to raster data layers were processed using the 'Maximum Area' method of cell value assignment. Using this method allowed for raster layers to slightly over estimate the size of polygons, thus ensuring that data from the polygon layers would be translated to the raster layer.

3.1 Forest Resource Threats

3.1.1 Issues that Threaten Kansas Forest Health

Climate change and other contributing factors may be responsible for creating some of the greatest threats to forest health ever experienced by our nation and state. The most serious threats to Kansas forests include emerald ash borer; thousand cankers disease of black walnut; pine wilt; and exotic invasive plants like tamarisk[1], Russian olive, and Amur honeysuckle, which destroy the biodiversity of Kansas forests, woodlands, and riparian areas.

There are an estimated 26.2 million black walnut (35.3 million cubic feet) and 56.1 million green and white ash (60.8 million cubic feet) in Kansas rural and urban landscapes at risk. Most of these trees occur in the rural landscape (94 percent black walnut and 97 percent ash). However the 1.5 million ash trees that occur in Kansas towns and cities will pose a much greater cost to Kansans in removal, stump grinding and replacement. Emerald ash borer is currently found in Douglas, Jefferson, Johnson, Leavenworth, and Wyandotte counties. A recent estimate of economic loss over a 20-year period associated with the introduction of thousand cankers disease to Kansas suggests $160 million in 2010 dollars.[2] With thousand cankers disease existing as close as Eads, Colorado, Kansas is a potential "doorway" to the entry of thousand cankers disease into the native range of black walnut, which would have disastrous consequences for the rest of the nation both economically and environmentally. Doniphan, Bourbon, Franklin, Osage, Linn, Leavenworth and Pottawatomie counties contain the largest number of black walnut trees in Kansas.

Unlike thousand cankers disease and emerald ash borer, which are recent threats, pine wilt was first discovered in Cherokee County, Kansas in 1979 in and has moved west at approximately 10 miles per year, killing thousands of Scotch pines, and to a lesser extent Austrian. Pine wilt is now present in the eastern half of Kansas. The western boundary of the disease runs from Republic County (north central) to Ellsworth (central) to Harper County in south central Kansas.

There is an estimated 50,000 acres of Tamarisk infestation in Kansas with the majority of concentration along the mainstem and tributaries of the Arkansas and Cimarron Rivers in southwestern Kansas (Table 3.1). Surveys indicate that tamarisk dominates 65 percent of the riparian corridor (16,540 acres) along the Arkansas River from the western state line east to Hutchinson. Tamarisk and Russian olive are both phreatophytes that compete for scarce water supplies and reduce biological diversity.

1 *Tamarisk is also known as saltcedar.*

2 *This report is available at: http://www.colostate.edu/Depts/bspm/extension%20and%20outreach/TCD%20Pub.pdf*

Table 3.1. *Kansas Department of Agriculture helicopter survey results of estimated tamarisk infestation along the Arkansas River and Cimarron River corridor by county (survey includes portions of Chikaskia River, Crooked Creek, Medicine River, and Meridin River) (Kansas Water Office, 2005).*

County	Total Acres Tamarisk	Percent Tamarisk Infestation	County	Total Acres Tamarisk	Percent Tamarisk Infestation
Hamilton	5,606	75	Sumner	<1	0
Kearny	3,644	71	Cowley	<1	0
Finney	1,804	58	Barber	1,513	68
Gray	960	41	Comanche	3,550	84
Ford	1,798	41	Clark	9,389	95
Edwards	989	53	Meade	4,104	89
Pawnee	492	27	Seward	3,642	61
Barton	58	6	Stevens	553	25
Rice	628	29	Morton	5,732	67
Reno	1,376	34	Grant	300	24

GIS Methodology — Issues that Threaten Kansas Forest Health

The 'Issues that Threaten a Healthy Forest' composite layer was created using a 'Weighted Sum' analysis to combine six individual data layers derived from four separate datasets. The four base datasets, 1) Emerald Ash Borer Risk, 2) Forest Inventory and Analysis Pine, 3) Pine Wilt Presence Assessment, and 4) Tamarisk, were processed into EAB 'High,' EAB 'Moderate,' Pine Wilt 'Present,' Pine Wilt 'Transition,' Pine Wilt 'Absent,' and Tamarisk.

Emerald Ash Borer Risk

Emerald Ash Borer Risk data were obtained from the USDA APHIS Cooperative Emerald Ash Borer Project as raster dataset covering North Dakota, South Dakota, Nebraska, and Kansas. Risk of emerald ash borer introduction and establishment is defined as a geographic function of four characteristics: preferred host range, urban ash forests, proximity of urban ash forests to natural forests, and phloem insect interceptions at U.S. ports of entry (citation needed). The original 750 × 750 meter resolution dataset contained 11 risk values (0 (low) – 10 (high)); areas of highest risk were those dominated by ash stands or urban areas, with risk levels lowering in a concentric gradient away from urban areas. To create the emerald ash borer data layers used in production of the Issues that Threaten a Healthy Forest composite layer, the original values of '9' and '10' were reclassified as '1' to create a emerald ash borer 'High' data layer; all other areas were assigned '0.' Values '6,' '7,' and '8' were reclassified as '1' to create the emerald ash borer 'Moderate' data layer; all other original data values were classified as '0.'

Pine Wilt Status

Pine wilt status information was obtained from Kansas Department of Agriculture, Plant Pathologist, Jon Appel. "Since 1979, [pine wilt] has moved west at approximately 10 miles per year, killing thousands of pines, and is now present approximately half way across the state" (Kennelly et al. 2009). Three zones were identified with this work: a present zone, a transition zone, and a zone where the disease is absent, or isolated incidents have been eradicated. With this information, we created a state polygon layer of the three zones and subsequently converted the polygon layer to a raster layer, with a different cell value for each zone.

To further refine this data layer input, pine data from the U.S. Forest Service, Forestry Inventory and Analysis (FIA) program were obtained. The FIA data is a 250 × 250 meter resolution modeled raster of live net volume (cubic feet per acre) of pine based on 2006 plot data, with data values ranging from 0 to 70.18. Due to the limited amount of pine in Kansas, and to be conservative given the potential devastation of disease spread, all original data values greater than zero were kept. All original non-zero values were reclassified to a value of '1' and all original zero values remained a '0' value.

The emerald ash borer has been found as close to Kansas as Wayne County, Missouri. It has the potential to kill millions of Kansas ash trees.

To create the final pine wilt layer for analysis, we combined the pine wilt zone raster and FIA pine raster. From the resulting raster, three reclassifications were performed. Cells where FIA pine data overlapped with the pine wilt present zone were reclassified with a value of '1' and all other cells were assigned a '0'; this became the Pine Wilt 'Present' analysis layer. Cells in which FIA pine data overlapped with the pine wilt transition zone were reclassified with a value of '1' and all other cells were assigned a '0'; this became the Pine Wilt 'Transition' analysis layer. Finally, cells in which FIA pine data overlapped with the pine wilt absent zone we reclassified with a value of '1,' and all other cells were assigned a '0; this became the Pine Wilt 'Absent' analysis layer.

Tamarisk

Tamarisk data were obtained from the Kansas Water Office. These data were collected between 2004 and 2008, in 28 western Kansas counties, using helicopter and land-based surveys. To create an analysis layer from the original data, a 'Union' was performed on the 11 survey polygon layers in order to generate a single polygon layer and create a single attribute field of coverage percent. This new single polygon layer was then converted to a raster layer. Due to the ability of tamarisk to out compete native species, the Tamarisk analysis layer incorporates all original percent coverage values greater than zero. These areas were then subsequently reclassified with a value of '1,' while all zero values received a value of '0.'

Table 3.2. *Kansas Forest Service Staff Average Ranking of Forest Issues/Data Layers*

	Analysis Weight (Average Score)
Threats	
Wildfire Risk	
Custom WUI	0.85
Eastern redcedar in Grassland	0.75
Fire Potential High	0.80
Fire Potential Mod	0.53
FSA CRP Parcels	0.60
ISO Fire Station Coverage Gaps	0.75
Issues that Threaten Forest Health Forest	
EAB High	0.77
EAB Mod	0.61
Pine Wilt Absent	0.59
Pine Wilt Present	0.70
Pine Wilt Transition	0.70
Tamarisk	0.70
Loss of Kansas Forestland	
Development High	0.82
Development Mod	0.61
Forest Fragmentation	0.59
Urban and Community Forest Index	0.65
Benefits	
Sustaining Water Quality and Quantity	
High Priority TMDL Riparian	0.80
High Stewardship Potential Reservoirs With	0.84
High Stewardship Potential Reservoirs Without	0.80
WRAPS Top 20 Riparian	0.78
Protecting and Restoring Forest Biodiversity and Wildlife Habitat	
40-acre Forest Patches	0.77
LANDFIRE Departure	0.57
LANDFIRE Return Interval	0.66
Rare Species	0.73
Sustaining and Protecting Forest and Agroforestry Ecosystems	
Agroforestry Potential	0.61
Forest Adjacent to Protected and Managed Areas	0.57
Forest Stewardship Program Properties	0.66
Natural Forest Communities	0.73
Non-Stewardship Program High Potential Private Forest	0.80
Tree and Shrub Suitability	0.89
Urban Woodland	0.73
Maintaining and Protecting the Economic Benefits of Woodlands	
Biomass	0.68
Black Walnut	0.82
Mill Haul Areas 2	0.52
Mill Haul Areas 3	0.55
Mill Haul Areas No	0.55

Issues that Threaten Kansas Forest Health — Composite Map

After developing the six individual analysis data layers described above, a 'Weighted Sum' analysis was performed, in which each '0,' '1' analysis raster is assigned a weight (Table 3.2) based on an average of data value returns from 11 Kansas Forest Service staff. The resulting raster contains values ranging from 0 to 2.17 (Figure 3.1). These values were later combined with similarly produced values from the 'Wildfire Risk' (Section 3.1.2) and 'Loss of Kansas Forestland' (Section 3.1.3) threats to produce a composite 'Forest Threats' layer (Figure 3.5).

Strategy for Issues that Threaten Kansas Forest Health

Issues that threaten Kansas forest health support the national objective of "identifying, managing, and reducing threats to forest and ecosystem health." Forest Health Management, Forest Stewardship Program and the Urban and Community Forestry Program are all USDA Forest Service State and Private Forestry Programs that can address these issues. To deal with thousand cankers disease, a state quarantine will be established to regulate the movement of black walnut into the state along with systematic monitoring and trapping to ensure early detection. A community tree assessment protocol will inventory pine, walnut, and ash in Kansas communities. Data from the inventory of pine, ash, and walnut will be used to estimate removal and replacement costs if these insects and diseases enter Kansas. A pest detectors program will be established to assist with monitoring and trapping protocol. An

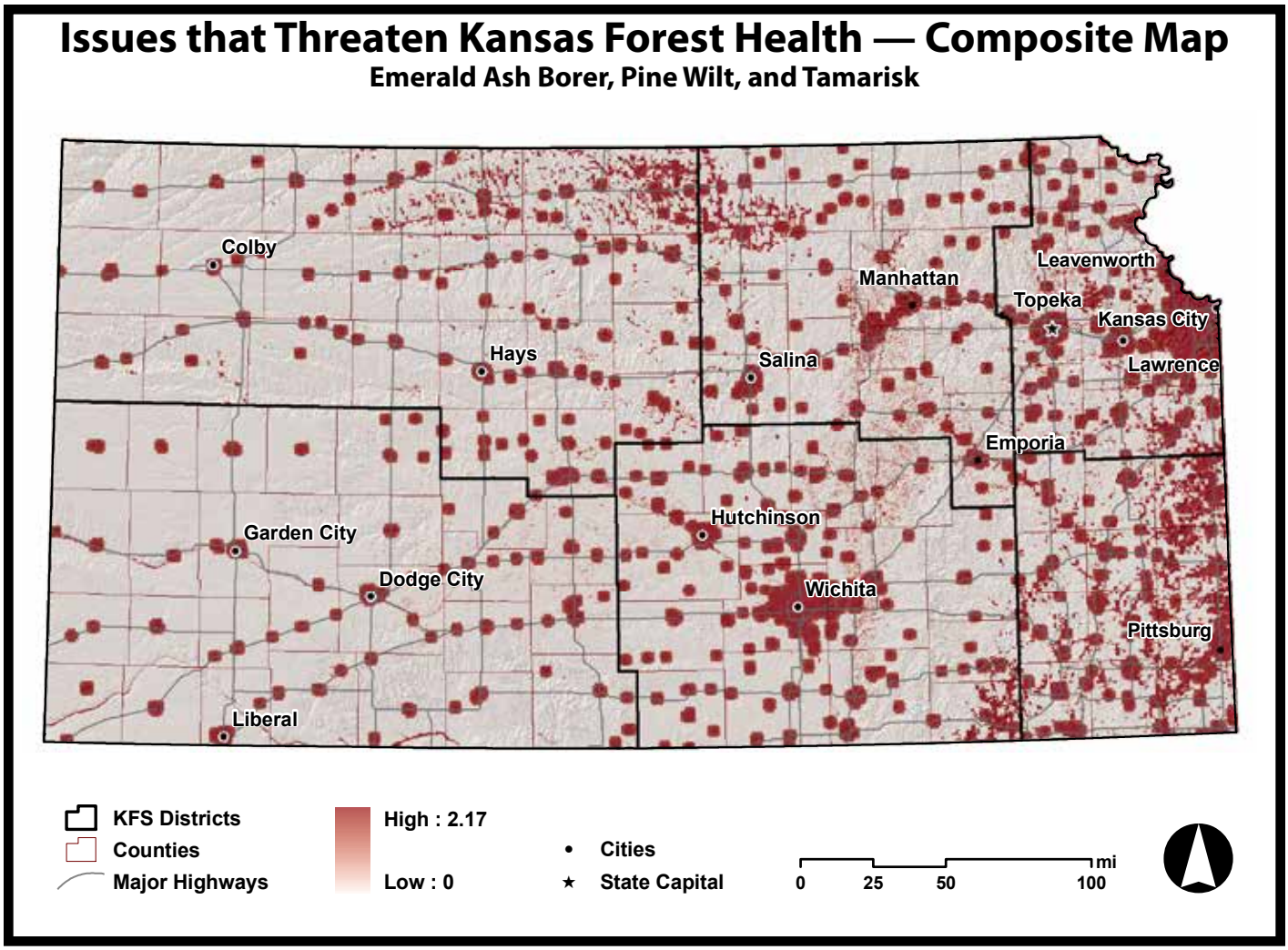


Figure 3.1. *The result of a weighted sum analysis on all cells combining the assigned weights (from Table 3.2) for the following datasets: Emerald Ash Borer risk (high and moderate), Pine Wilt status (absent, present, and transition), and tamarisk.*

educational program for the public will be continued. Natural resource professionals will receive annual training in Colorado where the disease may be observed first-hand. The Kansas Readiness Response Plan for Emerald Ash Borer will serve as a guide should thousand cankers disease be discovered in state. Registration of forest industry, firewood distributors and other appropriate groups that handle raw wood products will occur and come under compliance agreements as stated in the quarantine. Annual trapping and monitoring for emerald ash borer will continue along with public education and awareness campaigns. The Readiness Response Plan will be updated as needed and a community response plan developed. Inventories of both ash and walnut tree populations in communities will occur and economic loss estimates will be provided. The focus the Pine Wilt Initiative[3] will be to limit, delay and mitigate the movement of the disease in the western half of the state by surveillance, outreach, communication, direct intervention and best management practices. The *10 Year Strategic Plan for the Comprehensive Control of Tamarisk and Other Non-native Phreatophytes*,[4] such as Russian Olive, will guide the strategies of this plan.

Southwestern Kansas will be the focus of tamarisk control along the mainstem and tributaries of the Arkansas River and Cimarron River and specifically in the Cimarron Breaks Priority Landscape. A multistate priority area on control of tamarisk and other invasives is shared with Nebraska and includes the Republican River basin. Additional inventory is needed to identify target areas for Russian olive control, though Stafford and Rice counties are obvious locations. Management will include inventory/mapping, control, regeneration, monitoring, and maintenance. EQIP for Forestland Health will provide financial assistance to control bush honeysuckle in eastern Kansas. An Exotic Invasive Species Committee for plants should be appointed by the Governor's

3 *Details of the initiative may accessed at: http://www.ksda.gov/plant_protection/content/184/cid/1276.*

4 *The report is available at: http://www.kwo.org/Reports%20%26%20Publications/Reports%20and%20Publications.htm#Stream%20Riparian*

Natural Resource Subcabinet to develop policy and guidelines to address invasive plant issues.

Resources Required and Performance Measures for Issues that Threaten Kansas Forest Health

Kansas Department of Agriculture's Plant Protection and Weed Control is a crucial partner for monitoring, trapping, quarantine development, and education. The Kansas Water Office provides important leadership by leading the 10-year strategic plan for tamarisk and Russian olive control. K-State Research and Extension pathologists and entomologists will provide diagnostics and education. Additional inventories are needed to better geographically identify species at risk and those targeted for control and eradication. Performance measures will include the number and percent of forest acres restored and or protected from invasive and native insects and diseases annually. Case studies and success stories will be developed.

3.1.2 Issues that Create Wildfire Risk

With the exception of eastern redcedar/hardwood, most forest types in Kansas do not pose significant fire management issues for the state. However, grasslands are a different story. Range and pasture lands make up more than 18 million acres or about 35 percent of the land area in Kansas with about 14 percent of that area comprising Conservation Reserve Program lands. These areas and wildland-urban interface areas where development has occurred are the focus of wildland fire management issues in Kansas. Trends include larger fires, a shift in fuel characteristics with the expansion of eastern redcedar into grasslands, multi-operational period fires, and consolidation of fire departments. Lack of fire occurrence in Kansas prairies is largely responsible for the 23,000 percent increase in eastern redcedar volume and other woody invasives over the last 45 years, which is indirectly responsible for population declines of "species of greatest conservation need" as identified in the Kansas State Wildlife Action Plan. Conversely, the annual landscape scale burning common in the Kansas Flint Hills has raised EPA air-quality concerns in some Kansas metropolitan areas. An estimated 1.5 to 2 million acres of Flint Hills prairie are burned annually. In some years, the ecological, cultural, and/or weather conditions limit the opportunity to conduct these burns to only a few days. The emissions resulting from such temporally concentrated large scale burning is a challenge that is being addressed by working on an EPA-mandated Smoke Management Plan for Kansas. Current lack of local level, (i.e. fire district or county), requirements and a past lack of enforcement of state statutes has led to a lack of fire occurrence data for both prescribed and wildfire being available in Kansas. Changes in enforcement of wildfire reporting requirements at the state level, as well as prescribed fire reporting requirements that are likely to be a part of the Smoke Management Plan, will give the Kansas Forest Service a much greater opportunity to begin using real-time fire occurrence data to assist in making the best fire management decisions. An estimated 40 percent of Kansans are protected by volunteer rural firefighters. A critical issue facing all Kansas citizens is the disturbing statistic that for the first five months of 2010, Kansas has the highest percentage of Line of Duty Fire Fighter fatalities in the country.[5] The National Incident Management System (NIMS) is the operational system used in Kansas for wildland fire suppression. Changes in fuel characteristics and continued development and fragmentation of rural areas suggests increased hazards and expense associated with wildland fire suppression. With the expansion of eastern redcedar into grasslands (Figure 3.2) there is a need for additional training on new suppression techniques and tremendous potential and need to promote prescribed fire throughout the state. There is a need to create a system that tracks endemic areas of fire origin from a historical prospective and geographically identify large fires. Such information would foster strategic placement of suppression resources.

GIS Methodology — Issues that Create Wildfire Risk

The 'Wildfire Risk' composite layer was developed using a 'Weighted Sum' analysis to combine six data layers produced from a combination of eight separate datasets. In close consultation with the Kansas Forest Service's Fire Management Coordinator, and other Fire Management staff six data inputs were developed to represent Wildfire Risk in Kansas: 1) Wildland Urban Interface; 2) ISO Fire Station Coverage Gaps; 3) Conservation Reserve Program Lands; 4) Eastern Redcedar in Grasslands; 5) 'Moderate' Fire Potential risk and; 6) 'High' Fire Potential risk.

Wildland-Urban Interface (WUI)

For this analysis a custom wildland-urban interface data layer was created from three datasets: 1) Kansas wildland-urban interface (WUI) data obtained from the SILVIS Lab in the Department of Forest and Wildlife Ecology at the University of Wisconsin – Madison; 2) Kansas Forest Service Community Wildfire Hazard Assessment completed assessments; 3) and exurban areas across Kansas.

The SILVIS Lab WUI assessment defined wildland-urban interface as "the area where houses meet wildland vegetation (interface WUI) or where houses and vegetation are mixed together (intermix WUI)."[6] This study was conducted for the conterminous United States at the 2000 Census block level. For this layer we selected the high and medium density interface, and intermix, SILVIS Lab study classifications.

5 *Current information available at: www.usfa.dhs.gov/downloads/pdf/10_fatality_summary.pdf*

6 *Definitions are available at: http://silvis.forest.wisc.edu/library/WUIDefinitions2.asp*

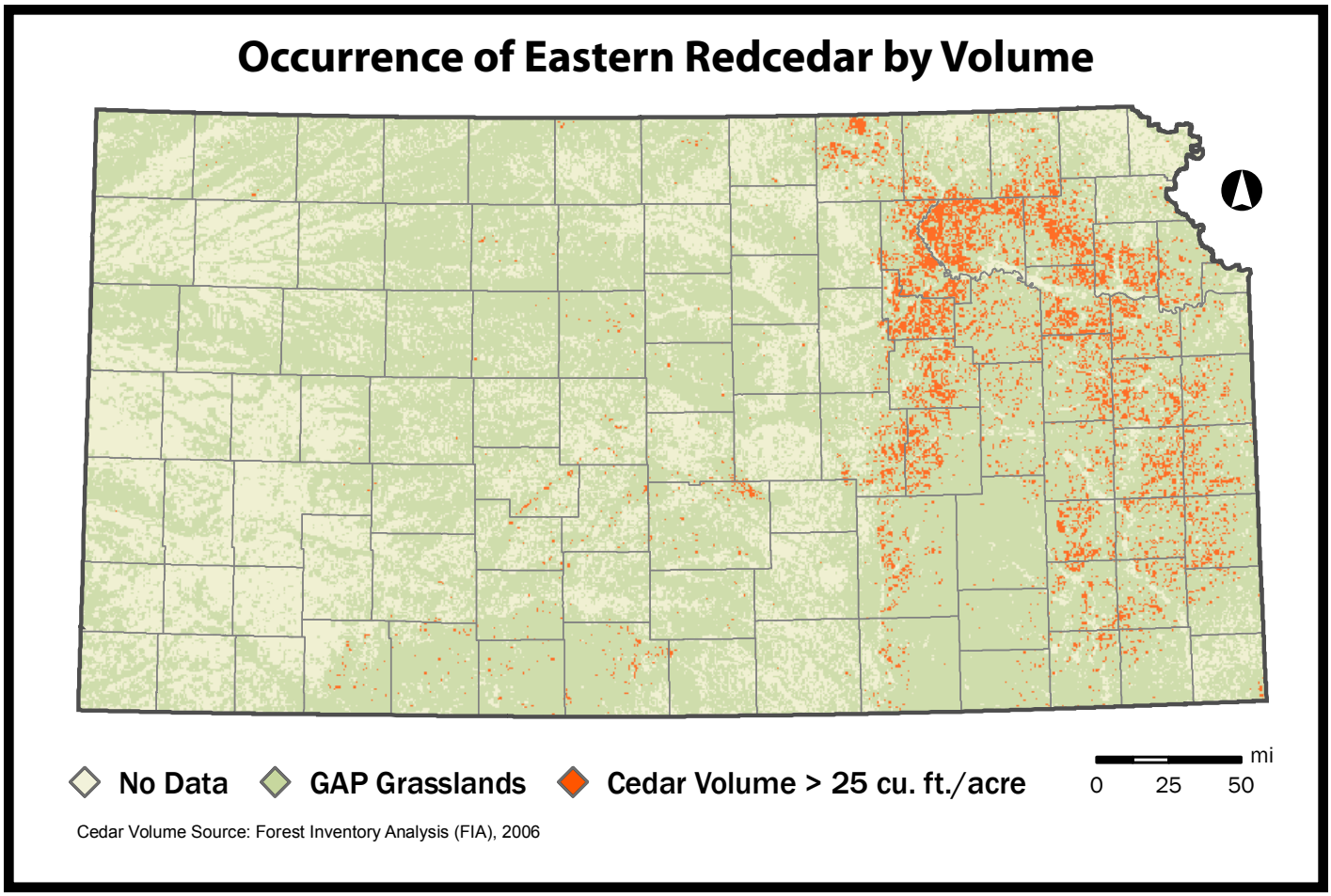


Figure 3.2. *Occurrence of Eastern Redcedar in Kansas by volume (cubic feet per acre).*

The Community Wildfire Hazard Assessment (CWHA) is used by the Kansas Forest Service Fire Management Program, in cooperation with local entities, to identify areas where threatening fuel types and/or fuel loads are in close proximity to structures. A 2000 Incorporated Places shapefile has been used by the Kansas Forest Service to document the spatial extent of completed CWHAs, and to identify the hazard condition (low, moderate, moderate/high, high, and not surveyed) in an additional attribute field. For the creation of this custom wildland-urban interface layer, we selected areas with a hazard classification of either moderate/high, or high.

To address exurban areas, incorporated areas, as defined by the Census Bureau in 2000, were buffered based on three categories of population size (2,500 to 10,000, 10,000 to 50,000, and 50,000+) at a distance of 1, 2, and 3 miles, respectively.

For the final wildland-urban interface analysis layer, the three vector data layers described above were joined using a 'Union' and converted to a raster. Any cells characterized by any of the data sets were assigned a value of '1' and all other cells were assigned a value of '0.'

Insurance Services Office Fire Station Coverage Gaps

The Insurance Services Office (ISO) requires that a rural home be served by a fire station within 5 road-miles of that home. In order to quickly and efficiently approximate this requirement, point location data of 998 fire stations throughout the Kansas, created by the Adjutant General's Office and obtained from the Kansas Data Access and Support Center (DASC), were buffered with a 4-mile radius. The buffered layer was then converted to a raster in which cells outside of the buffered polygons were identified as coverage gaps and assigned a value of '1,' while cells inside of the buffered polygons were assigned a value of '0.'

Conservation Reserve Program Lands

CRP land was identified by the Fire Management Program staff as critical land for wildfire fuel. CRP parcel data, current as of January 2009, were obtained from the Farm Service Agency. We converted the CRP polygon layer to a raster layer, with CRP parcels receiving a value of '1,' and all non-CRP land receiving a value of '0.'

Eastern Redcedar in Grassland

Eastern redcedar, a species that has been encroaching into grasslands and interface areas throughout Kansas, was identified as a fire threat by Fire Management Program staff.

Modeled live volume (cubic feet per acre) Eastern redcedar data, based on 2006 FIA plots, were obtained from FIA at a 250 × 250 meter cell resolution. Based on data presented in the 2005 Kansas Forests publication, the original data were reclassified to select those areas representing a live volume of 25 cubic feet per acre or greater. Areas selected by the process were assigned a value of '1,' while all other areas were assigned a values of '0.'

The Kansas Applied Remote Sensing (KARS) Program 2005 Kansas Landcover Dataset is the most recent available landcover dataset for Kansas and is used in land cover based layer creation throughout this Statewide Assessment. The data were obtained from Kansas Geological Survey Data Access and Support Center as an 11-class, 30 × 30 meter raster dataset. Grasslands (cover type code 30) and CRP Lands (cover type code 31) were selected from the Level I and Level II classes (Table 3.3) and reclassified to a value of '1,' while all other classes were reclassified with a value of '0.'

Finally, these two raster data layers (Eastern Redcedar and Grasslands) were summed. Areas resulting in a raster value of '2' were reclassified to a value of '1,' while all other cells were assigned a value of '0.'

Wildland Fire Potential (Two Input Layers)

Wildland Fire Potential is one of seven layers that were created for the U.S. Forest Service National Assessment. It was provided as a dataset for Statewide Assessments through the FSGeodata Clearinghouse. Wildland Fire Potential was characterized at a one kilometer square cell size from 'Very Low Fire Potential' to 'Very High Fire Potential' based on fire intensity, frequency, weather, and size. The State of Kansas contained no 'very high' cells. Therefore, two analysis layers were created: 'high' and 'moderate.' To create the 'High Wildland Fire Potential' data layer cells containing original data values of 'High' were reclassified to a value of '1,' while all other original values were reclassified to '0.' Similarly, cells containing original values of 'Moderate' were reclassified to a value of '1,' while all other original values were reclassified to '0' in order to create the 'Moderate Wildland Fire Potential' layer.

Issues that Create Wildfire Risk — Composite Map

The six data layer inputs described above were combined using a 'Weighted Sum' analysis, using, again, the weights (Table 3.2) based on average weights assigned by 11 Kansas Forest Service staff. The resulting raster contains values ranging from 0 to 3.48 (Figure 3.3). These values were later combined with similarly produced values from the 'Issues that Threaten a Healthy Forest' (Section 3.1.1) and 'Loss of Kansas Forestland' (Section 3.1.3) threats to produce a 'Forest Threats' composite layer and map (Figure 3.5).

Strategy for Issues that Create Wildfire Risk

Issues that create wildfire risk support the national objective of "Restoring fire-adapted lands and reducing wildfire impacts." Cooperative Fire Program is the main USDA Forest Service State and Private Forestry program that supports this objective. The Flint Hills Priority Landscape will be the focus of this strategy. Areas where fire exclusion has lead to an increase in eastern redcedar and other woody species will be identified and assessed geospatially. Local Community Wildfire Protection Plans (CWPP)[7] and Master Fire Plans will further target priority areas to restore native prairie and mitigate wildfire impacts. New curriculum will be developed and presented on fire fighting techniques in eastern redcedar forest types and woodlands with a focus in the Flint Hills priority landscape. A major focus of the Kansas wildfire risk strategy will be empowering stakeholders in the use of prescribed fire for prairie management and wildfire prevention in priority areas identified by Community Wildfire Protection Plans. The Kansas Forest Service will provide training and information on management of cedar and other invasives via prescribed fire and other suitable means at every opportunity. FireWise and similar fire prevention programs will be implemented in wildland-urban interface priority areas as defined by Community Wildfire Protection Plans. Strategy must include exploring incentives with rural fire departments and the Kansas State Fire Marshall to improve quality, timeliness and availability of fire occurrence data for planning purposes. A weather station network will be developed and expanded to integrate weather and historic fire occurrence data to identify fire trends, danger, and forecasts.

Table 3.3. *KARS 2005 Kansas land cover dataset level 1 and 2 classes (Nowak and Greenfield, 2010).*

Level I and II Class Codes and Names
10. Urban
11. Urban Commercial/Industrial
12. Urban Residential
13. Urban Openland (Golf courses, cemeteries, parks)
14. Urban Woodland
15. Urban Water
20. Cropland
30. Grassland (Includes rangeland and pasture)
31. Conservation Reserve Program (CRP)
40. Woodland
50. Water
60. Other (Sandbars, quarries, segments of major highways)

7 *A detailed map of County Community Wildfire Protection Plans is available in Appendix G. An example of a Kansas plan is available at:* http://www.renogov.org/emergency/index.php?option=com_content&view=article&id=89&Itemid=149

Resources Required and Performance Measures for Issues that Create Wildfire Risk

Fire departments, RC&D's, emergency managers, landowners, conservation districts, Kansas State Firefighters Association, public land management agencies, rural/suburban development and/or residential improvement district homeowners associations are all important partners to work with to accomplish the strategy. Additionally assistance from county governments, RC&D's, local emergency planning committees and emergency managers, and contractors developing hazard mitigation plans, rural/suburban development and/or residential improvement district homeowners associations can help deal with the wildland urban interface issues. The State Fire Marshall, National Weather Service, and K-State/State Climatologist can help establish a baseline and system to collect data on fire occurrence, weather and fuel conditions. Performance measures may include: 1) increasing the number of acres treated to restore fire-adapted ecosystems and maintaining those acres in desired conditions; 2) total acres treated to reduce hazardous fuels on state and private lands through the State Fire Assistance Program; 3) percent of at-risk communities that increase suppression capacity by increasing the number of trained/certified fire fighters; and 4) upgrading fire-suppression equipment or formation of a new department or expansion of existing ones.

3.1.3 Loss of Kansas Forestland

Each year an estimated 1 million acres of forestland is lost to development nationally.[8] Since 1992 urban areas in Kansas have expanded by 170,000 acres permanently converting significant areas of forestland to other uses. Conversion of forestland to development will continue with an estimated increase of our national population by 120 million in the next 50 years. The Kansas City metro area alone is projected

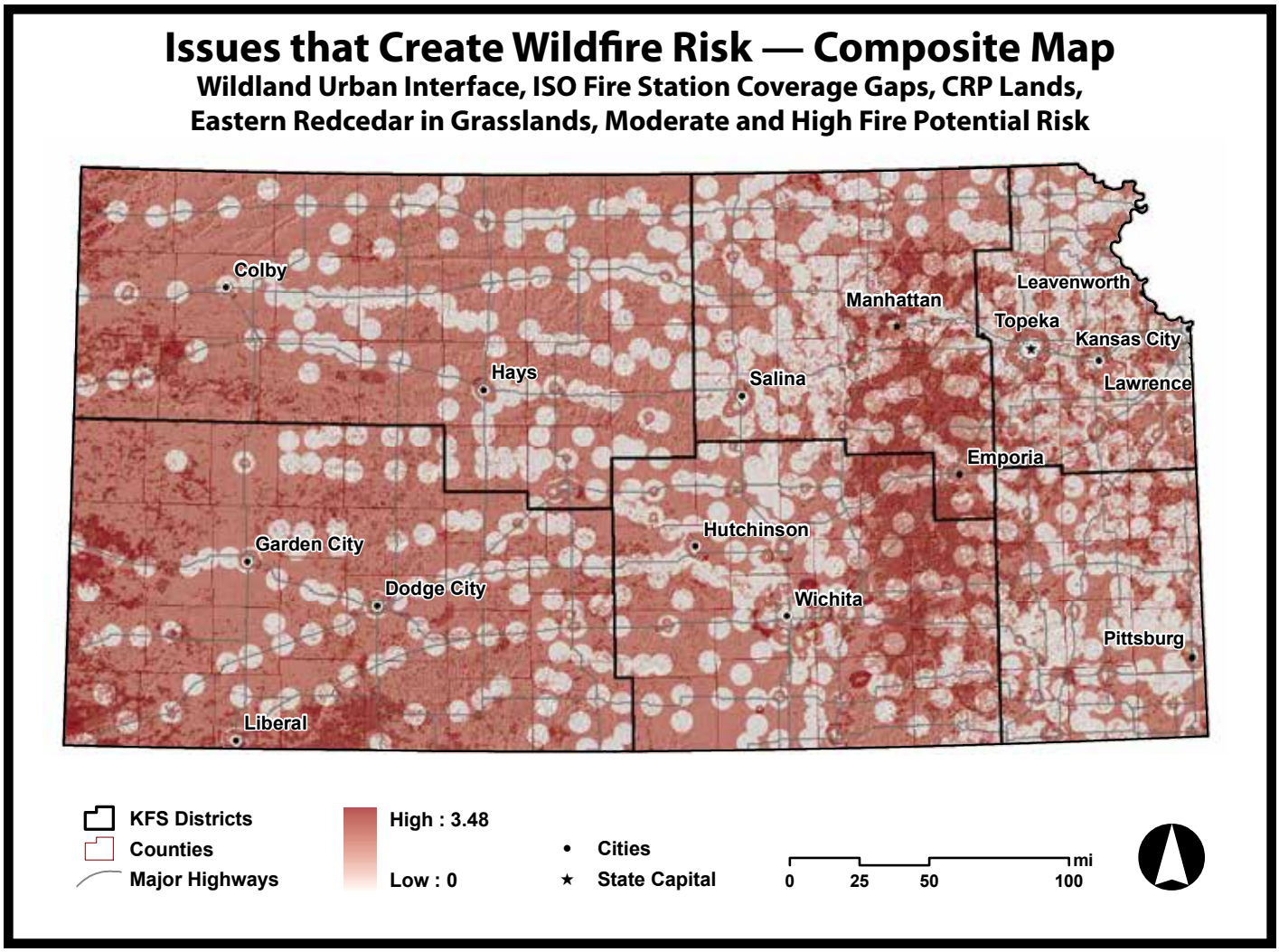


Figure 3.3. *The result of a weighted sum analysis on all cells combining the assigned weights (from Table 3.2) for the following six datasets: Wildland-Urban Interface, ISO Fire Coverage Gaps, Conservation Reserve Program Lands, Eastern Redcedar in Grasslands, And USFS Wildland Fire Potential (high and moderate).*

8 *A newsletter with more information on this topic is available at: http://www.fs.fed.us/pnw/sciencef/scifi88.pdf*

to increase by 350,000 people in the next 20 years converting an estimated 400,000 acres of land to urban use. Of that 400,000 acres, 22 percent is described as having "good to high ecological value." Of the ecologically good to high rated land, 18 percent is forests and woodlands.

Riparian forests are generally located in areas where the most valuable agricultural crops are grown and often where prime urban development opportunities exist. Although no good trend data exists experience suggests that significant areas of riparian forest are converted to cropland and urban development each year adversely impacting water quality, aquatic and terrestrial species, and other benefits riparian forests provide.

There currently is a need for effective programs in Kansas that provide long-term protection of riparian forests. It is hoped that the Forest Legacy Program can address this need.

GIS Methodology — Loss of Kansas Forestland

The 'Loss of Kansas Forestland' composite layer was developed using a 'Weighted Sum' analysis to combine four data layers produced from a combination of five datasets. Urban forestry, development, and fragmentation issues are addressed through four data layers: 1) Urban and Community Forestry Index; 2) Forest Fragmentation; 3) 'Moderate' Development Risk and; 4) High Development Risk.

Urban and Community Forestry Index

The Urban and Community Forestry Index[9] (UCF-i) is designed to identify areas where urban tree planting should be targeted as a function of inverse tree canopy percentage, impervious surface percentage, and population density. We used National Land Cover Dataset Canopy Cover and Impervious Surface datasets, as well as 2007 census block group population density data from a ESRI Block Group data layer. Upon running the model, an index is derived (0 to 100) based upon the three data inputs. Resulting values for Kansas ranged from 0 to 93. Cells containing values from the upper class of a seven class quantile classification (values 35 to 93) were selected for the final analysis and converted to '1,' while all other cell values (0 to 35) were assigned a value of '0.'

Forest Fragmentation

Forest Fragmentation is one of seven layers that were created for the U.S. Forest Service National Assessment. It was provided as a dataset for statewide assessments through the FSGeodata Clearinghouse. This dataset was extracted from a global assessment of forest fragmentation that examined types of fragmentation, but not causes (natural vs. human-induced). One kilometer square cells are classified into one of eight classes: water, edge, undetermined, perforated, interior, patch, transitional, and unlabeled land area. For this analysis layer, all fragmentation classification types (six in all) were utilized. Cells containing edge, undetermined, perforated, interior, patch, and transitional fragmentation classes were reclassified to a value of '1,' while all other cells were assigned a value of '0.'

Development Risk (Two Input layers)

Development Risk is one of seven layers that were created for the U.S. Forest Service National Assessment. It was provided as a dataset for statewide assessments through the FSGeodata Clearinghouse. This dataset is intended to emphasize areas that are projected to experience increased housing development through 2030. One kilometer square cells are classified from 'no risk' through to 'very high risk' of development. No areas of very high development risk are present in Kansas. For the final analysis, two development risk layers were created: 'High' and 'Moderate.' For the 'High' development risk category, cells from the original data set containing a value of 'high' were reclassified to a value of '1,' while all other cells were assigned a value of '0.' Similarly, the 'Moderate' development risk category was created by reclassifying those original data set cells containing a 'moderate' value to a value of '1,' while all other cells were assigned a value of '0.'

Loss of Kansas Forestland — Composite Map

The four analysis data layers described above were combined in a 'Weighted Sum' analysis, using, again, the weights (Table 3.2) based on average data weight value returns from 11 Kansas Forest Service staff. The resulting raster contains values ranging from 0 to 2.06 (Figure 3.4). These values were later combined with similarly produced values from the 'Issues that Threaten a Healthy Forest' (Section 3.1.1) and 'Wildfire Risk' (Section 3.1.2) threats to produce a 'Forest Threats' composite layer (Figure 3.5).

Strategy for Loss of Kansas Forestland

Loss of Kansas forestland supports the national objective of "Identifying and conserving high priority forest ecosystems and landscapes." USDA Forest Service State and Private Forestry programs that address this issue include Forest Legacy Program, Forest Stewardship Program, and the Urban and Community Forestry Program. The I-70 metro corridor is Priority Landscape where this strategy will be focused followed by the Wooded Plains and Greater Wichita. The Loess and Glacial Hills, Flint Hills and I-70 metro corridor are the Priority Landscape areas for this issue. Forest inventory will be conducted to identify areas in need of protection and ecosystem service values will be assigned to forestland as a catalyst for protection policy development. The i-Tree Eco and i-Tree Hydro models will predict values. Grow Out and Paint The Town models will be employed to predict future trends.

9 *More information on the Urban and Community Forestry Index (UCF-i) can be found on page 10 of the document at: http://www.northeasternforests.org/FRPC/files/1238445508Geospatial%20Resource%20Guide%20for%20Urban%20Component%20of%20State%20Assessments.pdf*

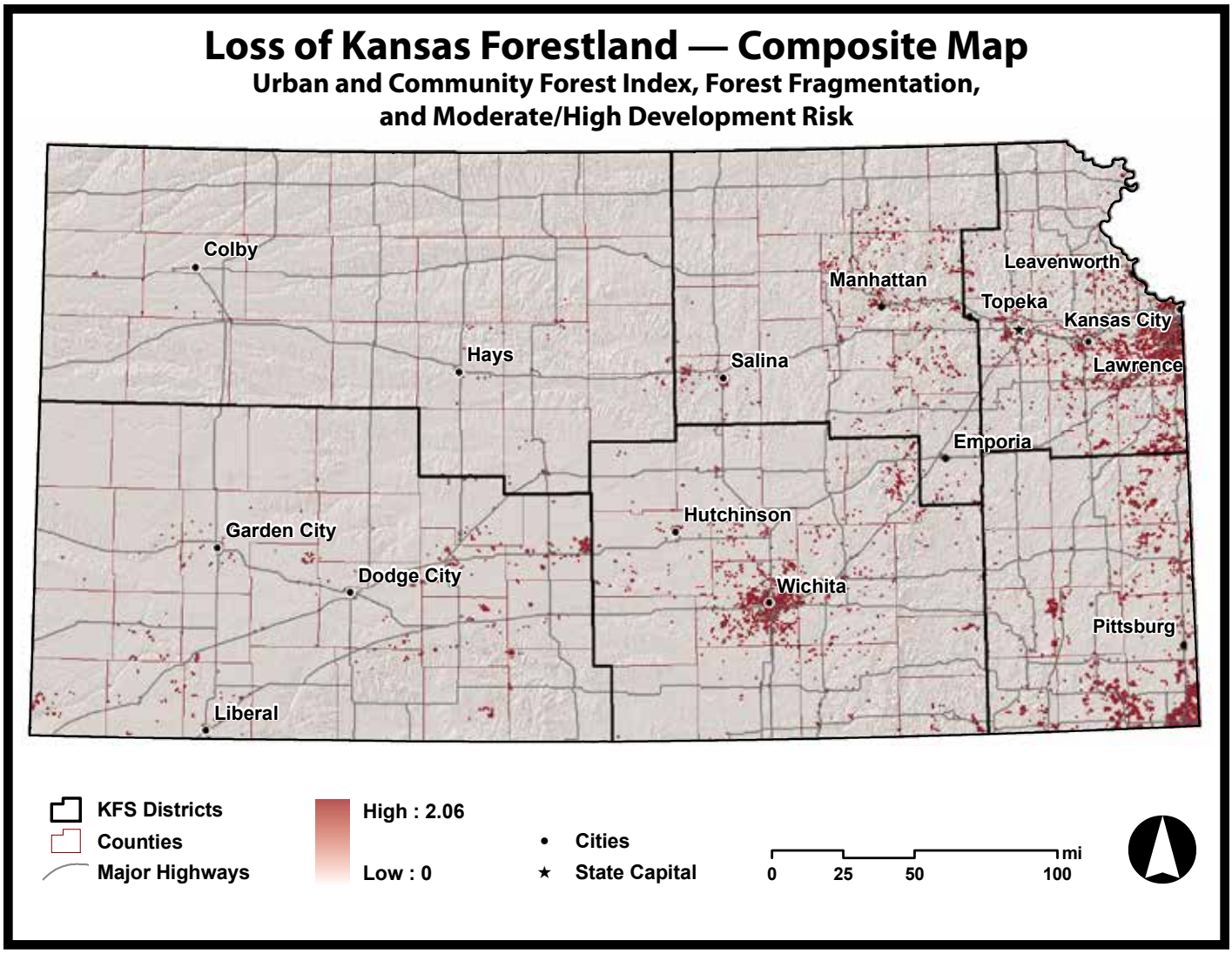


Figure 3.4. *The result of a weighted sum analysis on all cells combining the assigned weights (from Table 3.2) for the following datasets: Urban and Community Forestry Index, Forest Fragmentation, and Development Risk (high and moderate).*

The Natural Resource Inventory[10] developed by the Mid-America Regional Council (MARC) will be used to target forests with high ecological values in the KC Metro area for protection. Tree preservation ordinances and green infrastructure conservation strategies will be integrated into municipal landuse, parks, transportation and watershed master plans. Forest Stewardship and urban forestry plans will be developed for these areas to sustain forest health by thinning and tree planting. Trees will be integrated into engineering and site design for watershed management, erosion control and energy conservation. Long-term goals are the adoption of planning guidelines, principles, specifications, and ordinances that facilitate green infrastructure conservation.

