

Edmond Sensitive Areas Project
By Cross Timbers Forestry
Tecumseh, OK

Edmond has a long history with the blackjack and post oak forests that can be seen throughout the area. This history has been documented to before permanent settlements in Edmond, when Native Americans passing through the area and wide-ranging wildlife were the only ones to appreciate the forest. The recorded history begins in 1871 when the first survey was conducted by the US Department of the Interior and continues through early settlement, the building of railroads and mills, the Dust Bowl and the current explosion of urban development. To learn more about this valuable resource and other sensitive areas in Edmond, Edmond's Urban Forestry Commission, in cooperation with the City of Edmond, commissioned a study of the Cross Timbers and other biologically sensitive areas.

The Edmond Sensitive Areas Project, undertaken in 2003, was funded through an Urban and Community Forestry Grant from Oklahoma Forestry Services and the United States Forest Service. The Edmond Forestry Commission and the City of Edmond contracted with Cross Timbers Forestry, a land management consulting firm, to conduct the study and assist in identifying sensitive areas. Data, including historic tree cover from 1871, 1930, and 2001, current land use, soil types, and historical and cultural sites, were compiled and analyzed for unique attributes and common factors.

Several locations were determined to contain potentially sensitive ecosystems or characteristics. For special note are the areas identified that may contain presettlement remnant forests. These areas have a high probability of containing trees and/or stands of trees that have existed since before 1871, that is before settlement in Oklahoma. Various other locations were found that have sensitive elements, including areas of risk for erosion and soil degradation, as well as potential cultural resource sites.

The sensitive areas identified in this project provide Edmond with a unique opportunity for re-evaluating the City's involvement in the conservation of remnant forests and creation of greenspaces. Through public education, partnerships and a revision of the development review process, Edmond can move forward with this unique study to set the standard in Oklahoma for conserving sensitive areas.

This report provides an overview of the project to accompany the digital data supplied to the Forestry Commission. Included is a summary of the methodology used for acquiring and analyzing the data. A technical description of each data set is provided following the methodology section, as well as visual representations of the data. Finally conclusions on the data's significance and recommendations for integrating this data into Edmond's development review system are provided.

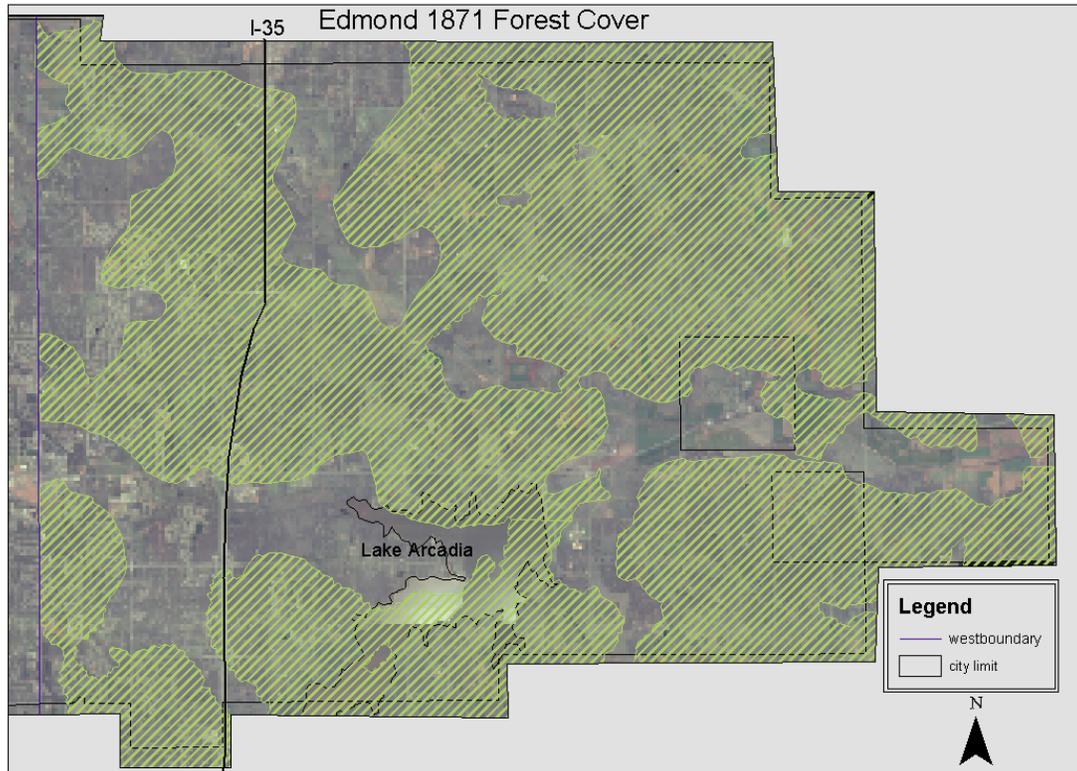
Methodology

The Edmond Sensitive Areas Project covers the land within the corporate city limits of Edmond, east of Bryant Avenue, an area of approximately 75 square miles. The project data sets cover the entire area, regardless of ownership or current land use. A data dictionary was created that outlined the characteristics for study, and the Edmond Urban Forestry Commission with Carrie Tomlinson, Urban Forester, assisted in refining the project parameters. A Geographic Information System (GIS) was then established for the data sets outlined in the project's data dictionary. An analysis of these data sets provided a resource for locating sensitive areas.

Each of the following data sets is provided as a shape file that can be incorporated into the GIS. In addition, the data are compatible with Edmond's 2001 digital orthophoto and municipal shape files, such as the city limits, street, and ward shape files. This allows for the comparison of the study data to several other aspects of Edmond and their integration into planning. The areas identified in the various shape files and their associated sizes are approximate. An inventory is needed to determine specific sizes and additional attributes of the areas.

1871 Vegetation

The 1871 vegetation theme provides locations of forestland in 1871. The density of the forest varied, but all areas shown were categorized as predominantly forest.