The Kansas Water Plan, Enhanced Stream Corridor and Wetland Management to Address Reservoir Sedimentation[11] policy will guide long-term strategy. Specifically, a comprehensive wetland and riparian area protection program will be developed using conservation easements, tax incentives, and possible regulation. This will require increased funding and state participation.

Resources Required and Performance Measures for Loss of Kansas Forestland

The Kansas Water Office, KDHE Water Bureau and Mid-America Regional Council are key partnerships. Legislative authority to create effective regulation and the funding to support the establishment and maintenance of easements is necessary. Forest Legacy and the Healthy Forest Reserve Program also have potential to support the strategy along

10 For more information about the Natural Resource Inventory, see: http://www.marc.org/Environment/

11 For more information about this policy, see: http://www.kwo.org/Reports%20&%20Publications/Comments%20and%20Applications.htm

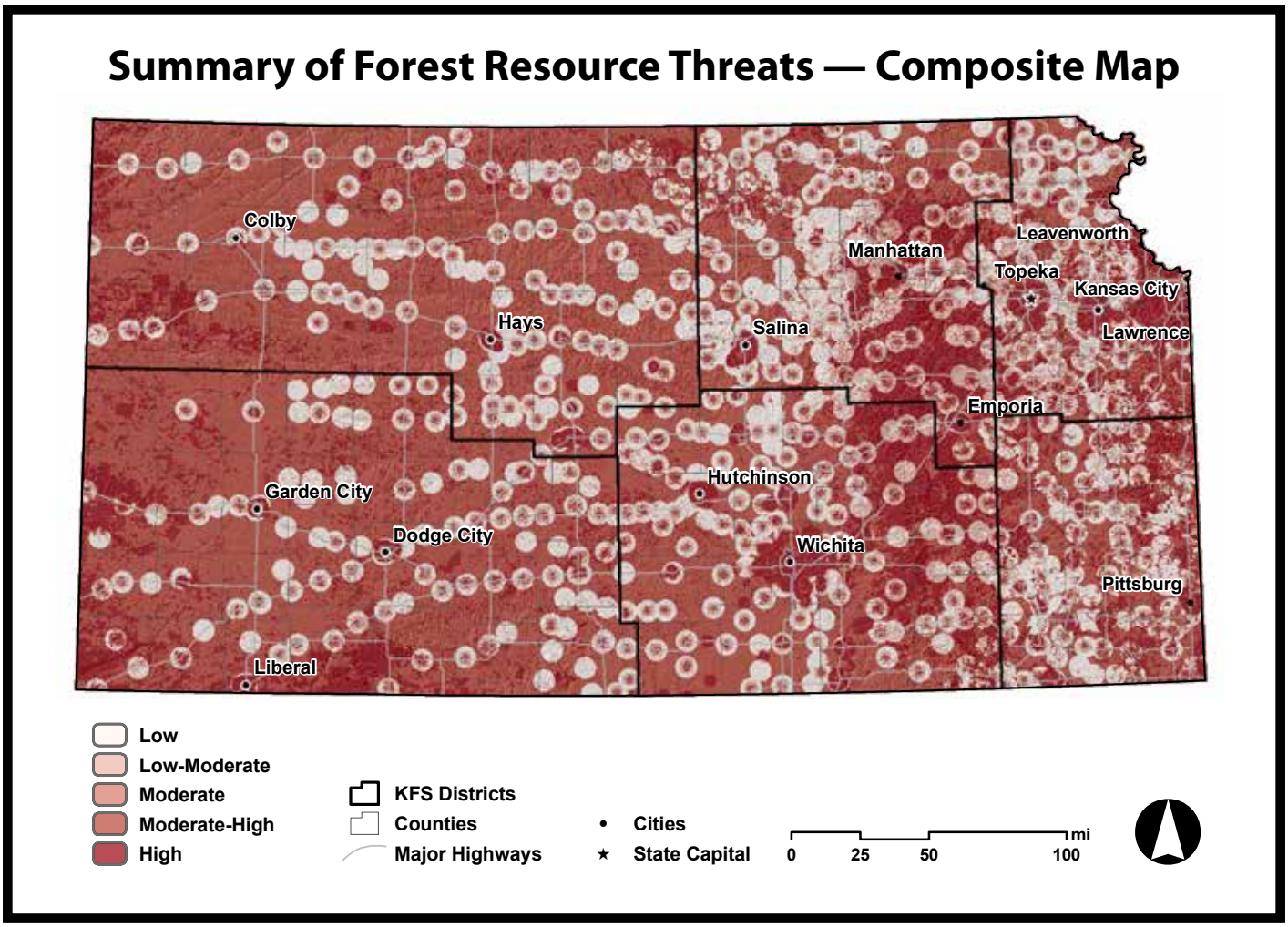


Figure 3.5. *A five-class quantile reclassification of the weighted sum analysis combining the composite maps for: Issues that Threaten a Healthy Forest, Issues that Create Wildfire Risk, and Loss of Forestland to Development.*

with EQIP, WRP and CCRP. Performance measures may include acres of high priority forest ecosystems and landscapes protected from conversion, Forest Legacy Program success stories, areas protected as a result of Forest Stewardship or Urban and Community Forestry Management Plans and the rate of green infrastructure policy adoption by municipalities.

Summary — Forest Resource Threats Composite Map

The final Forest Threats Composite data layer and map represents the results of a "Weighted Sum" analysis combining the full suite of data layers across all three sub-issues. Table 3.2 shows the weights assigned to each data set in this Forest Threats composite. No additional weights were assigned to the three sub-issue composite maps. This weighted sum resulted in an output raster with values between 0 and 4.74. The resulting raster dataset was then reclassified using a five-class quantile classification scheme. Given this quantile classification is based on a uniform cell size (30 × 30 meter) across the state, the five classes also represent five equal areas. The resulting classes (Figure 3.5) have been termed 'low,' 'low-moderate,' 'moderate,' 'moderate-high,' and 'high.'

3.2 Forest Resource Benefits and Services

3.2.1 Sustaining Water Quality and Quantity

Kansas federal reservoirs provide municipal and industrial water supply to two-thirds of the state's population. The state of Kansas owns storage in 13 of these reservoirs, which average 51 years of age and are operated by the U.S. Army Corps of Engineers. However, sedimentation from streambank erosion has reduced storage capacity and life span of federal reservoirs by 50 to 100 years. Studies indicate that decreasing water supplies due to sedimentation, increasing demands and drought could create water supply shortages in several basins in the foreseeable future.

Additionally 90 percent of Kansas surface waters are impaired in rural and urban landscapes based on Clean Water Act

Section 303(d) listing of Total Maximum Daily Loads (TMDLs).[12] Nitrogen, phosphorus and fecal coliform bacteria, all carried by sediment, are some of the most common pollutants that exceed water quality standards.

According to Kansas State University research following the 1993 flood, riparian forests were more efficient than other vegetation at stabilizing Kansas streambanks and keeping sediment out of streams, rivers and subsequently federal reservoirs. Research also suggests that most sedimentation occurs during high-flow events and originates from streambanks (Geyer, W. 1998).[13]

Several Kansas communities need to continue to work on coming into compliance with the Clean Water Act, National Pollutant Discharge Elimination System (NPDES) stormwater permits.

GIS Methodology — Sustaining Water Quality and Quantity

The 'Sustaining Water Quality and Quantity' forest resource benefit layer was created using a 'Weighted Sum' analysis combining four individual data layers generated from seven separate data sets. Forest benefits for water quality and quantity are addressed through: 1) High Soil Survey Geographic (SSURGO) Database Runoff Riparian Areas within High Total Maximum Daily Load (TMDL) Watersheds, 2) High SSURGO Runoff Riparian Areas within Top 20 Watershed Restoration and Protection Strategy (WRAPS) Watersheds, 3) High Stewardship Potential within Kansas Federal Reservoir Drainage Areas with State-Owned Storage, and 4) High Stewardship Potential within Kansas Federal Reservoir Drainage Areas without State-Owned Storage.

High SSURGO Runoff Riparian Areas within High Total Maximum Daily Load Watersheds

This analysis input data layer was created by combining SSURGO Runoff, U.S. Geological Survey (USGS) National Hydrography Dataset (NHD) Flowline, and Kansas Department of Health and Environment (KDHE), Bureau of Water, 2009 Hydrologic Unit Code (HUC) 14, High TMDL watersheds data.

A statewide Kansas SSURGO soil map unit boundary polygon feature class was joined to the component tabular data table (the table containing the runoff data values) and converted to a raster data layer using the runoff attribute values as the cell values for the newly created raster. The runoff raster was then reclassified to select only those cells in which 'very high' or 'high' runoff values were present. Cells containing these two values were assigned a value of '1' and the remainder of the cells received a value of '0.'

A Kansas NHD flowline feature class was buffered on either side by 45 meters to create a statewide riparian area polygon layer. The buffered layer was then converted to a raster data layer in which cells within the riparian polygons were assigned a value of '1' and cells outside the polygons received a value of '0.'

A data set of High TMDLs (current to August 2009) identified at the HUC-14 watershed level was obtained from the KDHE Bureau of Water. According to the KDHE website "Total Maximum Daily Loads (TMDLs) are quantitative objectives and strategies needed to achieve water quality standards. The water quality standards constitute the goals of water quality adequate to fully support designated uses of streams, lakes, and wetlands. The process of developing TMDLs determines: 1) the pollutants causing water quality impairments, 2) the degree of deviation away from applicable water quality standards, 3) the levels of pollution reduction or pollutant loading needed to attain achievement of water quality standards, 4) corrective actions, including load allocations, to be implemented among point and nonpoint sources in the watershed affecting the water quality limited water body, 5) the monitoring and evaluation strategies needed to assess the impact of corrective actions in achieving TMDLs and water quality standards, and 6) provisions for future revision of TMDLs based on those evaluations." Watersheds identified as High TMDLs were converted to a raster data layer. Those cells within the indicated watersheds were assigned a value of '1' and cells outside of the watershed boundaries received a value of '0.'

To create the final 'High SSURGO Runoff Riparian Areas within High Total Maximum Daily Load Watersheds' analysis input layer, the three previously described raster data layers were combined using the raster math 'Plus' tool. The resulting raster was composed of cell values '3,' '2,' '1,' and '0.' Cells with a value of '3' resulted from an overlap of all three data layers; these cells were reclassified to a value of '1.' Values '0,' '1,' or '2' were reclassified to a value of '0.'

High SSUGRO Runoff Riparian Areas within Top 20 Watershed Restoration and Protection Strategy (WRAPS) Watersheds

This analysis input data layer was created by combining SSURGO Runoff, USGS NHD Flowline, and Kansas WRAPS watersheds data. The SSURGO Runoff and USGS NHD Flowline data layers are the same as those described under the 'High SSURGO Runoff Riparian Areas within High Total Maximum Daily Load Watersheds' analysis layer methods.

12 For more information about total maximum daily loads, see: http://www.kdheks.gov/tmdl/basic.htm#tmdl

13 Available at: http://www.ksre.ksu.edu/library/forst2/srl122.pdf

Kansas WRAPS watershed data were obtained from the KDHE Bureau of Water. According the WRAPS website,[14] the program: "offers a framework that engages citizens and other stakeholders in a teamwork environment aimed at protecting and restoring Kansas watersheds. The WRAPS framework consists of: 1) identifying the watershed restoration and protection needs, 2) establishing watershed goals, 3) creating plans to achieve the established goals, and 4) implementing the plans." For fiscal years 2009 and 2010, the Kansas Forest Service focuses on the top 20 WRAPS watersheds prioritized by the state WRAPS Working Group. For this layer, the WRAPS watersheds were converted to a raster in which cells within the Kansas Forest Service selected project areas were assigned a value of '1' and all other cells received a value of '0.'

As with the 'High SSURGO Runoff Riparian Areas within High Total Maximum Daily Load Watersheds' analysis input layer, the final 'High SSURGO Runoff Riparian Areas within Top 20 WRAPS Watersheds' analysis input layer was created by combining the SSURGO Runoff, NHD Flowine, and WRAPS Watershed data layers using the raster math 'Plus' tool. Again, cells from the resulting raster with a value of '3' were reclassified to a value of '1' and cells with values '0,' '1,' or '2' were reclassified with a value of '0.'

High Stewardship Potential within Kansas Federal Reservoir Drainage Areas ('With State-Owned Storage' and 'Without State-Owned Storage')

This analysis input data layer was created by combining: Forest Stewardship Program Spatial Analysis Project (SAP) High Stewardship Potential areas and NHD Waterbody and HUC-14 Watersheds derived federal reservoir drainage areas.

The SAP was conducted to identify priority areas of private forest to target for inclusion in the Forest Stewardship Program, a USDA Forest Service program for private forest management. To create the 'High Stewardship Potential' data layer, 12 required data layers (Riparian Corridors, Forest Patch Size, Priority Watersheds, Private Forestland, Public Drinking Water Supplies, Threatened and Endangered Species, Wetlands, Slope, Proximity to Public Lands, Development Risk, Wildfire Assessment, Forest Health) and three state-identified optional data layers (Agroforestry, Tree and Shrub Suitability, Forest Productivity) were combined using a 'Weighted Overlay' analysis. The resulting raster data layer was the classified using a three-class ('High,' 'Medium,' 'Low') quantiles classification scheme (Hutchinson et al. 2008). For this analysis layer, the SAP 'Potential for Forest Stewardship Program Benefits' raster layer was reclassified with original values of 'High' assigned a new value of '1' and original values of 'Medium' and 'Low' assigned a value of '0.'

A list of Kansas federal reservoirs was obtained from the Kansas Water Office website (Kansas Water Office 2004), as was a map displaying those federal reservoirs with state-owned storage.[15] All 24 reservoirs were selected from the Kansas NHD Waterbody data set and extracted to a new data layer. This layer was then used in combination with the HUC-14 Watershed data set to identify drainage areas for each reservoir.

For each of the 24 Kansas Federal Reservoirs, HUC-14 Watersheds were combined to produce drainage basins. After creating two separate data layers – one for the 14 reservoirs with state-owned storage and one for the 10 reservoirs without state-owned storage – reservoir polygons were extracted from the drainage areas. Each of the two drainage area data layers was then converted to a raster layer in which cells within drainage areas were assigned a value of '1' and cells outside of the drainage areas received a value of '0.'

The final analysis input data layers ('High Stewardship Potential within Kansas Federal Reservoir Drainage Areas with State Owned Storage' and 'High Stewardship Potential within Kansas Federal Reservoir Drainage Areas without State Owned Storage') were produced using the raster math 'Plus' tool to combine the 'High Stewardship Potential' data layer with each of the two reservoir layers. The resulting raster layers each were comprised of values '0,' '1,' and '2.' Values of '2' were reclassified to a value of '1' and values of '0' or '1' were reclassified to a value of '0.'

Sustaining Water Quality and Quantity — Composite Map

After developing the four analysis input data layers ('High SSURGO Runoff Riparian Areas within High TMDL Watersheds,' 'High SSURGO Runoff Riparian Areas within Top 20 WRAPS Watersheds,' 'High Stewardship Potential within Kansas Federal Reservoir Drainage Areas with State-Owned Storage,' 'High Stewardship Potential within Kansas Federal Reservoir Drainage Areas without State-Owned Storage') described above, a 'Weighted Sum' analysis was performed, in which each '0,' '1' analysis raster is assigned a weight (Table 3.2) based on an average weight determined by 11 Kansas Forest Service staff. The resulting raster contains values ranging from 0 to 2.41 (Figure 3.6). These values were later combined with similarly produced values from the 'Protecting and Restoring Forest Biodiversity and Wildlife Habitat' (Section 3.2.2), 'Sustaining and Protecting Forest and Agroforestry Ecosystems' (Section 3.2.3) and 'Maintaining and Promoting Livelihoods and Economic Benefits of Woodlands' (Section 3.2.4) benefits to produce a composite 'Forest Resource Benefits and Services' layer (3.11).

14 For more information on the WRAPS program, see: http://www.kswraps.org/

15 http://www.kwo.org/ReservoirInformation/Reservoir%20Information.htm

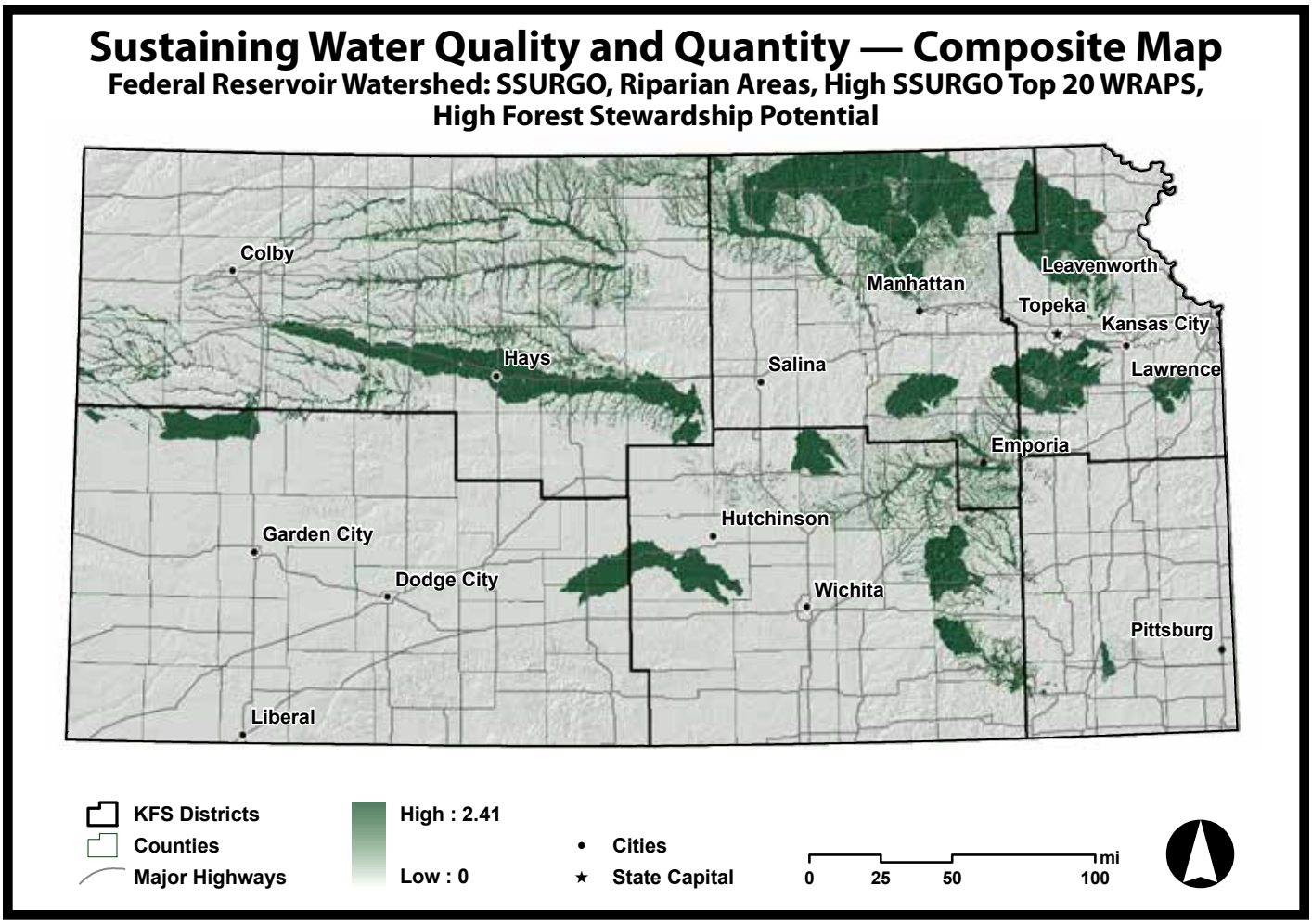


Figure 3.6. *The result of a weighted sum analysis on all cells combining the assigned weights (from Table 3.2) for the following datasets: High SSURGO Runoff Riparian Areas within High Total Maximum Daily Load Watersheds, High SSUGRO Runoff Riparian Areas within Top 20 Watershed Restoration and Protection Strategy (WRAPS) Watersheds, and High Stewardship Potential within Kansas Federal Reservoir Drainage Areas ('With State-Owned Storage' and 'Without State-Owned Storage').*

Strategy for Sustaining Water Quality and Quantity

Sustaining water quality and quantity supports the national objective of "Protecting and enhancing water quality and quantity." The Forest Stewardship Program, Urban and Community Forestry, and Forest Legacy Program will be the USDA Forest Service State and Private Forestry Programs that address this issue. Watershed Restoration and Protection Strategy (WRAPS) stakeholder groups in priority TMDL watersheds and their strategies will guide the protection, management, and establishment of riparian forests. Functioning condition of riparian forests will be classified through local Watershed Protection and Restoration Strategy (WRAPS) stakeholder groups in priority TMDL watersheds with remote sensing and forest inventory. Local WRAPS groups land ownership will be targeted based on priority areas identified in WRAPS plans. Land ownership GIS data layers will be created when needed to facilitate the process. Forest Stewardship Management plans will guide implementation of BMPs on contiguous ownership within targeted watersheds. The Forest Legacy Program will be used to bring targeted riparian forests under protection. The Kansas Water Office, Kansas Water Plan's, Enhanced Stream Corridor and Wetland Management to Address Reservoir Sedimentation policy will guide strategy.

Resources Required and Performance Measures for Sustaining Water Quality and Quantity

Funding sources include Kansas Department of Wildlife and Parks, CWA and KWO State Water Plan funding through KDHE's WRAPS program, EPA Region 7 Wetland Developmental Grant, NRCS TSP, State and Private Forestry programs. Performance measures include acres and percent of priority watersheds where State and Private Forestry activities are enhancing or protecting water quality or quantity.

3.2.2 Protecting and Restoring Forest Biodiversity and Wildlife Habitat

Rationale and strategy for this issue are taken directly from *Kansas State Wildlife Action Plan*, (formerly *Kansas Comprehensive Wildlife Conservation Plan*).[16] Out of 1,488 wildlife species in Kansas, 316 have been identified as "Species in Need of Conservation" with 59 listed threatened and endangered species. In the shortgrass and central mixed grass prairie ecosystems, riparian forests, and shrubs are declining due to a lowering water table from surface water and groundwater depletion. In the Eastern Tall Grass Prairie there is lack of active management and conservation of deciduous forests and floodplain habitats. Lack of management, protection, and loss of habitat create issues in sustaining populations for targeted forest and woodland species.

GIS Methodology — Protecting and Restoring Forest Biodiversity and Wildlife Habitat

The 'Protecting and Restoring Forest Biodiversity and Wildlife Habitat' forest resource benefit layer was generated using a 'Weighted Sum' analysis combining four individual data layers generated from four separate data sets. Biodiversity and wildlife habitat needs are addressed in this analysis by: 1) Kansas Natural Heritage Inventory Rare Species, 2) Forest Patches Greater than or Equal to 40 acres, 3) LANDFIRE Departure Index, and 4) LANDFIRE Simulated Historical Mean Fire Interval.

Kansas Natural Heritage Inventory Rare Species

Kansas Natural Heritage Inventory[17] Rare Plants, Animals, and Natural Communities data were obtained from the Kansas Biological Survey (KBS). According to the data set metadata:

> "Rare plants and animals include: Species listed as threatened or endangered at the state or federal level; federal Candidate species; Kansas species in need of conservation (SINC); other species considered rare by the Kansas Natural Heritage Inventory. Location data have been collected from a variety of sources including museum records, reports, publications, theses and dissertations, databases received from other agencies and research institutions, field work conducted by the Kansas Biological Survey, and a variety of other sources. Polygons depicting rare species locations include actual locations plus a measure of locational uncertainty. Uncertainty is based on the accuracy and completeness of the location provided in the original data source."

Using the 'Category' attribute field, values 'Vertebrate Animals,' 'Invertebrate Animals,' and 'Vascular Plants' were selected and a new polygon layer of only rare species locations was created. This vector layer was then converted to a raster in which cells within rare species polygons were assigned a value of '1' and cells outside of the polygons were assigned a value of '0.'

Forest Patches Greater than or Equal to 40 acres

A data layer initially utilized in SAP (Hutchinson et al., 2008) has been updated to include a newly available land cover data set (the Kansas Land Cover Project, 2005) and areas masked out in the initial SAP analysis. The 40-acre forest patch layer is a layer composed of large continuous tracts of forestland that are rare in Kansas, especially in the semi-arid western part of the state. Where large tracts do exist, the benefit of management activities can be maximized. The minimum patch size was set at 40 acres (16 hectares). Forty acres (a 16th of a section) seemed an appropriate size to complement the statewide scale of analysis as it is a common land ownership unit in Kansas. The 2005 Level I, Kansas Land Cover Project (KLCP) dataset was selected as the source of land cover as it is currently the most up-to-date land cover dataset available for the state. This dataset depicts 11 cover types and was generated using data from the red, near-infrared, and shortwave infrared parts of the spectrum (Landsat bands 3, 4, 5, and 7).

To create the data layer, larger contiguous patches of forest needed to be isolated and patches below the size threshold needed to be removed. First, the KLCP raster data were reclassified to combine the two woodland categories (cover codes 14 and 40) so that forest types received a value of '1' and all other types a value of '0.' Next, two road layers consisting of interstates, U.S. highways, and Kansas state roads were buffered by 60 meters then converted to a grid. This grid was then subtracted from the forested areas to create a raster layer of forest patches. Patches were classified by size using the Region Group and Zonal Geometry tools in ArcToolbox. Those patches of more than 40 acres in area were extracted using the Extract by Attributes tool and saved as a separate raster, and assigned a value of '1'; all other cells received a '0' value.

LANDFIRE Departure Index

This is a modeled dataset created by the LANDFIRE Project (a cooperative project of the USDA-US Forest Service, United States Geological Survey, The Nature Conservancy, and the Department of the Interior) and was obtained as a 30 × 30 meter raster dataset for the state of Kansas. The LANDFIRE FRCC Departure Index "uses a range from 0 to 100 to depict the amount that current vegetation has departed from simulated historical vegetation reference conditions" (Hann and Bunnell 2001; Hardy and others 2001; Hann and others 2004;

16 *This plan can be found at: http://www.wildlifeactionplans.org/kansas.html*

17 *For more information on this inventory, see: http://www.ksnhi.ku.edu/data/html/avail.htm*

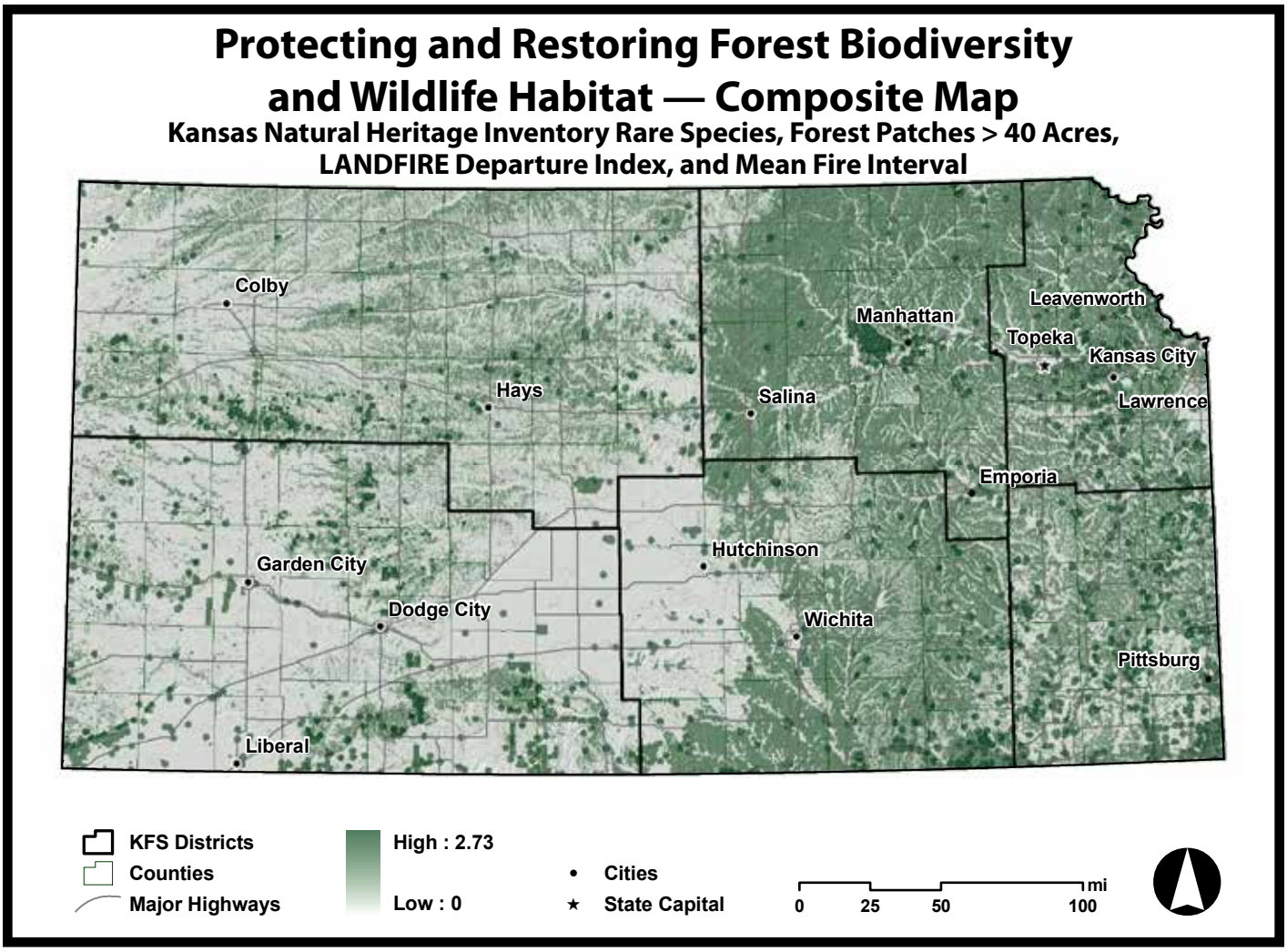


Figure 3.7. *The result of a weighted sum analysis on all cells combining the assigned weights (from Table #) for the following datasets: Kansas Natural Heritage Inventory Rare Species, Forest Patches Greater than or Equal to 40 acres, LANDFIRE Departure Index, and LANDFIRE Simulated Historical Mean Fire Return Interval.*

Holsinger and others 2006).[18] This departure is a reflection of modeled changes in species composition, structural age, and canopy closure.[19]

For this analysis, a Fire Departure Index score of 83 or higher was selected, representing the top 20 percent of values present in Kansas. Those cells containing a score of 83 or higher were then reclassified and assigned a value of '1,' while all other areas were assigned a value of '0.'

LANDFIRE Simulated Historical Mean Fire Return Interval

This is a modeled dataset created by the LANDFIRE Project and was obtained as a 30 × 30 meter raster dataset of the contiguous United States. According to the dataset metadata:

> "The Simulated Historical Mean Fire Return Interval data layer quantifies the average number of years between fires … derived from vegetation and disturbance dynamics simulations using LANDSUM. LANDSUM simulates fire dynamics as a function of vegetation dynamics, topography, and spatial context in addition to variability introduced by dynamic wind direction and speed, frequency of extremely dry years, and landscape-level fire size characteristics. … Simulated historical mean fire return intervals were classified into 22 categories of varying temporal length to preserve finer detail for more frequently burned areas and less detail for rarely burned areas."[20]

To address the needs of the grasslands in Kansas, the 1 to 5 year interval class was chosen for this analysis. The original raster

18 *For more information about* LANDFIRE, see: *http://www.landfire.gov/NationalProductDescriptions11.php*

19 *Full details on the development of the LANDFIRE Fire Regime Data Products can be found at: http://www.landfire.gov/documents_frcc.php*

20 *LANDFIRE metadata describing this dataset is available at http://landfire.cr.usgs.gov/distmeta/servlet/gov.usgs.edc.MetaBuilder?TYPE=html&DATASET=F0N*

dataset was reclassified with the 1 to 5 year class assigned a value of '1' and all other interval classes assigned a value of '0.'

Protecting and Restoring Forest Biodiversity and Wildlife Habitat — Composite Map

After developing the four analysis input data layers ('Kansas NHI Rare Species,' 'Forest Patches Greater than or Equal to 40 acres,' 'LANDFIRE Departure Index,' 'LANDFIRE Simulated Historical Mean Fire Return Interval') described above, a 'Weighted Sum' analysis was performed, in which each '0,' '1' analysis raster is assigned a weight (Table 3.2) based on an average weight determined by 11 Kansas Forest Service staff. The resulting raster contains values ranging from 0 to 2.73 (Figure 3.7). These values were later combined with similarly produced values from the 'Sustaining Water Quality and Quantity' (Section 3.2.1), 'Sustaining and Protecting Forest and Agroforestry Ecosystems' (Section 3.2.3) and 'Maintaining and Promoting Livelihoods and Economic Benefits of Woodlands' (Section 3.2.4) benefits to produce a composite 'Forest Resource Benefits and Services' layer (Figure 3.11).

Strategy for Protecting and Restoring Forest Biodiversity and Wildlife Habitat

Protecting and Restoring Forest Biodiversity and Wildlife Habitat supports the national objective of "Protecting, conserving and enhancing wildlife and fish habitat." The Forest Stewardship Program and Forest Legacy Program are the main USDA Forest Service State and Private Forestry programs that address this issue. All of the priority landscapes listed in Section 4.2 *Kansas Forest Legacy State Priority Area Map* are relevant areas to invest program resources. Riparian forest and shrub habitat will be conserved and established for priority species in priority habitats that have some dependency on forested areas or trees. In the shortgrass prairie Ecological Focus Areas (EFA), targeted species include Bell's vireo, bald eagle, red-headed woodpecker, rusty blackbird, Brewer's blackbird and the eastern spotted skunk (threatened). The mixed grass prairie EFAs targets the eastern spotted skunk (threatened), red-spotted toad and pallid bat. Forests and woodlands located within EFAs in eastern Kansas such as Eastern Forest, Ozark Plateau, Verdigris, Neosho, and Marais des Cygnes will be actively managed and protected in priority landscapes to sustain or increase populations of the following species — **Birds:** rusty blackbird, cerulean warbler, whip-poor-will, yellow-throated warbler, Kentucky warbler; **Mammals:** eastern spotted skunk(threatened), little brown myotis, gray myotis (Endangered), southern flying squirrel; **Reptiles:** timber rattlesnake, redbelly snake(threatened), smooth earth snake; **Amphibians:** green frog, northern cricket frog, Oklahoma salamander; **Insects:** Ozark emerald (damselfly), American burying beetle (endangered), gray petaltail (damselfly).

Resources Required and Performance Measures for Protecting and Restoring Forest Biodiversity and Wildlife Habitat

Acres and percent of priority habitat areas where State and Private Forestry activities are protecting, conserving and enhancing wildlife and fish habitat and acres of connected forests resulting from State and Private Forestry investments will serve as performance measures.

3.2.3 Sustaining and Protecting Forest and Agroforestry Ecosystems

Of 24.6 million acres of cultivated cropland in Kansas, approximately 2.9 million (12 percent) exceed "tolerable limits" for erosion.[21] Windbreaks are recognized as a way to reduce erosion on cropland and yet, in Kansas, 44 percent of windbreaks (127,414 acres) are in fair to poor condition and in need of renovation[22]. According to the Forest Stewardship Spatial Analysis Project[23] 21 million acres (42 percent) of the Kansas landscape has the potential to benefit the people of Kansas through forest stewardship (tree planting and management of existing rural forest and agroforestry resources). The Kansas urban and community forest is mature to over-mature with declining canopies as indicated in Section 2.3. Average diameter is 13.6 inches with 48 percent of the population in fair to poor condition and 38 percent in three species – silver maple, Siberian elm, and hackberry. Of Kansas rural hardwood forests, 51.5 percent are classified as cull. Fluvial geomorphic dynamics (declines in sandbars and active flood plains) and land use conversions have reduced cottonwood regeneration, which is evidenced in decline of trees in smaller diameter classes (1 to 3 inches) and the majority of volume occurring in larger diameter classes (17 inches or larger). Although oak volume, tree numbers, and density have all increased, oak forests are not replacing themselves, which is evidenced with the overwhelming proportion making up the overstory canopy in the oak-hickory forest type.

GIS Methodology — Sustaining and Protecting Forest and Agroforestry Ecosystems

The 'Sustaining and Protecting Forest and Agroforestry Ecosystems' forest resource benefit layer was generated using a 'Weighted Sum' analysis combining seven individual data layers generated from seven separate data sets. Biodiversity and wildlife habitat needs are addressed in this analysis by: 1) Kansas Natural Heritage Inventory Natural Forest

21 Natural Resource Inventory, NRCS: http://www.nrcs.usda.gov/technical/NRI/

22 Great Plains Initiative Inventory 2008 - 2009: http://www.nfs.unl.edu/documents/GPI%20Fact%20Sheet%20May%202009.pdf

23 For information about this project, see: http://www.kansasforests.org/rural/foreststewardship/index.shtml

Communities, 2) Forest Stewardship Program Properties, 3) Forest Adjacent to Protected and Managed Areas, 4) Non-Forest Stewardship Program High Stewardship Potential Private Forests, 5) Urban Woodland, 6) Agroforestry Potential, and 7) Tree and Shrub Suitability.

Kansas Natural Heritage Inventory Natural Forest Communities

Data for this analysis input layer were obtained in the same Kansas Biological Survey data set used for the 'Kansas National Heritage Inventory Rare Species' layer described in Section B. According to the dataset metadata:

> "A natural community is an assemblage of interacting plants, animals, and other organisms that occurs repeatedly across the landscape under similar environmental conditions and is structured by natural processes rather than modern, anthropogenic disturbances. Natural community data … are largely the result of field surveys conducted by the Kansas Biological Survey. Natural community occurrences were delineated using aerial photography and field surveys."

Using the 'Com_Name' attribute field, all forest and woodland community values ('Ash – Elm – Hackberry Floodplain Forest,' 'Cottonwood – Sycamore Floodplain Forest,' Cottonwood – Willow Floodplain Forest,' 'Cross Timbers Woodland,' 'Maple – Basswood Forest,' 'Mixed Oak Floodplain Forest,' 'Oak – Dogwood Forest,' 'Oak – Hickory Forest,' 'Pecan – Hackberry Floodplain Forest,' 'Post Oak – Blackjack Oak Forest') were selected and extracted to create a Natural Forest Communities polygon layer. The polygon layer was subsequently converted to a raster data layer in which cells within forest and woodland community polygons were assigned a value of '1' and cells outside of the community polygons received a value of '0.'

Forest Stewardship Program Properties

As a requirement for fulfillment of the Forest Stewardship Program, Spatial Analysis Project, previously established Forest Stewardship Program Plans were heads-up digitized to create a spatial database (Hutchinson et al., 2008). Since the establishment of the Forest Stewardship Program Plan spatial database, plans have been updated periodically to keep the dataset current. For this analysis input layer the most current dataset was converted from a polygon to a raster in which cells within Forest Stewardship Program properties were assigned a value of '1' and cells outside of property polygons were assigned a value of '0.'

Forest Adjacent to Protected and Managed Areas

To address the need to preserve large tracts of forest where possible, the 'Forest Adjacent to Protected and Managed Areas' layer was created using forest within buffers around currently protected and managed lands. This analysis input layer was created from three separate data layers: KARS Woodland, Kansas Protected Areas, and Forest Stewardship Program properties.

To create a layer of Kansas Woodland, the KARS 2005 Kansas Land Cover Dataset was employed once again. Class codes '14' (Urban Woodland) and '40' (Woodland) were reclassified to a value of '1' and all other class codes were assigned a value of '0.'

A dataset of Kansas Protected Areas created by the Kansas Natural Heritage Inventory was obtained from DASC. Protected areas included in the dataset include Kansas's public lands (Army Corps of Engineers, Kansas Department of Wildlife and Parks, U.S. Fish and Wildlife Service, U.S. National Park Service, USDA Forest Service, etc.) and lands held privately by nongovernmental organizations, nonprofit organizations, and those held in conservation easements.

The 'Forest Stewardship Program Properties' analysis data layer was incorporated as land currently under management.

To complete this analysis layer, the protected areas and Forest Stewardship Program properties were buffered using a one-half mile radius to target areas potentially containing forest that are adjacent to currently protected forest and would therefore create larger tracts of protected forest. The newly created buffered polygon layer was then converted to a raster data layer in which cells within the buffers were assigned a value of '1' and cells outside of buffer polygons were assigned a value of '0.' This layer was subsequently combined with the KARS 'Woodland' raster data layer using the raster math 'Plus' tool. The resulting data layer was composed of values '0,' '1,' and '2.' To create the final analysis layer, cells with the original value '2' were reclassified to a value of '1' and cells containing the original values '0' and '1' were assigned a value of '0.'

Non-Forest Stewardship Program High Stewardship Potential Private Forests

Currently enrolled Forest Stewardship Program properties are targeted with an analysis input layer; this analysis input layer was produced to incorporate areas that should be targeted for Forest Stewardship Program enrollment. Those public lands within the Protected Areas dataset described above were selected and extracted to create a new Public Lands data layer. The newly created polygon layer was converted to a raster in which cells within public lands polygons were assigned a value of '1' and cells outside of the polygons were assigned a value of '0.' The Forest Stewardship Program properties layer described above was subsequently combined with the Public Lands raster using the raster math 'Plus' tool. The resulting layer contained values of '0' and '1' due to the lack of Forest Stewardship Program and Public Lands overlap. The previously described 'Woodland' layer was reclassified so that values

of '1' were assigned a value of '10' and values of '0' remained '0.' The newly reclassified layer was then combined with the Forest Stewardship Program Property/Public Lands layer using the raster math 'Plus' tool. Resulting values were: '0,' '1,' '10' and '11.' Because non-Forest Stewardship Program, private forest was desired, cells with values of '10' – the value of the reclassified 'Woodland' layer – were reclassified to a value of '1' and values of '0,' '1,' or '11' were assigned a new value of '0,' creating a Private Woodland layer. To complete the analysis input layer, the 'SAP High Stewardship Potential' data layer described above was combined with the 'Private Woodland' layer using the raster math 'Plus' tool. This created a new raster with values of '0,' '1,' and '2.' Values of '2' were reclassified to a value of '1' and values of '0' or '1' were assigned a value of '0.'

Urban Woodland

Urban forests have been identified as a Kansas Forest Service priority. Along with addressing those threats to Urban forests in Section 3.1.3 of the Forest Resource Threats component of this analysis, an Urban Woodland analysis input data layer was needed to identify existing patches that need to be targeted for management.

The KARS 2005 Kansas Land Cover Dataset includes an 'Urban Woodland' land cover class. Class code '14' cells were reclassified to a value of '1' and all other class codes were assigned a value of '0,' producing the final 'Urban Woodland' analysis input data layer

Agroforestry Potential

The 'Agroforestry Potential' data layer was one of three optional data layers included in the SAP analysis. 'Agroforestry Potential' was created by combining a '0,' '1' raster data layer of Kansas 2001 Gap Analysis Program (GAP) Land Cover 'Cultivated Land' cover class with a '0,' '1' raster data layer of SSURGO 'Wind Erodability Index (WEI)' values greater than '87.' The resulting data layer was reclassified with areas where the 'WEI' and 'GAP' data layers overlapped (values of '2') assigned a value of '1' and values of '0' or '1' receiving a new value of '0' (Hutchinson, 2008). The resulting 'Agroforestry Potential' data layer from the SAP analysis has been incorporated into this analysis to address a key forestry activity in Kansas.