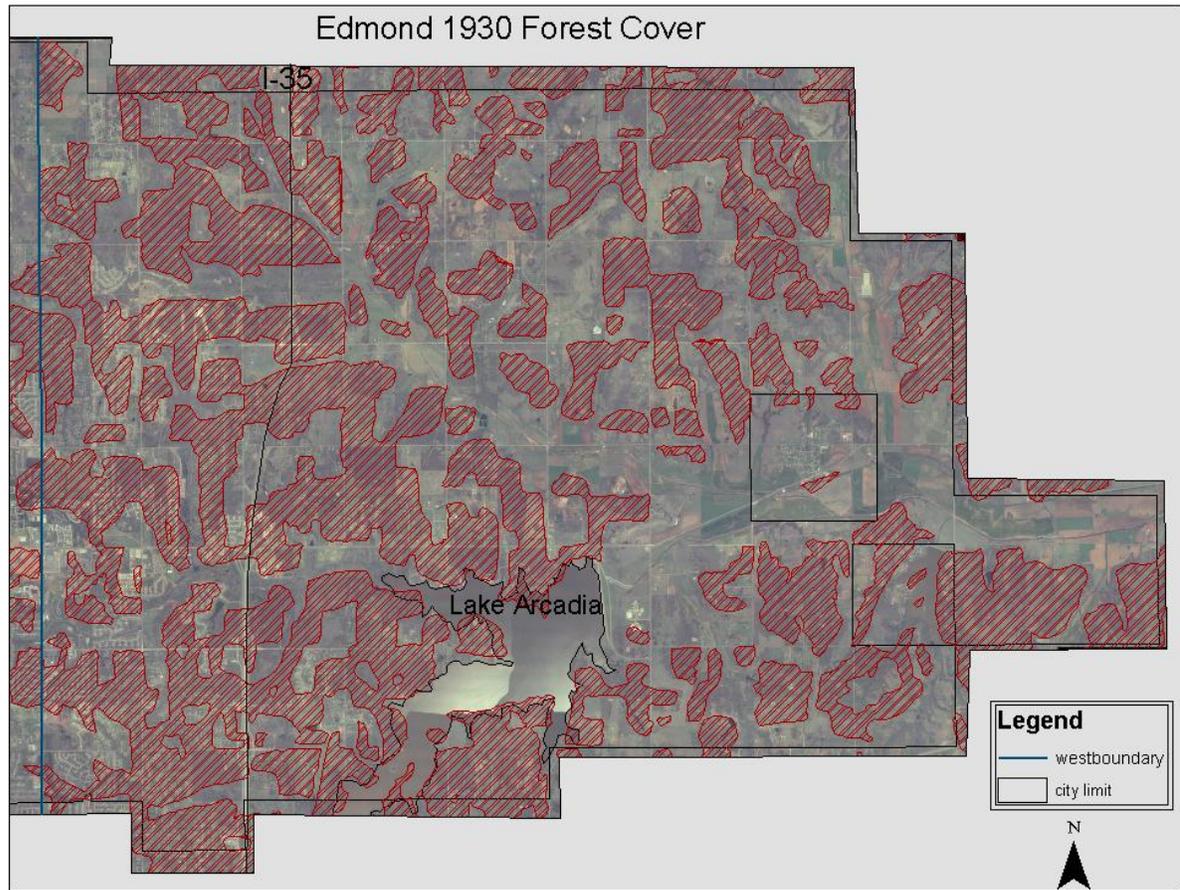


Data: Forests
Year: 1871
Approximate forest area: 27,950 acres
Source: US Department of the Interior

This theme is based on maps created by land surveyors in 1871 and commissioned by the United States Department of the Interior. The maps were provided by the Oklahoma State Archives and digitized by Cross Timbers staff. The forests were typical Cross Timbers post oak-blackjack oak forests, densely stocked with many stems to the acre, a closed canopy and little groundcover. The trees would have been predominantly post oak and blackjack oak with elm, hackberry, redbud, and eastern redcedar trees. Because this survey was conducted before Native American or European organized settlements, this data is believed to show the historical forest locations with a minimum of, if any, human influence.

1930 Vegetation

The 1930 vegetation theme provides locations of forestland in 1930. As with the 1871 map, the density of the forest varied, but all areas included were categorized by the map makers as predominantly forest.



Data: Forests

Year: 1930

Approx. forest area: 17,245 acres

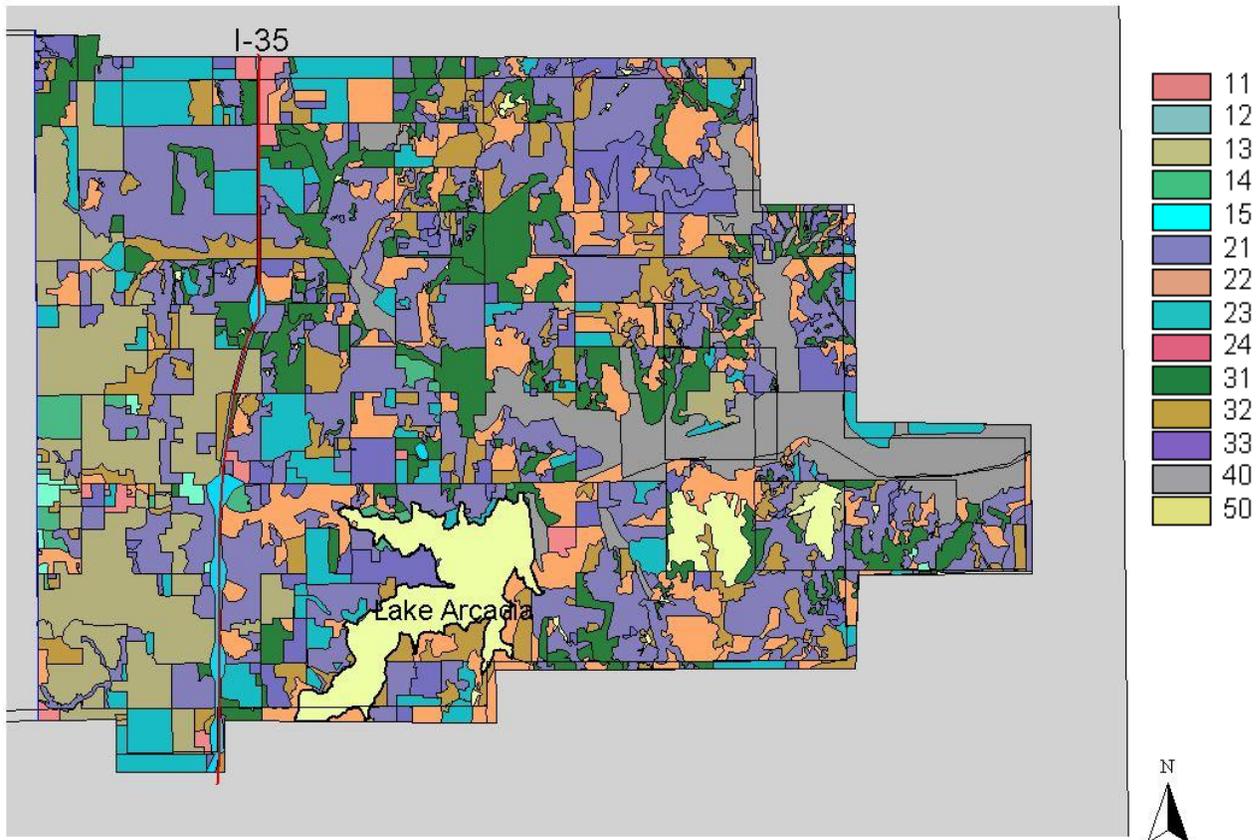
Source: US Department of the Interior

This theme is based on a map commissioned by the United States Department of the Interior, Geological Survey in 1930. The map was provided by the University of Oklahoma Geology Library and digitized by Cross Timbers staff. The species distribution and stocking of these forests would be similar to the areas identified in 1871. These areas in 1930 would still be heavily stocked with post oak and blackjack oak, with occasional redbud, elm, hackberry, and eastern redcedar trees.

2001 Land Cover

The 2001 land cover theme identifies the land uses or land cover for the entire project area based on the 2001 digital orthophoto. The land is categorized in large divisions (urban, forestland, pasture/grassland, agriculture, and water) with more specific divisions within each category. The following page provides a listing and definition of each land cover or land use within the theme.

Edmond Land Use



Data: Land use/cover

Year: 2001

Source: City of Edmond and
Cross Timbers Forestry staff

This map shows the different land uses in Edmond today. The growing development of the area can be seen in the large area in categories 11-15. Forested areas (21-24) and other rural areas (21-40) are decreasing rapidly, with water (50) being the smallest land base.

Land Use Categories

- 11: Urban, Industrial
- 12: Urban, Commercial
- 13: Urban, Residential
- 14: Urban, Institutional
- 15: Urban, Transportation

- 21: Forest cover, 95% or greater tree cover
- 22: Forest cover, 50-95% tree cover
- 23: Forest cover, 50-95% tree cover, 5-10% residential
- 24: Forest cover, bottomland

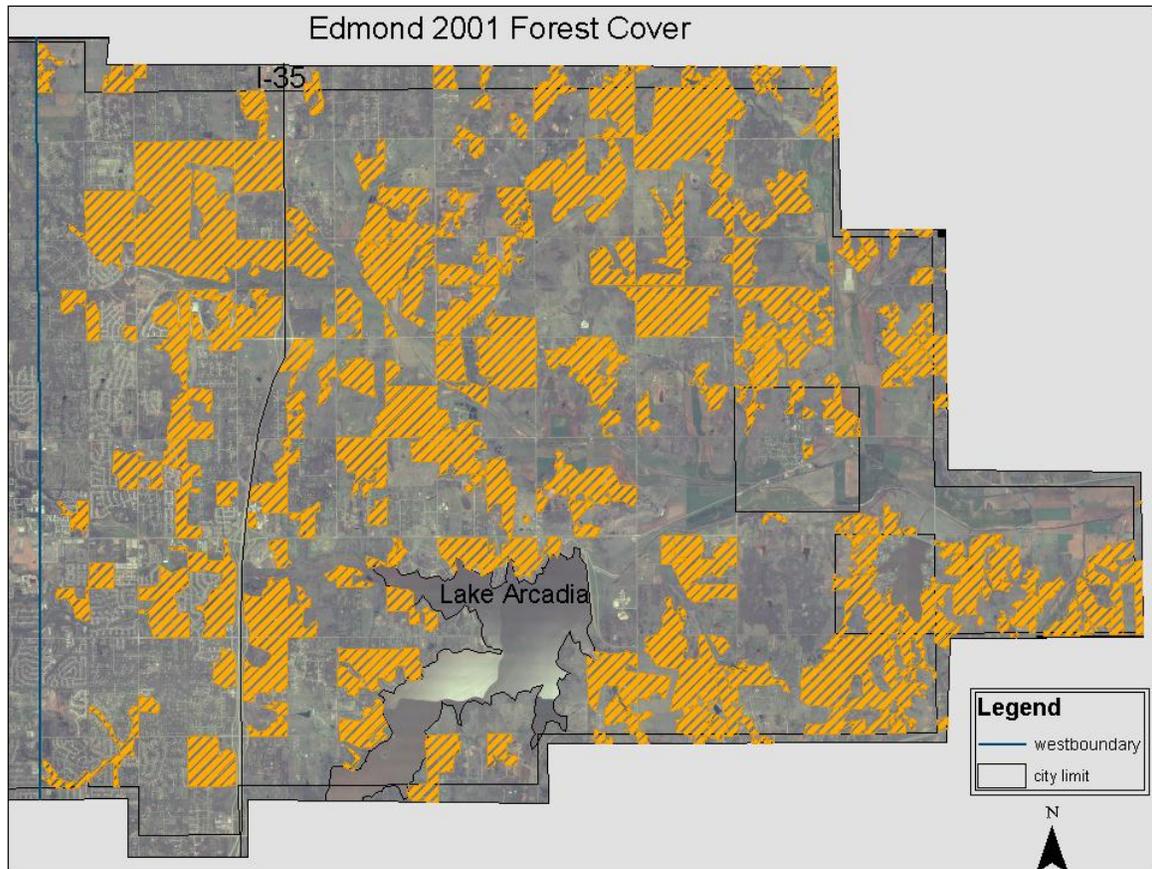
- 31: Prairie/pasture, 95% grass
- 32: Prairie/pasture, 50-95% grass
- 33: Prairie/pasture, 50-95% grass, 5-10% residential

- 40: Agricultural land

- 50: Water

2001 Forest Cover

The 2001 forest cover theme identifies the areas considered heavily forested (95% or more) based on the 2001 digital orthophoto.