Tree and Shrub Suitability

Like the 'Agroforestry Potential' data layer, the 'Tree and Shrub Suitability' data layer has also been borrowed for the SAP analysis. The 'Tree and Shrub Suitability' layer was another of the three optional data layers incorporated into the SAP analysis, and was included to provide "a measure of suitable soil characteristics that will sustain the growth of native Kansas trees and shrubs." To create the dataset, SSURGO 'Conservation Tree/Shrub Suitability Group' attribute values '1' and '2' were selected and used to create a raster data layer in which cells containing those values were reclassified to a value of '1' and all other cells were assigned a value of '0' Hutchinson et al., 2008. The resulting SAP analysis data layer has been incorporated into this analysis to further address areas for potential agroforestry activities.

Sustaining and Protecting Forest and Agroforestry Ecosystems — Composite Map

After developing the seven analysis input data layers ('Kansas Natural Heritage Inventory Natural Forest Communities,' 'Forest Stewardship Program (FSP) Properties,' 'Forest Adjacent to Protected and Managed Areas,' 'Non-Forest Stewardship Program High Stewardship Potential Private Forests,' 'Urban Woodland,' 'Agroforestry Potential,' 'Tree and Shrub Suitability') described above, a 'Weighted Sum' analysis was performed, in which each '0,' '1' analysis raster is assigned a weight (Table 3.2) based on an average weight determined by 11 Kansas Forest Service staff. The resulting raster contains values ranging from 0 to 3.60 (Figure 3.8). These values were later combined with similarly produced values from the 'Sustaining Water Quality and Quantity' (Section 3.2.1), 'Protecting and Restoring Forest Biodiversity and Wildlife Habitat' (Section 3.2.2) and 'Maintaining and Promoting Livelihoods and Economic Benefits of Woodlands' (Section 3.2.4) benefits to produce a composite 'Forest Resource Benefits and Services' layer (Figure 3.11).

Strategy for Sustaining and Protecting Forests and Agroforestry Ecosystems

Sustaining and protecting forest and agroforestry ecosystems supports the national objectives of "Actively and sustainably managing forests and identifying and conserving high-priority forest ecosystems and landscapes." The USDA Forest Service State and Private Forestry Programs that address this issue include the Forest Stewardship Program, Urban and Community Forestry Program, and Cooperative Fire Programs. All priority landscape areas are appropriate areas to apply this strategy. The data set for agroforestry potential has identified 917,000 acres of cultivated cropland with a wind erodability index of 87 or higher (one of the requirements for CRP participation for field windbreak establishment). Working through local RC&D's and conservation districts, landowners will be identified in this area and contacted to promote the adoption of field windbreaks. The Coronado Crossing RC&D has just completed a remote sensing project to identify the condition and location of windbreaks within their seven-county area. This information will be used to identify landowners with windbreaks in fair to poor condition to promote windbreak renovation. EQIP will be the financial incentive program to promote adoption. Landowners located in areas with high Forest Stewardship Program potential/high-priority resources will be invited to participate in the Forest Stewardship Program. The urban and community forest will be assessed through inventory to target defective and hazardous trees for

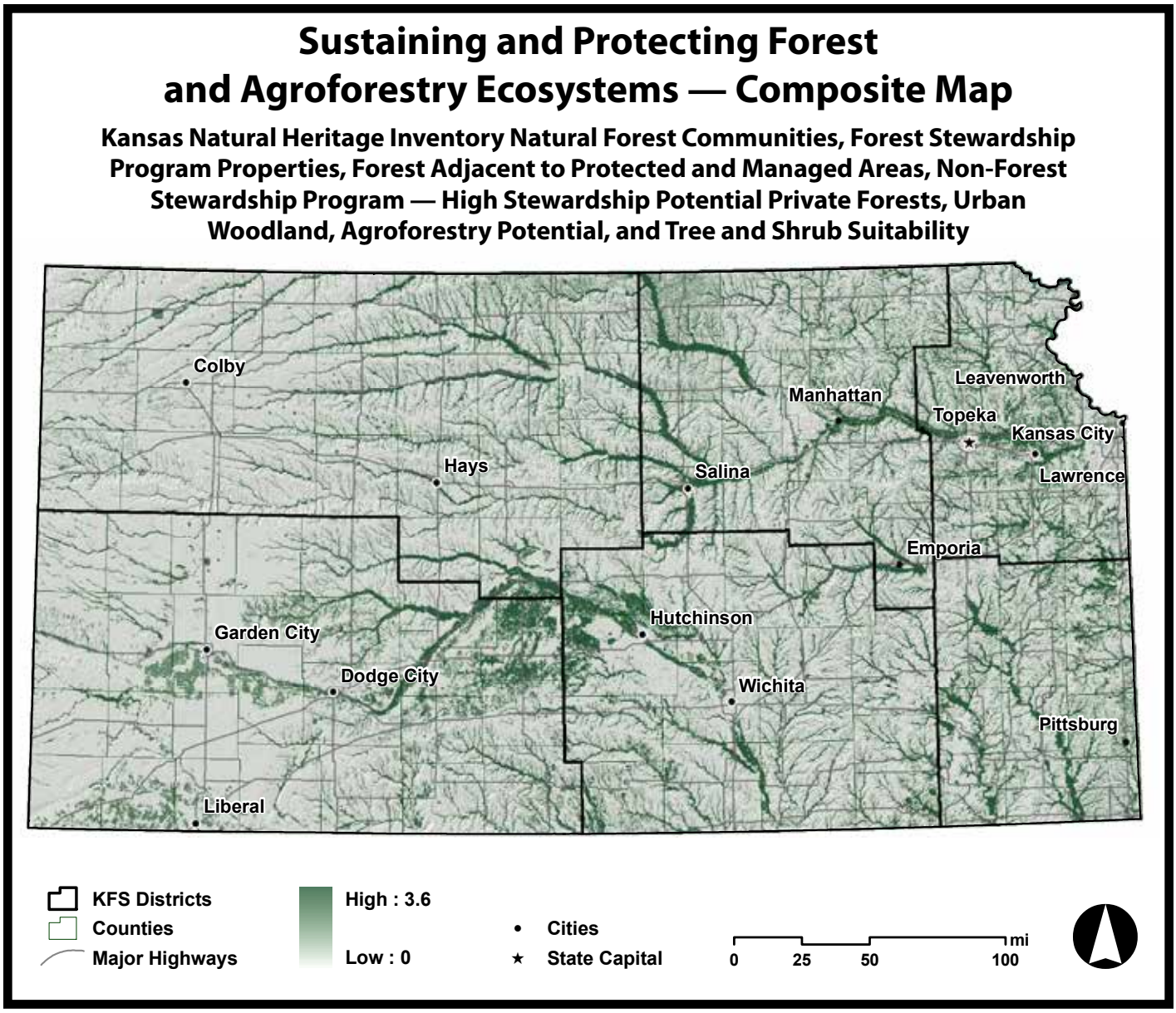


Figure 3.8. *The result of a weighted sum analysis on all cells combining the assigned weights (from Table 3.2) for the following datasets: Kansas Natural Heritage Inventory Natural Forest Communities, Forest Stewardship Program Properties, Forest Adjacent to Protected and Managed Areas, Non-Forest Stewardship Program High Stewardship Potential Private Forests, Urban Woodland, Agroforestry Potential, and Tree and Shrub Suitability.*

removal. Mitigation pruning of defects from the canopy to prevent or delay trees from becoming hazardous and a tree planting program will be initiated to increase species diversity. Training will be provided on hazard tree identification, assessment, risk management, mitigation pruning, removals, utilization, tree selection and replacement. Technical assistance will be focused on smaller communities that lack resources to accomplish the strategy. A program to promote forest stand improvement through EQIP for Forestland Health will be developed. Development of new biomass markets for cull material will be pursued. The number of forestry contractors that provide forest stand improvement and tree planting services will be increased. Areas where river dynamics support the silvicultural conditions needed for cottonwood regeneration will be identified geospatially. An initiative to promote the regeneration of cottonwood in these target areas will be developed using existing USDA conservation programs. The USDA Forest Service Northern Research Station will assist with the refinement of silvicultural techniques to increase light through timber stand improvement and prescribed burning. The Kansas Department of Wildlife and Parks and the National Wild Turkey Federation will be close partners. Areas of the state will be identified where oak regeneration efforts will be focused.

Resources Required and Performance Measures for Sustaining and Protecting Forest and Agroforestry Ecosystems

NRCS, National Agroforestry Center, University of Missouri Center for Agroforestry, USDA ARS Wind Erosion Research Unit, USDA Forest Service Northern Research Station, Tree Boards, Tree City USA, and the Kansas Arborists Association are all important resources and partners that can help accomplish this strategy. The *Status and Trend of Cottonwood Forests along the Missouri* (Dixon, M et al. 2010) is an excellent reference to deal with lack of cottonwood regeneration. Performance measures will include the number of forest acres being managed sustainably as defined by current Forest Stewardship Management Plans, acres of high priority forest ecosystems, and landscapes protected from conversion and Community Forestry Management Plans.

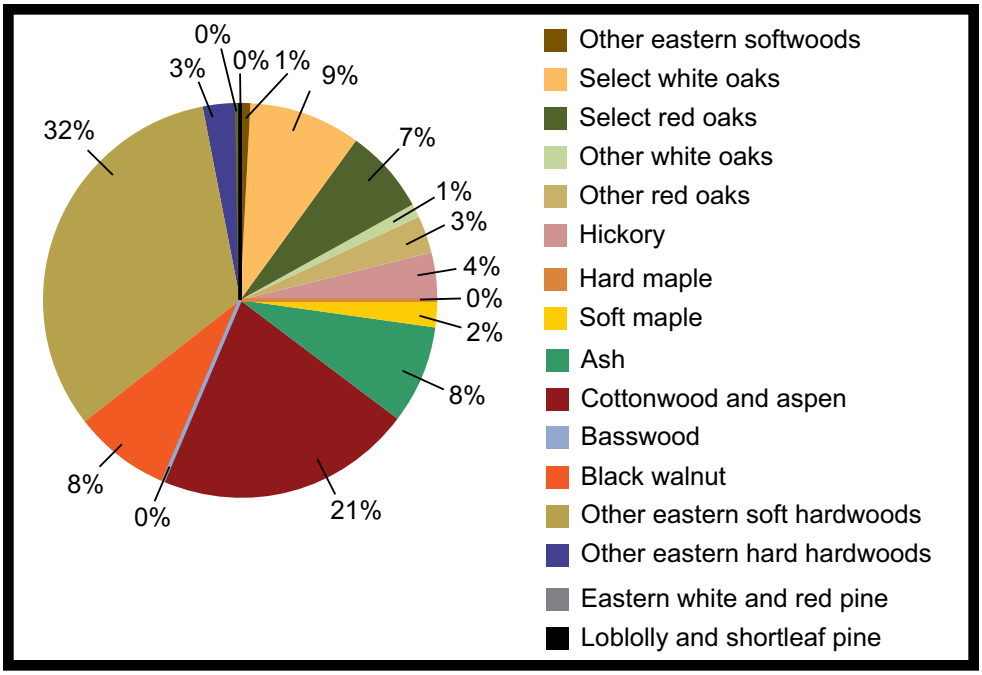


Figure 3.9. *Volume of sawtimber by species in millions of board feet, Kansas Forests 2005 (Moser et al. 2008).*

3.2.4 Maintaining and Promoting Livelihoods and Economic Benefits of Woodlands

The forest products industry contributes $1.3 billion annually to the Kansas economy in 2010 dollars. The forest industry supports more than 6,700 jobs at a payroll of about $329 million and is responsible for $39 million in state taxes that help and another $63 million in federal taxes.[24] Currently only one-third of green woody biomass produced annually by wood manufacturing is available for use as a wood energy feedstock (Camas Creek Enterprises). Models are needed to assign ecosystem service values to forest and agroforestry resources. A biomass market will be developed for the utilization of eastern redcedar. In 2010, Kansas processed 5.4 billion board feet of saw timber, a 125 percent increase since 1981 (Moser et al. 2008). Cottonwood and hackberry were the most common species (Figure 3.9).

The Kansas forest industry annually provides $1.3 billion to the Kansas economy.

GIS Methodology for Maintaining and Promoting Livelihoods and Economic Benefits of Woodlands

The 'Maintaining and Promoting Livelihoods and Economic Benefits of Woodlands' forest resource benefit layer was generated using a 'Weighted Sum' analysis combining five individual data layers generated from four separate data sets. Forestry economic issues are addressed in this analysis by: 1) Black Walnut, 2) Biomass, and 3) Forest within Mill Average Haul Areas.

Black Walnut

As the most economically important tree species in Kansas, incorporating an analysis input data layer portraying black walnut information was a priority. Modeled live volume (cubic feet per acre) black walnut data, based on 2006 FIA

24 Tom Treiman, Natural Resource Economist, Missouri Department of Conservation, U.S. Bureau of Economic Analysis, U.S. Department of Labor Statistics, USDA and Minnesota Implan Group.

plots, were obtained from USDA Forest Service, Forest Inventory and Analysis program at a 250 × 250 meter cell resolution. All cells with values greater than or equal to 10 cubic feet per acre were reclassified to a value of '1' and cells with values less than 10 cubic feet per acre were assigned a value of '0.'

Biomass

To approximate other potentially harvestable forest, Biomass data were obtained from FIA in the form of a 250 × 250 meter raster representing dry pounds per acre, with values ranging from 0 to 271,584. Based on data in the *2005 Kansas Forests* (Moser et al., 2008)), cells containing original data values greater than 200,000 pound per acre were reclassified to a value of '1' and cells with values less than or equal to 200,000 pounds per acre were assigned a value of '0.'

Forest within Mill Average Haul Areas ('No Overlap,' 'Two Mill Overlap,' and 'Three Mill Overlap')

To generate this analysis input data layer, representatives at the top three producing saw mills within the state according to the *Kansas Timber Industry – An Assessment of Timber Product Output and Use (*Reading and Bruton, 2007) were contacted for their average haul distance. Once this information was gathered, point data for each of the three mills was buffered by the obtained average distance. The resulting polygon layer was clipped to a Kansas boundary and converted to a raster in which cells where only one mill hauled from – or, where no overlap of mill haul areas occurred – were assigned a value of '1,' cells in which two mill haul areas overlapped were assigned a value of '2,' cells in which three mill haul areas overlapped were assigned a value of '3,' and cells outside of mill haul areas were assigned a value of '0.' The previously discussed reclassified 'Woodland' layer, with a value of '10' for woodland and '0' for non-woodland, was combined with the mill haul areas raster layer using the raster math 'Plus' tool. Values of '0,' '1,' '2,' '3,' '10,' '11,' '12,' and '13' resulted from this process. Three new raster data layers were produced by reclassifying the resulting layer. Cells containing a value of either '11,' '12,' or '13,' representing areas of 'woodland' combined with either 'No Mill Overlap,' 'Two Mill Overlap,' or 'Three Mill Overlap' respectively, were reclassified to a value of '1,' while all other cells were assigned a value of '0.' These three newly created data layers ('Forest within Mill Average Haul Areas with No Overlap,' 'Forest within Mill Average Haul Areas with Two Mill Overlap,' 'Forest within Mill Average Haul Areas with Three Mill Overlap') became three separate analysis input layers.

Maintaining and Promoting Livelihoods and Economic Benefits of Woodlands — Composite Map

After developing the seven analysis input data layers ('Black Walnut,' 'Biomass,' 'Forest within Mill Average Haul Areas with No Overlap,' 'Forest within Mill Average Haul Areas with Two Mill Overlap,' 'Forest within Mill Average Haul Areas with Three Mill Overlap') described above, a 'Weighted Sum' analysis was performed, in which each '0,' '1' analysis raster is assigned a weight (Table 3.2) based on an average weight determined by 11 Kansas Forest Service staff. The resulting raster contains values ranging from 0 to 2.05 (Figure 3.10). These values were later combined with similarly produced values from the 'Sustaining Water Quality and Quantity' (Section 3.2.1), 'Protecting and Restoring Forest Biodiversity and Wildlife Habitat' (Section 3.2.2) and 'Sustaining and Protecting Forest and Agroforestry Ecosystems' (Section 3.2.3) benefits to produce a composite 'Forest Resource Benefits and Services' layer (Figure 3.11).

Kansas black walnut gunstock blanks. Kansas forest industry has the potential to grow by increasing local use of native species.

Strategy for Maintaining and Promoting the Livelihoods and Economic Benefits of Woodlands

Maintaining and promoting the livelihoods and economic benefits of woodlands supports the national objective of "Maintaining and enhancing the economic benefits and values of trees and forests." The Urban and Community Forestry Program and Forest Stewardship Program are the two USDA Forest Service State and Private Forestry Programs that address this issue. The I-70 Metro Corridor, Wooded Plains, and Greater Wichita and Southern Arkansas River are the targeted priority landscapes (Figure 3.16). Feasibility studies

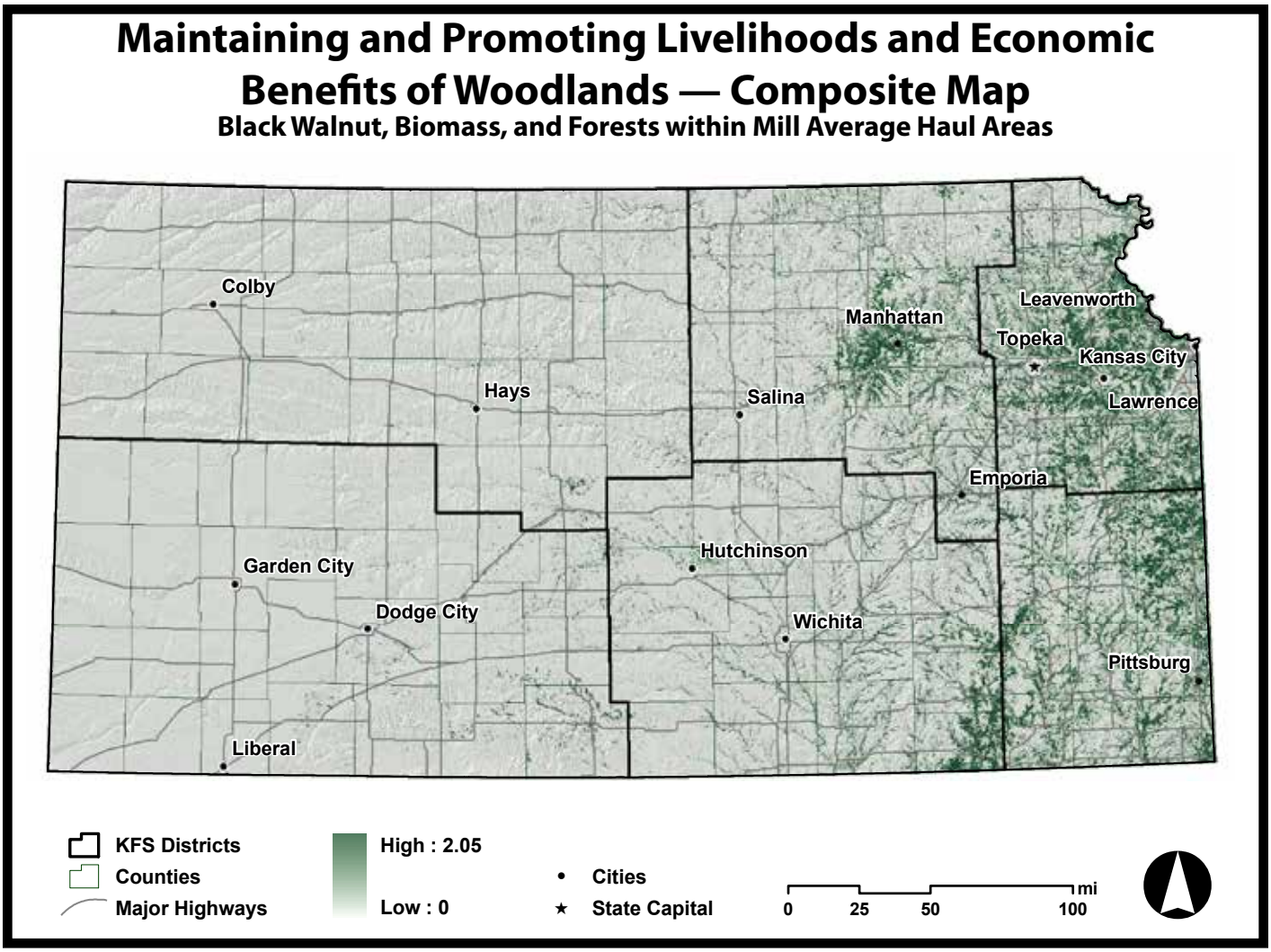


Figure 3.10. *The result of a weighted sum analysis on all cells combining the assigned weights (from Table 3.2) for the following datasets: Black Walnut, Biomass, and Forest within Mill Average Haul Areas ('No Overlap,' 'Two Mill Overlap,' and 'Three Mill Overlap').*

will be conducted in areas surrounding Kansas City, Topeka, Wichita, and Pittsburg, targeting public boiler systems 40 years or older for conversion to woody biomass. Annual or periodic forest inventory of communities, riparian forest and windbreaks in priority landscapes will be conducted and ecosystem service values assigned. Annual or periodic forest inventory of communities, riparian forests and windbreaks in priority landscapes will be conducted and ecosystem service values assigned. A community of interest and support for utilization of eastern redcedar biomass will be developed with Kansas Legislature, State Departments of Commerce, Energy, Labor and Health and Environment – Air Quality Division, Kansas Association of Conservation Districts, Kansas Water Office, Kansas Livestock Association, Tall Grass Legacy Alliance, Natural Resource Conservation Service, Rural Development and Kansas State University's Center of Engagement and Economic Development. To create better data for feasibility studies, the quality of forest inventories will be improved by increasing the number of plots sampled.

Resources Required and Performance Measures for Maintaining and Promoting the Livelihoods and Economic Benefits of Woodlands

A community of interest and support for utilization of eastern redcedar biomass will be developed with Kansas Legislature, State Departments of Commerce, Energy, Labor and Health and Environment – Air Quality Division, Kansas Association of Conservation Districts, Kansas Water Office, Kansas Livestock Association, Tallgrass Legacy Alliance, Natural Resource Conservation Service, Rural Development and Kansas State University's Center of Engagement and Economic Development. Performance measures will include the number of communities and the percent population served under active urban and community forest management plans; the number of total jobs (direct, indirect, and induced) sustained or maintained in the economy annually due to State and Private Forestry investments; and the total value of resources leveraged through partnerships with states and other partners.

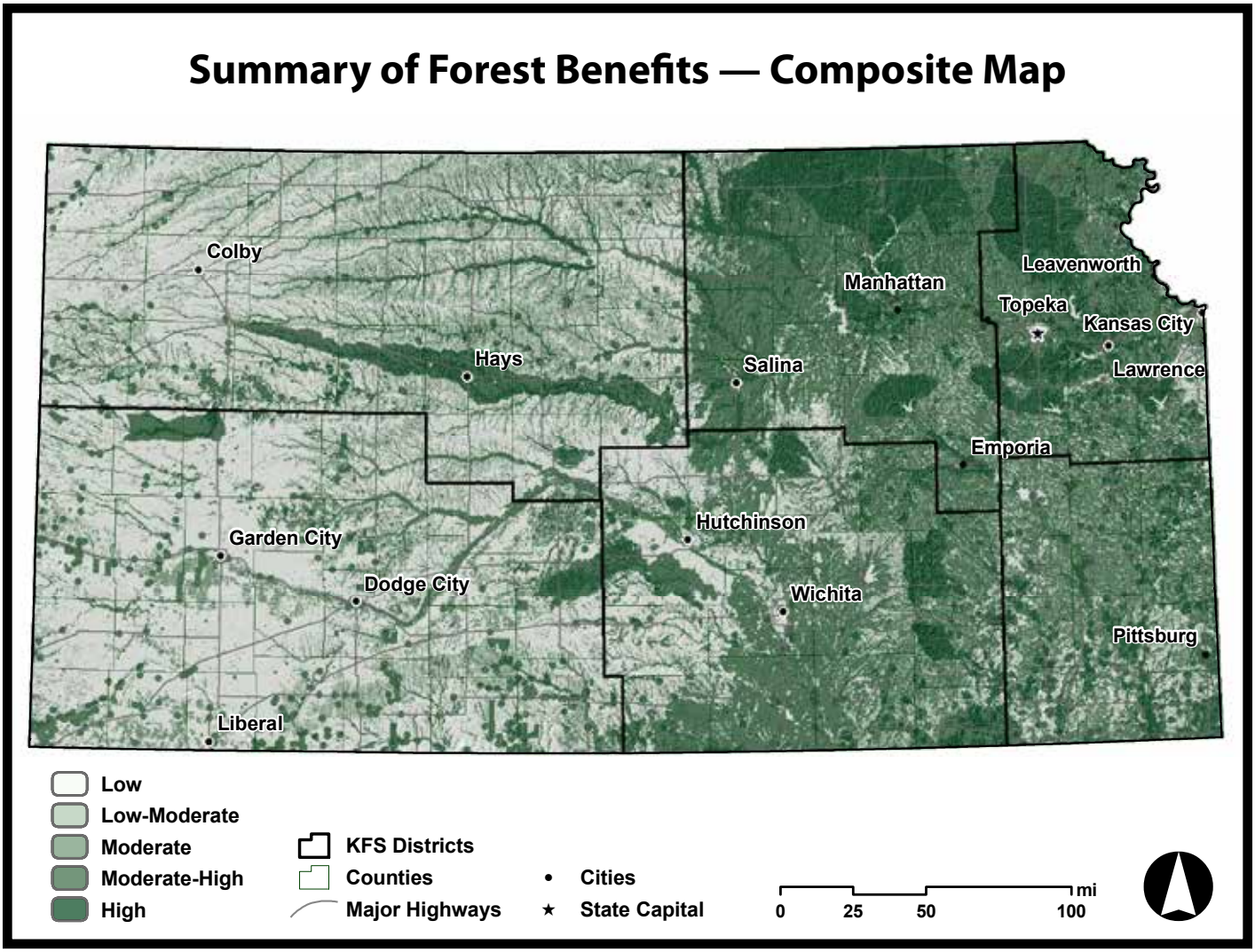


Figure 3.11. *A five-class quantile reclassification of the weighted sum analysis combining the composite maps for: Sustaining Water Quality and Quantity, Protecting and Restoring Forest Biodiversity and Wildlife Habitat, Sustaining and Protecting Forest and Agroforestry Ecosystems, and Maintaining and Protecting the Economic Benefits of Woodlands.*

Summary — Forest Resource Benefits Five-Class Composite Map

The final Forest Resource Benefits Composite data layer and map represents the results of a "Weighted Sum" analysis combining the full suite of data layers across all four sub-issues. Table 3.2 shows the weights assigned to each data set in this Forest Threats composite. No additional weights were assigned to the three sub-issue composite maps. This weighted sum resulted in an output raster with values between 0 and 2.73. The resulting raster dataset was then reclassified using a five-class quantile classification scheme (Figure 3.11). Given this quantile classification is based on a uniform cell size (30 × 30 meter) across the state, the five classes also represent five equal areas. The resulting classes have been termed 'low,' 'low-moderate,' 'moderate,' 'moderate-high,' and 'high.'

3.3 Summary of Kansas Forest Action Plan

3.3.1 Summary of GIS Methodology

Staff Input and Weights

Kansas Forest Service staff members were involved throughout the iterative process of the statewide assessment analysis, identifying issues found in the field, as well as critiquing data and map series generated along the way. In order to target priority issues identified in the process, staff members were provided a list of final data layers and asked to indicate a level of importance ('Most Important,' 'Very Important,' 'Moderately Important,' 'Somewhat Important,' 'Unimportant') for each. Once surveys were collected, point values ('Most Important' = '1,' 'Very Important' = '0.75,' 'Moderately Important' = '0.5,' 'Somewhat Important' = '0.25,' 'Unimportant' = '0') were established for each importance level and individual staff

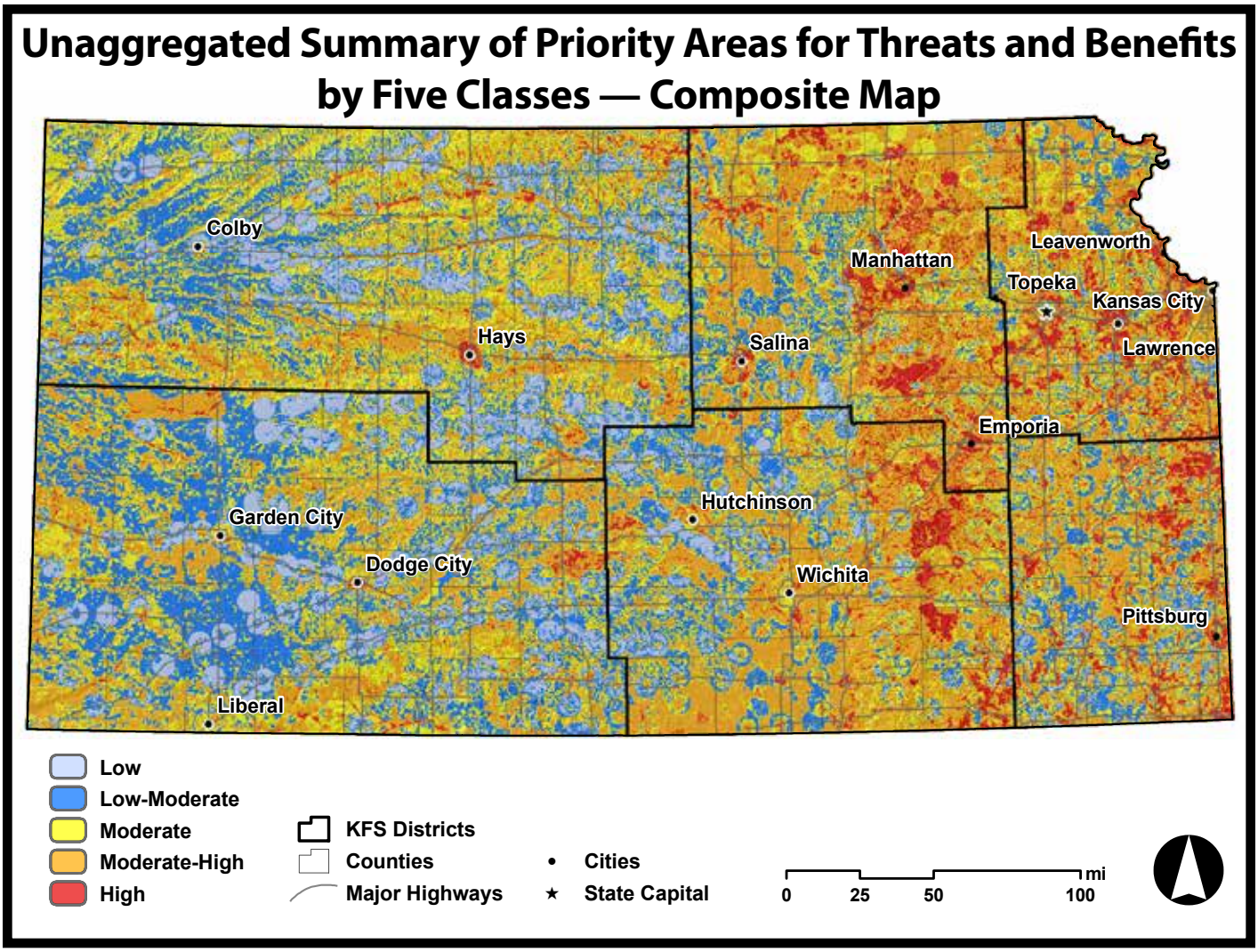


Figure 3.12. *A five-class quantile reclassification of the cell values as a result of combing the composite maps for 'Forest Resource Threats' and 'Forest Resource Benefits.' No additional weights were assigned at this stage of analysis; rather, values 1 to 5 from each classified layer were combined to produce an assessment composite layer with values ranging from 2 to 10. These cell values were then reclassified into a five-class quantile classification (Low, Low-Moderate, Moderate, Moderate-High, and High).*

values were averaged to create a final weight for each analysis input data layer (Table 3.2).

Final weights were applied, through a 'Weighted Sum' analysis as discussed in the 'Forest Resource Threats' and 'Forest Resource Benefits and Services' sections, to the individual input data layers to create the seven issue composite layers ('Issues that Threaten a Healthy Forest,' 'Wildfire Risk,' 'Loss of Kansas Forestland,' 'Sustaining Water Quality and Quantity,' 'Protecting and Restoring Forest Biodiversity and Wildlife Habitat,' 'Sustaining and Protecting Forest and Agroforestry Ecosystems,' 'Maintaining and Promoting Livelihoods and Economic Benefits of Woodlands'). The 'Issues that Threaten a Healthy Forest,' 'Wildfire Risk,' and 'Loss of Kansas Forestland' issue composite layers carried their output values – and thus the composite weights – forward into the 'Forest Resource Benefits' composite layer. Similarly, the 'Sustaining Water Quality and Quantity,' 'Protecting and Restoring Forest Biodiversity and Wildlife Habitat,' 'Sustaining and Protecting Forest and Agroforestry Ecosystems,' and 'Maintaining and Promoting Livelihoods and Economic Benefits of Woodlands' issue composite layers carried their values forward into the 'Forest Resource Benefits and Services' composite layer.

At this point in the analysis, both the threats and benefits composite layers were classified as described in their respective sections. The classified layers were then combined as described in the 'Statewide Composites' section below. By using the classified results, both forest benefits and forest threats were considered of equal importance in the final analysis so that areas where the various combinations of threat values and benefit values intermingled could be identified.

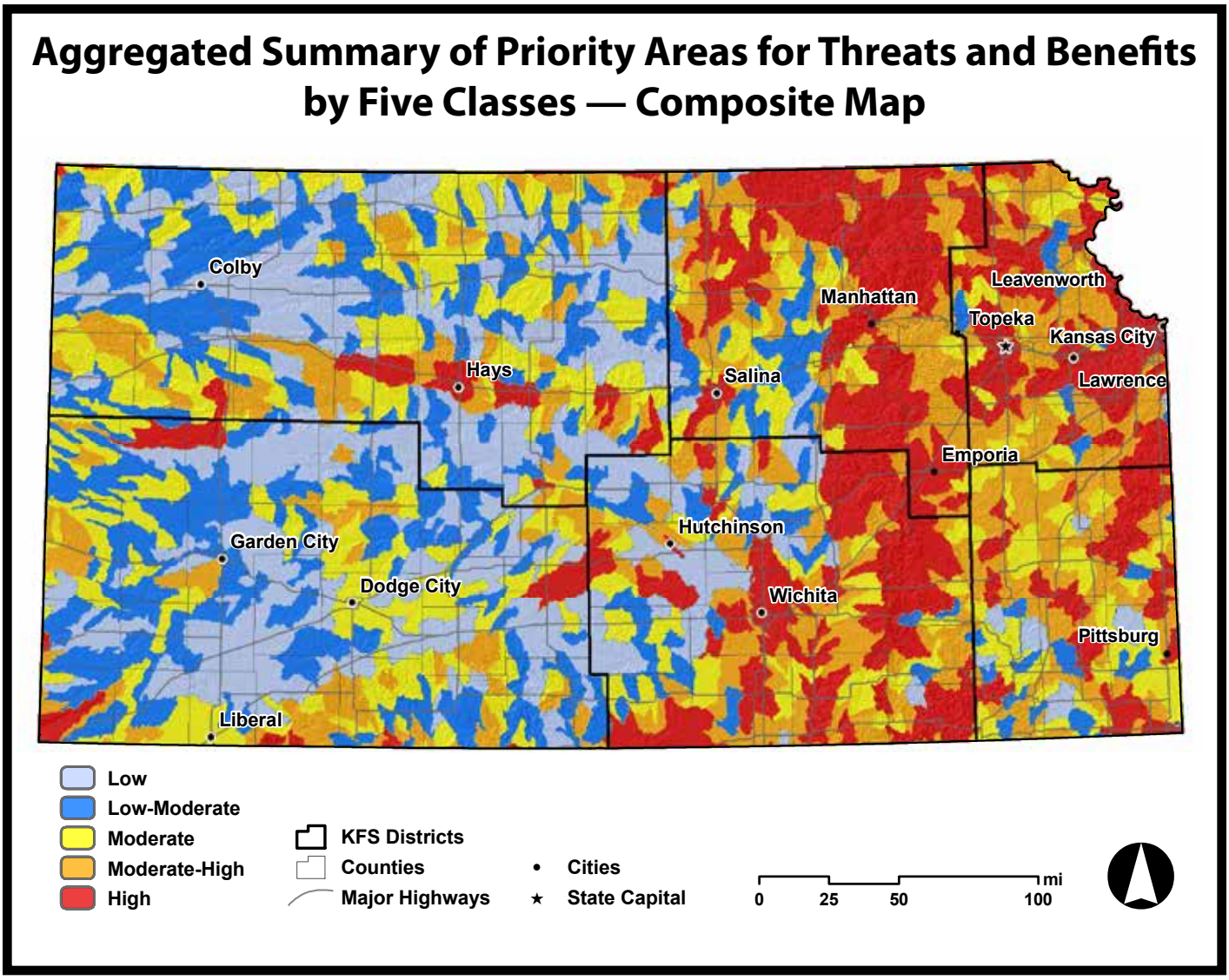


Figure 3.14. *A five-class quantile classification of Hydrological Unit Code (HUC) 14 watersheds derived from the mean raster cell value from the statewide composite map (Figure 23) within each watershed.*

Summary of Priority Areas Threats and Benefits Composite Maps

To complete the analysis portion of the Statewide Assessment and Strategy, a series of final statewide composite layers were generated, combining threats and benefits, as an apparatus for helping to identify priority resource areas – or areas where Kansas Forest Service funds and staff should be targeted. The classified 'Forest Resource Benefits and Services' and 'Forest Resource Threats' composite layers (Figures 3.11 and 3.5) were combined using a 'Weighted Sum.' No additional weights were assigned at this stage of analysis; rather, values 1 to 5 from each classified layer were combined to produce an assessment composite layer with values ranging from 2 to 10 . Higher values in the Assessment composite layer indicate a combination of both high benefits and high threats. The layer was subsequently classified using a five-class quantile classification scheme producing classes: 'High,' 'Moderate – High,' 'Moderate,' 'Low – Moderate,' and 'Low' (Figure 3.12).

In order to create the Priority Resource Areas – 'forest landscape areas' in Final Guidance language – the unclassified Assessment layer cell values were aggregated to HUC-14 watershed boundaries. To achieve this aggregation, the 'Zonal Statistics' tool was applied, with HUC-14 watersheds used as the 'Zone' and the unclassified Assessment composite used as the 'Input value raster.' Aggregation was conducted based on the mean cell value within each HUC-14 watershed. The aggregated output layer was subsequently classified, again using a five-class quantile scheme, resulting in 'Low,' 'Low – Moderate,' 'Moderate,' 'Moderate – High,' and 'High' classes (Figure 3.14). From this layer the 'Moderate – High' and 'High' classes were selected for a final 'Priority Resource Areas' map (Figure 3.15). 'Moderate – High' areas were selected with the idea that there may be potential for cross-boundary work from areas classified as 'High.' The entire GIS methodological approach throughout the Statewide Forest Resource Assessment to this point is shown in a simplified graphical form in

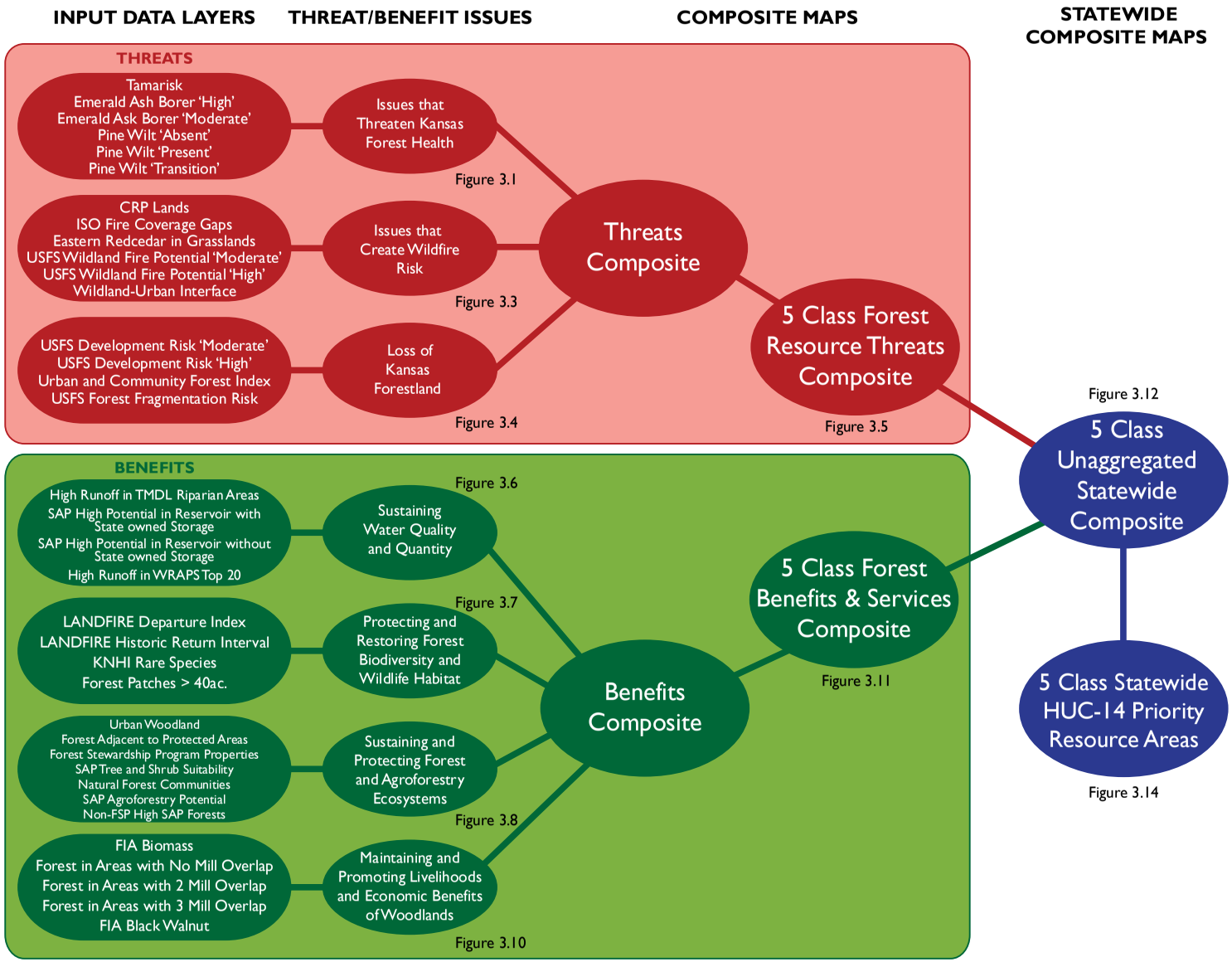


Figure 3.13. *This diagram shows, in a simplified graphic manner, the GIS methodological procedure followed in the Kansas Statewide Forest Resource Assessment. Each column represents a stage in the analytical procedure that eventually resulted in a five-class Statewide HUC-14 Priority Resource Areas, Figure 3.14. The data layers column represents the 36 data inputs developed for the analysis, 16 for Forest Resource Threats, and 20 for Forest Resource Benefits. Maps detailing all 36 data input layers can be found in Appendix C. These 36 data layers produce seven sub-issue composite maps, which were created through weighted sum analysis and are represented by the second column. These seven sub-issues, three for Forest Resource Threats and four for Forest Resource Benefits, in turn created composite maps representing statewide Forest Resource Threats (Figure 3.5) and Forest Resource Benefits Services (Figure 3.11). When combined (Figure 3.12) and aggregated by HUC-14 Watersheds, these two composite maps represent the Kansas Statewide Priority Resource Areas (Figure 3.14).*

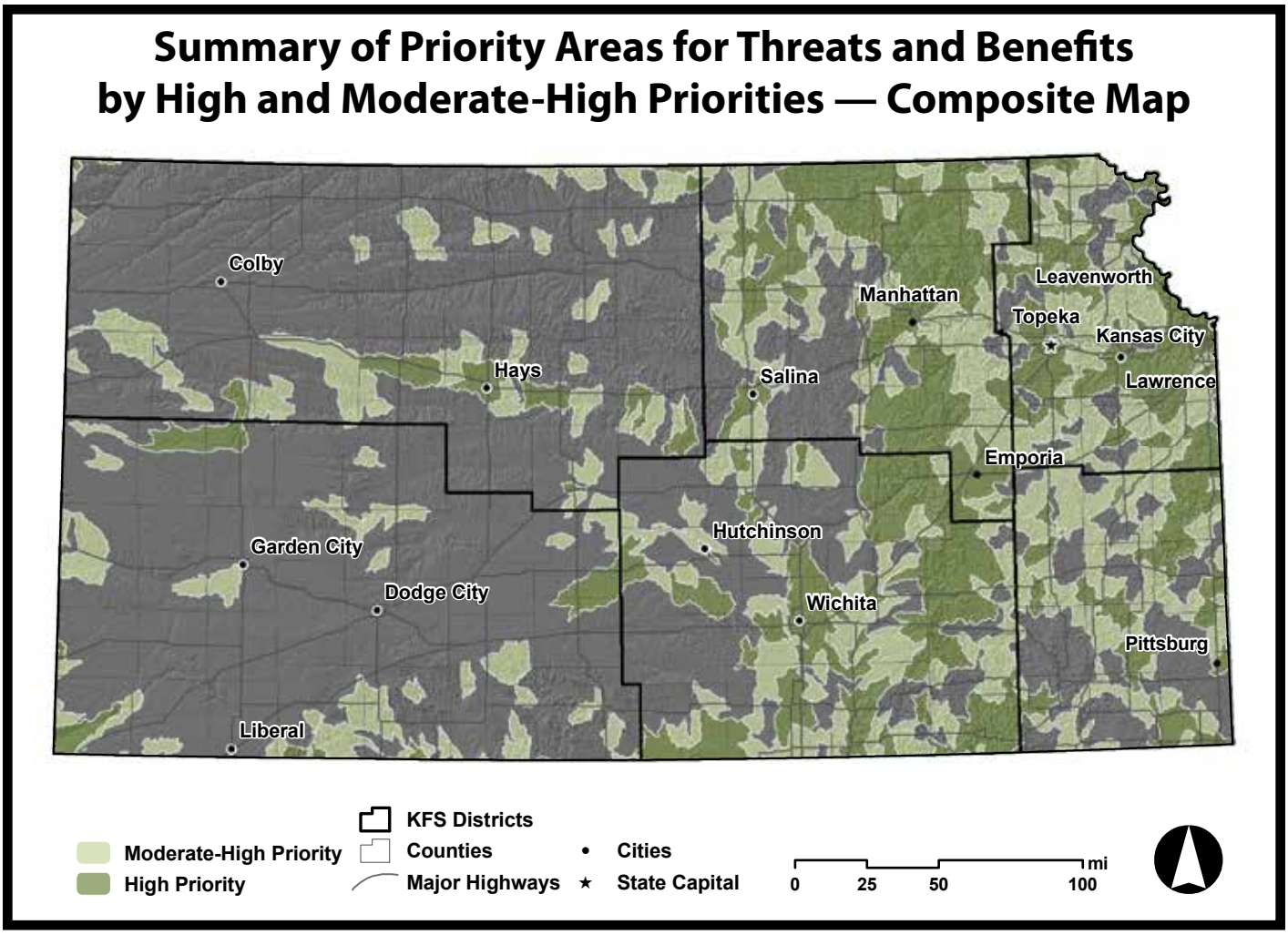


Figure 3.15. *Kansas Forest Resource Assessment identified primary resource areas.*

Figure 3.13, with marked reference to Assessment map figures contained within the text.