Data: Forest

Year: 2001

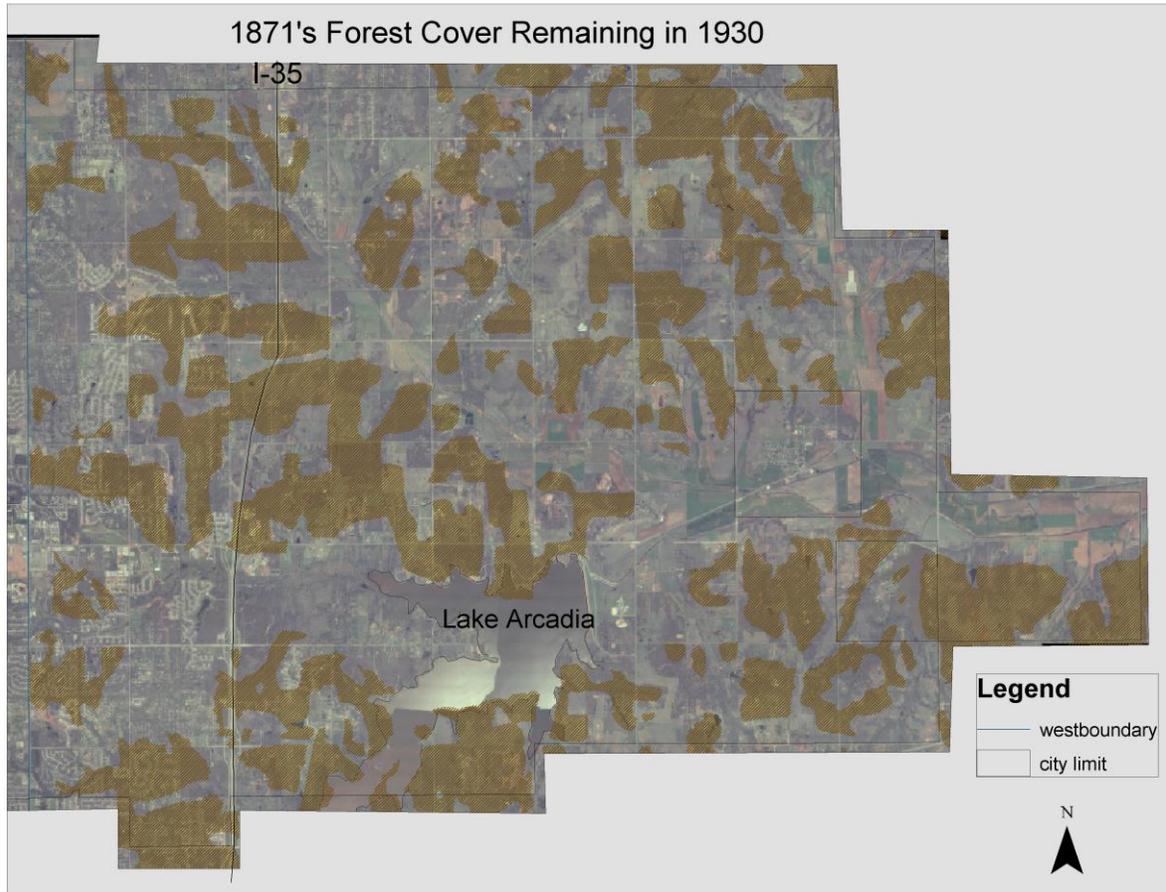
Approx. forest area: 11,540 acres

Source: City of Edmond and
Cross Timbers Forestry staff

This map shows how the forest areas are interspersed with urban and agricultural land throughout Edmond. The growing pressure of urban expansion can be seen readily on this map, and forested areas can be identified that may prove very valuable for greenspace.

Intersection/Overlap of 1930 and 1871 Vegetation

The intersection/overlap theme of 1930 and 1871 shows where forestland was found in both 1930 and 1871.

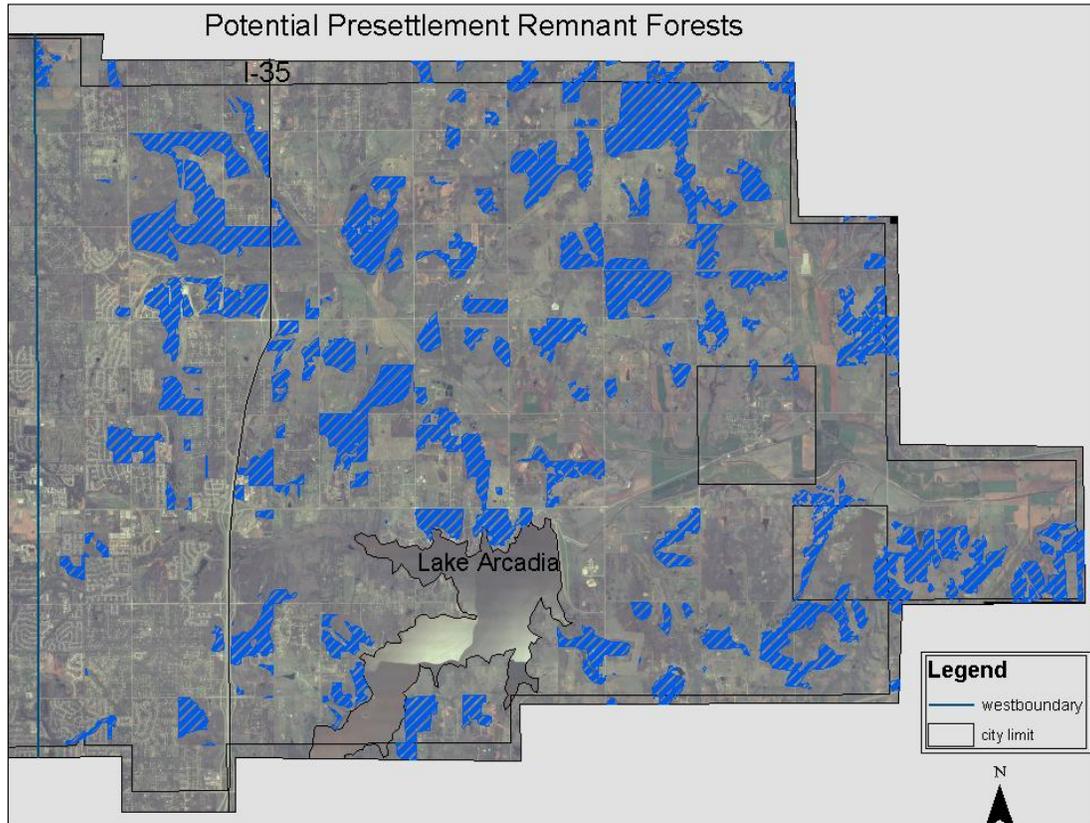


Data: Forest
Year: 1930 and 1871
Approx. forest area: 13,440 acres
Source: US Department of Interior

These areas were likely to have trees sixty or more years old. It is not possible to say for certain that these areas were not harvested between 1871 and 1930; however, the likelihood was high of finding individual trees or stands of trees that were at least 60 years old when the 1930 map was created.

Intersection/Overlap of 2001, 1930, and 1871 Vegetation

The vegetation intersection map of 2001, 1930, and 1871 identifies areas that contain potential presettlement remnant forests, areas that were forested in 2001, 1930, and 1871.