After the creation of the Priority Resource Areas, it was decided that to better efficiently and effectively coordinate resources and efforts across areas delineated as 'Moderate-High' and 'High,' an additional level of refinement could prove beneficial, especially in promoting work to the public and working with other agencies and stakeholders. To address this need, nine Landscape Priority Areas were created to focus future work (Figure 3.16). These areas were delineated along broad ecological and/or issue related themes. This additional level of delineation does not preclude work in other Priority Resource Areas; it simply provides a framework for broader landscape partnerships and projects with other agencies and stakeholders.

3.3.2 Summary for Kansas Forest Resource Assessment and Strategy

The Kansas Forest Resource Assessment and Strategy will guide the development of USDA Forest Service, State and Private Forestry consolidated grant narratives, competitive redesign grants, and other grants by indicating activities in the narratives that address specific issues and strategies. Baseline forest resource conditions identified under each issue will be used to monitor successful outcomes in priority landscapes and areas. Strategies will be reviewed annually as grant narratives are developed to determine success and revised accordingly based on performance measures and indicators. The assessment and strategy will also be revised as new data becomes available with a major review in 2015, assuming funding is available.

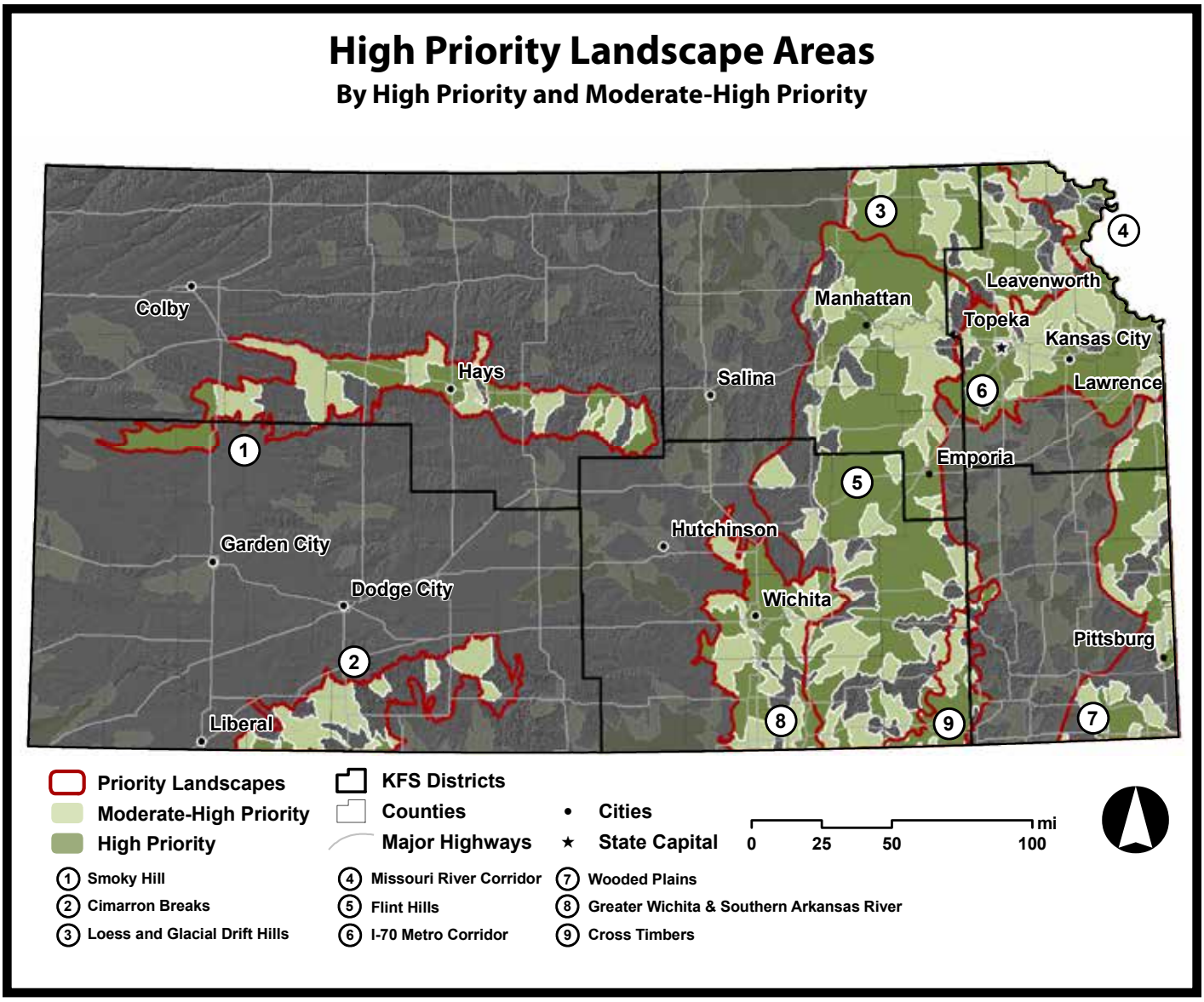


Figure 3.16. *Kansas Forest Resource Assessment and Strategy priority landscapes.*

3.4 Multi-State/Regional Issues and Priority Areas

Six multi-state or regional issues and areas have been identified (Figure 3.17) and are listed below. Some issues and areas represent ongoing projects and programs. Others will require additional planning, collaboration, and consensus.

Cross Timbers
A description of this regional area and its issues are described under section 4.2.5 as a Forest Legacy Program Area. It includes the states of Oklahoma, Texas, and Arkansas.

Flint Hills
This multi-state priority area has been described in detail in Chapter 4, Assessment of Needs under sections 4.2.1 Northern Flint Hills Forest Legacy Program Area, page 57 and 4.2.2 Central Flint Hills Forest Legacy Program Area, page 57. Geographically, the issues in this area include Oklahoma and Kansas.

Invasive Species Multi-State Area
This area involves a continuation of the Great Plains Forestry Partnership to address the threat of emerald ash borer, thousand cankers disease, tamarisk, Russian olive, Amur Honeysuckle, and other invasives. These issues and strategies to address them are described on page 22, section 3.1.1, under Issues that Threaten Forest Health. The Great Plains Forestry Partnership includes the states of North Dakota and South Dakota, Nebraska, and Kansas. Colorado, Oklahoma, and Missouri are also important states to involve because of the potential movement of infected wood across state lines.

Kansas City Metro Area
A multi-state area and issue of Loss of Kansas Forestland (Section 3.1.3) that involves Missouri.

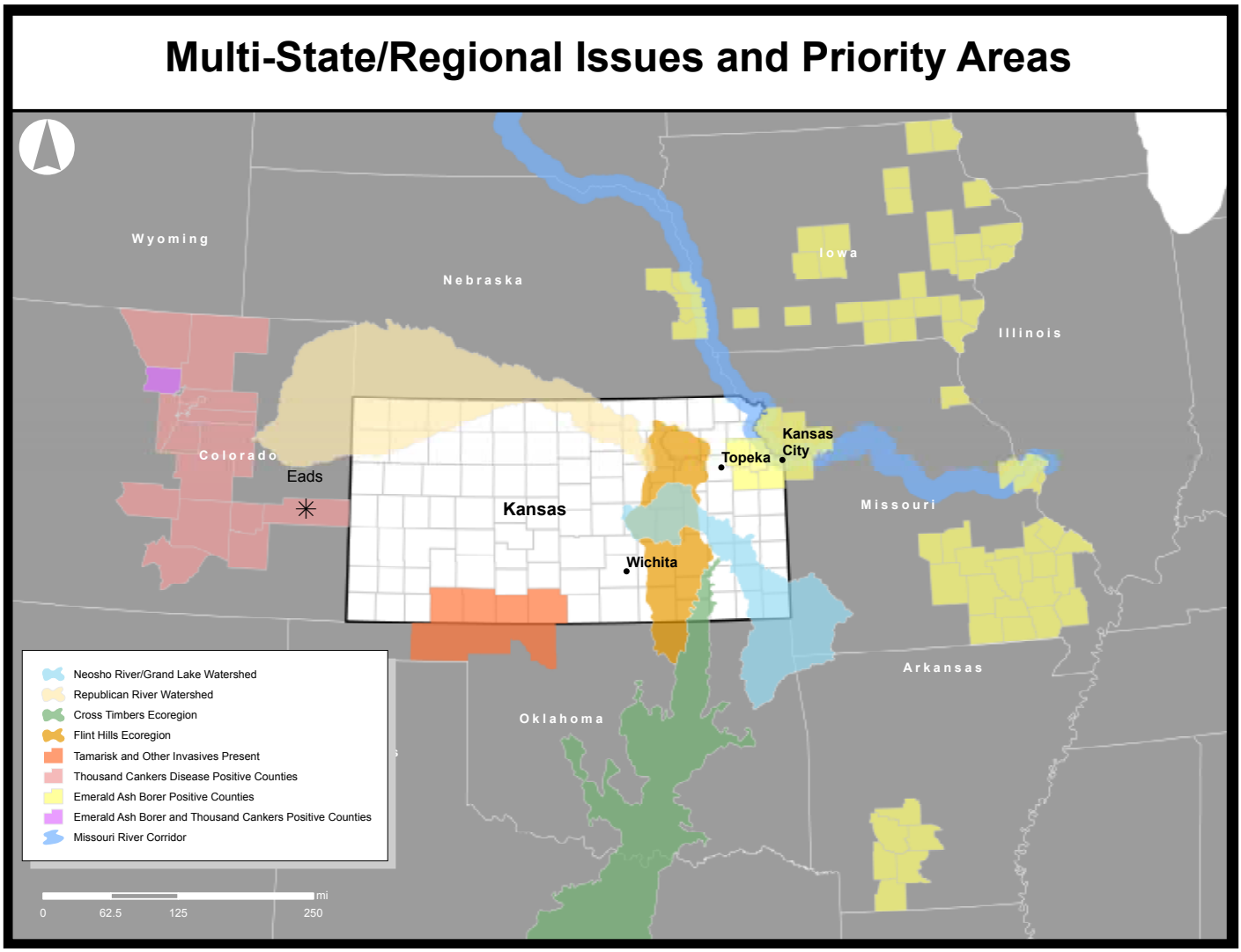


Figure 3.17. *Multi-state or regional issues identified by the Kansas Forest Service.*

Missouri River Corridor

Since European settlement, the Missouri River Valley has been transformed from flood plain forest and grassland to agricultural cropland and river impoundments. Estimates suggest as much as 47 percent of the forestland has been converted since 1982. A recent study of riparian forest along the Missouri River from Fort Benton, Montana to Kansas City, Missouri found 62 percent of the cottonwood are 50 years or older and only 14 percent are 25 years or less.[25] Cottonwood is not regenerating at adequate levels. This issue along with water quality, invasive species, species in need of conservation, and loss of riparian forest to agricultural conversion are regionally shared by the Great Plains Forestry Partnership.

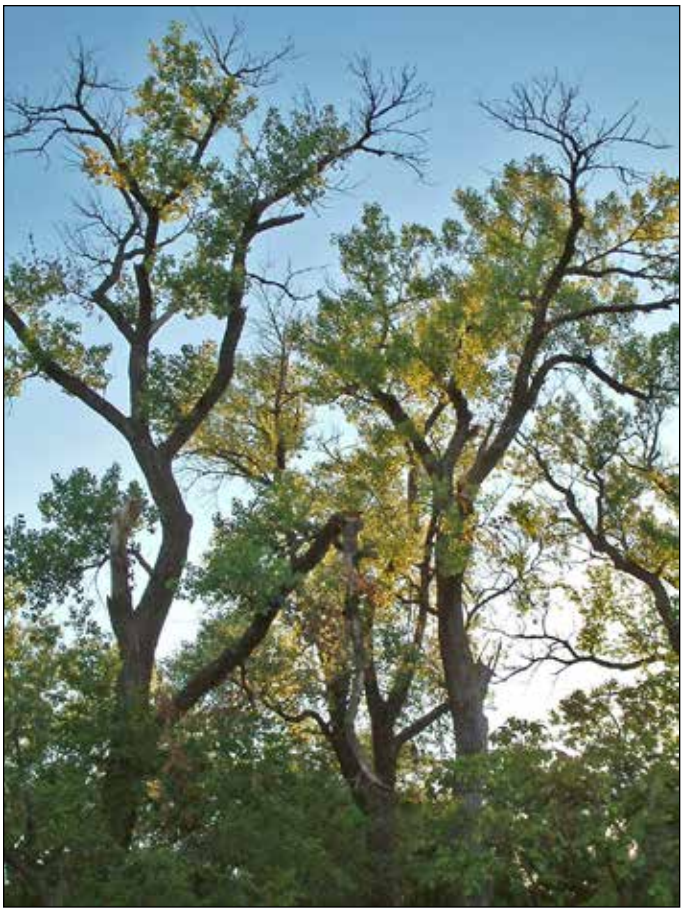
Neosho-Grand Lake Watershed

An initiative that involves Oklahoma, Arkansas, Missouri and Kansas. The 10,298 square mile watershed traverses two separate Environmental Protection Agency regions, includes numerous tribal areas, and has many county and local governments within its boundaries. Impaired waters caused by nutrient (most notably phosphorous) pollution are widespread throughout the Grand Lake watershed. Each of the three major watershed rivers (Neosho River, Spring River, and Elk River) has nutrient impairment and each flows into Grand Lake and other reservoirs. The Neosho River Subwatershed has three federal reservoirs (Marion Reservoir, Council Grove, and John Redmond), each negatively impacted by nutrients. A 2005 algae bloom occurred on Marion Reservoir that resulted in the beaches being closed and communities prevented from using lake water as their water supply. Beach closings at Marion have occurred in subsequent years. This information has been taken directly from the Grand Lake Watershed Plan, which will guide collaborative efforts.[26]

25 A report on the decline of cottonwood forests along the Missouri River is available at: http://www.moriverrecovery.org/mrrp/f?p=136:134:3591667163164289::NO:::

26 The plan is available at: http://grandlakefun.com/cleargrand/Grand%20Lake%20Watershed%20Plan%202008.pdf

Republican River Watershed
A watershed shared with the states of Nebraska and Colorado. In Kansas, the Upper Republican focuses on the issue of sedimentation of Tuttle Creek Reservoir described on page 32 in Section 3.2.1, Sustaining Water Quality and Quantity. The Lower Republican's focus is on the shared issue of controlling invasive species and water quantity



Cottonwood decline is a statewide issue shared with other Great Plains states, specifically in the Missouri River Valley.

Chapter 4

KANSAS FOREST LEGACY PROGRAM
ASSESSMENT OF NEED

The Forest Legacy Program is a voluntary program that encourages the protection of environmentally important privately owned forestlands from conversion to non-forest use mainly through conservation easements that restrict development. The Forest Legacy Program requires an "Assessment of Need" document to guide the implementation of the program. The Kansas Forest Resource Assessment and Strategy serves as that document for the Forest Legacy Program in Kansas.

4.1 Forest Legacy Program Responsibility

In November 2008, former Governor Kathleen Sebelius designated the Kansas Forest Service as the lead agency for the Forest Legacy Program (FLP) in Kansas (Appendix F). The program will be implemented through a State Grant Option, by which the state of Kansas, and specifically the Kansas Forest Service, will hold title to all conservation easements or deeds. The Kansas Forest Service may elect to delegate management and administration of individual tracts of land to other government entities or organizations such as land trusts.

4.1.1 Goals and Objectives of FLP in Kansas

- Protection of riparian forests from agricultural and urban development to sustain water quality and quantity.
- Protection of forest biodiversity and wildlife habitat for species of greatest conservation need and threatened and endangered species.
- Protection of forests and woodlands of good to high ecological value from agricultural, commercial, and residential development and fragmentation.

4.1.2 Eligibility Criteria for Establishing FLP Landscape and Priority Areas

Potential Forest Legacy Areas must be high-priority landscape areas as defined by the Kansas Forest Resource Assessment and Strategy that address at least one of three issues identified in the strategy including 1) Loss of Kansas Forestland, 2) Sustaining Water Quality and Quantity and 3) Protecting and Restoring Forest Biodiversity and Wildlife Habitat. FLP Areas should offer one or more of the following public values:

- Scenic resources;
- Public recreation;
- Water quality/quantity;
- Threatened and endangered or species in greatest need of conservation;
- Archeological, cultural or geologic features;
- Contiguous or close to existing public forests or unique forest resources;
- Provides multiple uses including but not limited to forest products, watershed protection, and recreation.

FLP Areas must be threatened by current or future conversion to nonforest uses as a result of change in ownership, conversion to agricultural use, gravel pits/mining, residential/commercial development or invasive species.

4.1.3 Process for Selection and Ranking Criteria of FLP Project Proposals

Project proposals will be identified through request processes managed by the Kansas Forest Legacy Program manager. A subcommittee of the State Forest Stewardship Coordinating Committee and the Kansas Technical Committee will review submitted projects, assign values to the project attributes according to the program ranking system (below), and rank the projects according to the total value derived from the ranking system. These ranked projects will then be submitted to the Kansas State Forester for additional review and consideration. Following the State Forester's final ranking approval, the proposed projects will be submitted to USDA Forest Service. Projects compete nationally for funding.

The Kansas Forest Stewardship Coordinating Committee and the Kansas Forest Service created the program evaluation and ranking system shown in Table 4.1 to rank Forest Legacy Program applications.

4.1.4 Methods of Protection of Forest Legacy Program Area Tracts

Conservation easements will be the preferred method for acquiring forestland. Full-fee may be utilized when appropriate. Development rights will be obtained on all tracts to prevent the conversion of forestland for the construction of buildings, utility right-of-ways, and other improvements that destroy forestland. Timber rights are retained by

Table 4.1. *Kansas Forest Legacy Ranking System*

	Max Points
Parcel located in an identified Priority Legacy Area	50
Conversion Risk (to non-forest urban or agricultural uses)	50
Economics (% contributions, 25% from non-federal or in-kind)	50
Public Resource Benefits	
Habitat for Species in Greatest Need of Conservation/T & E	25
Water (watershed protection/water quality/ quantity)	25
Forest Products (timber/wood products/ biomass)	25
Aesthetics (scenic or unique landscapes)	25
Recreation (public non-motorized opportunities)	25
Cultural Resources (historic/archeological values)	25
Unique Ecological Area	25
Size and Continuity (75 percent forested, 5 acre minimum, larger parcels more value)	25
Forest Stewardship Potential (occurring in high potential SAP area)	25
Mineral Rights (owned/controlled by applicant)	25
Parcel Crosses State Boundaries	25
Contiguous to Public or Protected Lands	10
Community Support	10
Contains Riparian Forestland	10
Evidence of Active and Historic Forest Management	10
Forest Type Ecologically Appropriate for Parcel	10
Total	**475**

the landowner. All management shall follow guidelines of a Forest Stewardship Management Plan approved by the Kansas Forest Service. Timber harvesting shall be in consultation with a professional forester and follow the guidelines described in the Forest Stewardship Management Plan or K-State Research and Extension publications *Marketing Kansas Timber*, C-542 and *Timber Harvesting*, MF-2749. Departures from sustained forest management are permitted only in limited response to outbreaks of forest insects and disease and salvage in the event of fire or natural disasters. An approved current Forest Stewardship Management Plan is required before a landowner is eligible to participate in the Forest Legacy Program. The plan shall be reviewed and updated as needed at least once every 10 years. Public access rights on each tract are not required and will be determined on a case-by-case basis by a sub-committee of the Kansas Forest Stewardship Coordinating and Kansas Technical Committee. The subcommittee will advise the state forester who will make the final decision prior to the start of negotiations. Disposal of waste or hazardous materials and construction of billboards are prohibited on all properties

Protecting and restoring habitat for state and federally listed species is a goal for all Forest Legacy Program areas.

unless they promote sustainable forestry and natural resource conservation.

4.1.5 Public Involvement in the Assessment of Need

The public involvement process has been described in detail under Section 1.1.1 Procedures, Stakeholders and Public Involvement and began in February 2009 at an Easement meeting convened by the Kansas Water Office targeting Kansas Land Trusts. Claire Harper, USDA Forest Service, State and Private Forestry Region 2, presented information on FLP at the meeting.

Additionally, a timeline for public involvement in the AON

is listed below.

- November 2008 – former Governor, Kathleen Sebelius designates Kansas Forest Service as lead agency for FLP.
- February 2009 – meeting with Kansas Land Trusts to discuss FLP potential and direction, Claire Harper, USDA Forest Service, presenting.

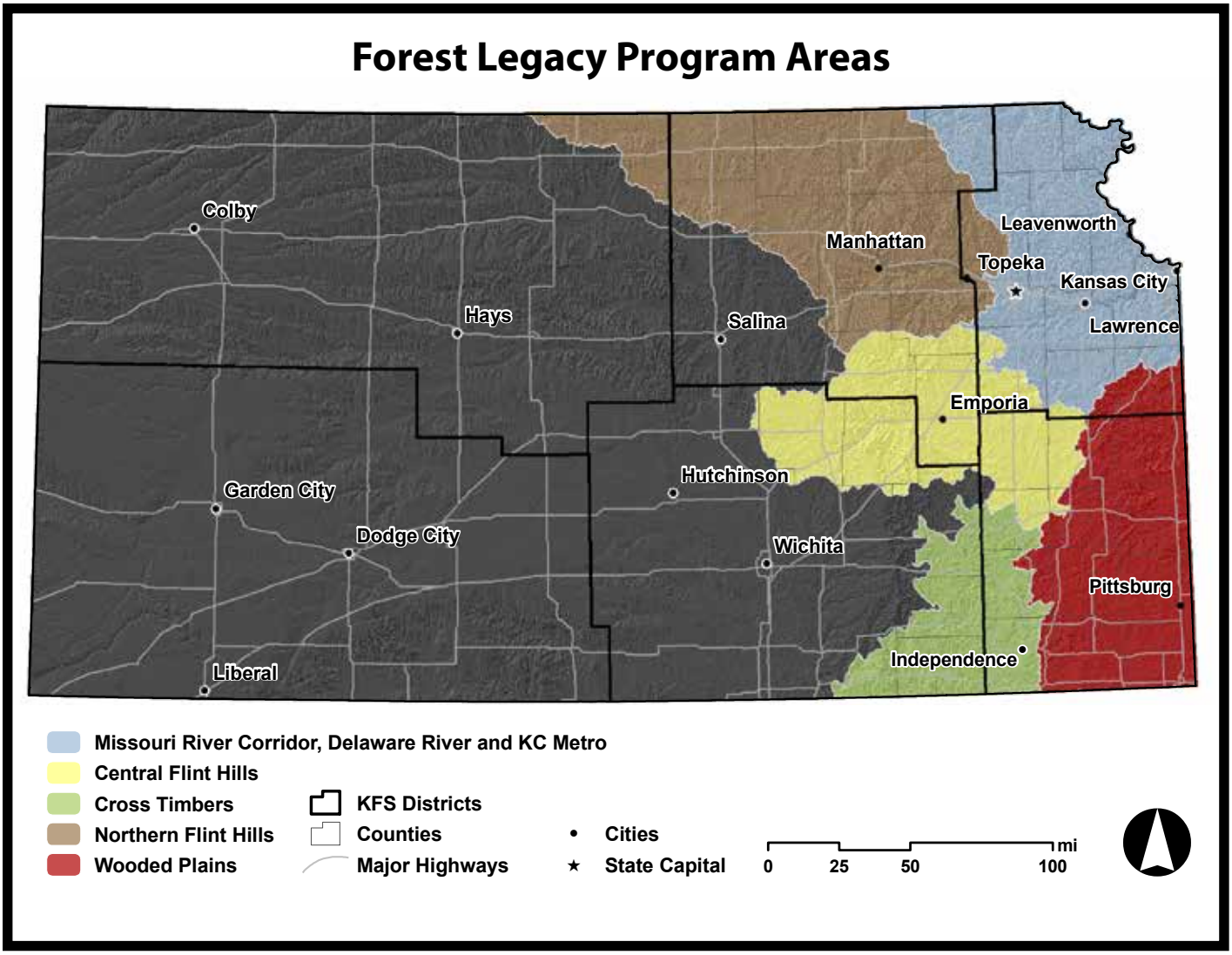


Figure 4.1. *Forest Legacy Program Areas.*

- Winter 2009, Issue #33, Kansas Canopy newsletter article on Forest Resource Assessment and Strategy.
- February 2009 – Kansas State Radio Network, Tree Tales, Forest Legacy Program.
- September 2009 – Posting of Forest Resource Assessment on the Web and "mail-out" to Kansas Technical Committee, State Forest Stewardship Coordinating Committee, and others.
- October 2009 – Kansas Technical Committee and State Forest Stewardship Coordinating Committee meeting to solicit input, (Lindon Wiebe and Dana Coelho, USDA Forest Service also attending).
- February 2010 – Kansas Natural Resource Conference, presentation of Forest Resource Assessment and Strategy.
- May 2010 – Final draft posted on Kansas Forest Service website and mailing of revised Forest Resource Assessment and Strategy to Kansas Technical Committee, State Forest Stewardship Coordinating Committee, and others. News releases, radio programs, soliciting public comment, etc.
- June 4, 2010 - Forest Resource Assessment and Strategy input deadline.

4.2 Kansas Forest Legacy State Priority Area Map

Eleven data layers used in the Kansas Forest Resource Assessment and Strategy (some of them multiple) were used to further refine priority areas specifically for the Forest Legacy Program. They are found under each issue's Map Data Description and Classification section and are listed below.

- Forest Fragmentation, Section 3.1.3
- Urban and Community Forest Index, Section 3.1.3
- High Development Risk, Section 3.1.3
- Moderate Development Risk, Section 3.1.3

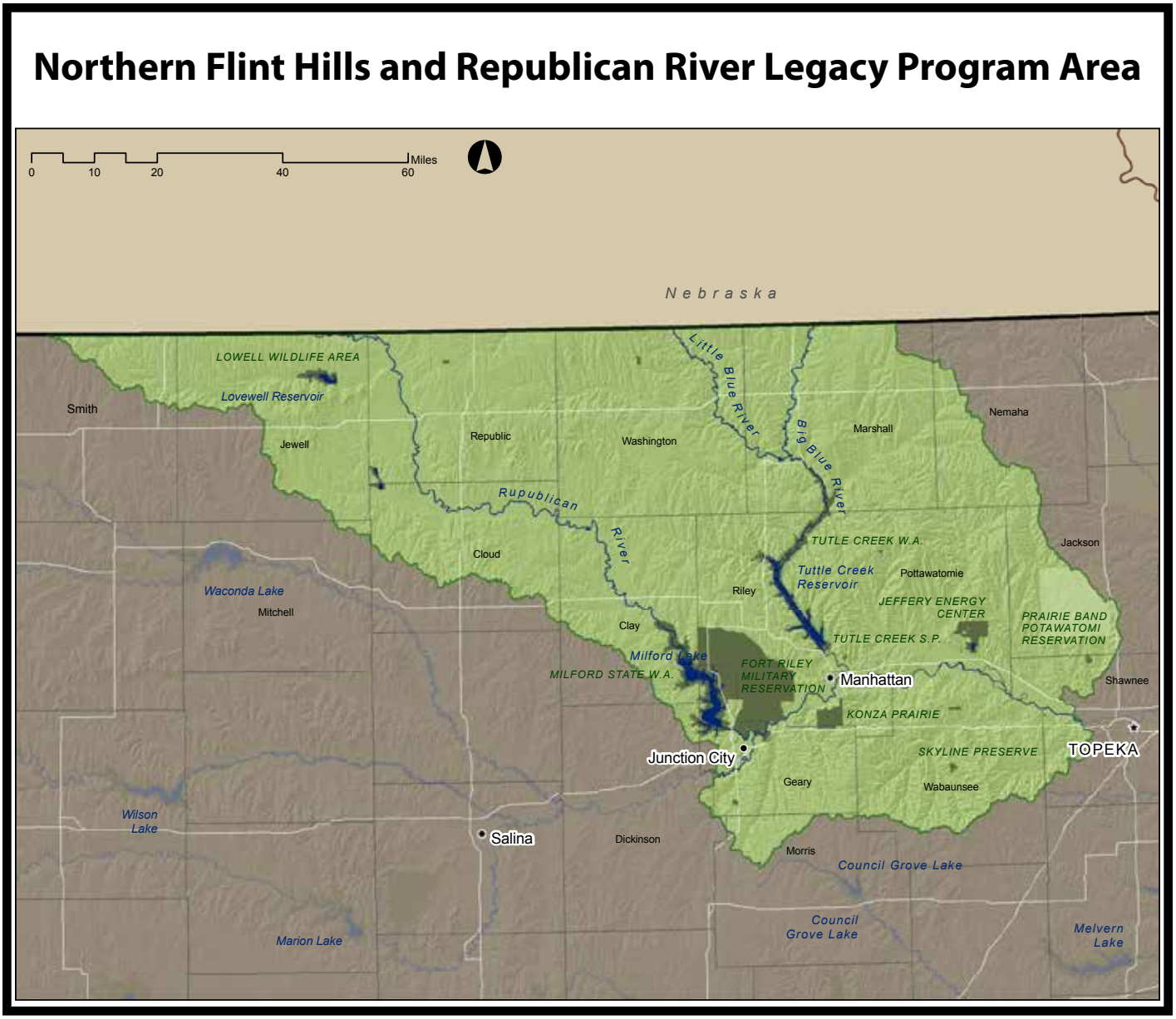


Figure 4.2. *Northern Flint Hills and Republican River Legacy Program Area.*

- WRAPS Riparian Areas/High SSURGO Runoff, Section 3.2.1
- Rare Species, Section 3.2.2
- Forest Patches Greater Than or Equal to 40 Acres, Section 3.2.2
- Forest Stewardship Program Priorities, Section 3.2.3
- Non-Forest Stewardship Program Private High Priority Forestland, Section 3.2.3
- Black Walnut, Section 3.2.4
- 3 Mill Overlap, Section 3.2.4

Determining Boundaries of FLP Areas

An equal weighted raster analysis utilizing ArcMap spatial analyst tools was performed statewide with all 11 datasets at a 30-meter cell resolution. The results of this equal weight analysis were then aggregated at the HUC-14 level and classified into nine quantile classes. The top three classes (a third of all HUC-14 watersheds) were subsequently chosen to represent the basis for the selection of Forest Legacy Areas for Kansas. Forest Legacy Areas have been identified based on the threat of conversion — mostly in the east, surrounding larger cities — and environmentally important forest areas (water quality, rare species, patch size, etc.). Boundaries have generally been defined by the western edge of the Flint Hills and Loess and Glacial Drift Hills ecoregions (Figure 1.2). Forest Legacy Area boundaries represent the edge of contiguous HUC-14 watersheds classified in the top three quantile classes within eastern Kansas and are shown in Figure 4.1. Additional changes to the Forest Legacy Program boundaries were made to incorportate suggestions received from stakeholders.

Protecting riparian forests is an important goal of the Forest Legacy Program.

4.2.1 Northern Flint Hills Forest Legacy Program Area

General Description
The Northern Flint Hills (Figure 4.2) include a majority of Riley, Pottawatomie, and Wabaunsee counties and parts of Geary, Clay, Marshall, Nemaha, Jackson, and Shawnee counties. Physiologically the area is mainly Flint Hills (Riley, Wabaunsee, Geary) with cherty, clayey soils, with some of the greatest tall grass prairie preserves remaining anywhere. Pottawatomie and Jackson represent deeper more fertile soils derived from an area once covered by glaciers. The main forest types are oak/hickory followed by elm/ash/cottonwood. Most forestland occurs as riparian forests, with eastern redcedar encroaching into grasslands. The Kansas River and Big Blue River are the major drainages. Tuttle Creek Lake and Milford Lakes are the major reservoirs.

State and Federal Lands
U.S. Department of Defense (Fort Riley), U.S. Army Corps of Engineers and Kansas Department of Wildlife and Parks (Tuttle Creek Reservoir), The Nature Conservancy, K-State University (Konza Prairie) are the main state, federal, and nongovernmental organizational entities that hold land or have interests in lands potentially associated with the Forest Legacy Program.

Environmental Values
Tuttle Creek Reservoir is a large federal reservoir that covers a surface area of 12,617 acres and has a storage capacity of 241,747 acre feet. The lake provides crucial flood control, public water supply, recreation, and fish and wildlife habitat. Forty-three percent of the storage capacity in the 47-year-old lake has been lost due to sedimentation. Riparian forests of the Big Blue River and the other streams in the 9,628-square-mile watershed provide important environmental benefits that reduce sedimentation rates and impact the longevity and function of the reservoir. Riparian forests along the Kansas River and its tributaries are also in need of protection and management. The Topeka shiner, least tern, piping plover, and the sturgeon chub are federal and state targeted species whose habitat needs development and protection. The bald eagle, which was recently removed from threatened and endangered species list benefits greatly from trees like cottonwood, the Kansas state tree.

Greatest Conversion Pressure
Models suggest the Manhattan area can expect a population increase of 28,700 people by 2012. This expansion is occurring primarily west of Junction City along US-77, east of Manhattan along US-24, with dispersed residential growth in Riley and Pottawatomie counties and along Tuttle Creek Lake Reservoir. Greatest conversion pressures will be associated with those growth projections and conversion of riparian forest to agricultural use.

Goals and Objectives
- Protect riparian forests of Tuttle Creek Lake Reservoir by classifying them for protection, establishment, and management.
- Incorporate goals, objectives, and policies from the Flint Hills Regional Growth Plan, Vision 2025 for Riley County, and the Tuttle Creek Lake WRAPS to target protection and management of riparian forests as Manhattan expands and rural areas become fragmented from residential development. The Kansas Forest Service will participate in the development of these goals, objectives and policies.
- Protect and restore critical habitat for state and federally listed species.

4.2.2 Central Flint Hills Forest Legacy Program Area

General Description
The Central Flint Hills (Figure 4.3) includes the majority of Coffey, Lyon, and Chase counties, with parts of Morris, Franklin, Woodson, Anderson, and Allen counties. Physiologically the majority of the area is Osage Cuestas (hills or crests) dominated by east-facing ridges with soils from limestone and shale origins. The Flint Hills, described in section 1.2.1 covers Chase and Morris counties. Riparian forests of cottonwood, bur oak, elm, ash, black walnut and hackberry line the Cottonwood and Neosho Rivers. John Redmond and Wolf Creek are the major reservoirs.

State and Federal Lands
The U.S. Fish and Wildlife Service (Flint Hills National Wildlife Refuge); U.S. Army Corps of Engineers (John Redmond Reservoir); and Kansas Department of Wildlife and Parks,

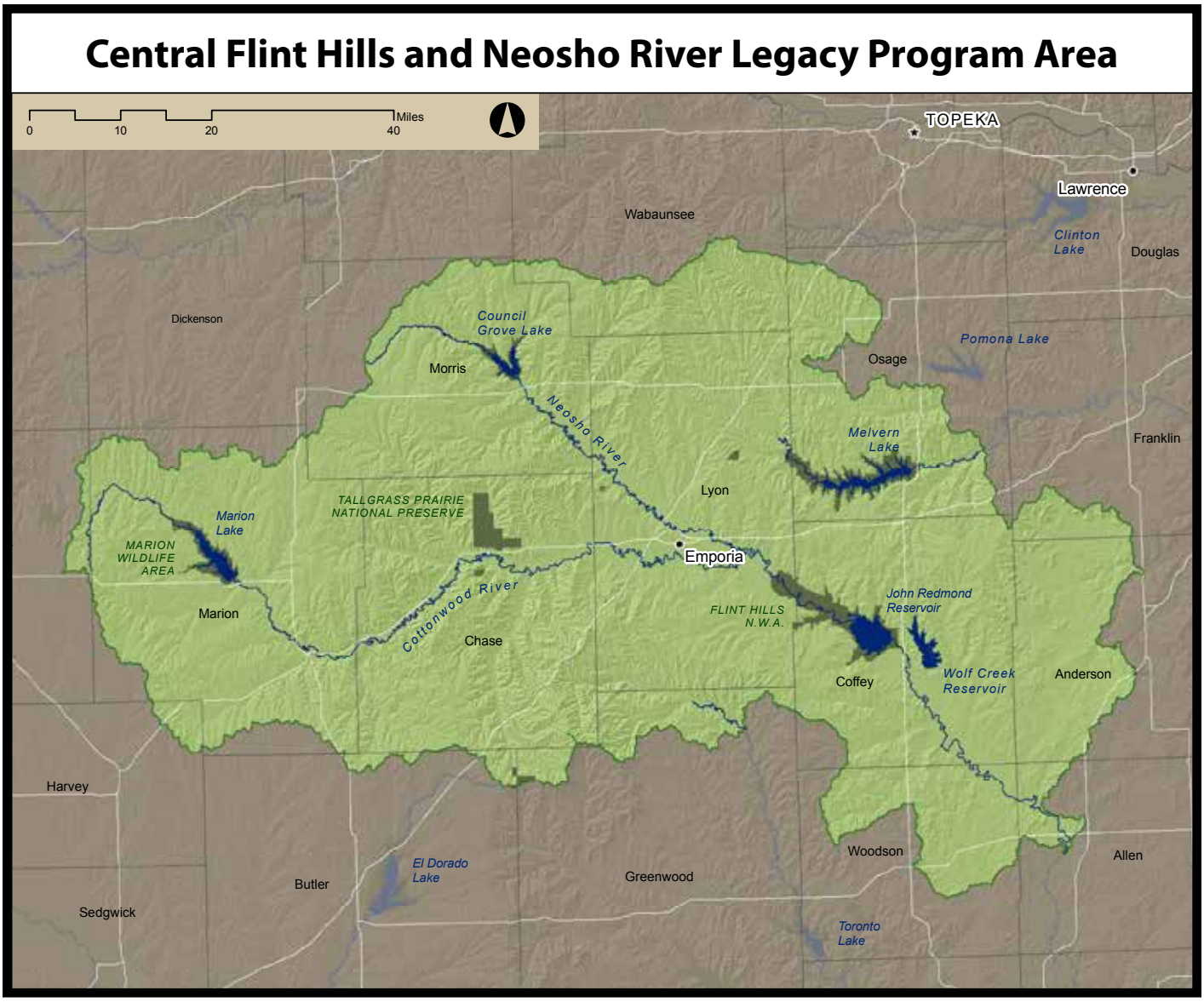


Figure 4.3. *Central Flint Hills and Neosho River Legacy Program Area.*

the Nature Conservancy, and National Park Service (Tall Grass Prairie Preserve) are the major entities that hold land or may have interests in lands potentially associated with Forest Legacy Program.

Environmental Values

John Redmond is a federal reservoir that covers a surface area of 8,516 acres and provides flood control, public water supply, recreation and fish and wildlife habitat has a storage capacity of 575,971 acre-ft. Thirty-six percent of the storage capacity in the 47 year-old lake has been lost due to sedimentation. Riparian forests of the Cottonwood and Neosho rivers and the other streams in the 3,015 square-mile watershed provide important environmental benefits that reduce sedimentation rates and impact the longevity and function of the reservoir. The Topeka shiner, Neosho madtom, Neosho mucket mussel, and eastern spotted skunk are federal and state-targeted species whose habitat needs development and protection. Emporia has experienced an estimated 12 percent increase in population growth over the last decade. Future projections suggest similar patterns with possible reductions in population in outlying areas. Wolf Creek Reservoir is owned by the major utility companies in the state with the primary purpose to cool the reactors at the nuclear power plant.

Greatest Conversion Pressure

Continued urban expansion of Emporia and residential expansion of rural areas along major transportation corridors (primarily I-35). Greatest conversion pressures will be associated with those areas and conversion of riparian forest to agricultural use.