Data: Forest
Year: 2001, 1930, and 1871
Approx. forest area: 5,400 acres
Source: US Department of Interior and
City of Edmond

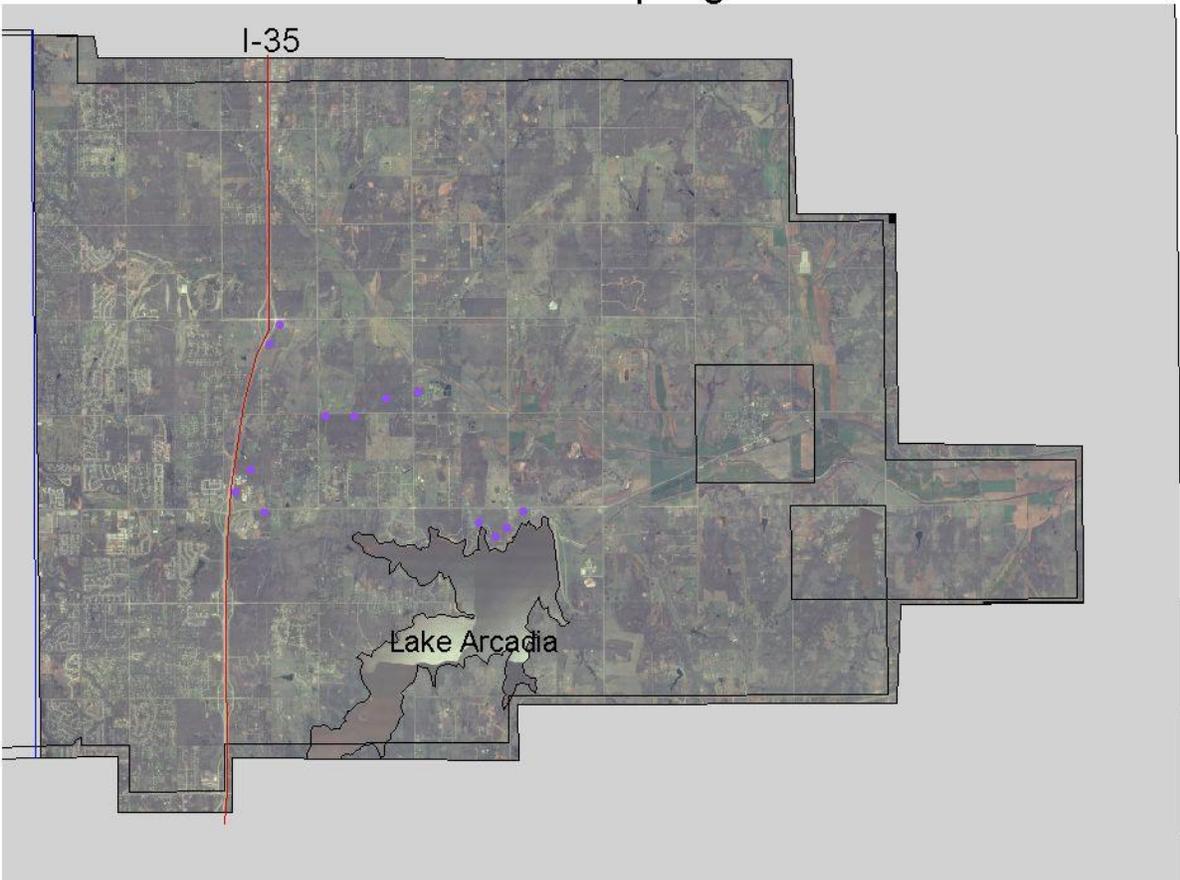
These forestlands show the common forest areas between the 1871-1930 overlap and the most densely forested areas in 2001. The 2001 land cover theme identified three different types of forestland; however, only the 95% forestland (category 21) was used for this comparison. The resulting polygons are the intersection of the 95% forested areas in 2001 and the land identified in both 1930 and 1871 as being forested. It is not possible to say for certain that these areas were not harvested

between 1871 and 2001, but the likelihood is high of finding individual trees or stands of trees that were at least 130 years old in 2001.

Sampling

Sampling was conducted throughout areas identified as potentially having presettlement remnant forests. The highlighted areas below identify sampling locations.

Remnant Sampling Locations



Data: Forest areas sampled

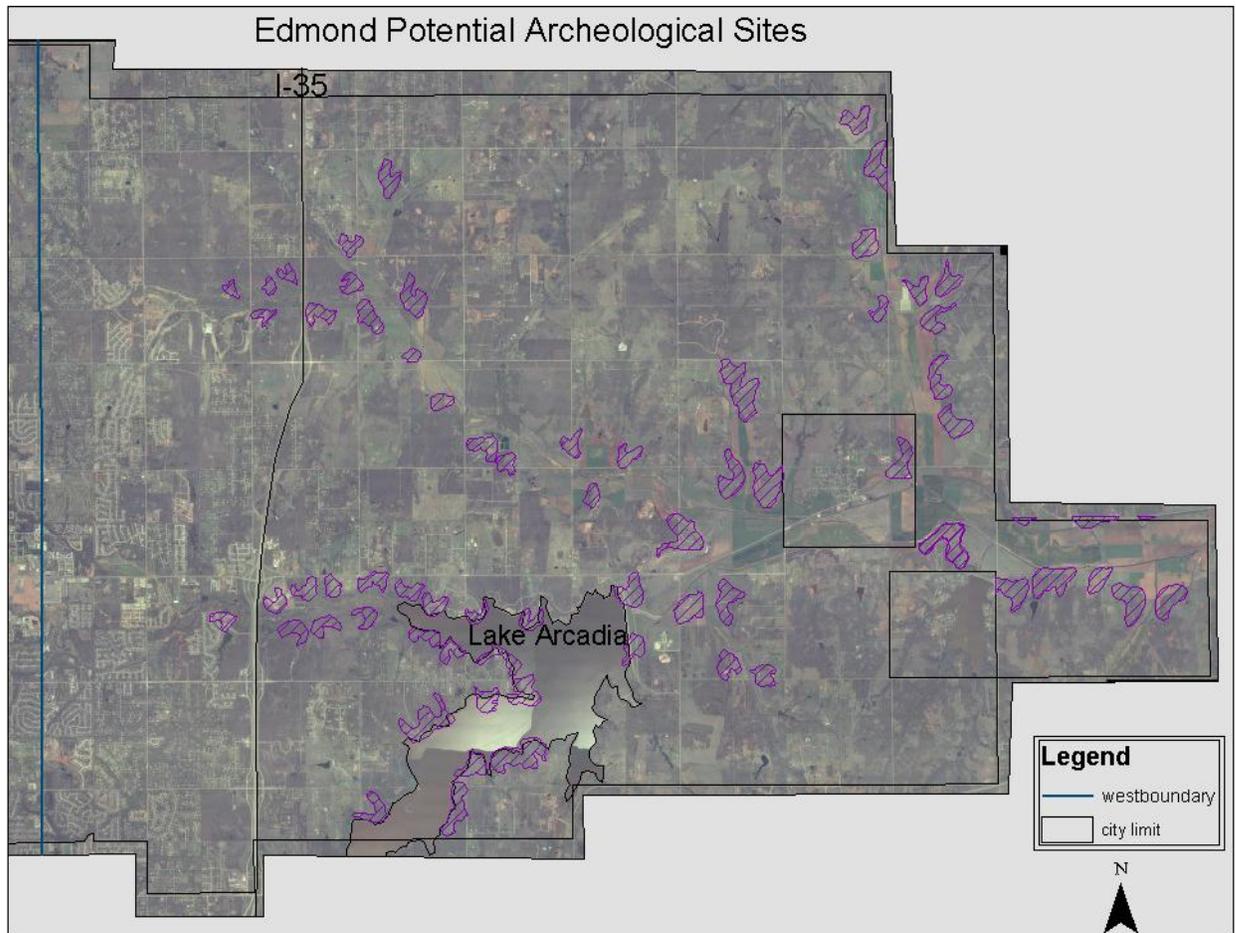
Year: 2003

Source: Cross Timbers Forestry

Visual surveys were made of twelve locations to determine species distribution, stocking levels, size and health of the trees. A one-tenth acre plot was sampled in one of the identified areas to identify species, diameter at breast height, height, and any additional observations. The visual surveys and point sampled suggested that the areas may have been selectively harvested for firewood or other uses, but there were isolated individual trees or small groups of trees that could be presettlement remnants.

Archeological Sites

The archeological theme provides the locations of potential archeological sites.



Data: Potential archeological sites

Year: 2003

Approx. site area: 1870 acres

Source: Oklahoma Archeological Survey and
US Geological Survey topographic maps

Four periods of human habitation are generally recognized in Oklahoma, the Paleoindian period which stretches from the first suspected human activity in the New World, 10,000 years ago, perhaps more, until 5000 or 6000 BC. Human activities consisted of hunting large animals including mammoths, mastodon, and giant bison. At the end of the Paleoindian period, seven or eight thousand years ago, begins the

Archaic period which runs until about 1 AD. During this time period people in North America moved from a reliance on big game for food to forager adaptation with gathering of wild foodstuffs as an important part of their diet. The Woodland period stretches from the Archaic until the advent of the European explorers of the 1400's. During this period North American man began to use the bow and arrow and began to grow domesticated plants such as corn, beans, and squash.

The general area surrounding Edmond has not been surveyed for archeological sites to any large extent with the exception of the land impounded for Arcadia Lake (1973). Surveys indicate that the area never supported a sizable permanent or even semi-permanent human occupation until historic times. All of the sites investigated were scatters of flakes (tool-making debris) with an occasional tool or artifact. The area was utilized on limited basis throughout the Archaic, Woodland, and Plains Village periods. During these occupations the sites might have been short term camp sites used by groups from outside of the immediate region who made occasional trips into the local area during the late Woodland and Plains Village periods. During the late Archaic and early Woodland periods this area may have been home to a number of nomadic groups.

The project area was determined to have several potential locations for archeological sites. These are areas identified by Cross Timbers, under the advisement of the Oklahoma Archeological Society, that have potential to contain various flakes and isolated artifacts. Because of the geography of the project location, the archeological sites tend to be along creeks and streams, near steep slopes. Very few of the archeological sites are in the same location as potential presettlement remnant forests; however, some of the archeological sites occur where soil characteristics pose a concern, such as high slope or eroded soil.

Conservation of the potential archeological sites is best addressed as a separate issue from the forested areas and soil considerations. Conserving the archeological sites may require surveying to determine if artifacts are present, and conserving them may require more strict limitations on development than the forest and soil sites. Finally, conserving or preserving these sites may pose greater challenges to being

accepted by the general public because these resources are often harder to define, locate, and observe than old forests and soil issues.

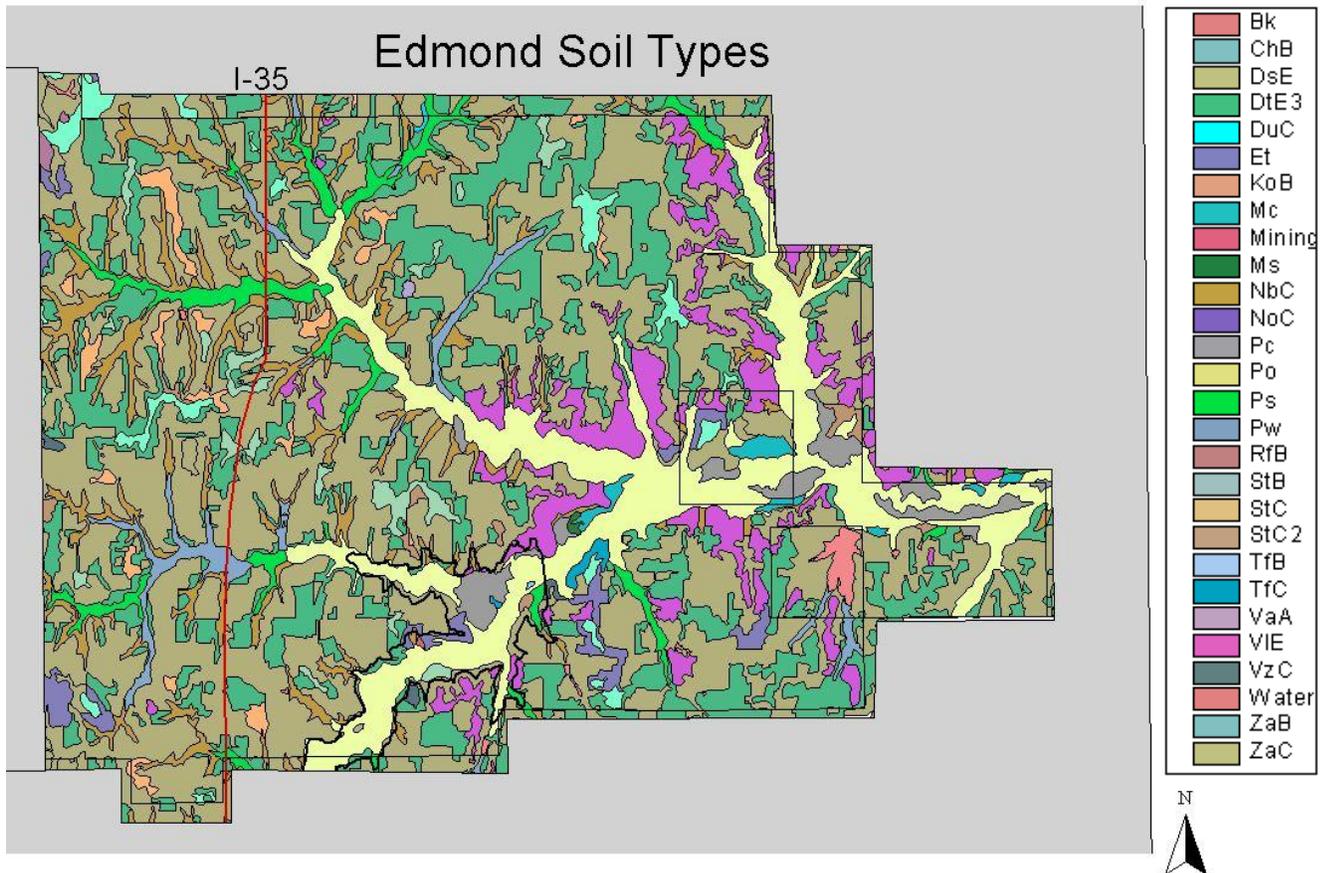
Bibliography

Neal, Larry. 1973. An Assessment of the Prehistoric Cultural Resources of the Proposed Arcadia Reservoir Oklahoma County, Oklahoma. University of Oklahoma , Norman, Oklahoma.