Missouri River Corridor, Delaware River, and Kansas City Metro Legacy Program Area

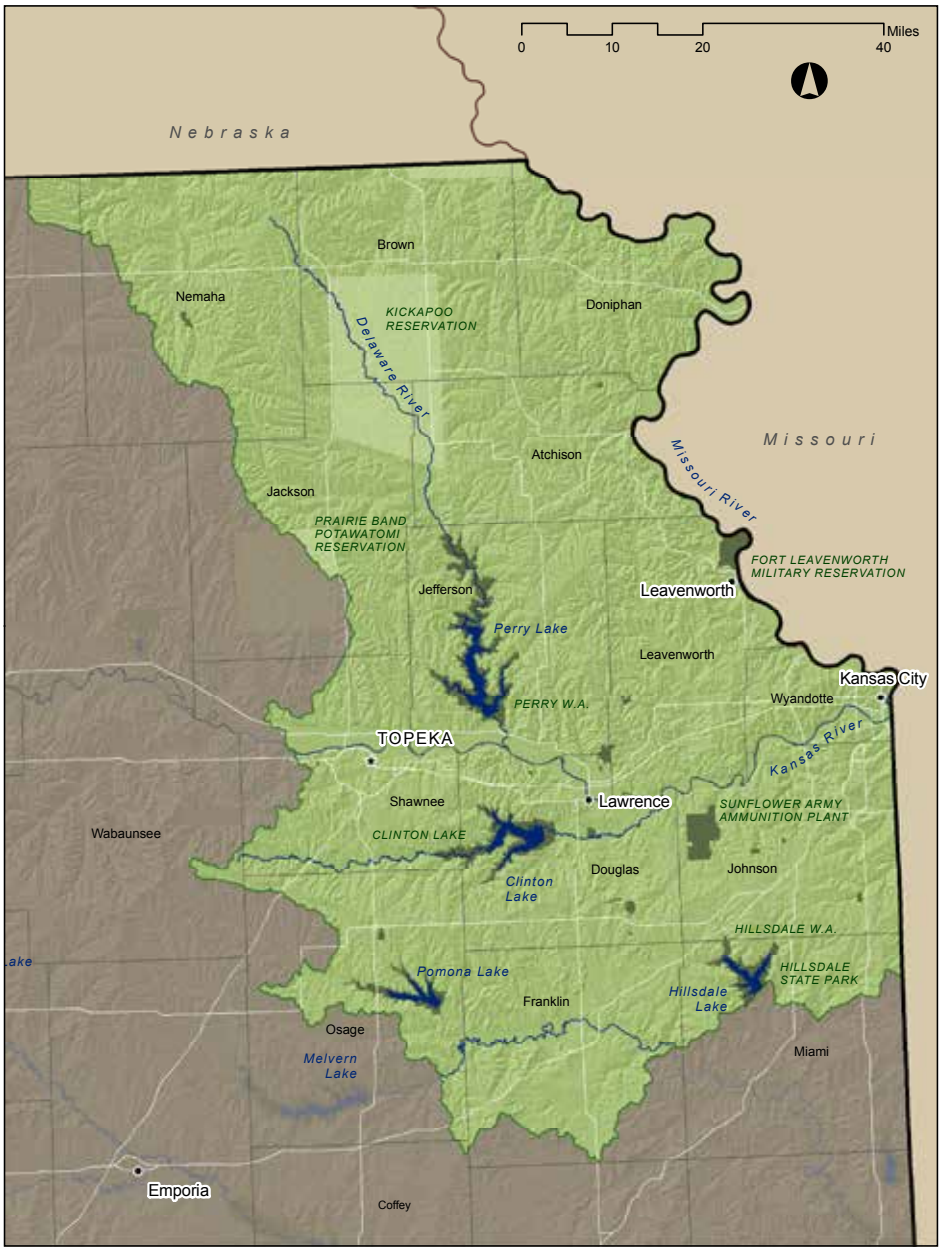


Figure 4.4. *Missouri River Corridor, Delaware River, and Kansas City Metro Legacy Program Area.*

Goals and Objectives

- Classify the size and condition of riparian forests in the John Redmond Reservoir watershed to target areas for protection, establishment and management.
- Protect and restore critical habitat for state and federally listed species.
- Work closely with Flint Hills Wildlife Refuge and Neosho WRAPS to accomplish goals and objectives.

4.2.3 Missouri River Corridor and Kansas City Metro Forest Legacy Program Area

General Description

The Missouri River Corridor, Delaware River, and Kansas City Metro (Figure 4.4) area contains all of Leavenworth, Wyandotte, Johnson, and Douglas counties, most of Franklin, Jefferson, Doniphan, and Shawnee and parts of Miami, Osage, Jackson, and Atchison counties. Physiologically a line from Wyandotte County to Topeka and north generally represents

The Missouri River corridor provides some of the most magnificent fall color in Kansas.

glaciated deep soils while counties south of the line have soil origins from Osage Cuestas. Oak/hickory represents the majority of forest type found in this area. Major reservoirs in this area include Perry, Clinton, Hillsdale, and Pomona. The Kansas and Missouri Rivers are the major drainages in the area. The Kansas City metro area, Leavenworth, Lawrence, and Topeka are the major cities. A scenic byway on Highway 7 from Leavenworth to Troy provides beautiful vistas of Missouri River bluffs, flood plains, and the oak-hickory forests that inhabit them.

State and Federal Lands

U.S. Army Corps of Engineers and Kansas Department Wildlife and Parks are the major state and federal entities that hold land or may have interests in lands potentially associated with the Forest Legacy Program. These lands are associated with Perry, Clinton, Hillsdale and Pomona lakes and the Benedictine Bottoms Wildlife Area. The University of Kansas and Kansas Land Trust also hold lands associated with Baldwin Woods, a designated National Natural Landmark by the Secretary of the Interior in 1980 for providing a "unique remnant oak-hickory forest located at the western edge of the eastern deciduous forest."

Environmental Values

Through the Natural Heritage Inventory, Kansas Biological Survey has ranked 38 forested sites to determine if they are high quality natural areas that harbor rare species (half in Douglas County). Determination was based on landscape context, size and condition. Out of 38 sites, 10 received a B rating and 28 a C. The Missouri River Corridor and Kansas City Metro Forest Legacy Program Area contains some of the best quality forestland in Kansas both from an ecological and commercial perspective. All reservoirs in this area provide crucial flood control, public water supply, recreation, and fish and wildlife habitat. Sedimentation has reduced Perry Lake's storage capacity by 25 percent. Riparian forests have a crucial role to play in reducing sedimentation rates to the reservoirs and prolonging the public benefits they provide. According to the Natural Resource Inventory by the Mid-America Regional Council (MARC) 22 percent of the land in the Kansas City metro area is of good to high ecological value with forests and woodlands comprising 18 percent.

Greatest Conversion Pressure

In the Kansas City metro area, population is anticipated to increase by 350,000 by 2030 consuming an estimated 400,000 acres. Pressures are similar surrounding each major city and transportation routes including the I-70 corridor, I-35, highways 10, 24, 59, 75, 169, and 69. Urban and rural residential development offer the greatest conversion pressure and agriculture second to conversion of riparian forest to cropland.

Goals and Objectives

- Work closely with MARC programs and planning such as Natural Resource Inventory, MetroGreen, Sustainable Growth for Small Cities and Creating Quality Places. Another program to work with is Douglas County's ECO2.
- Classify the size and condition of riparian forests above reservoirs to target areas for protection, establishment, and management.
- Protect and restore critical habitat for state and federally listed threatened and endangered species.
- Work with counties and municipalities to create zoning, policy, and ordinance to facilitate the adoption of the Forest Legacy Program.

4.2.4 Wooded Plains Forest Legacy Program Area

General Description

The Wooded Plains Forest Legacy Program Area (Figure 4.5) includes all of Cherokee, Labette, Crawford, Neosho, Bourbon, and Linn counties, most of Miami, Anderson, and Allen and parts of Franklin, Montgomery, Wilson, and Woodson counties. Physiologically the area consists of the Ozark Plateau in the southeastern corner of Cherokee County characterized by thin rocky soil with chert gravel on the surface. It is the wettest area of the state with springs, seeps and caves. Oak/hickory forests dominate hillsides. The Cherokee Lowlands make up the remainder of Cherokee County and

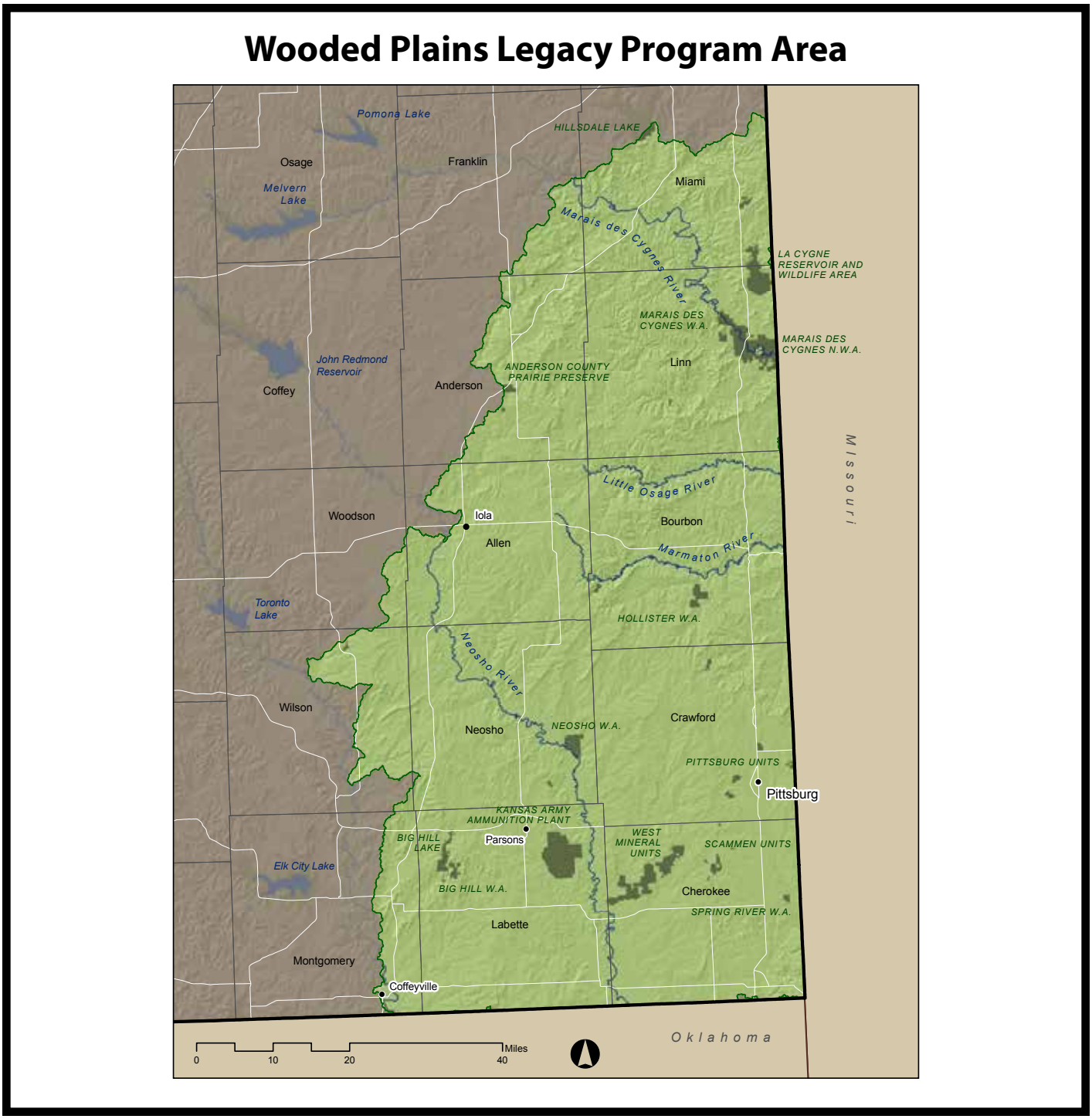


Figure 4.5. *Wooded Plains Legacy Program Area.*

parts of Labette, Crawford, and Bourbon counties. These are gently rolling plains with deep fertile soils and oak/hickory forests. Osage Cuestas make up the remaining counties in the northern part of this area. Coal, lead, and zinc mining have caused significant environmental damage in Crawford and Cherokee counties. The Neosho, Marmaton and Marias des Cygnes rivers are the main drainages. Highway 69 is recognized as a scenic byway. The largest sawmill in the state is located at St. Paul. Pittsburg is the largest city followed by Parsons and Coffeyville.

State and Federal Lands

U.S. Fish and Wildlife Service (Marais des Cygnes National Wildlife Refuge) and Kansas Department of Wildlife and Parks (Marais des Cygnes Wildlife Area and Neosho Wildlife Area) are the major entities that hold land or may have interests in lands potentially associated with Forest Legacy Program.

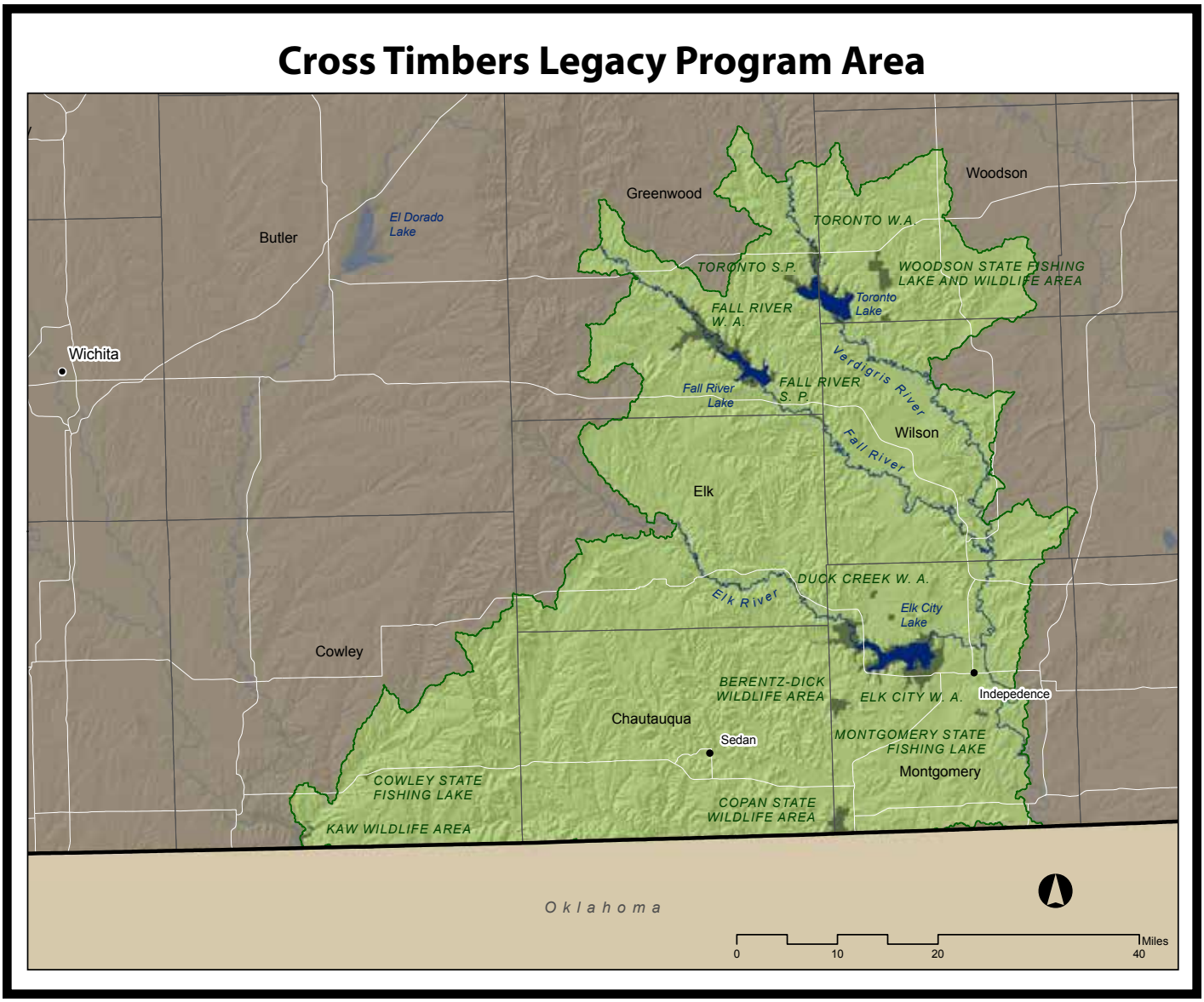


Figure 4.6. *Cross Timbers Legacy Program Area.*

Environmental Values

Federal and state listed species and species of greatest conservation need include the Neosho madtom, Neosho mucket mussel, eastern spotted skunk and the American bald eagle. Riparian forests along the Neosho, Marais des Cygnes and Marmaton rivers provide important water quality and streambank stabilization benefits especially during high-flow events.

Greatest Conversion Pressure

Conversion of riparian forest to agricultural use and loss of forestland to urban development of Pittsburg and rural residential fragmentation of the landscape. Also conversion pressures along Highway 69.

Goals and Objectives

- Classify the size and condition of riparian forests in Marmaton, Neosho, and Spring River watersheds. Target riparian areas for protection, establishment, and management.
- Protect and restore critical habitat for state and federally listed species.
- Work closely with Marais des Cygnes National Wildlife Refuge and Wildlife Area to accomplish goals and objectives.
- Work closely with Neosho-Grand Lake Watershed Planning and Strategy.

The Cross Timbers region is dominated by post oak that range from 200 to 400 years in age.

4.2.5 Cross Timbers Forest Legacy Program Area

General Description
The ancient Cross Timbers is named for the numerous post oak that range from 200 to 400 years of age and eastern redcedar that exceed 500 years. Half of the 11.8 million acre ecotone occurs in Oklahoma, with the remaining area in Texas, Kansas, and a small part of Arkansas. It is a complex of upland forest, savannah and glade. In Kansas, it includes all of Chautauqua and parts of Cowley, Elk, Greenwood, Woodson, Wilson, and Montgomery counties (Figure 4.6). Physiologically the Kansas Cross Timbers are described as the Chautauqua Hills and includes rock outcroppings and narrow valleys walled by sandstone bluffs. Consequently the main agricultural use is pasture. The Verdigris, Fall, and Elk rivers are the main drainages. The majority of forest could be described as low-stature, drought-stressed, slow-growing black jack and post oak, which have little to no commercial value. Other common species include black hickory, bitternut hickory, black oak, shumard oak, and eastern redcedar.

State and Federal Lands
Kansas Department of Wildlife and Parks is the major state and federal entity that holds land or may have interests in lands potentially associated with the Forest Legacy Program. Specifically the Cross Timbers State Park at Toronto Lake, Fall River, Berentz-Dick, Copan, KAW, Elk City, Toronto, and Woodson wildlife areas. The Ancient Cross Timbers Consortium is another important potential partner.

Environmental Values
The lack of agricultural and timber value has made the Cross Timbers one of the least disturbed ecosystems in the United States. It is indeed the "old-growth" forests of the central United States. Toronto, Fall River, and Elk City lakes are all sources of public water supply, flood control, recreation and fish and wildlife habitat. Priority wildlife species include rusty blackbird, cerulean warbler, Lewis's woodpecker; eastern spotted skunk (threatened), little brown myotis, gray myotis (endangered), southern flying squirrel; timber rattlesnake, redbelly snake (threatened), smooth earth snake; green frog, northern cricket frog, Oklahoma salamander; Ozark emerald (damselfly), American burying beetle (endangered), gray petaltail (damselfly). The Cross Timbers provides important research and educational opportunities for numerous scientists including those at the Ancient Cross Timbers Tree-Ring Lab, University of Arkansas, official home of the Ancient Cross Timbers Consortium. The Cross Timbers can help us understand relevant issues such as climate change and the importance of biodiversity.

Greatest Conversion Pressures
Aerial herbicide applications to convert forestland to pasture for grazing. Rural residential development (suburban, ex-urban development) for home sites. Oil, gas, and wind energy development. Logging for chip mills. Eastern redcedar encroachment.

Goals and Objectives
- Work closely with the Ancient Cross Timbers Consortium, Kansas Department of Wildlife and Parks, and other groups to identify priority areas for protection.
- Work with local WRAPS groups to classify the size and condition of riparian forests above Toronto, Fall River, and Elk City lakes. Target riparian areas for protection, establishment and management to help reduce sedimentation.
- Protect and restore habitat for species of greatest conservation need.

4.2.6 Growth and Accountability

A recent audit of the Forest Legacy Program by the Office of Inspector General suggests that follow up monitoring and quality assurance inspections are areas where the program can

be improved. Kansas Forest Legacy Program policy will follow all guidance offered in Forest Legacy Program Guidelines.[1]

Additionally the Kansas Forest Service will follow recommendations for baseline documentation, monitoring, record keeping, and other elements of conservation easement stewardship listed in Development of Conservation Easement Stewardship Policy – A Discussion Guide, Appendix H.

Standards and guidelines created by the Land Trust Alliance[2] will also guide program development and success. Finally, no conservation easement will be entered into without first obtaining an adequate endowment for the maintenance of the perpetual easement. A full-time program coordinator is necessary for the Forest Legacy Program to be sucessful in Kansas.

1 *For more information on the guidelines, see: http://www.fs.fed.us/spf/coop/library/flp_guidelines.pdf*

2 *The standards are available at: http://www.landtrustalliance.org/*

The Forest Legacy Program protects forestland, which provides many different cultural benefits, such as morel mushrooms.

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Community Wildfire Protection Plans; http://www.fs.fed.us/projects/hfi/field-guide/web/page15.php; Local Example Reno County: http://www.renogov.org/emergency/index.php?option=com_content&view=article&id=89&Itemid=149 (Section 3.1.2)

Cooperative Forestry Assistance Act - The Cooperative Forestry Assistance Act of 1978 (P.L. 95-313) revised authority (of the Clarke-McNary Act of 1924) for the Forest Service to provide financial and technical assistance to states and private landowners on a variety of forestry issues: forest management and stewardship, fire protection, insect and disease control, reforestation and stand improvement, urban forestry, etc., under State and Private Forestry. http://ag.senate.gov/FinalTitles/WEI07B38_xml.pdf. (Introduction)

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Emerald Ash Borer; http://www.emeraldashborer.info/. (Section 3.1)

Flint Hills Regional Growth Plan, Land Use and Planning; http://www.ci.manhattan.ks.us/index.aspx?nid=1043. (Section 4.2.1)

Great Plains Initiative - Funded by a U.S. Forest Service grant and matching state funds, state forestry agencies in Kansas, Nebraska, North Dakota and South Dakota are engaging in a regional initiative to prepare for the arrival of invasive pests, such as emerald ash borer and thousand cankers disease that threaten tree resources in the northern Plains. The Great Plains Tree and Forest Invasives Initiative (Great Plains Initiative) gives state forestry agencies the opportunity to work together to create public awareness, promote appropriate species alternatives and prepare for invasive's arrival by assessing the region's tree resources and determining and addressing the potential impacts to those resources. Inventory through GPI was conducted in KS 2008-2009. http://www.nfs.unl.edu/documents/GPI%20Fact%20Sheet%20May%202009.pdf (Chapter 2)

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Kansas State-Wide Woody Biomass Supply and Utilization Assessment; http://www.kansasforests.org/pubs/rural/woodybiomass.pdf. (Section 3.2.4)

Kansas Water Plan; http://www.kwo.org/ (Section 3.2.1)

Mid-America Regional Council, MARC (http://www.marc.org/Environment/) (Section 3.1.3)

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Natural Resource Inventory, NRCS; http://www.nrcs.usda.gov/technical/NRI/. (Section 2.3.1)

Pine Wilt; http://www.hfrr.ksu.edu/DesktopModules/ViewDocument.aspx?DocumentID=1978. (Section 3.1.1)

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Status and Trend of Cottonwood Forests Along the Missouri River, Dixson, Johnson and Bowman, 2010; http://www.moriverrecovery.org/mrrp/f?p=136:134:3591667163164289::NO::: (Section 2.1.2)

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Tamarisk - 10 Year Strategic Plan for the Comprehensive Control of Tamarisk and Other Non-Native Phreatophtes, Kansas Water Office, 2005, http://www.kwo.org/Reports%20&%20Publications/Rpt_Tamarisk_10-Year_Plan_FINAL_120805_sm.pdf (Section 3.1.1)

Urban and Community Forests of the North Central West Region, USDA Forest Service NRS-56; This report details how land cover and urbanization vary within the states of Iowa, Kansas, Minnesota, Missouri, Nebraska, North Dakota, and South Dakota by community (incorporated and census designated places), county subdivision, and county. Specifically this report provides critical urban and community forestry information for each state including human population characteristics and trends, changes in urban and community lands, tree canopy and impervious surface cover characteristics, distribution of land-cover classes, a relative comparison of urban and community forests among local government types, determination of priority areas for tree planting, and a summary of urban tree benefits. http://www.treesearch.fs.fed.us/pubs/34757. (Section 2.3.1)

USDA Forest Service PNW Research Station, Ralph Alig, Science Findings, 2006; http://www.fs.fed.us/pnw/sciencef/scifi88.pdf. (Section 3.1.3)

USDA Forest Service Forest Products Lab, Sandra Morgan, "an average wood-frame house has approx. 10,000 – 20,000 board feet (roughly). An average would be 12,000 bd. http://www.fpl.fs.fed.us/ (Section 2.1.1)

ACRONYM GLOSSARY

AON – Assessment of Needs (Forest Legacy Program)

APHIS – Animal Plant Health Inspection Service

CFAA – Cooperative Forestry Assistance Act

CRP – Conservation Reserve Program

CWHA – Community Wildfire Hazard Assessment

CWPP – Community Wildfire Protection Plans

DASC – Data Access Support Center

EAB – Emerald Ash Borer

EQIP – Environmental Quality Incentives Program

ESRI – Environmental Systems Research Institute

FIA – Forest Inventory and Analysis

FLP – Forest Legacy Program

FRCC – Fire Regime Condition Class

FS – Forest Service (USDA)

FSP – Forest Stewardship Program

GAP – Gap Analysis Program

GI – Green Infrastructure

GIS – Geographic Information Systems

GISSAL – Geographic Information Systems Spatial Analysis Laboratory, KSU

GPI – Great Plains Initiative

HUC – Hydrologic Unit Code

ISO – Insurance Services Office

KARS – Kansas Applied Remote Sensing Program

KBS – Kansas Biological Survey

KC – Kansas City

KDHE – Kansas Department of Health and the Environment

KFS – Kansas Forest Service

KLCP – Kansas Land Cover Project

KSU – Kansas State University

KWAP – Kansas Wildlife Action Plan

NGO – Non Governmental Organization

NHD – National Hydography Data Set

NHI – National Heritage Inventory

NIMS – National Incident Management System

NPDES – National Pollutant Discharge Elimination System

NRI – Natural Resource Inventory (NRCS)

NRCS – Natural Resource Conservation Service

NRS – Northern Research Station (USDA Forest Service)

NWOS – National Woodland Owners Survey

MARC – Mid-America Regional Council

RC&D – Resource Conservation Development Councils

SAP – Spatial Analysis Project

SFSCC – State Forest Stewardship Coordinating Committee

SINC – Species in Need of Conservation

S&PF – State and Private Forestry (USDA Forest Service)

SSURGO – Soil Survey Geographic Database

TCD – Thousand Cankers Disease

T & E – Threatened and Endangered Species

TMDL – Total Maximum Daily Load

TSI – Timber Stand Improvement

TWI – The Watershed Institute

USDA – United States Department of Agriculture

USGS – United States Geological Survey

WRAPS – Watershed Restoration and Protection Strategy

WEI – Wind Erodability Index

WUI – Wildland Urban Interface

APPENDIX A
FINAL GUIDANCE NATIONAL THEMES AND OBJECTIVES

Farm Bill Requirement & Redesign Components:
STATE ASSESSMENTS & RESOURCE STRATEGIES
Final Guidance

State assessments and resource strategies are integral to the State and Private Forestry (S&PF) Redesign and required as an amendment to the Cooperative Forestry Assistance Act (CFAA), as enacted in the 2008 Farm Bill. This document provides national guidance to States to develop their state assessments and resource strategies.

There are three components to the assessment and planning required by the State and Private Forestry (S&PF) Redesign approach to identify priority forest landscape areas and highlight work needed to address national, regional, and state forest management priorities:

- **State-wide Assessment of Forest Resources***—provides an analysis of forest conditions and trends in the state and delineates priority rural and urban forest landscape areas.
- **State-wide Forest Resource Strategy†**—provides long-term strategies for investing state, federal, and other resources to manage priority landscapes identified in the assessment, focusing where federal investment can most effectively stimulate or leverage desired action and engage multiple partners.
- **Annual Report on Use of Funds‡**—describes how S&PF funds were used to address the assessment and strategy, including the leveraging of funding and resources through partnerships, for any given fiscal year.

Each State is required to complete a State Assessment and Resource Strategy within two years after enactment of the 2008 Farm Bill (June 18, 2008) to receive funds under CFAA.

State-wide Assessment of Forest Resources

To ensure that federal and state resources are being focused on important landscape areas with the greatest opportunity to address shared management priorities and achieve measurable outcomes, each state and territory will work collaboratively with key partners and stakeholders to develop a statewide forest resource assessment. The state forest resource assessment should provide a comprehensive analysis of the forest-related conditions, trends, threats, and opportunities within the state.

At a minimum, state forest resource assessments will:

- Provide an analysis of present and future forest conditions, trends, and threats on all ownerships in the state using publicly available information.

* Previously titled "State Forest Resource Assessment". The title was changed to reflect Farm Bill terminology
† Previously titled "State Response Plan". The title was changed to reflect Farm Bill terminology
‡ Previously titled "Annual Action Strategy". The title was changed to reflect Farm Bill terminology

- Identify forest related threats, benefits, and services consistent with the S&PF Redesign national themes.
- Delineate priority rural and urban forest landscape areas to be addressed by the state resource strategy. States can also identify linkages between terrestrial and aquatic habitat, as appropriate.
- Work with neighboring States and governments to identify any multi-state areas that are a regional priority.
- Incorporate existing statewide plans including Wildlife Action Plans, Community Wildfire Protection Plans, and address existing S&PF program planning requirements. States can also utilize relevant national and regional assessments as appropriate.

A combination of qualitative, quantitative, and geospatial data can be used in the statewide assessment to provide information relevant to key state issues and national themes. In addition, non-geospatial information can be used in combination with geospatial data to identify priorities. States may identify separate priority areas for different programs and issues.

Appendix B contains suggested guidance for identifying state and regional priority forest landscape areas.

State-wide Forest Resource Strategy

A state's forest resource strategy will provide a long-term, comprehensive, coordinated strategy for investing state, federal, and leveraged partner resources to address the management and landscape priorities identified in its assessment. The resource strategy should incorporate existing statewide forest and resource management plans and provide the basis for future program, agency, and partner coordination.

At a minimum, state resource strategies should:

- Outline long-term strategies for addressing priority landscapes identified in the state forest resource assessment and the following national themes and associated management objectives (the intent and policy implications of each of these national objectives are described in Appendix A):
    - ***Conserve Working Forest Lands:*** conserving and managing working forest landscapes for multiple values and uses.
        - Identify and conserve high priority forest ecosystems and landscapes.
        - Actively and sustainably manage forests.
    - ***Protect Forests From Harm:*** protect forests from threats, including catastrophic storms, flooding, insect or disease outbreak, and invasive species.
        - Restore fire-adapted lands and reduce risk of wildfire impacts.
        - Identify, manage and reduce threats to forest and ecosystem health.
    - ***Enhance Public Benefits from Trees and Forests:*** including air and water quality, soil conservation, biological diversity, carbon storage, and forest products, forestry-related jobs, production of renewable energy, and wildlife.
        - Protect and enhance water quality and quantity.

    - Improve air quality and conserve energy.
    - Assist communities in planning for and reducing wildfire risks.
    - Maintain and enhance the economic benefits and values of trees and forests.
    - Protect, conserve, and enhance wildlife and fish habitat.
    - Connect people to trees and forests, and engage them in environmental stewardship activities.
    - Manage and restore trees and forests to mitigate and adapt to global climate change.
- Describe how the state proposes to invest federal funding, along with other resources, to address state, regional, and national forest management priorities.
- Include a long-term timeline for project and program implementation.
- Identify partner and stakeholder involvement.
- Identify strategies for monitoring outcomes within priority forest landscape areas and how action will be revised when needed.
- Describe how the state's proposed activities will accomplish national State and Private Forestry program objectives and respond to specified performance measures and indicators.
- Describe how State and Private Forestry programs will be used to address priority landscape and management objectives.
- Incorporate existing statewide plans including Wildlife Action Plans, community wildfire protection plans, and address existing S&PF program planning requirements.

Annual Report on Use of Funds

The annual report should describe how the State used all S&PF program funding, for any given fiscal year. The annual report should describe specific actions taken within the fiscal year, under each program, to address the state assessment and resource strategy. The annual report should include a comprehensive budget with known contributions from all federal, state, and nongovernmental partners.

Additional Guidance

Coordination and Stakeholder/Public Involvement—State forestry agencies shall coordinate with the State Forest Stewardship Coordinating Committee, State Technical Committee, the State wildlife agency, applicable Federal land management agencies such as the Forest Service and Bureau of Land Management, and State Urban Forestry Council to ensure that assessments and resource strategies address the rural-to-urban landscape continuum and identify opportunities for program coordination and integration. State forestry agencies should also involve other key partners, including Tribes and natural resource and related entities in their state to ensure that the state's assessment and strategy integrate, build upon, and

complement other natural resource plans (e.g., State Wildlife Plans). This input is not necessary for the annual report.

In states where the lead agency for the Forest Legacy Program (FLP), or other CFAA program, is not the state forestry agency, state assessments should be developed in partnership with the state lead agency. In addition, the FLP section or other relevant sections, of the resource strategy should be developed by the state lead agency, even if it is not the state forestry agency and include all program-specific requirements.

Timeline and Updates—State forest resource assessments and resource strategies are to be completed no later than two years after enactment of the 2008 Farm Bill (June 18, 2008). Assessments and strategies shall be reviewed and updated at least every five years, or as determined by the Secretary of Agriculture. Annual reports for a given fiscal year must be developed and submitted by the end of the first quarter of the next federal fiscal year.

Approval Process—State resource assessments and resource strategies will be approved by the State Forester, with final approval by the Secretary of Agriculture. Once approved by the Secretary, the State-wide assessment and State-wide resource strategy shall satisfy all relevant S&PF planning and assessment requirements. The annual report should be submitted through the Forest Region or Area, to the S&PF Deputy Chief.

In states where the lead agency for the Forest Legacy Program (FLP) is not the state forestry agency, the state lead agency shall concur on all aspects of assessments and resource strategies that pertain to the Forest Legacy Program, including the identification of Forest Legacy Areas. If the state assessment incorporates a state's Forest Legacy Assessment of Need, the approval process is that which is required for the Forest Legacy Program.

Grant Narrative—States are encouraged to use a single annual grant narrative, which outlines actions to address the state assessment and resource strategy, for all S&PF programs that are authorized to receive funding under a consolidated grant option.

Forest Service Support—Each geographic region and the islands shall have an S&PF point of contact to assist states with development of assessments and resource strategies and to coordinate with Forest Service program staff.

This document describes the national strategic objectives that tier to the three Redesign themes. The descriptions include suggestions on how states may address the objectives in their assessments and resource strategies. There is also a list of potential data layers that could be used in the assessments for addressing each objective. States will likely have unique state or regional issues that may also be addressed in their assessments and strategies.

National Theme: Conserve Working Forest Lands

Identify and conserve high priority forest ecosystems and landscapes.

In many parts of the United States, forests and other open space are being fragmented and converted to development. Forestry agencies can work with partners, stakeholders and communities to identify and protect priority forest landscapes through land acquisition, conservation easements, and land use policies. Forestry agencies can also provide technical assistance to communities to help them strategically plan for and conserve forests and other open space.

Factors contributing to loss include residential, commercial and industrial development; expansion of utility infrastructure and transportation networks; and planning, zoning, and policies that favor conversion. Consequences include the outright loss of public benefits associated with forests or the marginalization of those values provided by contiguous forested landscapes. Fragmentation also includes "parcelization," or the fracturing of large singular ownerships into numerous smaller ones.

Assessments and strategies should attempt to identify, protect and connect ecologically important forest landscapes, and open space, thus maintaining a green infrastructure, particularly around and within areas of, population growth and development.

Potential data layers: Green infrastructure composite, protected areas, including Forest Legacy Areas, open space conservation plans, community forests, development risk, forest fragmentation, roads and other infrastructure.

Actively and sustainably manage forests.

Forestry agencies and partners can provide landowner assistance and incentives to help keep working forests working. Providing forestry assistance to landowners can improve the economics of, and encourage sustainable forest management. In urban and suburban areas, forest agencies can assist communities to develop sustainable forest management and green infrastructure programs.

Assessments and strategies can identify viable and high potential working forest landscape where landowner assistance programs, such as Forest Stewardship can be targeted to yield the most benefit in terms of economic opportunities and ecosystem services. Assessment and strategies can also identify opportunities for multi-landowner, landscape scale planning and landowner aggregation for access to emerging ecosystem service markets.

Potential data layers: Spatial Analysis Project (high potential for Forest Stewardship), forest cover

National Theme: Protect Forests from Harm

Restore fire-adapted lands and reduce risk of wildfire impacts.

The strategic management of wildfires is crucial to the health of our nation's forests, the safety of our citizens and the contributions of forests to our economy. Assessments should identify areas where management can significantly reduce the risk of catastrophic wildfire while enhancing multiple associated forest values and services.

Many forest ecosystems are dependent on fire for their health and sustainability. Decades of fire suppression and a changing climate have disrupted natural fire regimes, resulting in fuel buildup, loss of biological diversity, changed species composition, and loss of some fire-dependent species. Assessments should identify areas where these effects of fire exclusion can feasibly be mitigated or countered through sound management, particularly where there are opportunities for federal, state and community partnerships. Resource strategies should identify appropriate treatment strategies for priority landscapes, including the use of fire as a management tool.

Potential data layers: Wildfire risk

Identify, manage and reduce threats to forest and ecosystem health.

A healthy forest landscape has the capacity for renewal and for recovery from a wide range of disturbances, while continuing to provide public benefits and ecosystem services. Threats to forest health include insects, disease, invasive plant and animal species, air pollution, and climate change.

Assessments should identify high value forest landscape areas that are especially vulnerable to existing or potential, forest health risk factors, where forest management practices are most likely to prevent and mitigate impacts. Assessments should also identify areas where management could successfully restore impacted forests.

Resource strategies should include feasible long term strategies for addressing forest health risks and opportunities within important forest landscape areas.

Potential data layers: Forest health risk

National Theme: Enhance Public Benefits from Trees and Forests

Protect and enhance water quality and quantity.

Forests and forestry practices can help protect, restore, and sustain water quality, water flows, and watershed health. Healthy urban and rural forested watersheds absorb rainfall and snow melt, slow storm runoff, recharge aquifers, sustain stream flows, and filter pollutants.

Assessments should identify watersheds where continued forest conservation and management is important to the future supply of clean municipal drinking water, or where restoration or protection activities will improve or restore a critical water source. Resource strategies should include actions for managing and conserving these priority watersheds for water quality and supply, and other ecosystem services.

Potential data layers: Priority watersheds, water quantity and quality by source, drinking water

Improve air quality and conserve energy.

Urban and exurban forest cover, including agroforests can improve air quality, reduce energy consumption and produce biomass for energy production. Assessments should identify areas where management or restoration of the urban or exurban forest canopy will have significantly positive and measurable impact on air quality and produce substantial energy savings.

Potential data layers: Impervious surfaces, heat islands, population density, non-attainment areas, canopy cover, ozone concentration

Assist communities in planning for and reducing wildfire risks.

Communities play an essential role in reducing the risks of catastrophic wildfire. State & Private Forestry programs assist communities in identifying wildfire risks, developing Community Wildfire Protection Plans (CWPPs), and promoting FIREWISE and other risk reducing policies and actions. .

Some communities are especially prone to loss of life and property from wildfire. Local or state laws, regulations and ordinances, landowner attitudes and priorities, and public policies all play important roles in managing fire risk near communities. Assessments should identify communities where State and Private programs can substantially mitigate the risk of catastrophic wildfire occurrence and associated risks to human safety and property.

Assessments should incorporate existing CWPPs and identify communities in especially vulnerable areas that need a CWPP. Resource strategies should include a plan for effectively addressing those communities that are most at risk.

Potential data layers: Wildland-urban interface, Existing CWPPs, fire potential

Maintain and enhance the economic benefits and values of trees and forests.

Assessments should identify forest landscape areas where there is a real, near term potential to access and supply traditional, non-timber, and/or emerging markets such as those for biomass or ecosystem services. These might be areas where necessary infrastructure currently exists, is planned or developing, where group certification of landowners has created market supply aggregation potential, or where retention and management of forest cover presents a money saving alternative to an engineered fix – such as a water filtration facility. Strengthening and developing new market opportunities for forest products and benefits provide incentives for forest stewardship and conservation.

Potential data layers: Biomass potential, site productivity, existing or planned mills and other forestry infrastructure, Biomass energy facilities, CROP areas, municipal water supply intakes

Protect, conserve, and enhance wildlife and fish habitat.

Protection, conservation, and restoration of forested wildlife habitat are critical to maintaining and enhancing the rich biodiversity of our nation. Major threats to fish and wildlife habitat include the patchwork of public-private ownership, threats associated with urbanization, and uncharacteristic wildfire.

Assessments and resource strategies should identify forest landscapes that represent or contribute to viable wildlife habitats (contiguous or connected), contain high species richness, endemism, and/or that represent core habitat for focal conservation species (i.e. species of concern, threatened and endangered species or keystone species that are representative of a healthy ecosystem). Assessments and resource strategies should incorporate State Wildlife Action Plans. Resource strategies should include actions for conserving and enhancing habitat attributes in priority landscape areas.

Potential data layers: Threatened and endangered species habitat, State Wildlife Action Plan data

Connect people to trees and forests, and engage them in environmental stewardship activities.

Our nation's federal, state, urban and private forests are the natural backyards for many communities and serve as society's connection to nature. Assessments and resource strategies can attempt to conserve and enhance a green infrastructure that effectively connects people with their natural environment. Resource strategies can include programs that provide opportunities for children, teens and adults to recreate while gaining an appreciation for the importance of forests and open space with respect to the health, security and well-being of society.

Potential data layers: Census data, recreation and trail networks, hunting and fishing areas, cultural and heritage sites

Manage and restore trees and forests to mitigate and adapt to global climate change.

America's forests offset a significant portion of the nation's annual carbon emissions. Additional climate change mitigation benefits could be achieved through partnerships and management measures. These measures include supporting the development of markets for carbon offsets, utilizing woody biomass for energy, wood product substitution, and promoting tree growth in urban areas. Assessments should identify opportunities for promoting carbon emissions offsets through forestry.

The important benefits that forests provide, such as biodiversity, wildlife habitat, and water storage and flows are affected by climate change. Forest range, type and composition are projected to change significantly– with corresponding changes in wildlife habitat, biodiversity, water flows, and fire regimes.

Assessments should consider how climate change will affect important public benefits from forests. Resource strategies should attempt to maintain and enhance resilient and connected forest ecosystems that will continue to provide public benefits in a changing climate.

Potential data layers: Climate change modeling such as the Climate Change Atlas, Northern and Southern Forest Futures forecast data

APPENDIX B
COORDINATION AND STAKEHOLDER/PUBLIC INVOLVEMENT

October 22, 2009

To: Key Partners & Stakeholders Providing Input on the KS State-Wide Forest Resource Assessment
Meeting - October 27 - Salina - NRCS Conference Center 747 Duval, 10 AM - 3PM

From: Bob Atchison
Rural Forestry Coordinator
Kansas Forest Service, KSU

Subject: Draft Assessment & October 27 Meeting Agenda

Thank you for taking time from your other responsibilities to review our State-wide Forest Resource Assessment. I have enclosed a hard copy draft of the State-wide Forest Resource Assessment and invite you to review the draft in preparation for our meeting next week. The Assessment will be used to create a long-term state-wide forest resource strategic plan for investing state, federal and other resources to manage priority landscapes.

We have attempted to provide pertinent GIS data layers under each national theme and objective. As you review the composite map on page 29, ask yourself if the brighter colors on the map truly capture the areas of our state where we should focus forestry and agroforestry efforts. We also invite you to share other pertinent data sources that may improve the analysis and consider any gaps or missing GIS data that should be developed into another layer.

Listed below is an agenda for the meeting. Refreshments and lunch will be provided by the Kansas Tree Farm Committee. If you have questions or suggestions to share prior to the meeting I may be reached at 785-532-3310 or at atchison@ksu.edu.

Agenda - October 27 - Salina - NRCS Conference Center - 747 Duval - 10AM - 3PM
Welcome, Introductions & Purpose - Larry Biles, State Forester, Kansas Forest Service

Background of Forest Resource Assessment & Strategy - Bob Atchison, Rural Forestry Coordinator, Kansas Forest Service

Presentation of Draft Assessment & Strategy - Rob Daniels, Operations Manager & Eli Martinson, GIS Spatial Analysis Laboratory, Geography Department

Noon - Lunch

Comments on Draft Assessment & Strategy

United States Department of Agriculture

NRCS

Natural Resources Conservation Service
760 South Broadway
Salina, KS 67401-4604

Phone: 785-823-4500
FAX: 785-823-4540
www.ks.nrcs.usda.gov

September 23, 2009

TO: Kansas Technical Committee (KTC)

Dear KTC Member:

The Kansas Forest Service has requested a KTC meeting to conduct an assessment of the forestry and agro-forestry resources of Kansas using Geographic Information System (GIS) analysis tools.

Please refer to the information provided by the Kansas Forest Service.

Sincerely,

(Signed)

ERIC B. BANKS
State Conservationist

Attachments

cc:
NRCS Kansas Management Team
NRCS Programs Staff
Rod J. Winkler, Agricultural Programs Specialist, Conservation and Emergency Programs Division, Farm Service Agency, Manhattan, Kansas

Agenda for Meeting with Project Partners

Kansas Forest Resource Assessment and Resource Strategy Meeting

October 27, 2009, Natural Resources Conservation Service (NRCS)Conference Center, 747 Duvall 10 AM -3 PM

Agenda

10:00 AM Welcome, Introductions and Purpose -Larry Biles, State Forester,

Kansas Forest Service **Background of Forest Resource Assessment and**

Strategy -Bob Atchison, Rural Forestry

Coordinator, Kansas Forest Service **Presentation of Draft Assessment and**

Strategy -Rob Daniels, Operations Manager and Eli Martinson, GIS Spatial Analysis Laboratory, Geography Department

Noon -Lunch Comments on Draft Assessment and Strategy

3:00 PM -Adjourn

Minutes from Kansas Technical Committee and State Forest Stewardship Coordinating Committee Meeting - Kansas Forest Resource Assessment

October 27, 2009 – NRCS Conference Center – 747 Duvall – Salina 10AM – 2PM — 42 in attendance

Welcome/Introductions/ Background – Banks, Biles and Atchison
Eric Banks, NRCS State Conservationist, welcomed people to the meeting. Larry Biles, State Forester, stated the purpose explaining that the Forestry Title of the 2008 Farm Bill requires the Kansas Forest Service to conduct an assessment of the forestry and agro-forestry resources of Kansas using Geographic Information System (GIS) analysis tools. A long-term strategy for protecting and managing forest and agro-forestry resources will be created based on the assessment.

The assessment focuses on three national themes, 1) Conserve Working Forestlands, 2) Protect Forests from Harm and 3) Enhance Public Benefits from Trees and Forests. There are 11 objectives under the national themes (attached). GIS data layers associated with each objective identify forest conditions, trends, threats and priority areas. The assessment will be similar to the Forest Stewardship Spatial Analysis Project (SAP) which may be viewed on the Web at **http://www.kansasforests.org/rural/foreststewardship/index.shtml.**
It is imperative that the Kansas Forest Service receives stakeholder input on the forest resource assessment and long-term strategy. A Resource Strategy/Plan will then be prepared based on the Assessment results. The Committee then introduced themselves and who they're representing.

A hard copy of the draft Assessment was provided to all participants prior to the meeting for their review. Bob Atchison provided additional background on the Assessment and introduced Rob Daniels and Eli Martinson, Geography Department, KSU, GIS Lab (GISSAL) who the Kansas Forest Service has hired to provide GIS services associated with the Assessment. GISSAL identifies, collects and evaluates data for inclusion into the Statewide Analysis. The Assessment must be presented to the Secretary of Agriculture for approval by June 2010. To allow time for publication, the Assessment will be finalized by December, 2009

Explanation of the Assessment – Daniels and Martinsen
Assessment Guidelines and basic GIS was described by Daniels: Identify, describe and spatially define forest landscapes where forest programs outreach and activity will be emphasized and coordinated **Geospatial Analysis will address the Three National Themes (and 11 national objectives).
Objective 1: Conserve working forestlands; 2) protect forests from harm; 3) Enhance public benefits from trees and forests. Primarily this project is drawn on existing data sources and will draw on Forest Stewardship Spatial Analysis Project (SAP), There will be a minimum of one data layer per object (for the most part this has been met), 30 meter cell size or finer. What this means is dividing the state into 30 meter blocks. For the most part this requirement has also been met.

Statewide Analysis Composite Map (draft): Includes all 11 objectives, 22 data sets and 29 data inputs have been incorporated. How did we get here? With Kansas Forest Service input we identified, by objective, suitable data layers from state and national sources. Some data layers comprise of several classifications. Initial data layer collection was reviewed and assessed by Kansas Forest Service employees in September, 2009. Employees were asked to prioritize and rank the themes and objectives based on their experience and knowledge of the opportunities and threats to the forest resources in Kansas.

The GIS analysis included a raster analysis (30 meter cell). Where necessary, data sets were converted to raster. There was some re-sampling of lower resolution raster data sets and conversion to a '1' and '0' raster and sums were "weighted" using an ESRI spatial analyst tool.

Raster datasets come in many forms: A spatial data model that defines space as an array of equally sized cells arranged in rows and columns, and composed of single or multiple bands. Each cell contains an attribute value and location coordinates. Groups of cells that share the same value represent the same type of geographic feature. Examples of various cell sizes were shown and explained.

In the analysis two types of raster were used. A simple yes/no raster, reflects real geographic coverage (fire station coverage across the state or watersheds). A value based raster, reflects the value of an attribute (walnut trees per acre) within the 30 meter cell (another example would be canopy cover). Initially this was a 250 meter cell. In these cases the data has to be reclassified and revalued. Each classification becomes part of the data layer. Weights vary on data layers

In the weighting scheme, both objectives and data layers were given weights. A total of 29 data inputs were weighted for the initial analysis. Input was obtained from Kansas Forest Service employees. This will need to be adjusted as new data sets are incorporated. We will be looking for feed back to reassign weights.

The objectives each got a rank from information received from Kansas Forest Service. They were converted to a weight – (ranked 1-11). Data layers received a percentage adding from 0-100%. (pg 29 of draft)

Explanations were provide for the maps that represent the National Themes (pg 30 of draft). The max value could be a one if everything fell into that pixel.

Results were interpreted using a Highest Potential Score = 1.0 (would assume at least one 30 meter cell was covered by all data inputs). In reality, the highest weighted sum = .502

Reclassified Data used a Quantile* scheme (four classes) to distribute a set of values into groups that contain an equal number of observations. In this case, seeing as we have divided the state into 30 meter cells, this also equals four equal groups.

Data layers still to be incorporated include:

- Fire Regime Condition Class – Departure Index – from Dept of Interior / US Forest Service, which quantifies the amount current vegetation departure from simulated modeling - Top 25% of Observations
- Stewardship Program Forest: Forest partials within FSP in the state.
- Non-Stewardship Private Forest: Forests not in the stewardship program.
- Basal Area: Data from Forest Inventory Analysis.
- Eastern redcedar in Grasslands: Data is from GAP
- Landfire – Mean Fire Return Interval – simulated quantifies years.
- Pine Wilt Presence – Different zones with transition into areas where pine wilt is not present.
- 1000 Canker Risk – threshold of 1 tree per acre was used. At this point, similar to emerald ash borer but buffered Urban areas. Strictly black walnut. New disease, which is already in Colorado. Pathologist feel if gets into the native rages then it could be devastating.
- W.R.A.P.S. – top 20 ranked watershed forests in state.
- Riparian Areas: NHD Flowline data set and buffered it to 45-meters to get 3 pixels.
- Black Walnut Density – 10 trees per acres. This is for the economic standpoint
- Kansas Saw Mills – from 3 top producing mills in state. Can get multiple layers out of this map. Classification used on operating saw mill was from Survey done in 2003.
- Biomass – from Inventory Analysis Data – 10 tons per acre

There were 22 data sets incorporated with new data layers, which totals 38 parent data layers incorporated. Hope to work with KU Kansas Biological Survey to get more data on specie changes/shifts due to global climate chang-

es. Hope to have new weightings and a new revised map by the end of the year.

Questions / Comments/ Input From the Kansas Technical Committee

#1: Does Larry feel comfortable with progress being made and where Kansas Forest Service expects to be in prep of final report due in June? Larry: Yes, everything is running on schedule and Resource Strategy will be written soon.

#2: Acronyms – please explain some of them. Provide a listing of them in the final report.

#3: Saw Mill Map: Why does the sawmill map only show Kansas and not Missouri? Why not identify mills on the Missouri that may have an impact? Response: Good point, we'll Bob check mills on the Missouri side, which may fall into the requirement of identifying multi-state. Nebraska is a partner with emerald ash borer and will be on Thousand Cankers and water quality issues. More information will be coming.

#4: Water quality issues – The multi-state requirement should consider identifying the Neosho-Grand Lake Watershed, which comprises more than 10,000 square miles including Kansas, Missouri, Oklahoma, and Arkansas and includes 4 major reservoirs with water quality impairments.

#5: Is multi state something we plan to add to assessment? Response – Multi-state is required as part of the Assessment but will be difficult to include in a final composite map. Therefore multi-state issues will have their own separate maps and will be addressed in the Resource Strategy Plan. The issue will be addressed in the national meeting in November.

#6: Reservoir sustainability and silt – how can we tie the report/assessment to the need of streambank stabilization? Response: Bob: watersheds above federal reservoirs that provide public drinking water with state-owned storage have been identified. Areas within those watersheds can be further targeted by using demographic elevation models and flood frequency based on soils, all available from NRCS. More weight can be given to riparian forests and lack of them in these areas.

#7: Didn't see management to mitigate the new extremes of weather occurring in Kansas. Specifically intense rainfall events that cause severe erosion of top soil. No-till will not solve soil erosion with 6-inch rainfall event. Would like to see concentration on mitigation in regard to climate change and not just carbon offsets. Response: The focus on riparian forests will help mitigate highflow events. A good area to explore but no existing data layers to address this issue. Eli: trying to get best data that they can find but in some cases they are working under the idea where there is a lack of data and possible studies can be held in the future. It may take the time until the report has to be turned in to create the data. Quickness in which things change in regard to the weather makes it difficult to track and find data. Would possibly have to get information from National Weather Service.

#8 A Question to Lindon Wiebe, USDA Forest Service Rocky Mtn. R2: What happens in 5 to 10 years – do we have to go back and update? Lynn referred to Dana Coelho, WFLC. Dana was unsure but will discuss in Denver in November with other states. There is potential and possibly to be updated in 5 years. Bob indicated that the Farm Bill Requirement and Redesign Components: STATE ASSESSMENTS and RESOURCE STRATEGIES, Final Guidance suggests 5 years.

#9: Are Rob, Eli and Bob going to the national meeting in Denver to discuss issues with other technical people? Yes – they are going to get feedback and ideas

#10: Fire data – There is valuable information on fire occurrence that is not being collected including controlled burns. An incentive needs to be provided to fire departments to collect this information and a database created and maintained by Kansas Forest Service or the State Fire Marshall office.

#11: Land cover and three different sources of data (GAP, NLCD, etc.) – is there interest to use just one or are there reasons to use all three – don't know difference. Response: Canopy cover and impervious surfaces….combine gap in CRP to get better info……

#12: CRP data – FSA is creating an MOU with Kansas Forest Service so we can have access to a current CRP data layer for CRP grass practices. Hopefully this will be in placed in time to use the data. Troy Munsch suggested that a KSU student map already have this data layer?

#13: Question on usefulness on data layers with tiny points such as champion trees and forest stewardship plans. What influence they have on assessment? Rob believes that add important nuances to the overall assessment even though they are neglible in impact. Could buffer for service area. The data layers under the objective "connect people to trees and forest…) are weak and challenging. Could buffer at 150 miles.

#14: Strategic Planning: Are you looking at cooperators. We have successes – there are folks out there who have to be willing and able and have priority target areas. Lots of criteria to look at for cooperators to develop an awareness program. Wonder if going through this study will get something done on the ground. Larry: We have info that we have 101,000 family forestland owners in Kansas and this will become a focal point but we can use more information about them even though the National Woodland Owners Survey provides some data. A data layer identifying land ownership is crucial but not available statewide. Our assessment tells us where our issues are…… getting the private landowners to participate is another issue that needs to be addressed perhaps in the Resource Strategy.

#15: Will small data layers be inclusive and not exclusive? Will people will be quicker to accept?

#16: Don't see much of an evaluation of woody biomass in regard to availability for power down the road. Kansas Forest Service recently completed a survey on available woody biomass sources and potential locations of boilers that can be converted. This information will be included in both the assessment and the resource strategy. Rob showed the map of woody biomass supply and boiler locations in Kansas. The focused was on three boiler manufacturers that are easier to convert. A 50 mile radius is considered economically feasible for transport. This will not be part of the composite map because it is point data but it will appear in other areas of assessment. Larry – wood waste survey on volume coming from urban areas … we have 285,000 tons of material laying around. There are opportunities for wood energy in the state.

#17: Will NRCS utilize the Assessment? NRCS – the more technical info NRCS has the better they can do their programs. SAP has already been incorporated into the ranking process for EQIP for FLH.

#18: Page 20 mentions mapping soils on more highly erodible areas – what about windbreaks? Where are they in reference to areas more susceptible to wind erosion? Bob: Both riparian and windbreaks are overlooked in traditional FIA inventory assessments because they don't meet baseline forestland definitions of 1 acres in size, 120 wide and 10% stocked. However, over the past two years we have started another inventory through the Great Plains Tree and Forest Invasives Initiative to capture this data. Data will be coming in that hasn't been available for some time. However, we don't have Geospatial info for this. Working on this but it is a missing component. Windbreaks have a big role to play especially in western Kansas with windblown soil. This new data will hopefully be included as part of the Resource Strategy.

#19: Any use for data sets about financial impacts of emerald ash borer or 1,000 Cankers? It is being developed. We know volume and size of walnut in Kansas. Coupled with ash and pine – these are serious threats. KDA: Such information will help with the establishment of quarantines would be helpful in the pursuit of state funding to address the threats.

Target deadlines – draft due in March. Review and comments will be received and final report submitted in June. Information will be kept up to date on the Kansas Forest Service website.

This is an ongoing process that will likely be reviewed every 5 years. Continual feedback is always welcome and helpful.

Attending Forest Resource Assessment Meeting - October 27 - 42 attending

Name	Organization	FSCC	KTC	Other
Larry Wagner	USDA-ARS Wind Erosion		x	
Jason Fizell	Kansas Land Trust	x	x	
Leonard Ellis	Kansas Tree Farm Comm.	x		
Doug Helmke	Kansas Rural Water Assoc		x	
Doug Lindahl	Forestland owner	x		
Thomas Wellington	Kansas Black Farmers Assoc		x	
Jim Hays	The Nature Conservancy	x		
Brandon Houck	National Wild Turkey Fed.		x	
Lindon Wiebe	USDA Forest Service Region 2		x	
Dana Coelho	Western Forestry Leadership		x	
John Barbur	Fort Riley			Community
Bob Kepka	Ellsworth Fire Dept			Fire
Pat Collins	Riley Co Fire Dept			Fire
David Kraft	Range Specialist NRCS		Fire	
Bill Waln	USFWS			Fire
Mike Nickels	Forestry Consultant		x	
Bob Atchison	Kansas Forest Service	x		
Jason Hartman	Kansas Forest Service			Fire
Larry Biles	Kansas Forest Service	x	x	
Patricia McCaffrey	Kansas Forest Service			x
Larry Rutter	Kansas Tree Farm Committee			x
Dennis Morriss	Kansas Tree Farm Committee			x
Ron Brown	Kansas Assoc Cons Dist		x	x
Brad Simpson	KDWP	x		
Harold Klaege	Kansas All. Wetlands/Streams		x	
Eric Banks	NRCS		x	
Troy Munsch	NRCS		x	
Terry Conway	NRCS			x
Travis Rome	NRCS			x
JD Rector	See-Kan RC & D		x	
Rob Resch	SCC		x	
Mark Janzen	NRCS	x		
Stephen Graham	KCARE		x	
Jon Appel	KDA			x
Kim Bomberger	Kansas Forest Service			x
Herb Bartel	Kansas Rural Center		x	
Carl Nuzman	Consulting Eng/Hydrologist		x	
Katie Miller	Kansas Rural Water Assn		x	
Monty Unruh	KDHE		x	
Larry Rutter	Kansas Tree Farm Committee		x	
Dennis Morriss	Kansas Chapter Walnut Council			x

The Wichita Eagle
Kansas.com

Back to web version

Thursday, May 27, 2010

Posted on Thu, May. 27, 2010

Kansas seeks input on forest protection strategy

The Associated Press

Kansas Forest Service is seeking public input on forest areas targeted for protection under its legacy program.

The agency says public opinion is important because 95 percent of Kansas forests are privately owned, with 65 percent of the holdings located in 10-acre patches or less.

The service's forest resource assessment and strategy will target funds and resources in an effort to get the best return of ecological, social and financial benefits. The state has about 5.2 million acres in forests and woodlands.

June 4 is the deadline for comments.

Online:

Kansas Forest Service: http://www.kansasforests.org/assessment.shtml

Kansas Is Conducting Forest Assessment

Since most forest lands are in private hands, public comment on new strategy for identifying and preserving forests is being sought.

Compiled by staff

Published: May 24, 2010

Increased pressures on the health of forests from pests, diseases and non-native species as well as a rapid increase in the conversion of forest and agroforestry lands to non-forest uses caused the Kansas Forest Service to take a new approach to identify forest areas at risk.

This approach has been titled the Kansas Forest Resource Assessment and Strategy and the Forest Service is seeking public comment because 95 percent of Kansas forests are privately owned with 65 percent of the holdings occurring in 10-acre patches or less. June 4 is the deadline for public submission of comments.

The Assessment and Strategy will guide the forest service in planning, operations and grant applications. In addition, Kansas will be assessing areas that can be identified for the federal Forest Legacy program, a voluntary federal program administered by USDA Forest Service that protects private forestland by purchasing development rights through conservation easements.

The Forest Resource Assessment and Strategy can be reviewed on the Web at http://www.kansasforests.org/assessment.shtml, or a paper copy can be provided by contacting the Kansas Forest Service at 785-532-3310 or Bob Atchison by email at atchison@ksu.edu.

Comments

Read comments from others and share your own thoughts.

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cjonline.com THE TOPEKA CAPITAL-JOURNAL

Forest service seeks public input

BY THE CAPITAL-JOURNAL
May 25, 2010 - 12:50pm

MANHATTAN — The Kansas Forest Service is seeking public comments by June 4 on a plan that will target its efforts during a future expected to bring pressures on and threats to the state´s forest-related resources.

The finalized plan must reach the U.S. Secretary of Agriculture by June 18.

"Ideas and opinions from the public are probably more important in Kansas than in any other state. That's why we are looking for individual written comments, submitted to us directly by mail or e-mail," said Bob Atchison, KFS rural forestry program coordinator.

The nation´s ongoing economic woes are just one force driving the strategic change, Atchison explained. The Kansas plan also must address a rather unusual fact: The state's forested land exceeds 5.2 million acres, at least 95 percent of which is privately owned. And, well over half of this private property occurs in scattered small holdings, affected by widely differing factors.

"This really raises the difficulty in figuring how best to target funds and resources," he said. "To fulfill our mission, the Kansas Forest Service must help produce the highest returns possible — in terms of ecological, social and economic benefits — from the state´s diverse forest and agroforestry resources."

The KFS´s proposed plan includes a changed approach for identifying forest areas at risk. It also covers Kansas´ participation in the Forest Legacy Program — a new, voluntary federal effort designed to protect private forestland by purchasing development rights (through conservation easements).

Atchison said the state's citizen-owned forest includes some large areas devoted simply to trees.

But, it also includes the riparian trees that preserve and protect Kansas water quality. It includes the carefully sited windbreaks that help to reduce the state's ongoing soil erosion and other wind-related losses. It includes urban trees that improve the quality of life in 631 Kansas communities, more than 100 of which have earned the title Tree City USA.

"That´s complicated enough. At the same time, though, we have invasive and often disease-carrying tree pests up to our eastern and western borders. Others are already here," Atchison said. "So far, education and proactive management are our best protection. These invasives are bringing problems without cures - as the European elm bark beetle did in the past with Dutch elm disease."

The threat identified most recently could be the worst, he warned. The 1,000 cankers disease wiping out black walnuts from California to Colorado is simply killing well-loved ornamental and shade trees.

If it makes its way into Kansas, however, 1,000 cankers could also decimate the stateÂ´s nut and lumber industries. In turn, the disease could enter the nation´s major walnut production areas, which extend from eastern Kansas to the East Coast.

"Added to that, Kansas has been losing forest and agroforestry land since World War I ushered in fencerow-to-fencerow agriculture. We´ve seen ebbs and flows in inventory since then. The Dust Bowl, for example, was a hard lesson that led to a big rise in tree plantings,"

he said. "Modern conservation efforts have played a part, too, but so has urban sprawl. Today, we´re seeing a rapid increase in converting woodlands to non-forest uses."

The "Kansas Forest Resource Assessment and Strategy" plan is available for review on the Web at http://www.kansasforests.org/assessment.shtml. Kansans can request a paper copy by contacting the KFS at (785) 532-3310. Atchison will collect the comments received on or before June 4 by e-mail (atchison@ksu.edu) or postal service (Rural Forestry Coordinator, Kansas Forest Service, 2610 Claflin Road, Manhattan, KS 66502).

United States Department of Agriculture NRCS Natural Resources Conservation Service

Kansas

Kansas Forest Resource Assessment and Strategy Public Comment Needed By June 4, 2010

MANHATTAN, KANSAS, May 19, 2010 - Kansas rural and community/urban forest, woodlands, and tree resources make up 10 percent of the state's land area, a little over 5.2 million acres. Though forest resources represent a small percentage of the total land area, they are woven throughout the state in the form of riparian forests, windbreaks, and in the 631 Kansas communities.

Increased pressures upon the health of forest resources from pests, diseases, and non-native species, as well as a rapid increase in the conversion of forest and agroforestry lands to nonforest uses, has required a new approach for identifying forest areas at risk. This approach is embodied in the Kansas Forest Resource Assessment and Strategy. The Assessment and Strategy will help target funds and resources to produce the highest returns of ecological, social, and economic benefits derived from Kansas forest and agroforestry resources.

To achieve this goal, Kansas is analyzing the conditions and trends of its forest resources, identifying priority areas, and developing strategies for wise financial investment of funds to address top issues identified by national, regional, and local stakeholders. The Kansas Forest Resource Assessment and Strategy will direct Kansas Forest Service's annual planning, operations, and grant applications for program funding received through the Cooperative Forestry Assistance Act and other sources.

Incorporated into the assessment are areas identified for Forest Legacy Program participation. The Forest Legacy Program is a voluntary federal program administered by the U.S Department Agriculture Forest Service that protects private forestland by purchasing development rights through conservation easements.

The Kansas Forest Service is seeking public comment on the Forest Resource Assessment and Strategy and the areas which have been targeted for protection for the Forest Legacy Program. Public opinion and ideas are extremely important since 95 percent of Kansas forests are privately owned with 65 percent of the holdings occurring in 10-acre patches or less.

The Forest Resource Assessment and Strategy can be reviewed on the Web at www.kansasforests.org/assessment.shtml, or a paper copy can be provided by contacting the Kansas Forest Service at 785-532-3310 or Bob Atchison by e-mail at atchison@ksu.edu. June 4, 2010, is the deadline for submitting comments. This will provide enough time for final edits before submitting the document to the Secretary of Agriculture for approval on June 18, 2010. The Kansas Forest Service is located at 2610 Claflin Road, Manhattan 66501

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Kansas Forest Service seeks public comments

Contributed to The Sentinel
Posted May 28, 2010 @ 10:40 AM

Manhattan, Kan. — The Kansas Forest Service is seeking public comments by June 4 on a plan that will target its efforts during a future expected to bring pressures on and threats to the state's forest-related resources.

The finalized plan must reach the U.S. Secretary of Agriculture by June 18.

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The nation's ongoing economic woes are just one force driving the strategic change, Atchison explained. The Kansas plan also must address a rather unusual fact: The state's forested land exceeds 5.2 million acres, at least 95 percent of which is privately owned. And, well over half of this private property occurs in scattered small holdings, affected by widely differing factors.

"This really raises the difficulty in figuring how best to target funds and resources," he said. "To fulfill our mission, the Kansas Forest Service must help produce the highest returns possible -- in terms of ecological, social and economic benefits -- from the state's diverse forest and agroforestry resources."

The KFS's proposed plan includes a changed approach for identifying forest areas at risk. It also covers Kansas' participation in the Forest Legacy Program -- a new, voluntary federal effort designed to protect private forestland by purchasing development rights (through conservation easements).

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But, it also includes the riparian trees that preserve and protect Kansas water quality. It includes the carefully sited windbreaks that help to reduce the state's ongoing soil erosion and other wind-related losses. It includes urban trees that improve the quality of life in 631 Kansas communities, more than 100 of which have earned the title Tree City USA.

"That's complicated enough. At the same time, though, we've got invasive and often disease-carrying tree pests up to our eastern and western borders. Others are already here," Atchison said. "So far, education and proactive management are our best protection. These invasives are bringing problems without cures – as the European elm bark beetle did in the past with Dutch elm disease."

The threat identified most recently could be the worst, he warned. The 1,000 cankers disease wiping out black walnuts from California to Colorado is simply killing well-loved ornamental and shade trees.

If it makes its way into Kansas, however, 1,000 cankers could also decimate the state's nut and lumber industries. In turn, the disease could enter the nation's major walnut production areas, which extend from eastern Kansas to the East Coast.

"Added to that, Kansas has been losing forest and agroforestry land since World War I ushered in fencerow-to-fencerow agriculture. We've seen ebbs and flows in inventory since then. The Dust Bowl, for example, was a hard lesson that led to a big rise in tree plantings," he said. "Modern conservation efforts have played a part, too, but so has urban sprawl. Today, we're seeing a rapid increase in converting woodlands to non-forest uses."

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Public Comment Needed: How Best to Assess and Address Kansas Forest, Agroforestry Resources

by K-State | May 28, 2010 at 12:42 AM

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Released May 18, 2010

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Kansas Technical Committee Members 2015

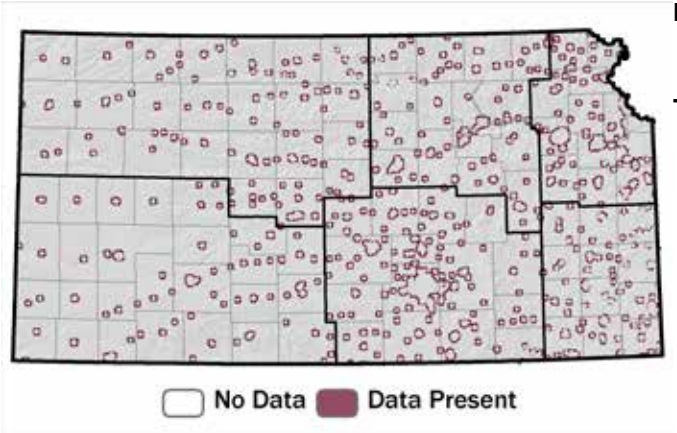
Name	Title	Organization
Calvin Adams		Smoky Hills Graziers Association
Kent Askren	Water Resources Specialist	Kansas Farm Bureau
Robert Atchison	Rural Forestry Coordinator	Kansas Forest Service
Darin Banks		U.S. Environmental Protection Agency
Eric Banks	State Conservationist	Natural Resources Conservation Service
Herb Bartel		Kansas Rural Center, Inc.
Mike Beam	Executive Secretary, Cow-Calf/Stocker Division	Kansas Livestock Association
Larry Biles	State Forester	Kansas Forest Service
Tim Boese	Manager	Equus Beds Groundwater Mgt. District No. 2
Wayne Bossert	Manager	Northwest Kansas Groundwater Management District No. 4
Jarrod Bowser	Conservation District Board Member	
Nicholas Bowser	Member	Farm Service Agency State Committee
Russell Bradley	Chairperson	Kickapoo Tribe of Kansas
Ronald Brown	Representative	Kansas Association of Conservation Districts and State Association of Kansas RC&Ds
Tim Christian		Kansas Grasslands Coalition
Patricia Clark	State Director	Rural Development
Kent Colwell	Area Rural Development Manager	Rural Development
Luke Cory		U.S. Army Corps of Engineers
Barth Crouch	Conservation Policy Directory	Playa Lakes Joint Venture
Dan Devlin	Director	KCARE/K-State Research and Extension
Mike Disney	Private Land Supervisor	U.S. Fish and Wildlife Service
Louise Ehmke		Farm Service Agency State Committee
Rodney Einsel	Chairman	Kansas Grazing Lands Coalition
Orrin Feril	Manager	Big Bend Groundwater Management District No. 5
Greg Foley	Division of Conservation	Kansas Department of Agriculture
Harvey Fredericks	Vice Chairman	Iowa Tribe of Kansas and Nebraska
Mary Fund		Kansas Rural Center, Inc.
Jaime Gaggero	Watershed Management Section	Kansas Department of Health and Environment
Justin Gilpin	Chief Executive Officer	Kansas Association of Wheat Growers/ Kansas Wheat Commission
Jim Hays	Conservation Projects Coordinator	The Nature Conservancy
Lance Hedges	Director of Conservation	The Nature Conservancy
Ryan Heiniger	Director of Conservation Programs	Ducks Unlimited
Douglas Helmke		Kansas Rural Water Association
Dalton Henry		Kansas Wheat Commission/Association of Wheat Growers
David Hibbs		U.S. Army Corps of Engineers
Edgar Hicks		Kansas Black Farmers Association
Penny Hughs	Executive Secretary	Kansas Land Improvement Contractors Association
Todd Jennison		Kennedy and Coe, LLC
Jerry Jost	Director of Land Protection	Kansas Land Trust
Sharon Kay Karr		Farm Service Agency State Committee
Jeff Keating	Partnerships Biologist	Department of Army
Jan King	Manager	Western Kansas Groundwater Management District No. 1
Rey Kitchkumme	Council Member	Prairie Band Potawatomie Nation
Ron Klataske	West Central Regional Representative	Audubon of Kansas

Name	Title	Organization
Joe Kramer	Division Director	Kansas Department of Wildlife, Parks, and Tourism
Greg Kramos	Biologist	Fish and Wildlife Service
Wally Leander	Soil Conservationist	Bureau of Indian Affairs
Brian Lindley	Executive Director	No-Till on the Plains
Dennis Lutgen		Star Seed Inc.
Carl Matousek	Land Manger	Prairie Band Potawatomie Nation
Jared McJunkin	Field Supervisor/Western Division	National Wild Turkey Federation
Rich McKee		Kansas Livestock Association
Terry Medley	Acting Section Chief, Livestock Waste Section	Kansas Department of Health and Environment
Julie Mettenburg	Executive Director	Kansas Rural Center
Susan Metzger	Watershed Coordination Unit Manager	Kansas Water Office
Howard Miller		Cheney Lake Watershed
Maurice Miller		Sharp Brothers Seed Company
Todd Miller	Representative	Kauffman Seeds
Jeff Neel	Executive Director	Kansas Alliance for Wetlands and Streams
Carl Nuzman	Consulting Engineer/Hydrologist	
Barb Oltjen	President	State Association of Kansas Watersheds
Tim Peterson		Farm Service Agency State Committee
Ronald Pfenninger	Representative	State Association of Kansas Watersheds
Mike (Bucky) Pilcher	Land Manager	Sac and Fox Nation of Missouri
Adrian Polansky	State Executive Director	Farm Service Agency
Dan Pollock	Conservation District Board Member	
Steven Riley	Regional Director	Pheasants Forever/Qual Forever
Mark Rude	Executive Director	Southwest Kansas Groundwater Mgt. District No. 3
Larry Rutter		Kansas Tree Farm Committee
Scott Satterthwaite	Watershed Management Section	Kansas Department of Health and Environment
Steve Schaff		U.S. Environmental Protection Agency
Troy Schroeder	Representative	Kansas Rural Center
Tom Schwartz		Grassland Installation Company
Steven Sorensen	Conservation Vice President	Kansas Wildlife Federation
Dr. Mark Steffen	M.D.	
Susan Stover	High Plains Unit Manager	Kansas Water Office
Tracy Streeter	Director	Kansas Water Office
Tim Stroda	President & CEO	Kansas Pork Association
Steve M. Swaffar	Director of Natural Resources	Kansas Farm Bureau
Mark Treaster		Farm Service Agency State Committee
Xiomara Tryban	Assistant State Conservationist for Programs	Natural Resources Conservation Service
Larry Wagner	Acting Research Leader	Wind Erosion Research Unit
Thomas Wellington		Kansas Black Farmers Association
Jere White	Executive Directory	Kansas Corn Growers/Grain Sorghum Producers Association
Jan Windscheffel		Netafim USA Precision Irrigation
Patti Winters	President	Kansas Association of Conservation Districts Employees' Organization
Erik Wisner	Policy and Program Analyst	Kansas Department of Agriculture

Kansas Forest Stewardship Committee Members 2010

Last	First	Title	Organization	City	State
Biles	Larry	State Forester	Kansas Forest Service	Manhattan	KS
Atchison	Robert	Rural Forestry Coordinator	Kansas Forest Service	Manhattan	KS
Barden	Charles	Extension Forester	K-State Research and Extension	Manhattan	KS
Brown	Ronald	Member	Kansas Association Conservation Districts (KACD)	Ft Scott	KS
Carlson	Dennis	District Forester	Kansas Forest Service	Hutchinson	KS
Harper	Claire	USDA/Fs Region 2	USDA Forest Service State & Private Forestry	Lakewood	CO
Ruder	Jim		Forestland owner	Wakeeney	KS
Lindahl	Doug		Forestland owner	Enterprise	KS
Ellis	Leonard	Independent Forestry Service	Forest Industry Kansas Forest Products Association Kansas Tree Farm Committee	Florence	KS
Winkler	Rod	Kansas State FSA Office	Farm Service Agency	Manhattan	KS
Simpson	Brad	Kansas Department Of Wildlife & Parks	State Fish & Wildlife Kansas Department Of Wildlife And Parks	Pratt	KS
Janzen	Mark	NRCS	Natural Resources Conservation Service	Salina	KS
Hays	Jim	TNC	Environmental Organization	Topeka	KS
Bosse	Sharon	Prairie Band Pottawatomie Nation Planning & Environ. Prot.	Tribal Representative	Mayetta	KS
Freeman	Craig	R. L. Mcgregor Herbarium	Kansas Biological Survey	Lawrence	KS
Fizell	Jason	Kansas Land Trust	Kansas Land Trust	Lawrence	KS

APPENDIX C
INPUT DATA LAYERS

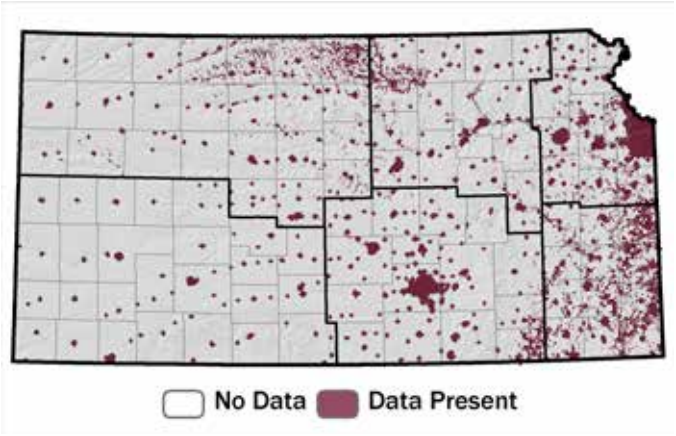


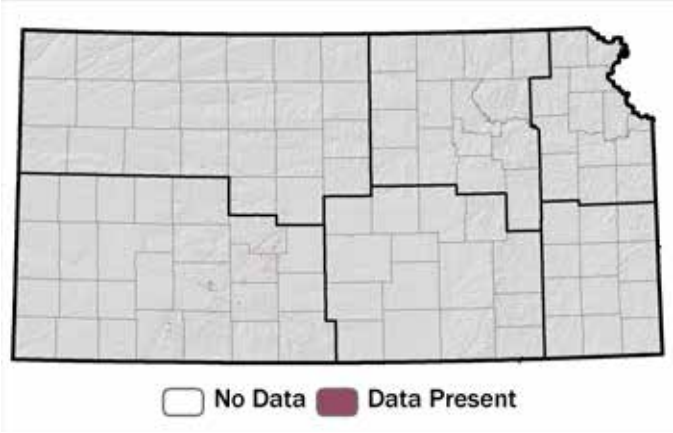
Layer | 'Moderate' Emerald Ash Borer Risk

Threat/Benefit Layer | Issues that threaten a healthy forest (3.1.1)

Layer | 'High' Emerald Ash Borer Risk

Threat/Benefit Layer | Issues that threaten a healthy forest (3.1.1)



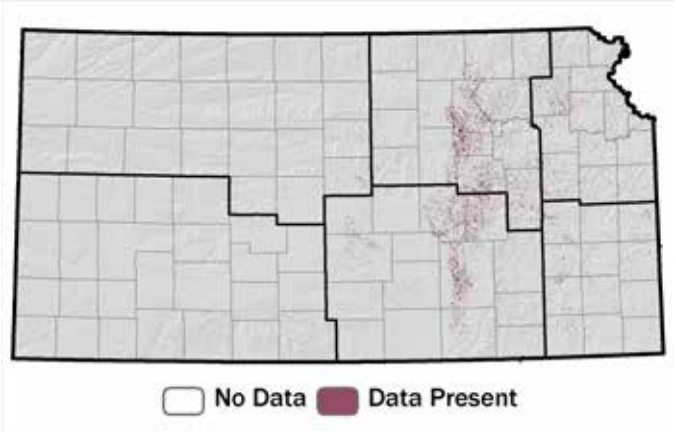


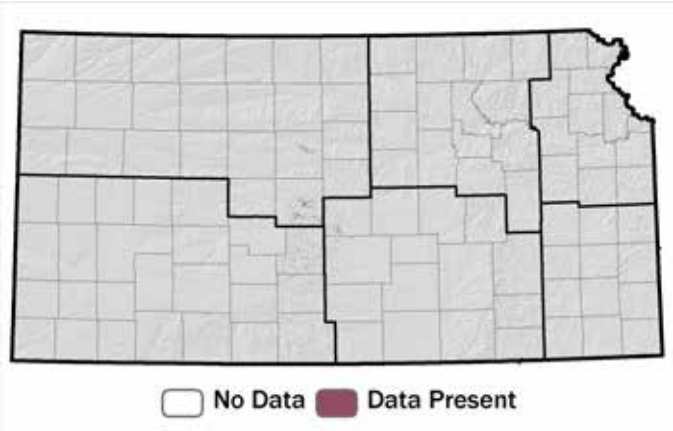
Layer | Pine Wilt 'Absent'

Threat/Benefit Layer | Issues that threaten a healthy forest (3.1.1)

Layer | Pine Wilt 'Present'

Threat/Benefit Layer | Issues that threaten a healthy forest (3.1.1)



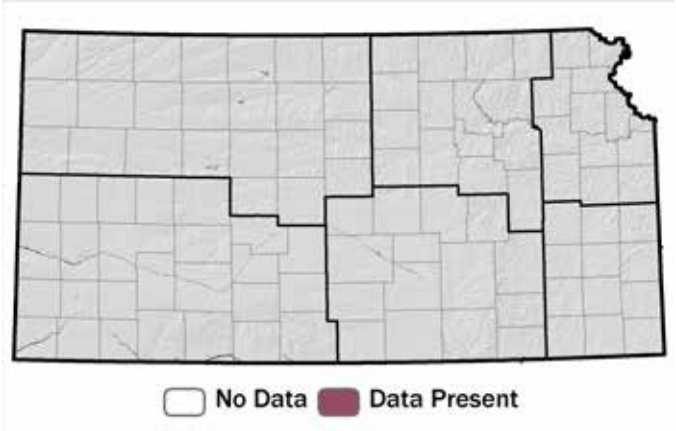


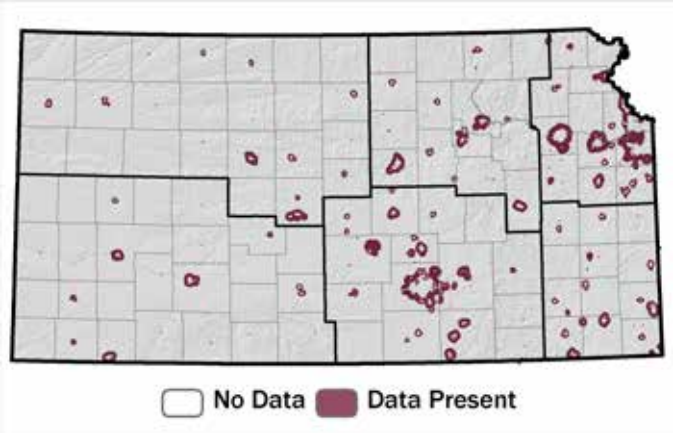
Layer | Pine Wilt 'Transition'

Threat/Benefit Layer | Issues that threaten a healthy forest (3.1.1)

Layer | Tamarisk

Threat/Benefit Layer | Issues that threaten a healthy forest (3.1.1)



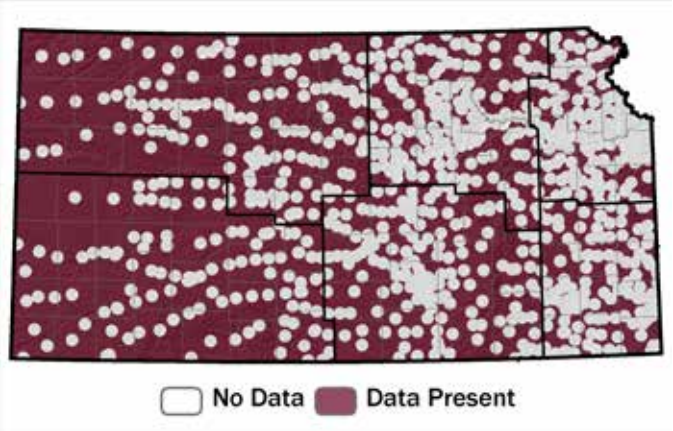


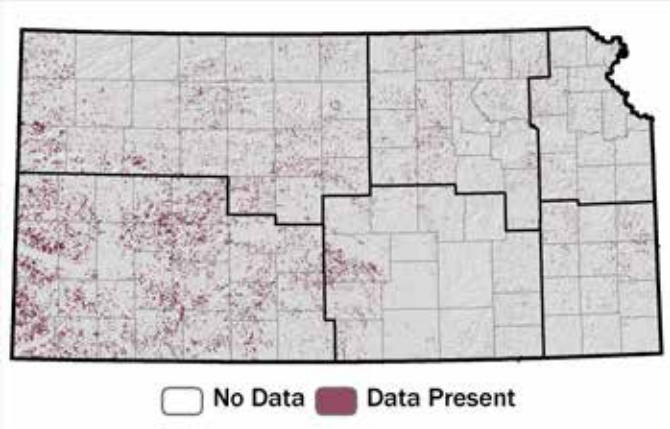
Layer | Wildland-Urban Interface (WUI)

Threat/Benefit Layer | Issues that create wildfire risk (3.1.2)

Layer | Insurance Services Office Fire Station Coverage Gaps

Threat/Benefit Layer | Issues that create wildfire risk (3.1.2)



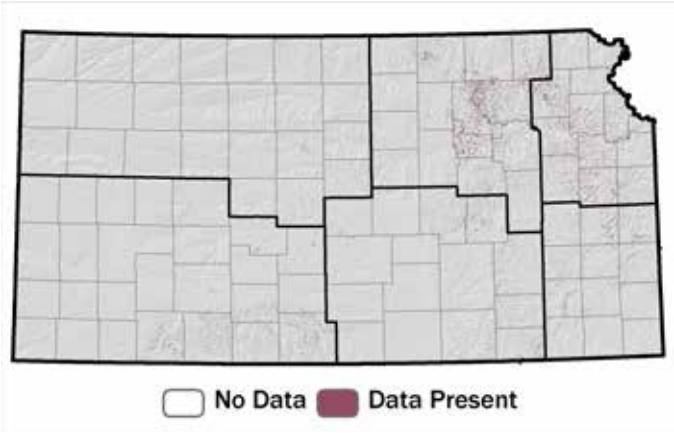


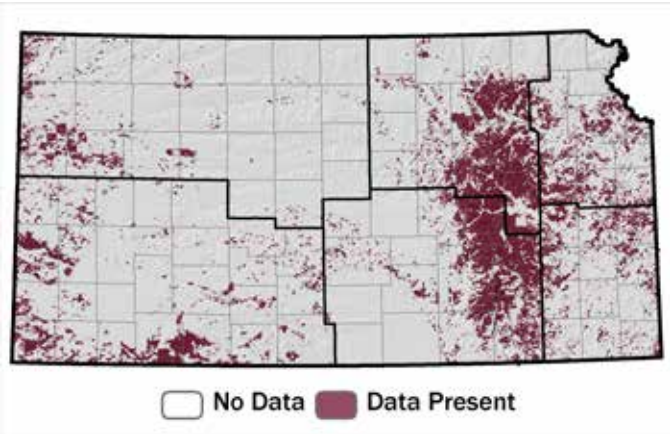
Layer | Conservation Reserve Program Land

Threat/Benefit Layer | Issues that create wildfire risk (3.1.2)

Layer | Eastern redcedar in Grassland

Threat/Benefit Layer | Issues that create wildfire risk (3.1.2)