Hartley, John D. 1976. A Resource Survey and Assessment of the Prehistoric Resources of Arcadia Lake, Oklahoma County, Oklahoma. Oklahoma River Basin Survey Project. University of Oklahoma, Office of Research Administration.

Soils Data

The soils theme provides the locations of each soil type based on the Natural Resources Conservation Service Soil Survey from 1969. Below is a listing of each soil type.



Data: Soil types

Year: 1969

Source: Natural Resources Conservation Service and
Cross Timbers Forestry Staff

Bk – Breaks-Alluvial land complex.

ChB – Chickasha loam, 1 to 3 percent slopes.

DsE – Darnell-Stephenville complex, 3 to 12 percent slopes.

DtE3 – Darnell-Stephenville complex, 3 to 12 percent slopes, eroded.

DuC – Dougherty loamy fine sand, hummocky.

Et – Eroded loamy land.

KoB – Konawa loamy fine sand, undulating.

Mc – Miller clay.

Mining

Ms – Miller-Slickspots complex.

NbC – Noble fine sandy loam, 3 to 8 percent slopes.

NoC – Norge loam, 1 to 3 percent slopes.

Pc – Port clay loam.

Po – Port loam.

Ps – Pulaski fine sandy loam.

Pw – Pulaski wet.

RfB – Renfrow clay loam, 1 to 3 percent slope.

StB – Stephenville fine sandy loam, 1 to 3 percent slopes.

StC – Stephenville fine sandy loam, 3 to 5 percent slopes.

StC2 – Stephenville fine sandy loam, 3 to 5 percent slopes, eroded.

TfB – Teller fine sandy loam, 1 to 3 percent slopes.

TfC – Teller fine sandy loam, 3 to 5 percent slopes.

VaA – Vanoss loam, 0 to 1 percent slopes.

VIE – Vernon-Lucien complex, 5 to 15 percent slopes.

VzC – Vernon-Zaneis complex, 3 to 5 percent slopes.

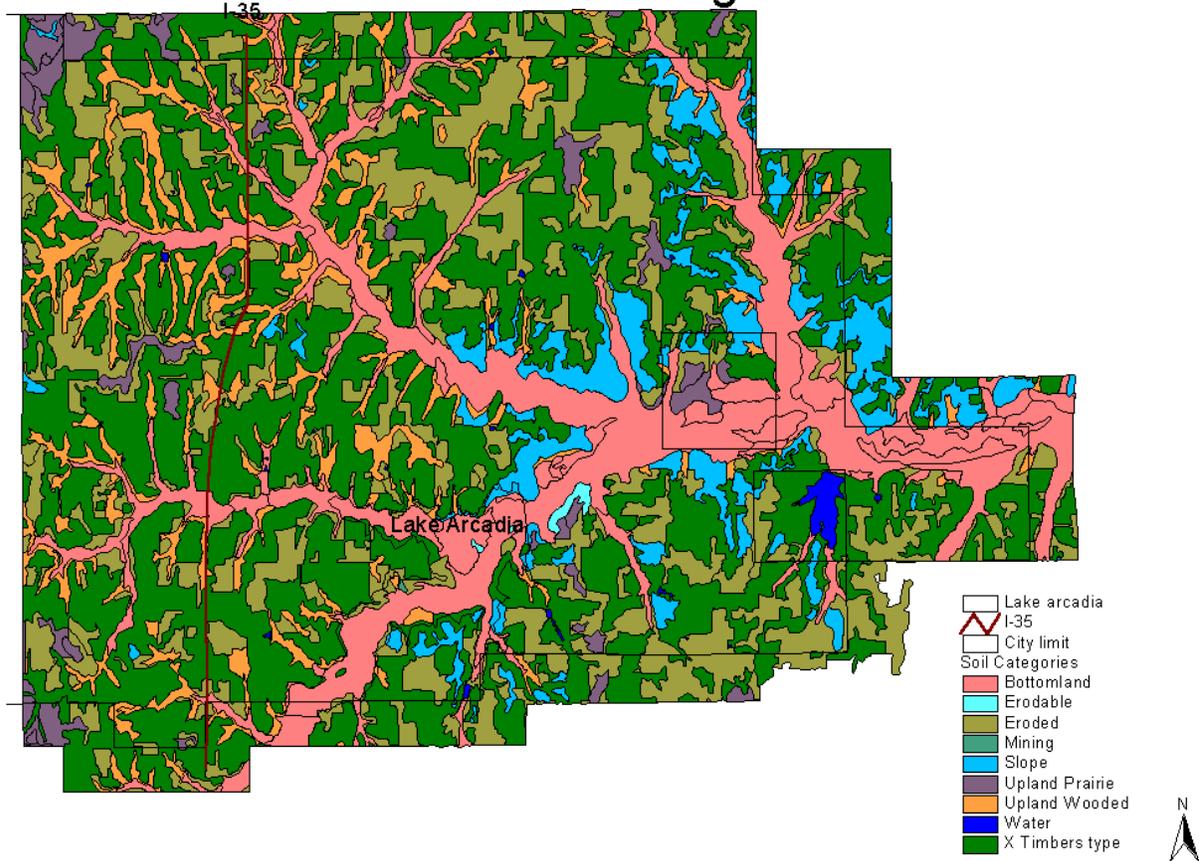
ZaB – Zaneis loam, 1 to 3 percent slopes.

ZaC – Zaneis loam, 3 to 5 percent slopes.

Soil Categories

The soil categories theme provides soil groupings of similar soil types based on the Natural Resources Conservation Service Soil Survey from 1969.

Edmond Soil Categories



Data: Soil categories

Year: 1969

Source: Natural Resources Conservation Service and
Cross Timbers Forestry Staff

The eight categories shown above provide a summary of the main soil characteristics. The groupings display the already eroded areas and areas at-risk for degradation. Areas considered at risk are the erodable and slope designations.