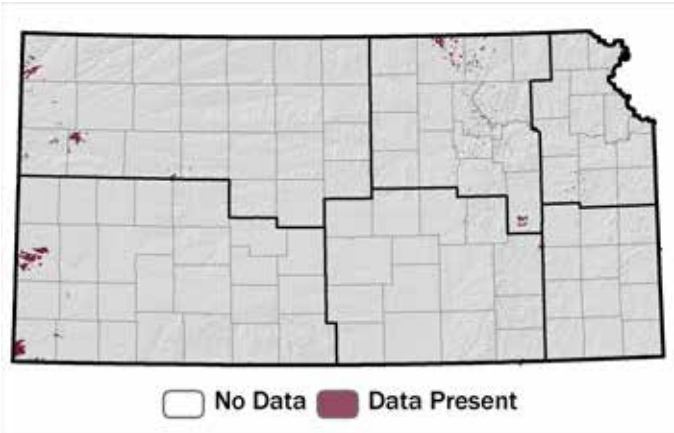


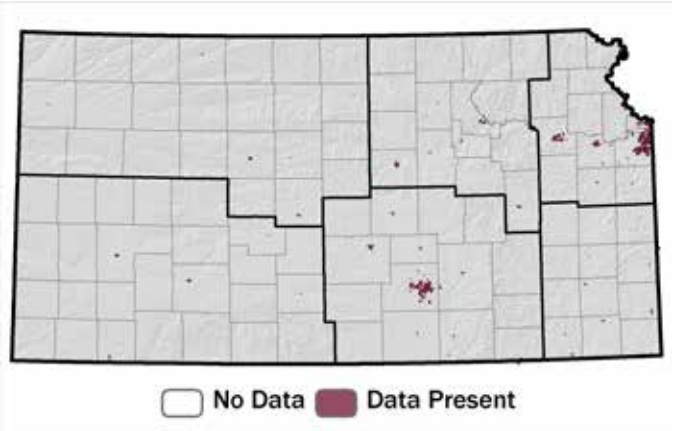
Layer | 'Moderate' Wildland Fire Potential

Threat/Benefit Layer | Issues that create wildfire risk (3.1.2)

Layer | 'High' Wildland Fire Potential

Threat/Benefit Layer | Issues that create wildfire risk (3.1.2)



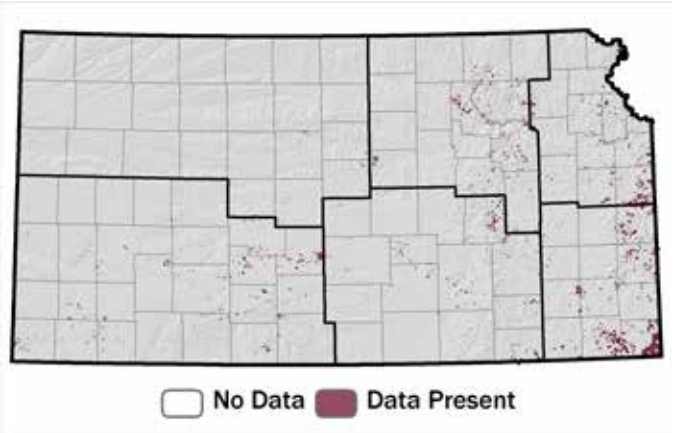


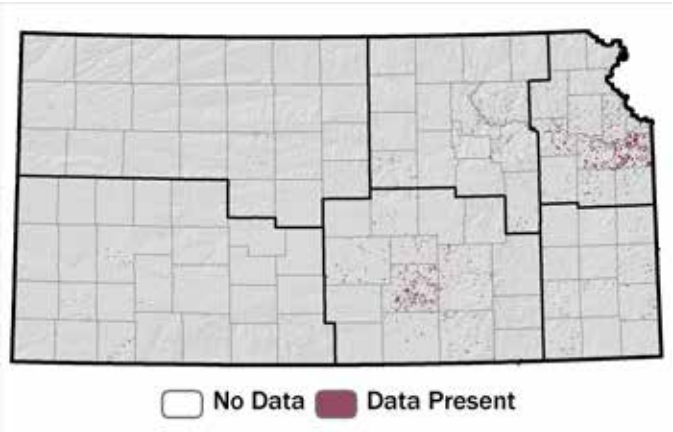
Layer | Urban and Community Forestry Index

Threat/Benefit Layer | Loss of Kansas Forestland (3.1.3)

Layer | Forest Fragmentation

Threat/Benefit Layer | Loss of Kansas Forestland (3.1.3)



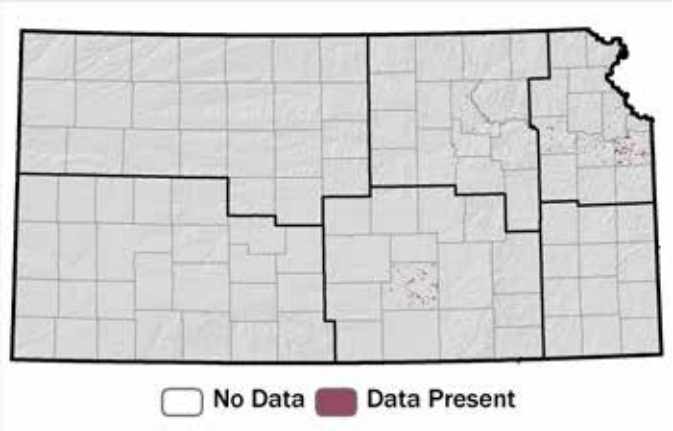


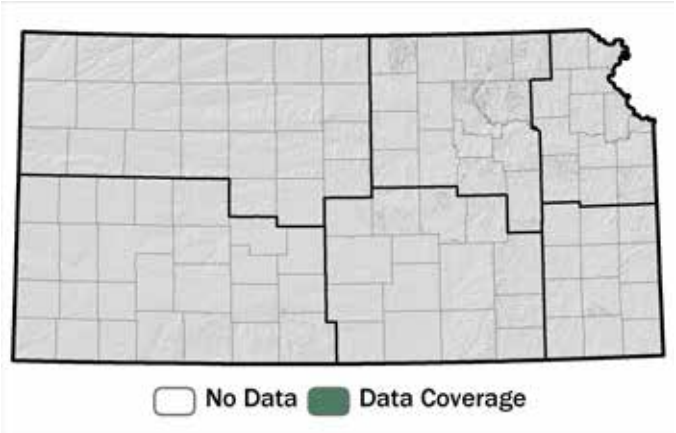
Layer | 'Moderate' Development Risk

Threat/Benefit Layer | Loss of Kansas Forestland (3.1.3)

Layer | 'High' Development Risk

Threat/Benefit Layer | Loss of Kansas Forestland (3.1.3)



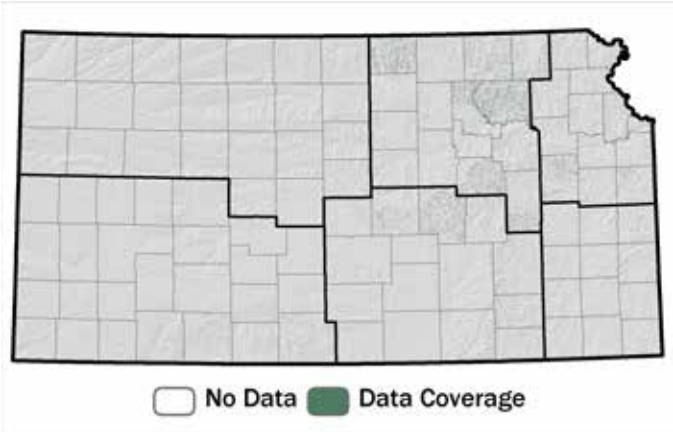


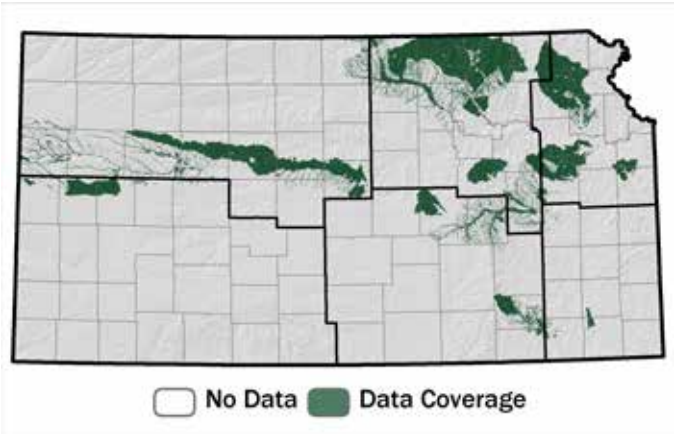
Layer | High SSURGO Runoff Riparian Areas within High Total Maximum Daily Load Watersheds

Threat/Benefit Layer | Sustaining water quality and quantity (3.2.1)

Layer | High SSURGO Runoff Riparian Areas within Top 20 Watershed Restoration and Protection Strategy (WRAPS) Watersheds

Threat/Benefit Layer | Sustaining water quality and quantity (3.2.1)



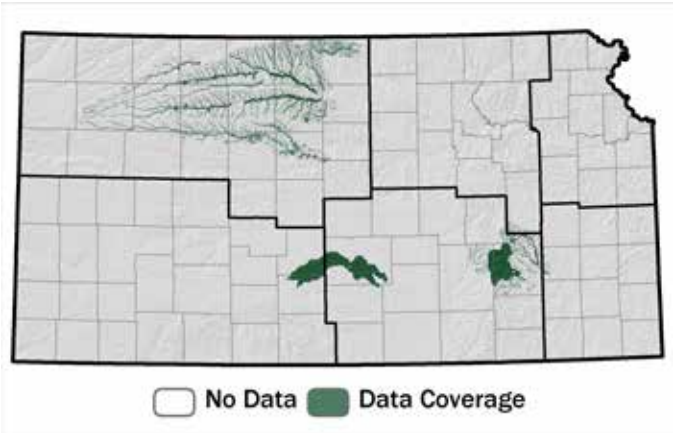


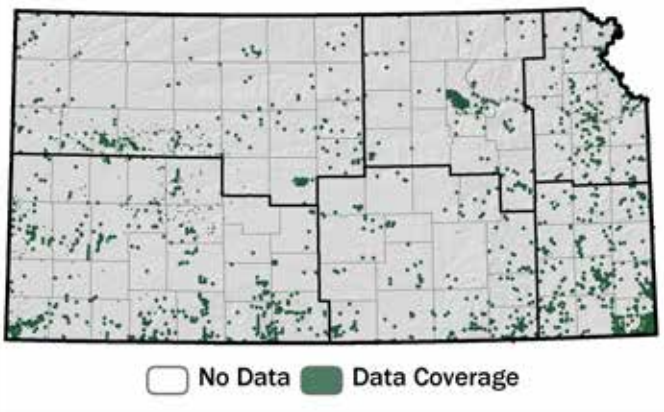
Layer | High Stewardship Potential within Kansas Federal Reservoir Drainage Areas 'With State-Owned Storage'

Threat/Benefit Layer | Sustaining water quality and quantity (3.2.1)

Layer | High Stewardship Potential within Kansas Federal Reservoir Drainage Areas 'Without State-Owned Storage'

Threat/Benefit Layer | Sustaining water quality and quantity (3.2.1)



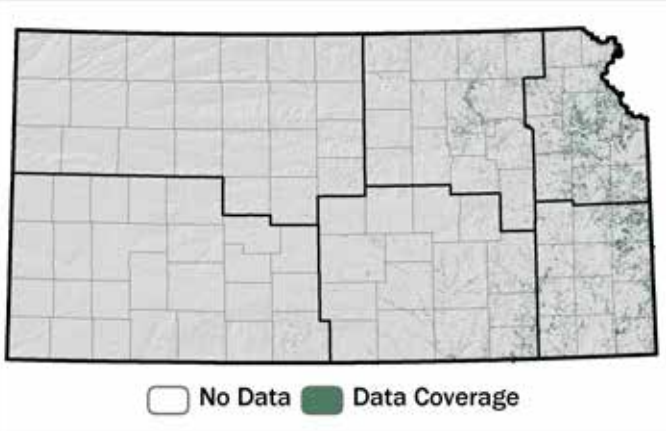


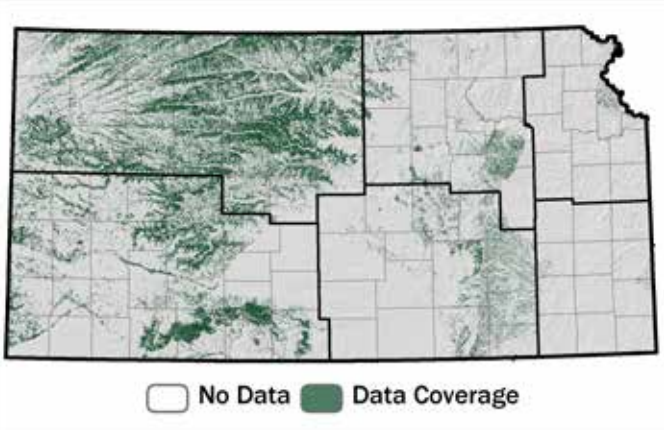
Layer | Kansas Natural Heritage Inventory Rare Species

Threat/Benefit Layer | Protecting and restoring biodiversity and wildlife habitat (3.2.2)

Layer | Forest Patches Greater than or Equal to 40 acres

Threat/Benefit Layer | Protecting and restoring biodiversity and wildlife habitat (3.2.2)



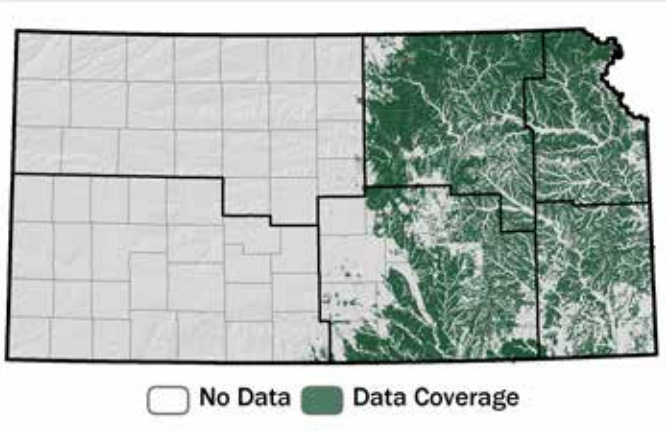


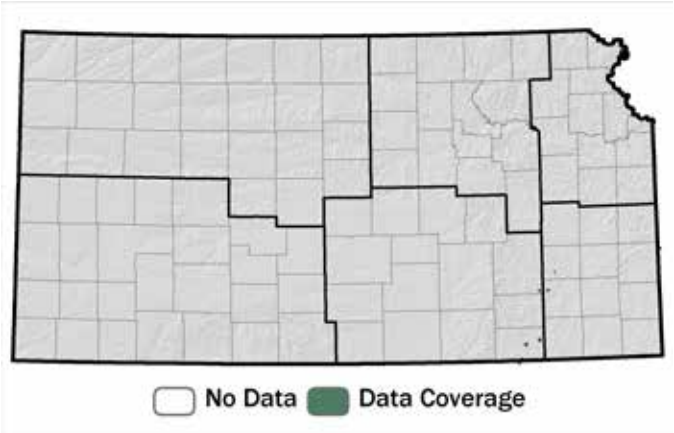
Layer | LANDFIRE Departure Index

Threat/Benefit Layer | Protecting and restoring biodiversity and wildlife habitat (3.2.2)

Layer | LANDFIRE Simulated Historical Mean Fire Return Interval

Threat/Benefit Layer | Protecting and restoring biodiversity and wildlife habitat (3.2.2)



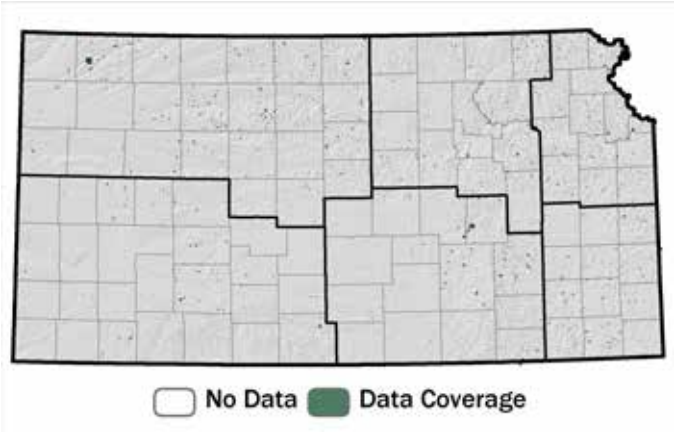


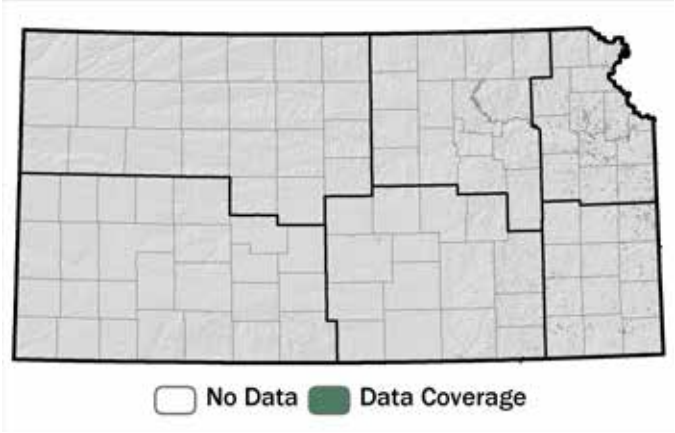
Layer | Kansas Natural Heritage Inventory Natural Forest Communities

Threat/Benefit Layer | Sustaining and protecting forest and agroforestry ecosystems (3.2.3)

Layer | Forest Stewardship Program Properties

Threat/Benefit Layer | Sustaining and protecting forest and agroforestry ecosystems (3.2.3)



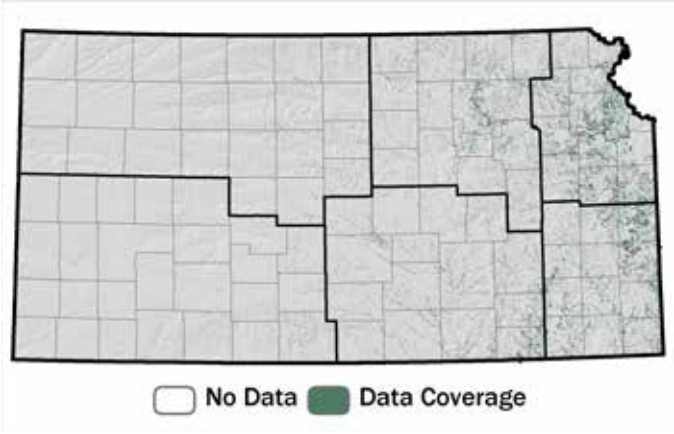


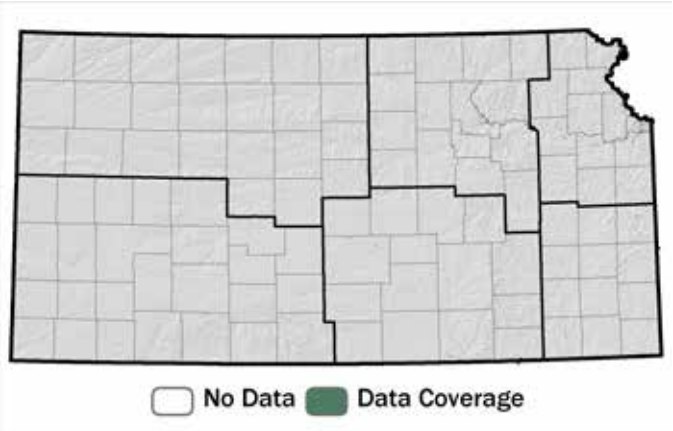
Layer | Forest Adjacent to Protected and Managed Areas

Threat/Benefit Layer | Sustaining and protecting forest and agroforestry ecosystems (3.2.3)

Layer | Non-Forest Stewardship Program High Stewardship Potential Private Forest

Threat/Benefit Layer | Sustaining and protecting forest and agroforestry ecosystems (3.2.3)



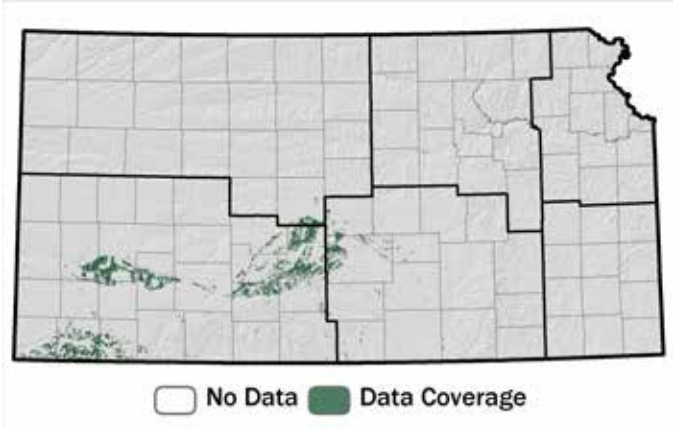


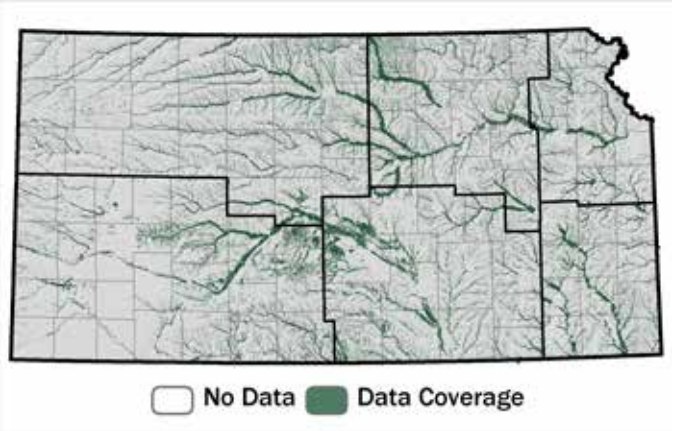
Layer | Urban Woodland

Threat/Benefit Layer | Sustaining and protecting forest and agroforestry ecosystems (3.2.3)

Layer | Agroforestry Potential

Threat/Benefit Layer | Sustaining and protecting forest and agroforestry ecosystems (3.2.3)



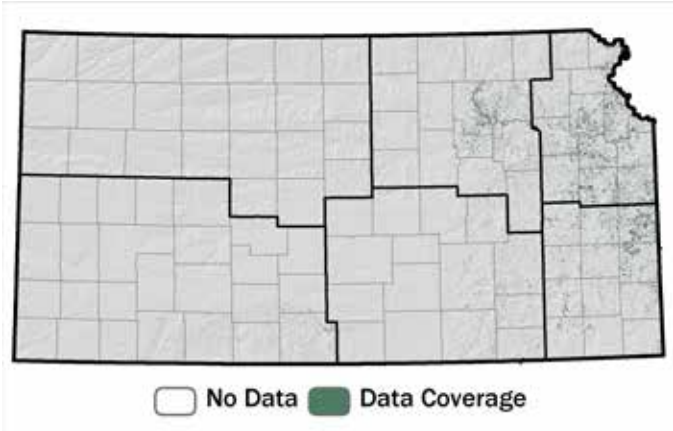


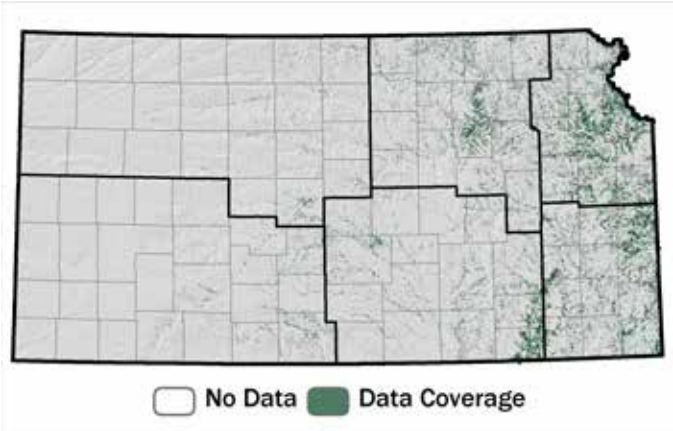
Layer | Tree and Shrub Suitability

Threat/Benefit Layer | Sustaining and protecting forest and agroforestry ecosystems (3.2.3)

Layer | Black Walnut

Threat/Benefit Layer | Maintaining and promoting livelihoods and economic benefits of woodlands (3.2.4)



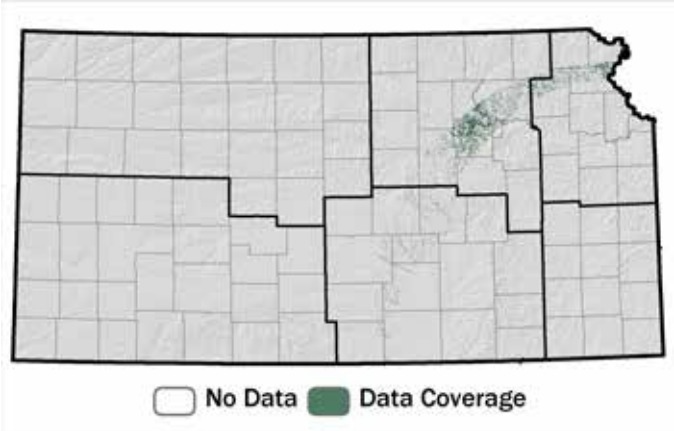


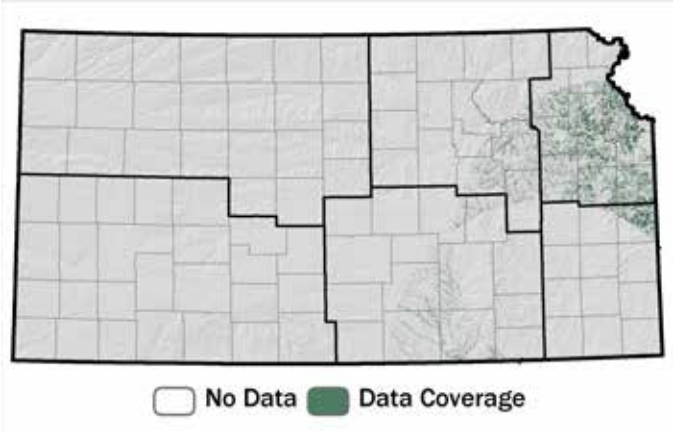
Layer | Biomass

Threat/Benefit Layer | Maintaining and promoting livelihoods and economic benefits of woodlands (3.2.4)

Layer | Forest within Mill Average Haul Areas 'No Overlap'

Threat/Benefit Layer | Maintaining and promoting livelihoods and economic benefits of woodlands (3.2.4)



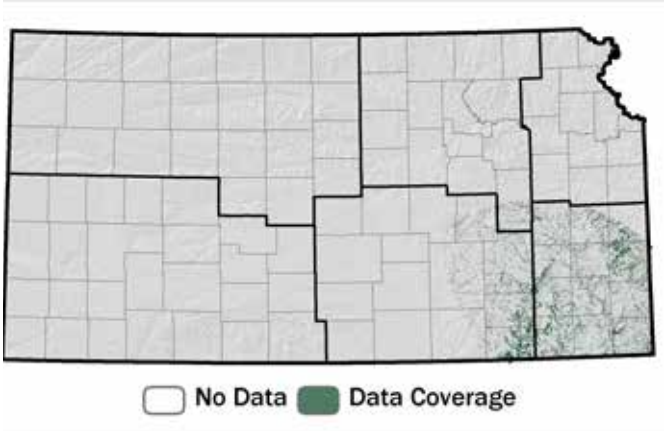


Layer | Forest within Mill Average Haul Areas 'Two Mill Overlap'

Threat/Benefit Layer | Maintaining and promoting livelihoods and economic benefits of woodlands (3.2.4)

Layer | Forest within Mill Average Haul Areas 'Three Mill Overlap'

Threat/Benefit Layer | Maintaining and promoting livelihoods and economic benefits of woodlands (3.2.4)



APPENDIX D

National Priorities, Objectives, Strategies, and Plan Implementation

National Objectives Addressed	Protect and enhance water quality and quantity.
General Issue	Sustaining Water Quality and Quantity
Priority Landscapes	Loess and Glacial Hills; Flint Hills; I-70 Metro Corridor
Specific Issues in Kansas:	1) Sedimentation of federal reservoirs – loss of water supply. 2) 90 percent of Kansas surface waters are impaired in rural and urban landscapes based on CWA Section 303(d) listing (TMDLs). 3) Compliance of municipalities with CWA stormwater NPDES permits.
Kansas Strategies	1) Work through local Watershed Protection and Restoration Strategy (WRAPS) stakeholder groups in priority TMDL watersheds to protect, manage and establish riparian forests. 2) Classify functioning condition of riparian forests through local Watershed Protection and Restoration Strategy (WRAPS) stakeholder groups in priority TMDL watersheds with remote sensing and forest inventory. 3) Through local WRAPS groups landownership will be targeted based on priority areas identified in WRAPS plans. Landownership GIS data layers (create them when needed) will facilitate the process. 4) Forest Stewardship Management plans will guide implementation of BMPs on contiguous ownership within targeted watersheds. 5) Forest Legacy will be used to bring targeted riparian forests under protection. 6) KWO Kansas Water Plan Enhanced Stream Corridor and Wetland Management to Address Reservoir Sedimentation policy will guide strategy.
State and Private Forestry Applicable Programs	• Forest Stewardship Program • Urban and Community Forestry • Forest Legacy Program
Resources Required	Funding sources include Kansas Department of Wildlife, Parks and Tourism, CWA and KWO State Water Plan funding, KDHE's WRAPS program, EPA Region 7 Wetland Developmental Grant, NRCS TSP, Kansas Department of Agriculture Division of Conservation, State and Private Forestry programs. Will fund positions for watershed forester and district foresters to provide technical services
Performance Measures	Acres and percent of priority watersheds where State and Private Forestry activities are enhancing or protecting water quality or quantity.

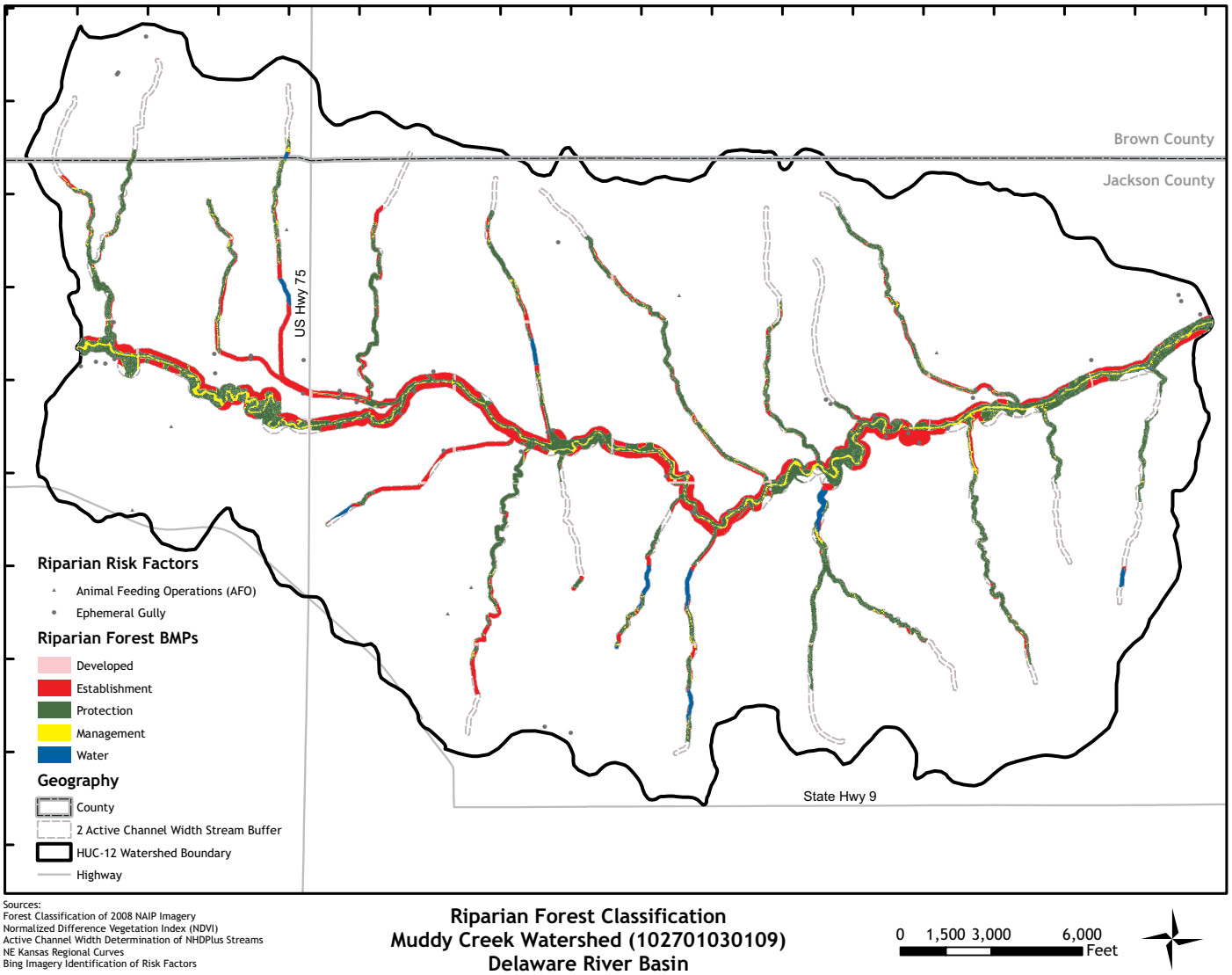
More than 15 miles of Kansas streambank tree plantings have been established since 2010.

Working with multiple partners since 2010, more than 15 miles of Kansas streambank tree plantings have been established and 811 acres of forest improved. These accomplishments prevent 856,000 cubic yards of sediment from entering identified priority watersheds annually saving $5.7 million in future dredging costs.

The Kansas Forest Service, Kansas Alliance of Wetlands and Streams (KAWS), and other partners worked closely with Watershed Protection and Restoration Strategy (WRAPS) stakeholder groups to complete assessments of the functioning condition of riparian forests. These assessments occurred in the Delaware, Tuttle Creek, and Spring River watersheds. Each of these watersheds has been identified as high-priority based on its history of exceeding total maximum daily loads (TMDL).

The Delaware assessment may be found on the Kansas Forest Service website at *www.kansasforests.org/streamside_forestry/streamside_docs/Delaware_Watershed_Assessment_Final.pdf*.

These geospatial assessments identify riparian forests in need of protection (properly functioning), in need of management (functioning at risk), and in need of establishment (nonfunctioning). Riparian forests in need of establishment represents 46 percent of the Delaware Watershed and are areas that contribute to the sedimentation of federal reservoirs and loss of water supply. The final GIS data layer added to the assessments included landowner parcel data. This landowner contact information enables a focused approach to strategically engage landowners with failing streambanks to implement forestry best management practices (BMPs).



Riparian Forest Classification Muddy Creek Watershed / Delaware River Basin.

Conserve Working Forestlands — Sustaining and Protecting Forests and Agroforests

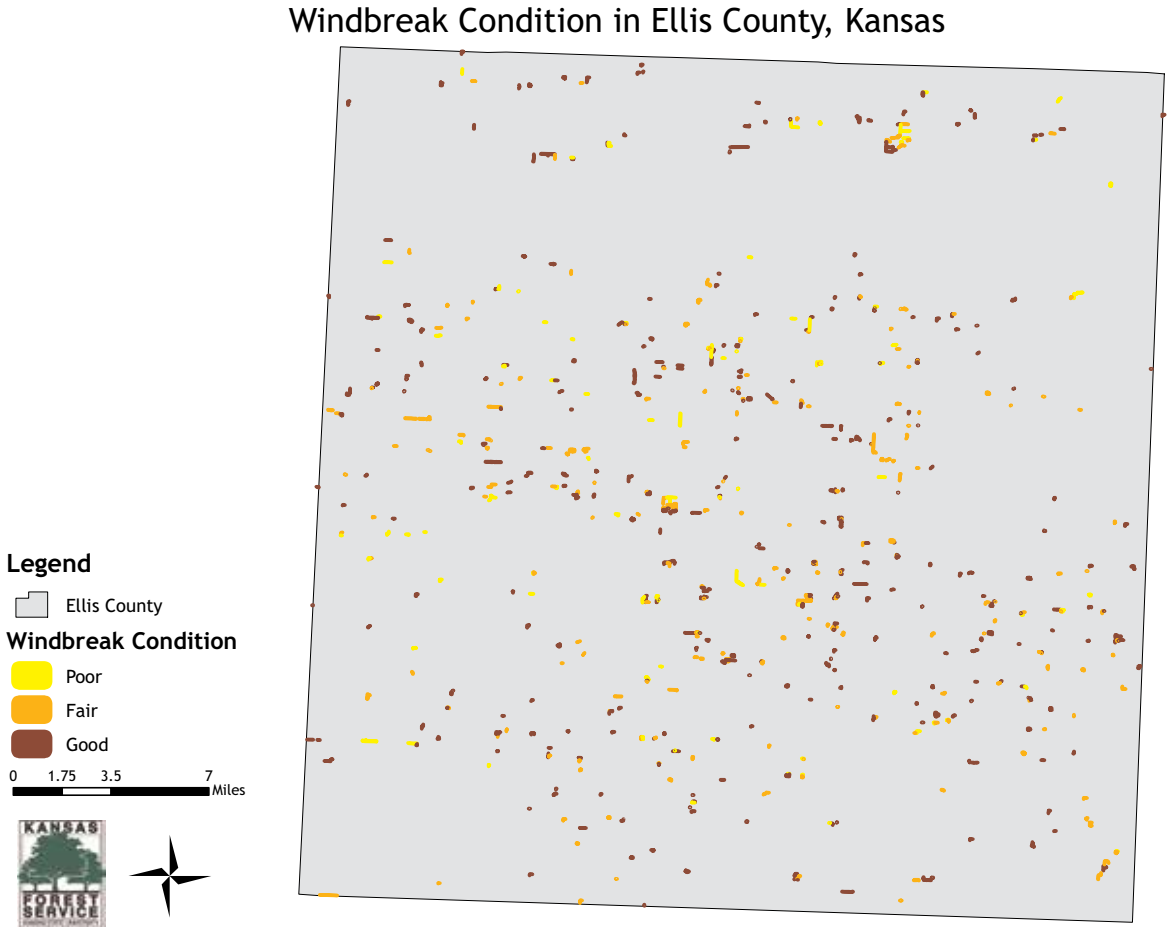
National Objectives Addressed	• Actively and sustainably manage forests. • Identify and conserve high priority forest ecosystems and landscapes.
General Issue	Sustaining and Protecting Forest and Agroforestry Ecosystems
Priority Landscapes	Loess and Glacial Hills; Flint Hills; I-70 Metro Corridor; Missouri River Corridor; Wooded Plains; Cimarron Breaks; Western Ark River – Cimarron Grasslands; Eastern and Western Smoky Hills; Greater Wichita
Specific Issues in Kansas:	1) 2.9 million acres of cultivated cropland (12 percent) of 24.6 million acres exceeds "tolerable limits" for erosion. 2) 44 percent of windbreaks (127,414 acres) are in fair to poor condition and in need of renovation. 3) 21 million acres (42 percent) of the Kansas landscape has the potential to benefit Kansans through forest stewardship (tree planting and management of existing rural forest and agroforestry resources). 4) Kansas urban and community forest is mature to over-mature with declining canopies. Average diameter is 13.6 inches with 48 percent of the population in fair to poor condition and 38 percent in 3 species – silver maple, Siberrian elm and hackberry. 5) 46 percent of hardwood forests are classified as cull. 6) Fluvial geomorphic dynamics (declines in sandbars and active flood plains) and landuse conversions have reduced cottonwood regeneration, which is evidenced in the decline of trees in smaller diameter classes (1 to 3 inches) and the majority of volume occurring in larger diameter classes (17 inches and larger). 7) Though oak volume, tree numbers and density have all increased, oak forests are not replacing themselves, which is evidenced with the overwhelming proportion making up the overstory canopy.
Kansas Strategies	1) The data set for agroforestry potential has identified 917,000 acres of cultivated cropland with a wind erodability index of 87 or higher (one of the requirements for CRP participation). Working through local RC&D's and Conservation Districts, landowners will be identified in this area (GIS data layers created if needed) and contacted to promote the adoption of windbreak establishment. 2) The Coronado Crossing RC&D has just completed a remote sensing project to identify the condition and location of windbreaks within their 7 county area. This information will be used to identify landowners with windbreaks in fair to poor condition to promote windbreak renovation. EQIP will be the financial incentive program to promote adoption. 3) Landowners located in areas with high forest stewardship program potential/high priority resources will be invited to participate in the FSP. 4) The urban and community forest will be assessed through US Forest Service FIA. Other inventories will target defective and hazardous trees for removal. Mitigation pruning of defects from the canopy to prevent or delay trees from becoming hazardous and a tree planting program will be initiated to increase species diversity. Training will be provided on hazard tree identification, assessment, risk management, mitigation pruning, removals, utilization, tree selection and replacement. Technical assistance will be focused on smaller communities that lack resources to accomplish the strategy. 5) Exceptional promotion of forest stand improvement through EQIP for Forestland Health. Development of new biomass markets for cull material. Increasing the number of forestry contractors that provide forest stand improvement services. 6) Areas where river dynamics support the silvilcultural conditions needed for cottonwood regeneration will be identified geospatially. An initiative to promote the regeneration of cottonwood in these target areas will be developed using existing USDA conservation programs. 7) The USDA Forest Service Northern Research Station(Daniel Dey) will assist with the refinement of silvicultural techniques to increase light through TSI and prescribed burning. KDWPT and NWTF will be close partners. Areas of the state will be identified where oak regeneration efforts will be focused.
State and Private Forestry Applicable Programs	• Forest Stewardship Program • Urban and Community Forestry Program • Cooperative Fire Programs
Resources Required	• Will work closely with NRCS, National Agroforestry Center, University of Missouri Center for Agroforestry, USDA ARS Wind Erosion Research Unit, USDA Forest Service Northern Research Station, Tree Boards, Tree City USA, Kansas Arborists Association. • Status and Trend of Cottonwood Forests Along the Missouri will be used as a reference.
Performance Measures	• Number of forest acres being managed sustainably as defined by current Forest Stewardship Management Plans. • Acres of high priority forest ecosystems and landscapes protected from conversion. • Community Forestry Management Plans, Inventories, and CTAP • Acres of windbreaks managed sustainably

Since 2010, more than 5 miles of shelterbelts have been renovated sustaining crop yield, wildlife and soil conservation benefits to more than 500 acres of cropland. These accomplishments occurred through the Environmental Quality Incentives Program (EQIP) and are the direct result of the implementation and expansion of a windbreak assessment strategy that began in Coronado Crossing RC & D (*www.kansasforests.org/rural_forestry/rural_docs/KS%20WB%20Assessment.pdf*).

The assessment methodology has since been published as "*Identification of windbreaks in Kansas using object-based image analysis, GIS techniques and field survey*.[1]

Since 2010 the condition and location of windbreaks and shelterbelts in a 14-county area in Kansas and a two-county area in Colorado have been assessed and located geospatially using new GIS and remote sensing methodologies. Assessments are also underway in an additional seven-county area in south central Kansas and a seven-county area in South Dakota. These assessments classify shelterbelts into good, fair, or poor condition classes based on criteria initially developed in the Great Plains Initiative (GPI). This same criteria was appropriated into Natural Resources Conservation Service (NRCS) Kansas Forestry Technical Note 11. In the technical note, shelterbelts classified in fair to poor condition qualify as a "Resource Concern" through the Environmental Quality Incentives Program (EQIP).

A GIS landowner parcel data layer was then used to identify farmers and ranchers with windbreaks in fair to poor condition. Direct mailings through local county conservation districts invited landowners to participate in EQIP. As a result, the number of windbreak renovation practices implemented in Kansas since 2010 has far exceeded any records of the historical implementation of the practice.



Identifying windbreak condition and location has increased the adoption of windbreak renovation practices.

1 *Ghimire, K., M.W.Dulin., R.L.Atchison., D.G. Goodin and J.M. S. Hutchinson. 2014. Agroforestry Systems. 88(5). 865-875*

Enhance Public Benefits from Trees and Forests — Wildlife and Fish Habitat

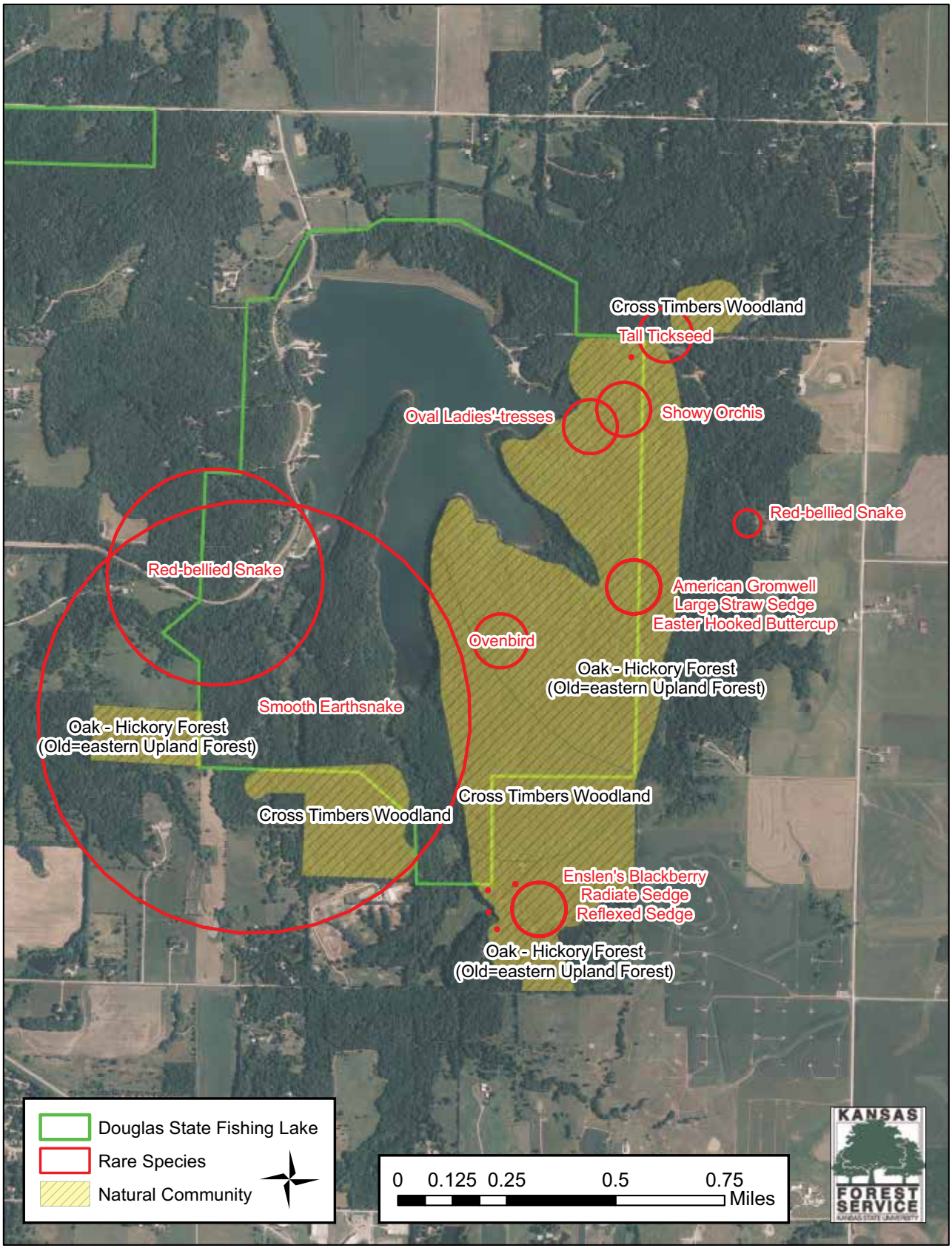
National Objectives Addressed	Protect, conserve and enhance wildlife and fish habitat.
General Issue	Protecting and Restoring Forest Bio-diversity and Wildlife Habitat
Priority Landscapes	Loess and Glacial Hills; Flint Hills; I-70 Metro Corridor; Missouri River Corridor; Wooded Plains; Cimarron Breaks; Western Ark River – Cimarron Grasslands; Eastern and Western Smoky Hills; Greater Wichita
Specific Issues in Kansas:	1) In the Shortgrass and Central Mixed Grass Prairie ecosystems riparian forests and shrubs are declining due to a lowering water table from surface and groundwater withdraw. 2) In the Eastern Tall Grass Prairie there is lack of active management and conservation of Deciduous Forests and Floodplain Habitats. Note: Issues come directly from the Kansas Comprehensive Wildlife Conservation Plan
Kansas Strategies	1) Riparian forest and shrub habitat will be conserved and established for priority species in priority habitats that have some dependency on forested areas or trees. In the Shortgrass Prairie Ecosystem, the focus is on the eastern spotted skunk(threatened) and barn owl while the Mixed Grass Prairie Ecosystem targets the eastern spotted skunk(threatened), red-spotted toad and pallid bat. 2) The Deciduous Forest and Floodplain is the 4th priority habitat in the Eastern Tall Grass Prairie Ecosystem. Forested habitat will be actively managed and protected in priority landscapes to sustain or increase populations of the following species. Birds: Rusty Blackbird, Cerulean Warbler, Lewis's Woodpecker; Mammals: Spotted Skunk(threatened), Little Brown Myotis, Gray Myotis (Endangered), Southern Flying Squirrel; Reptiles: Timber Rattlesnake, Redbelly Snake(threatened), Smooth Earth Snake; Amphibians: Green Frog, Northern Cricket Frog, Oklahoma Salamander; Insect: Ozark Emerald (damselfly), American Burying Beetle (Endangered), Gray Petaltail (damselfly).
State and Private Forestry Applicable Programs	• Forest Stewardship Program • Forest Legacy Program
Resources Required	Will seek strong partnerships with Kansas Department of Wildlife, Parks and Tourism, Kansas Biological Survey, National Wild Turkey Federation, US Fish and Wildlife Service, Quality Deer Management, and Kansas Water Office to pursue State and Private Forestry Competitive Grant opportunities and State and Private Forestry forestry programs.
Performance Measures	• Acres and percent of priority habitat areas where State and Private Forestry activities are protecting, conserving and enhancing wildlife and fish habitat. • Acres of connected forests resulting from State and Private Forestry investments.

Accomplishments toward Protecting and Restoring Forest Biodiversity and Wildlife Habitat

More than 1,000 acres of priority deciduous forest habitat for the redbelly and smooth earth snake and other threatened and rare species are being actively managed and protected through landscape forest stewardship planning and the Forest Legacy Program in the I-70 Metro Corridor priority landscape. The plan includes Douglas County State Fishing Lake and the Baldwin Woods Forest Legacy project.

Kansas Department of Wildlife, Parks and Tourism; U.S. Forest Service; Conservation Fund; University of Kansas; Kansas Land Trust; and private forestland owners are protecting this important landscape through a mix of conservation easements and fee simple agreements.

Public meetings have solicited input and participation in the project and the landscape forest stewardship plan. Forest stand improvement practices have been implemented on public and private lands.



The landscape forest stewardship plan protects a variety of rare and threatened species.

Enhance Public Benefits from Trees and Forests — Socioeconomic Benefits

National Objectives Addressed	Maintain and enhance the economic benefits and values of trees and forests.
General Issue	Sustaining and Enhancing Socioeconomic Benefits of Forests and Agroforests
Priority Landscapes	I-70 Metro Corridor; Wooded Plains; Greater Wichita
Specific Issues in Kansas:	1) Currently only one-third of green woody biomass produced annually by wood manufacturing is available for use as a wood energy feedstock or biobased product feedstock. 2) Ecosystem service values must be assigned to forest and agroforestry resources. 3) Develop a biomass market for the utilization of eastern redcedar.
Kansas Strategies	1) Conduct feasibility studies in areas surrounding Kansas City Topeka, Wichita and Pittsburg targeting public boiler systems 40 years or older for conversion to woody biomass. 2) Conduct annual or periodic forest inventory of communities, riparian forest and windbreaks in priority landscapes and assign ecosystem service values. 3) A community of interest and support for utilization of eastern redcedar biomass will be developed with Kansas Legislature Natural Resource and Utilities Committees, State Departments of Commerce, Energy, Labor and Health and Environment – Air Quality Division, Kansas Association of Conservation Districts, Kansas Water Office, Kansas Livestock Association, Tall Grass Legacy Alliance, State Conservation Commission, Natural Resource Conservation Service, Rural Development and Kansas State University's Center of Engagement and Community Development. Forest inventory will be intensified to improve data quality for feasibility studies.
State and Private Forestry Applicable Programs	• Urban and Community Forestry Program • Forest Stewardship Program
Resources Required	USDA Forest Service FIA, GPI, Kansas Legislature Natural Resource and Utilities Committees, State Departments of Commerce, Energy, Labor and Health and Environment – Air Quality Division, Kansas Association of Conservation Districts, Kansas Water Office, Kansas Livestock Association, Tall Grass Legacy Alliance, NRCS, Rural Development and K-State's Center for Engagement and Community Development
Performance Measures	• Number of communities and percent population served under an active urban and community forest management plan. • Number of total jobs (direct, indirect, and induced) sustained or maintained in the economy annually due to State and Private Forestry investments. • Total value of resources leveraged through partnerships with states and other partners.

Restoring grasslands and processing eastern redcedar into biomass.

The Kansas Forest Service and the Kansas Wood & Bio-Based Interest Group is recruiting and sustaining biomass processing facilities through the following activities:

- Measuring the movement of woody by-product by county from timber harvests and waste wood from primary and secondary wood processors, municipalities, utilities, and commercial arborists. See *Kansas State-wide Woody Biomass Supply & Utilization Assessment* (*www.kansasforests.org/forest_products/forest_product_docs/woodybiomass.pdf*).
- Biannual educational programs and wood harvesting equipment demonstration field days.
- Transportation cost studies based on road miles and bridge crossings from harvest to processing sites.
- Development of the *Kansas Wood Supply* business plan for Biochar Now.
- Collaborative competitive grant proposal writing activities central to joint interests in restoring grasslands by removing eastern red cedar.
- Business related confidentiality agreements and the filing of wood-based business and wood-volume data by Kansas Department of Health & Environment. These agreements are associated with the potential composting to dispose of millions of chickens and turkeys resulting from the bird flu epidemic.
- The Center for Engagement and Community Development will serve to enhance industrial collaboration between the Kansas Forest Service and other public and private partners.
- The development of the Kansas City Utilization District to network on the processing, use and sale of lumber and mulch from the 3 million ash trees located in the Kansas City Metro area as a result of potential mortality from emerald ash borer.

Recruiting and sustaining biomass processing facilities.

National Objectives Addressed	Identify, manage, and reduce threats to forest and ecosystem health
General Issue	Issues that Threaten Kansas Forest Health
Priority Landscapes	• All Priority Landscapes for emerald ash borer and thousand cankers disease. • Smoky Hill and Cimarron Breaks for Pine Wilt, Tamarisk and Russian Olive. • Greater Wichita, Flint Hills, Loess and Glacial Drift Hills, Missouri River Corridor, I-70 Metro Corridor, Wooded Plains for bush honeysuckle.
Specific Issues in Kansas:	1) Thousand Cankers Disease is an imminent threat to black walnut. Found as close as Eads, Colorado, the complex has the potential to create over $160 million dollar loss to the Kansas economy and a loss of environmental benefits as well. 2) Emerald Ash Borer is an imminent threat to white and green ash. It was first found in Wyandotte County Kansas in 2012, Johnson County in 2013, and Leavenworth County in 2014. All these counties are under federal and state quarantines. 3) Pine Wilt was first discovered in Kansas in 1979 in Cherokee County. It has since moved west at approximately 10 miles per year killing thousands of Scotch pines and to a lesser extent Austrian. It is now present in the eastern half of Kansas. 4) Exotic invasive plants have threatened the health and biodiversity of Kansas forests. The main three threats include bush honeysuckle in the eastern third and tamarisk and Russian olive in the south central and southwestern parts of the state.
Kansas Strategies	1) A state quarantine will be established to regulate the movement of black walnut into the state. A systematic monitoring and trapping program will be established to ensure early detection of the disease complex along with a First Detectors program. An educational program for the general public will be continued and annual training of natural resource professionals in Colorado where the disease may be observed first-hand. The Kansas Readiness Response Plan for Emerald Ash Borer will serve as a guide should thousand cankers disease be discovered in state. Registration of forest industry, firewood distributors and other appropriate groups that handle raw wood products will occur and come under compliance agreements. 2) Annual trapping and monitoring for emerald ash borer will continue along with public education and awareness campaigns. The Readiness Response Plan will be updated as needed and Community Response Plans developed. Inventories of both ash and walnut tree populations in communities will occur through CTAP and economic loss estimates provided. 3) The focus of the Pine Wilt Initiative will be to limit, delay and mitigate the movement of the disease in the western half of the state by surveillance, outreach, communication, direct intervention and best management practices. Details of the Initiative are located in the Appendix. 4) The 10 Year Strategic Plan for the Comprehensive Control of Tamarisk and Other Non-native Phreatophytes, such as Russian Olive, is found in the Appendix and will guide the strategies of this plan. Southwestern Kansas will be the focus of Tamarisk control along the mainstem and tributaries of the Arkansas and Cimarron Rivers. Additional inventory is needed to identify target areas for Russian olive control, though Stafford County is an obvious location. Management will include inventory/mapping, control, regeneration, monitoring and maintenance. EQIP for Forestland Health will provide financial assistance to control bush honeysuckle in eastern Kansas. 5) An Exotic Invasive Species Committee for plants should be appointed by the Governor's Natural Resource Subcabinet to develop policy and guidelines to address invasive plant issues.
State and Private Forestry Applicable Programs	• Forest Health Management • Forest Stewardship Program • Urban and Community Forestry Program
Resources Required	Kansas Department of Agriculture's Plant Protection and Weed Control is a crucial partner for monitoring, trapping, quarantine development and education. The Kansas Water Office provides important leadership through by leading the 10 year strategic plan for tamarisk and Russian olive control. K-State Research and Extension pathologists and entomologists will provide diagnostics and education. Additional inventories are needed to better geographically identify species at risk and those targeted for control and eradication.
Performance Measures	• Number and percent of forest acres restored and or protected from invasive and native insects and diseases annually. • Case studies and success stories will be developed.

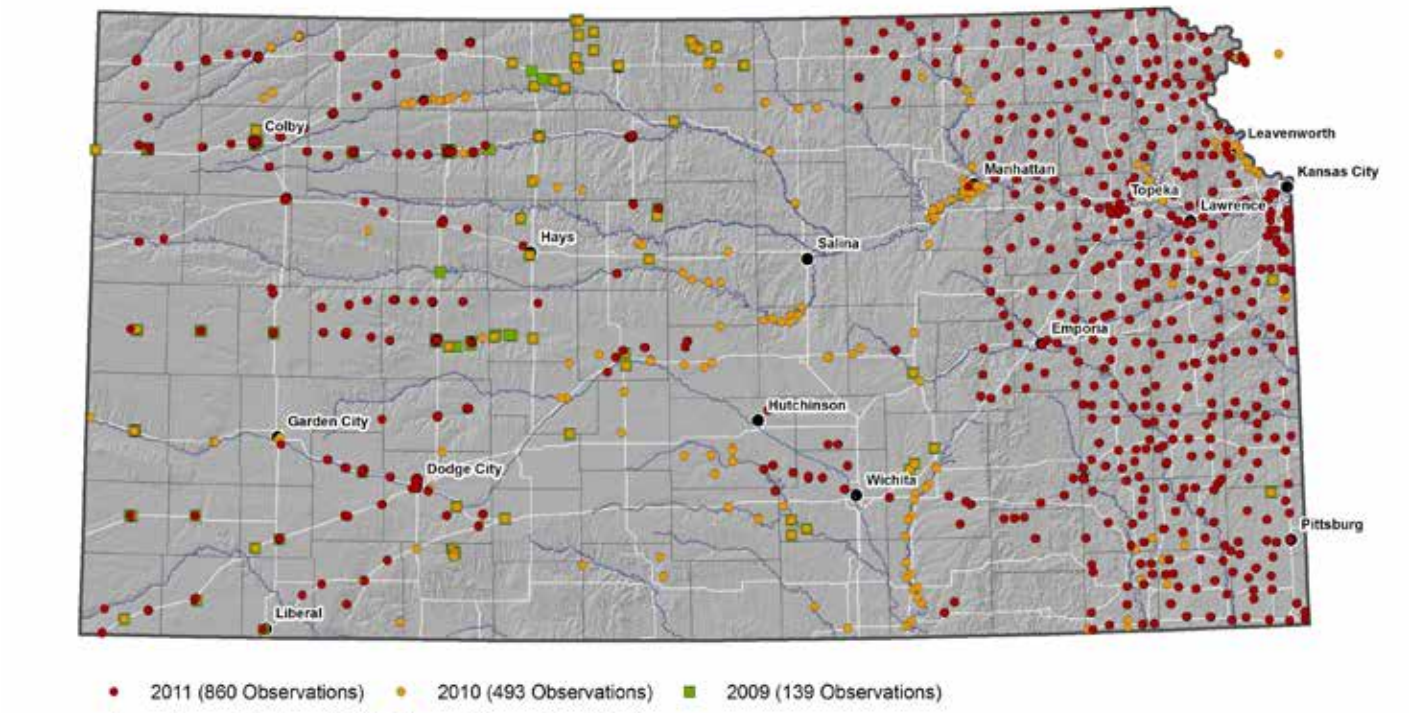
Working closely with the Secretary of the Kansas Department of Agriculture (KDA), the Kansas Forest Service assisted with the establishment of a statewide quarantine in 2010 to prevent and suppress the spread of Thousand Cankers Disease of Walnut. (*https://agriculture.ks.gov/divisions-programs/plant-protect-weed-control/thousand-cankers-disease*).

In partnership with KDA-Plant Protection and Weed Control, a systematic trapping and monitoring program and First Detectors Program began in 2009 and has continued to date. The primary high-risk areas of concern occur in central and eastern Kansas where walnut is common and anthropogenic pathways a concern.

A secondary area of risk is western Kansas because of the most recent discovery of the disease in Eads, Colorado, 40 miles west of Tribune, Kansas. In eastern and central Kansas, five sites are monitored for a 60-day cycle at transportation hubs, parking areas, wood debris collection points, camping sites, wood utilization businesses. In western Kansas a sentinel site program monitors 20 traps May through October.

Several Kansas Forest Service foresters and KDA-Plant Protection and K-State Research and Extension entomologists and pathologists attended on-site training in Colorado in identification and diagnosis of the disease. A registry for forestry industry, firewood distributors, and other appropriate groups that use black walnut is being maintained and compliance agreements developed as necessary (*https://agriculture.ks.gov/docs/default-source/pp-application-center/kansas-walnut-registry-application4352d2002e6262e1aa5bff0000620720.pdf?sfvrsn=0*). Several publications have been developed including E*conomic Loss Associated with the Introduction of Thousand Cankers Disease of Black Walnut to Kansas*, *Thousand Cankers Disease and Walnuts*, and *State of Kansas Thousand Cankers Disease of Walnut Strategic Plan* (*www.kansasforests.org/forest_health/emerging_threats/thousandcankerdisease.html*).

Professionals receiving training in TCD diagnosis from Colorado State University.



Trapping and monitoring thousand cankers disease in Kansas.

Protect Forests from Harm — Reducing Wildfire Risk

National Objectives Addressed	Restore fire- adapted lands and reduce wildfire impacts
General Issue	Wildfire Risk
Priority Landscapes	• Flint Hills • Cimarron Breaks • I-70 Metro Corridor • Wooded Plains • Greater Wichita
Specific Issues in Kansas:	1) Lack of fire occurrence in Kansas grasslands is one factor that has caused eastern redcedar volume to increase by 23,000 percent over the last 45 years invading grasslands and adversely affecting the populations of a variety of species identified in the Comprehensive Wildlife Conservation Plan as the "top species of greatest conservation need". Other woody plants such as Osage orange and honeylocust are also problematic. 2) Conversion of rural land to residential, expansion of urban areas and dramatic increase in eastern redcedar forest type has created potential wildland urban interface issues where fire can move readily between structural and vegetative fuels. 3) Lack of data on fire occurrence, weather and fuels.
Kansas Strategies	1) Whenever possible, identify areas in which fire exclusion has lead to an increase in Eastern Redcedar and other fire-prone species. Identify areas of concern on Community Wildfire Protection Plans, Master Fire Plans, and other information being provided to counties. Include information on fighting fires in cedar and timber in training programs offered to rural firefighters around the state. Continue to support and encourage efforts to use prescribed fire safely and appropriately as a management and prevention tool in affected areas. 2) Emphasize this concern in Community Wildfire Protection Plans, and identify areas of danger to local stakeholders. Provide training and information on management of cedar and other invasives via prescribed fire and other suitable means at every opportunity. Emphasize FireWise and similar fire prevention programs in both fire and other programs' information (e.g. community forestry) when writing plans and sharing information with landowners, community groups, and other stakeholders 3) Continue to work with the Kansas State Fire Marshall to try to improve fire occurrence data – and its timely availability – on wildfires statewide. Continue to work with the National Weather Service to develop the weather station network that is already in progress. Ultimately, integrate fire occurrence and weather data in a manner that can provide long term historic data correlating fire and weather, which can be used in the future for identifying fire trends, danger, and forecasts.
State and Private Forestry Applicable Programs	• Cooperative Fire Programs • Urban and Community Forestry
Resources Required	1) fire departments, RC&D's, emergency managers, landowners, conservation districts, Kansas State Firefighters' Assoc., public land management agencies, rural/suburban development and/or residential improvement district homeowners associations 2) county governments, RC&D's, local Emergency Planning Committees and Emergency Managers, and contractors developing hazard mitigation plans, rural/suburban development and/or residential improvement district homeowners associations 3) State Fire Marshall, NWS, KSU/State Climatologist, and whoever else is pursuing the weather network
Performance Measures	• Number of acres treated to restore fire-adapted ecosystems are moved toward and maintained in desired conditions. • Total acres treated to reduce hazardous fuels on state and private lands through the State Fire Assistance Program. • Percent of at-risk communities who increase suppression capacity by increasing the number of trained/ certified fire fighters; upgrading fire suppression equipment or formation of a new department or expansion of existing ones.

In the preceding 5 years, Kansas Forest Service has provided assistance in prescribed burning of 11,280 acres of public and private land. Many of these acres lay within the urban interface and serve as a illustration of the benefits of fuel reduction to life safety and property survivable in the event of a wildfire.

The fire program continues to advocate the development of community wildfire protection plans, master plans, or similar documents to provide guidance to communities in the development of fire-resistant areas. If a community receives prescribed fire services provided by the Kansas Forest Service, it must participate in some form of guidance planning. Because the fire return interval for eastern redcedar is approximately 5 years, land managers are encouraged to include this schedule in their fire management plans.

Through the combined efforts of the Office of the State Fire Marshal, State Weather Data Library at Kansas State University, and Kansas Forest Service, fire reporting through the National Fire Incident Reporting System has become much more complete and accurate. In cooperation with the National Weather Service, we are beginning to be able to align high fire occurrence and weather patterns to provide pre-burn information to land managers.

Kansas Forest Service has offered specific prescribed fire training in the management of eastern red cedar and other invasives.

Conserve Working Forest Lands — Reducing Loss of Kansas Forestland

National Objectives Addressed	Identify and conserve high priority forest ecosystems and landscapes
General Issue	Loss of Kansas Forestland
Priority Landscapes	• I-70 Metro Corridor • Greater Wichita • Wooded Plains
Specific Issues in Kansas:	1) Each year an estimated 1 million acres of forestland is lost to development nationally. Since 1992 urban areas in Kansas have expanded by 170,000 acres permanently converting significant areas of forestland to other uses. Conversion of forestland to development will continue with an estimated increase of our national population by 120 million in the next 50 years. The Kansas City Metro area alone is projected to increase by 350,000 people in the next 20 years converting an estimated 400,000 acres of land to urban use. 2) Riparian forests are generally located in areas where the most valuable agricultural crops are grown. Though no good trend data exists experience suggests that significant areas of riparian forest are converted to cropland each year adversely impacting water quality, aquatic and terrestrial species and other benefits riparian forests provide.
Kansas Strategies	1) Forest inventory will be conducted to identify areas in need of protection and ecosystem service values will be assigned to forestland as a catalyst for protection policy development. The i-TREE ECO and i – TREE HYDRO models will predict values. GROW OUT and PAINT THE TOWN models will be employed to predict future trends. The Natural Resource Inventory developed by the Mid-America Regional Council (MARC) will be used to target forests with high ecological values in the KC Metro area for protection. Tree preservation ordinances and GI conservation strategies will be integrated into municipal land use, parks, transportation and watershed master plans. Forest Stewardship and urban forestry plans will be developed for these areas to sustain forest health by thinning and tree planting. Trees will be integrated into engineering and site design for watershed management, erosion control and energy conservation. Long-term goals are the adoption of planning guidelines, principles, specifications, and ordinances that facilitate GI conservation. 2) The Kansas Water Plan, Enhanced Stream Corridor and Wetland Management to Address Reservoir Sedimentation policy (Appendix) will guide long-term strategy. Specifically, a comprehensive wetland and riparian area protection program will be developed using conservation easements, tax incentives and possible regulation. This will require increased funding and state participation.
State and Private Forestry Applicable Programs	• Forest Legacy Program • Forest Stewardship Program • Urban and Community Forestry Program
Resources Required	The Kansas Water Office, KDHE Water Bureau and MARC are key partnerships. Legislative authority to create effective regulation and their funding to support the establishment and maintenance of easements is necessary. Forest Legacy and the Healthy Forest Reserve Program also have potential to support the strategy along with EQIP, WRP and CCRP.
Performance Measures	• Acres of high priority forest ecosystems and landscapes protected from conversion. • Forest Legacy Program success stories • Areas protected as a result of Forest Stewardship or Urban and Community Forestry Management Plans • Rates of policy adoption by municipalities.

Accomplishments toward Reducing Loss of Kansas Forestland

There are more than 249 million trees in the urban forest in the greater Kansas City metro area. These trees provide a structural value of $93.4 billion, mitigating 37,000 tons of air pollution annually and providing $14 million of energy savings each year. This is just a sample of the information that is guiding local leaders, planners, and residents to help reduce the conversion of forestland to development in an area projecting a conversion of 400,000 acres in the next 20 years.

Beginning in 2010 a nine-county wide forest inventory was conducted in partnership with the Kansas Forest Service, Mid-America Regional Council, the Davey Resource Group, and the Missouri Department of Conservation. Data from 340 randomly selected plots was analyzed using the U.S. Forest Service's i-Tree modeling software and ecosystem service values assigned.

This regional initiative creates a framework to improve long-term management planning and policies that will protect and preserve the urban forest for future generations.

Greater Kansas City Regional Forest Summary

Feature	Measure
Number of trees	249,450,000
Tree and shrub cover	28.3%
Tree cover	18.6%
Most common species	American elm, northern hackberry, Osage orange, honey locust, eastern red cedar
Percentage of trees < 6-inches	71.0%
Pollution removal – trees & shrubs	37,000 tons/year ($286 million/year)
Ozone	23,040 tons/year ($207 million/year)
Particulate matter	8,380 tons/year ($50 million/year)
Sulfur dioxide	3,300 tons/year ($7.3 million/year)
Nitrogen dioxide	2,300 tons/year ($21 million/year)
Carbon monoxide	310 tons/year ($392,000/year)
Carbon storage	19.9 million tons ($411 million)
Carbon sequestration	1.0 million tons/year ($20.7 million/year)
Building energy reduction	$14.0 million/year
Reduced carbon emissions	$500,800/year
Structural value	$93.4 billion

Affecting Policy Change in Urban Development in the Kansas City Metro Area

Task 1: Policy Survey	A survey of local and national ordinances will provide a basis for the development of locally tailored ordinances.
Task 2: Forestry Focus Group	A focus group of planners, public works officials and other city leaders will identify critical issues and concerns.
Task 3: Training Session	A training session with recognized topical experts will target public works, planning, parks and forestry officials.
Task 4: Stakeholder Workshop	A stakeholder workshop will build agreement on priority opportunities, barriers and next steps.
Task 5: Policy Guide	Based on stakeholder input, a policy guide will be developed to elaborate on priority strategies that local governments can embrace to enhance forest cover in commercial areas.
Task 6: Planning & Education	Demonstration tree planting and community education projects will be conducted with partners to show alternative models of community-based forestry efforts.

APPENDIX E
KANSAS LAND TRUSTS

Kansas and Other Land Trusts

The Conservation Fund
807 Rodeo Dr., SE, Pine Island, MF 55963
(507) 356-6301 Fax (507) 356-6302
cmiller@conservationfund.org
www.conservationfund.org

Kansas Land Trust
16 East 13th Street, Lawrence, KS 66044-3502
(785) 749-3297 Fax (785) 842-3039
info@klt.org
www.klt.org/index.htm

KLA Ranchland Trust
6031 SW 37TH ST
Topeka, KS 66614
(785) 273-5115
www.klaranchlandtrust.org

The Nature Conservancy
Kansas Chapter
700 SW Jackson, Suite 804
Topeka, KS 66603
(785) 233-4400
(785) 233-2022 (fax)
kansas@tnc.org
http://www.nature.org/wherewework/northamerica/states/kansas/

Sunflower Land Trust
Jim Michael, CEO
316-744-3550
1jmichael@cox.net
http://www.sunflowerlandtrust.com/

The Watershed Institute
7211 W. 98th Terr, Ste. 140
Overland Park, KS 66212
913/685-4600 x15
Frank@WatershedInstitute.biz
http://www.watershedinstitute.biz/

APPENDIX F
FOREST LEGACY LEAD AGENCY DESIGNATION LETTER

KANSAS
OFFICE OF THE GOVERNOR

Kathleen Sebelius, Governor

www.governor.ks.gov

November 3, 2008

Ms. Abigail Kimbell, Chief
U.S. Forest Service
14th and Independence Avenue, SW
Washington, DC 20090-6090

Dear Chief Kimbell:

I hereby designate the Kansas Forest Service as the lead agency for the USDA Forest Service's Forest Legacy Program in Kansas as authorized under Section 1217 of Title XII of the Food, Agriculture, Conservation, and Trade Act of 1990.

Please forward information and other materials concerning the Forest Legacy Program to:

Larry E. Biles, State Forester
Kansas Forest Service
2610 Claflin Road
Manhattan, KS 66502

The Kansas Forest Service is the appropriate agency to lead Kansas's Forest Legacy Program as the agency is charged with providing forest management advice and assistance to state, local and private forest landowners. We look forward to working with the Forest Service in implementing the Forest Legacy Program in Kansas.

Sincerely,

Kathleen Sebelius
Governor

Capitol Building, Room 212S, Topeka, KS 66612-1590 • (785) 296-3232 • Fax: (785) 296-7973
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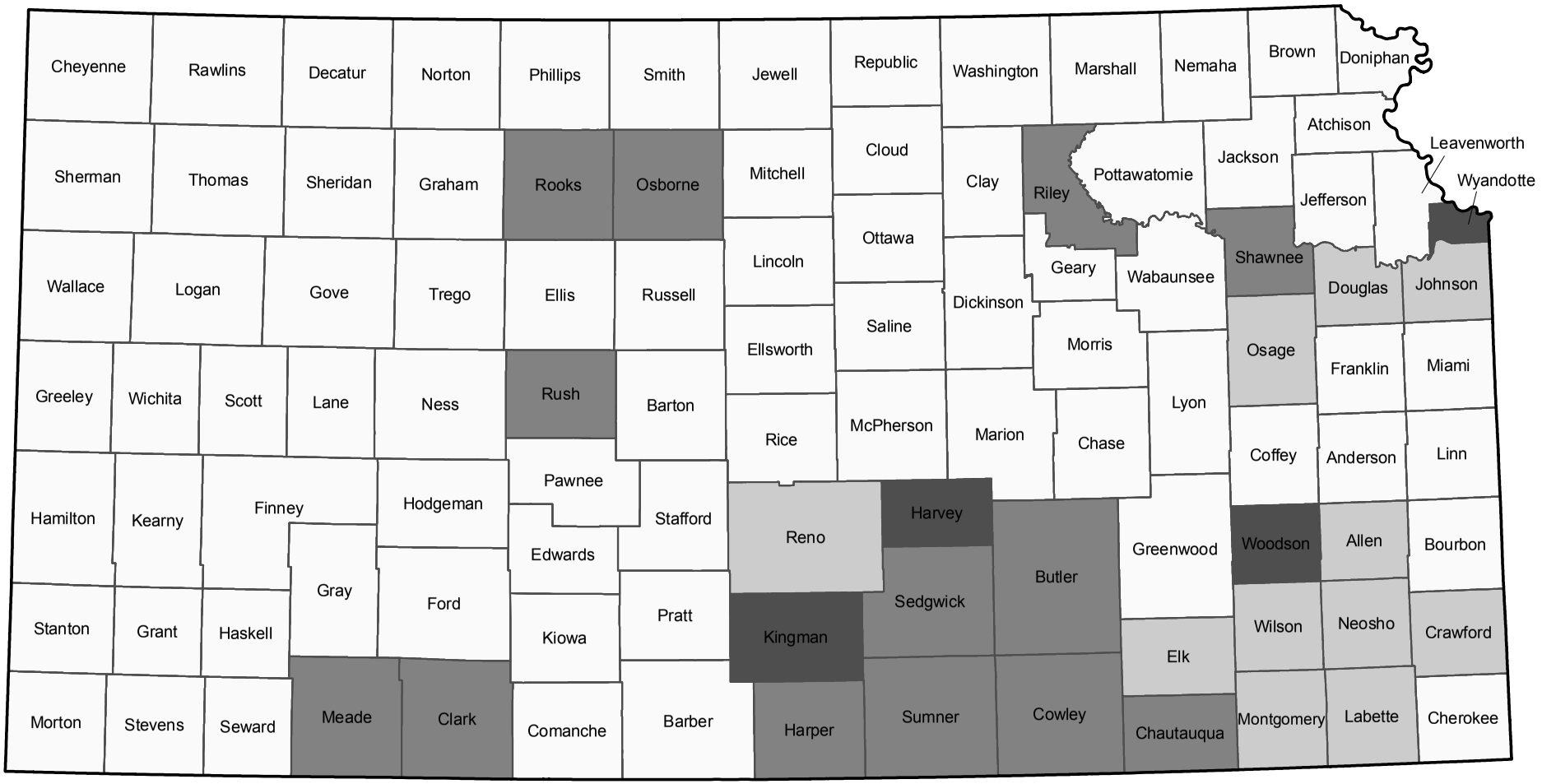
APPENDIX G
COMMUNITY WILDFIRE PROTECTION PLANS- COUNTY MAP



Kansas Community Wildfire Protection Plan Status

- Pending
- In Progress
- Approved

APPENDIX H
CONSERVATION EASEMENT STEWARDSHIP POLICY DISCUSSION GUIDE

Development of Conservation Easement Stewardship Policy-A Discussion Guide
National Forest Legacy Program Meeting
Chattanooga, Tennessee
May 2010

Securing the interest in a piece of land is the first step and some might say it is the easy part. While purchasing an easement may be less expensive than full fee acquisition it is far more complicated in the acquisition and in the management. The grantee is taking on the responsibility to ensure that the conservation values secured are protected into perpetuity. Future generations will have the benefit of the conserved lands and what those lands provide but they will have the responsibility to ensure they are forever conserved. We have the responsibility to lay the groundwork so that those who come after have the tools they need to ensure that protected forests are in fact protected. Conservation easements alone do not protect land. A comprehensive conservation easement stewardship policy and a commitment to adhere to the policy are needed.

Development of conservation easement stewardship policies lays out not only how we will do business during our tenure with the program but also allows us to communicate with our successors.

This discussion guide is in four parts

1. Baseline documentation
2. Monitoring
3. Record Keeping
4. Other Elements of Conservation Easement Stewardship

1. BASELINE DOCUMENTATION

Baseline documentation provides detailed information on the condition of the property-relevant to the terms of the easement-at the time the easement is transferred (LTA The Conservation Easement Handbook).

Important because:

1. Provides documentation of resource values
2. Is required by FLP implementation guidelines
3. Is required by IRS to obtain tax deductions, and
4. Provides an initial data point against which subsequent data may be compared.

IRS 26 CFR requires that:

> "….the donor must make available to the donee, prior to the time the donation is made, documentation sufficient to establish the condition of the property at the time of the gift. Such documentation is designed to protect the conservation interest associated with the property, which although protected in perpetuity by the easement, could be adversely affected by the exercise of the reserved rights. Such documentation may include:

(A)The appropriate survey maps from the United States Geological Survey, showing the property line and other contiguous or nearby protected areas;
(B) A map of the area drawn to scale showing all existing man-made improvements or incursions (such as roads, buildings, fences, or gravel pits), vegetation and identification of flora and fauna (including for example, rare species locations, animal breeding and roosting area, and migration routes), land use history (including present uses and recent past disturbances), and distinct natural features (such as large trees and aquatic areas);
(C) An aerial photograph of the property at an appropriate scale taken as close as possible to the date the donation is made; and
(D) On-site photographs taken at appropriate locations on the property. If the terms of the donation contain restrictions with regard to a particular natural resource to be protected, such as water quality or air quality, the condition of the resource at or near the time of the gift must be established. The documentation, including the maps and photographs, must be accompanied by a statement signed by the donor and a representative of the donee clearly referencing the documentation and in substance saying "This natural resources inventory is an accurate representation of [the protected property] at the time of the transfer."

Guidance on baseline development offered in Appendix J of the June 30, 2003 Forest Legacy Program Implementation Guidelines is attached.

Baseline report should reflect the terms of the conservation easement. If there are specific areas of restricted use these should be documented.

In development of the baseline; consider adjacent lands as well. If there is a likelihood of a third party impacting the subject property attention should be given to that boundary in the baseline.

2. MONITORING

Purpose of Monitoring: To document current condition of property and changes to property since last site visit.

Objectives:

1. To meet obligations of the program. FLP guidelines state "The governmental entity holding title to interest in land acquired under the FLP shall monitor and manage those interests in perpetuity."
   "…shall occur periodically, but not less than annually."
2. Monitoring is the means by which we build and maintain partnerships with landowners.

Each year establish a monitoring schedule and ensure those who are responsible for the monitoring know their responsibilities.

Monitors will be trained on how to monitor and will be aware of monitoring policy and record keeping policy.

A monitoring plan for each protected property will be prepared.

Many FLP easements have notice requirements and time frames for response. Notice requirements and timeframes should be kept in a spreadsheet. Put important dates on your calendar. This will assist in knowing what the State's obligations are and ensuring that they are met.

Suggested framework for undertaking monitoring

Before the site visit:
1. Contact the landowner via mail
2. Review:
    - ❖ Easement
    - ❖ Baseline including maps
    - ❖ Stewardship/Multi-use Management Plan
    - ❖ Previous monitoring reports
    - ❖ Recent correspondence including any approvals
    - ❖ Notices
    - ❖ Aerial photos if available

Be certain that the purposes and terms of the conservation easement are understood by the monitor.

It may not be possible to visit all parts of a property on a monitoring visit. If possible, acquiring aerial photos on a regular basis can help track changes on the property.

A review of the baseline documentation, conservation easement, maps and correspondence can help in developing a plan of what parts of the property will be visited.

At the site visit:
- ❖ Document what you see
- ❖ Do not interpret the conservation easement
- ❖ Fully fill out monitoring report

While on the Property pay attention to:
- ❖ Reserve areas/exclusion zones
- ❖ Boundaries (particularly where 3rd party trespass is likely
- ❖ Riparian buffer zones
- ❖ Ongoing or recent harvest areas
- ❖ Areas where concerns were identified in previous monitoring report

What should be in a monitoring report?
- ❖ Identify the easement

- Date of monitoring visit
- Name of monitor
- Signature of monitor
- Names of any other persons present
- Describe which areas were visited
- Photos (only use ones that show change) If photos are taken include a narrative of what the photo shows
- If landowner is present-ask what actions are planned for the next year.

Other considerations
Will you bring the CE with you? Some do and some do not. One reason not to bring it with you is to avoid on site interpretations. Remember the purpose of the visit is to observe and collect facts. The purpose of monitoring is to document-During site visit do not interpret the easement on the ground-do not give approval of planned activities or appear to do so.

Take photos of any new improvements, encroachments and management activities. This is documenting change, not necessarily documenting a violation. If a violation is suspected, thoroughly document with photos.

Upon returning to the office
- If there are items of concern revealed from the site visit meet with those who will need to take action to discuss and determine actions
- Communicate with landowner. If it has been determined that there is a violation you need to determine how you will notify the landowner (phone call, letter, personal visit carrying the concern in writing).
- if it is determined a violation has occurred Schedule a meeting with the landowner
- Send a letter to landowner documenting monitoring. Be cautious about wording. You can let them know that you observed no violations; it is a leap to state that there are no violations.
- Send copy of report to landowner if you choose to share reports; if it is decided that reports will not be shared, send a letter documenting that the monitoring visit took place
- File monitoring report according to records keeping policy.

Other considerations
What do you do with the report upon returning to the office? Do you discuss your visit and the report with others? Will you discuss with others only when you suspect that there may be a violation? Who will you discuss your concerns with? How will you notify the official ultimately responsible for enforcement or legal counsel that you have monitored?

The program requirement is annual monitoring but this does not mean you cannot be a resource and be in touch with the landowner more frequently. Document all contacts with the landowner.

3. RECORD KEEPING

Purpose of record keeping policy: To ensure successful monitoring stewardship and defense.

Original documents file-All files related to acquisition and management
Working file-"desk file" information needed on a routine basis

What will be kept in original documents file?

- Baseline
- Subordination documents
- Conservation easement and any assignments
- Monitoring Reports
- Title search/ Title insurance/ AG opinion
- Option/Purchase agreement
- Minerals determination
- Survey
- Approval requests and responses
- Correspondence to and from landowner
- Correspondence to and from partner organizations
- Stewardship/multi-use management plan
- Amendments
- Grant agreement
- Maps related to the protected property

Questions that must be addressed
How it will be kept?
Determine who will have access to original documents
Determine State archive policy
Is a fire proof safe needed to protect documents?
Is an electronic system appropriate?
How will documents be handled? Will there be a sign-out log for original and working documents?

Documenting non-written communication: How will other landowner i.e. phone, in person contacts be tracked? Will the practice be to draft a letter to the file? If this is to be practice it may be worthwhile to state this in record keeping policy.

What will be kept in working file?

- Final Recorded Conservation Easement
- Summary of easement terms
- Directions to site
- Signed Baseline documentation
- Requests and approvals/denials as outlined in the conservation easement
- Annual monitoring reports
- Management Plans
- Appraisal/Review appraisal
- MOU/agreements related to the project
- Approvals

If an easement has provisions for subdivision and these are exercised-a new file must be developed for the "new" parcel.

4. OTHER ELEMENTS OF CONSERVATION EASEMENT STEWARDHIP

Approvals

Conservation Easements frequently address reserved rights that must receive approval before any action can be taken.

Upon contact by a landowner requesting approval review the conservation easement to see what the mechanism is within the easement. Don't rewrite the easement with your actions.

a. Determine if the request is to exercise a reserved right is in line with the reserved right. If you are unsure you may need to seek legal assistance.
b. Whether it is decided to approve or disapprove a letter must be drafted laying out the decision.

Who can grant the approval? The conservation easement may state this; it may identify the director of DNR or something along those lines. It may simply refer to the grantee. If it simply refers to the grantee you must determine who can grant approval on behalf of the lead agency. Can this be the program coordinator or must it be the head of the State lead agency? Is the agency/division who manages the easement the same as the agency/division that holds the easement? Now is the time to decide how approvals will be handled.

New Landowners
How will new landowners be contacted?

How will you know if there is a new landowner?

Often easements require notification of sale, this does not always happen.

Conservation easement holding organizations sometimes include a requirement that payment of a fee to the land trust upon transfer, which can be waived. The purpose of this is that there is a legal requirement that must be met before the land can be transferred. This may work if the easement is fully reviewed by the new landowner or his/her attorney. If they get title insurance and the title simply references an easement this may not result in notification. This is a novel idea and is not yet tested.

Some organizations holding conservation easements review newspapers of record to track land sales. This might work if the area of focus is relatively small.

One means to ensure that the land has not changed hands is to check county records before sending a monitoring notification letter.

If you develop strong relationship with landowners, you won't have to worry about finding out about a sale after the fact. You will likely know what the landowner is planning.

When there is a new landowner:

(a) Send a certified letter to the landowner. You may wish send a copy of the baseline documentation. They should have the conservation easement with their deed.
(b) Schedule a meeting to discuss the conservation easement and Forest Stewardship/Multi-resource management plan.

Correspondence

It may be helpful to draft form letters for correspondence. Including but not limited to
New landowner letter
Pre-monitoring letter
Post monitoring letter

Enforcement

Who in the organization will be notified upon suspicion of violation? (Department head, State Forester, Agency counsel, Attorney general?)
In corresponding with landowner; who will sign correspondence?

Having a policy in advance answers the uncomfortable question "What do I do now that I found a violation?"

Amendments

There should be a policy in place on how to handle amendments. Many conservation easements discuss how amendments will be handled. Generally when they are discussed they cite state law as well. Nevertheless, if there is a request you need to know how the request will be handled administratively.

Planning

Track staff time and resources required for conservation easement stewardship. This will help in budgeting funds and in determining capacity.

In long term planning for conservation easement stewardship the ultimate number of relationships that the State may have must be the basis for planning. That is to say, in the case of legal subdivision-plan as if that already happened.

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