Results

In analyzing the various data sources included in this study, the focus was to locate sensitive areas that had a biological significance for the Edmond community. In particular, the data was used to locate potential presettlement remnants, forests or groves that have a high probability of containing trees that have existed since before settlement. As secondary objectives, the project considered areas that are sensitive from a soil, archeological or wildlife standpoint. The project is a success in that effective criteria were established for identifying sensitive areas, and a large land base was found that meets one or more of the sensitive area standards.

The potential presettlement remnant forests comprise a substantial resource. In terms of the full project area, the remnants do not cover a large acreage; however, there are approximately two hundred twenty distinct areas that may contain 130-year old or older trees. In particular, two large areas of potential remnants are located at Lake Arcadia on public property, which may facilitate the City studying and conserving these areas. Many of the other large tracts identified in the study appear to be in private ownership. The privately owned areas may pose a greater challenge for conservation, but with effective public outreach, these areas can be conserved through proactive landowners and partnerships.

Throughout this project and report the areas have been identified as “potential” remnants. Their identification is based on maps and/or photos from three distinct time periods (1871, 1930, and 2001). These maps and photos only show a single moment in time; various changes, such as clearing for farmland, harvesting timber or natural disasters, could have modified the forest at any time during the interims between maps. Therefore, the identified remnant areas are considered to have only the potential to contain very old trees.

In sampling the potential sites, Cross Timbers was able to characterize these areas' appearance. In general, the potential remnants (pictured below) are an uneven-aged stand with a post oak-blackjack oak overstory with a dense understory of trees, shrubs, and vines, including substantial regeneration of the post and blackjack oaks. It was surprising, in some ways, to discover that overall these potential remnants looked very similar to other areas that contained mature forests not more than 40-50 years old.

Post oak and blackjack oak forests have an appearance that is fairly consistent regardless of age, once the trees reach maturity. The main difference in the remnant areas is that there are individual specimen trees or groves of trees that are noticeably larger in diameter and may be more damaged or broken in the crown. These larger trees are often not substantially taller.





This overall consistent appearance of mature oak forests and potential remnants is attributed to selective harvests and natural mortality. Selective harvests for firewood, railroad ties, and fence posts throughout the last 130 years would result in an uneven-aged forest that has trees of varying size and distribution of species creating a similar appearance to the 40-50 year old mature forests. Natural mortality through age, insect or disease infestations, competition and catastrophic events would act on the remnant forests in the same way that these events affect the younger forest, adding to the similarity in their appearance. Edmond has a beautiful, valuable resource in their remnant forests, but citizens will have difficulty in finding remnant forests that bring to mind the graceful “old growth” forests of the West.

A secondary objective for this project was identifying areas that have a risk for degradation because of the balance between soil type and land use. These areas have shown substantial erosion or have the potential to erode or degrade. The soil categories of concern are the “eroded,” “erodable” and “slope” designated soils. These soils comprise less than half of the total project area and can be found in predictable

locations. For instance, the eroded soils tend to be flat upland areas that are currently or were historically farmed. As further development takes place in these areas, attention should be given to the amount of re-contouring that will take place and the exposure of soil through clearing of vegetation, as well as the increased run-off potential from substantial paving. The current status of these areas should be considered stable, but they have the substantial possibility of degrading and causing concerns for the city if not managed and monitored properly.

Archeological sites were another secondary objective. Approximately seventy sites were pinpointed as having the typical topographic and soil characteristics where artifacts are often found. Edmond has not been surveyed by the Oklahoma Archeological Society; therefore, there have been no sites designated through the Survey. As with the potential remnant locations, the archeological sites located in this project are based on current techniques for mapping and extrapolation but have not been designated through on-the-ground surveying. They are potential sites and as such serve to narrow the area to be surveyed. Further research is needed to determine which sites, if any, contain artifacts and what effective conservation practices could be applied to the areas.

The last secondary objective was wildlife habitat. Currently, there are no threatened or endangered species on the state or federal lists that are located in Edmond, as determined by the Oklahoma Natural Heritage Inventory (ONHI) and US Fish and Wildlife Department. There are three species that were identified as biologically sensitive: the Texas horned lizard, the river otter, and the woodchuck. The Texas horned lizard is considered sensitive (SS1 class) because the eradication of various ant populations has limited the lizard's food source. Because of the declining population, there is no open season for hunting Texas horned lizards in Oklahoma. The river otter and woodchuck are considered sensitive species also (SS2 class). Both animals are believed to have resided in the Edmond area at various times historically, and ONHI is recommending additional study of them to determine if any are currently residing in this area of Oklahoma. Edmond city officials should be aware that these three species are of interest in the area; however, no direct action is needed by the City in relation to them, except to enforce applicable restrictions on the Texas horned lizard,

as appropriate. Additional information is available from ONHI and Oklahoma Department of Wildlife Conservation.

Conclusion and Recommendations

Edmond has identified valuable resources in its presettlement remnant forests and other sensitive areas. The next steps for the project should include inventorying the potential sensitive areas, considering revising the development review process, and public education on these resources.

The potential remnants offer locations for very old trees; however, an inventory is needed to determine the exact location of the remnant trees. The inventory would allow the city to gain in-depth information on each tree and/or grove in addition to the description framework of remnant characteristics provided earlier in this report. Other sensitive areas can be surveyed in a similar fashion to refine the City's knowledge of its resources. As many of the potential sensitive areas are located on private property, surveys of the individual parcels would provide valuable data to the homeowners and facilitate public education. Techniques for accurately assessing the value of these areas in light of possible conflicting interests will be an important step in the conservation process.

After the inventory identifies the individual remnants and other sensitive areas, the City can begin planning for conservation, and the City's development review process and coding are two avenues for encouraging conservation. The development review process provides an opportunity for city staff to evaluate the existence of sensitive areas in a proposed plan and bring that to the attention of the developer. City coding can also be used to encourage conservation. Edmond's existing code contains frontage requirements for planting. A system could be devised to credit developers' planting requirements with the presettlement remnants, having the credits based on the value proportional to their worth as historic treasures and not merely as large oak trees. Similarly, a system could be devised for "credits" when conserving archeological sites and heavily erodable locations. Through the development review process and coding, Edmond can work toward a cooperative effort of conserving their sensitive areas.

The sensitive areas encompass many different land types and ownership categories, which will make conservation a challenge. Public education on the areas' value and the need for unified efforts among public, residential and commercial landowners will encourage citizen involvement in the conservation effort. By involving various partners, the City builds a base of active supporters working toward the City's goals for conservation.

Being the first study of its kind in Oklahoma, Edmond's Sensitive Areas Project sets the standard for evaluating locations that may contain presettlement remnant forests and other important natural features. This study has shown that a valuable resource exists within Edmond that warrants more research and continued efforts to conserve these sensitive areas.