Campbell County
Forest Quality Assessment

August 2008

Prepared For:
Northern Kentucky Urban and Community Forestry Council
Boone County Extension Office
6028 Camp Ernst Road
Burlington, Kentucky 41005

Prepared By:

NKU NORTHERN KENTUCKY UNIVERSITY
CENTER FOR APPLIED ECOLOGY

Center for Applied Ecology
Northern Kentucky University
510 Johns Hill Road
Highland Heights, Kentucky 41076

Campbell County Forest Quality Assessment
Project Partners

Center for Applied Ecology, NKU

Northern Kentucky Urban and Community Forestry Council

Campbell County Conservation District

The Northern Kentucky Area Planning

Campbell County and Municipal Planning and Zoning Commission

Generous funding was provided by:

Funded in part by a grant from The Greater Cincinnati Foundation, and from the Ed and Jean Hengelbrok Foundation and U. A. Bank, N. A./Northern Kentucky Funds.

Kentucky Division of Forestry

and

Nippert Foundation

The following NKU Center for Applied Ecology personnel participated in the design, implementation, technical oversight, and presentation of the project.

Campbell County Forest Quality Assessment

CAE Faculty and Staff:

Lawrence Brewer
Barry Dalton
Jessica Metzger
Mark Leopold
Devin Schenk

CAE Student Technical Staff:

Garrett Blessing
Peter Chileshe
Sean Goins
Ryan Pinguely
Tara Sturgill
Tanner Yess

TABLE OF CONTENTS

EXECUTIVE SUMMARY

Forests are increasingly being recognized as important natural resources that require special consideration in land use planning; however, they are of varying ecological quality and value. This is often overlooked because there is a lack of science-based evaluations that adequately assess and classify forestlands. To remedy this, the Northern Kentucky Urban and Community Forestry Council partnered with the Northern Kentucky University Center for Applied Ecology to commission an ecological evaluation, classification and mapping of forests throughout Campbell County, Kentucky.

High-resolution digital orthophotographs (DOQQ) and aerial photographs taken in 2004 were used to identify and map each woodland parcel meeting the project definition of forest. Forests were divided into three tree crown size classes—*small*, *medium* and *large*. Forest cover data from historical aerial photographs and field inspections on public and private land were used to substantiate the presence and boundaries of the forest delineations.

Summary of Major Findings:

- Campbell County has 39,781 acres of forest, which is 42% of its total land area.
    - The Small Crown Forests encompass 34,461 acres, which represents 87% of the forest cover and 36% of the total land area of the County.
    - The Medium Crown Forests cover 4,694 acres, which represents 12% of the forest cover and 5% of the total land area of the County.
    - The Large Crown Forests cover 626 acres, which represents 2% of the forest cover and 0.7% of the total land area of the County.
- Municipalities with the most Large Crown Forests include Fort Thomas (86 acres, 8% of its forest area) and Melbourne (47 acres, 22% of its forest area).
- Watersheds with the most Large Crown Forests include the Licking River (214 acres) and Ohio River (160 acres).

INTRODUCTION

Forests are a valuable resource. They provide numerous services to the citizens of Campbell County including recreation, outdoor education, air quality improvement, stormwater reduction, noise buffering, energy conservation, erosion control, hillside stabilization, and wildlife habitat. Everyday the planners, land managers, developers, and conservationists of Campbell County make decisions that affect these valuable forests. Whether it's where to place a building on a wooded lot or which parcel to protect, these decisions are generally made with little baseline knowledge of the forest resources. As with streams, soils, and other natural resources, forests are of varying ecological quality and functional value. Without baseline knowledge of this differentiation, high quality, mature forests have been overlooked and unnecessarily destroyed because their presence was unknown and underappreciated.

The Northern Kentucky Urban and Community Forestry Council (NKUCFC) commissioned the Northern Kentucky University Center for Applied Ecology (CAE) to conduct an ecological evaluation, classification and GIS mapping of the forests throughout Campbell County, Kentucky. The Kentucky Division of Forestry, through their Urban and Community Forestry Grant Program and the Greater Cincinnati Foundation provided funding for this assessment. This project represents the third, countywide forest quality assessment sponsored by the NKUCFC. Northern Kentucky now has a baseline "green" data layer upon which to base local, county and region-wide land use decisions.

As a result of this project, the value of individual forest parcels in Campbell County can now be determined through GIS analysis by planners or managers. While all forests are valuable, the results of this study will help decision makers visualize the differences in age and ecological value so that they can easily include forests in their plans. Forest location and crown size can be associated with other GIS data (such as municipal boundaries, parks and other public lands, geology, soils, streams, wetlands, and topography) for query-specific evaluation and comparisons.

FOREST ASSESSMENT METHODS

Acquisition of Data

The CAE acquired, from the Northern Kentucky Area Planning Commission, the most recent high-resolution aerial photographs (2004), and other Campbell County Geographic Information Systems (GIS) data such as soils, topography, parcel boundaries, watershed boundaries, and municipal boundaries. From the Campbell County Conservation District we obtained historical aerial photographs of the county (1954).

Determination of Forest Canopy Crown Size

High-resolution digital orthophotographs taken in 2004 were used to identify and map each woodland parcel. Forests were digitized on-screen along the edge of the forest canopy boundary (excluding fence rows and narrow tree-lined property boundaries).

The delineated forests were systematically evaluated and categorized into three tree crown size classes—*small*, *medium* and *large*. In previous countywide forest quality assessments (Boone & Kenton) crown size had been determined as the most representative indicator of forest ecological quality and integrity due to correlations of tree crown size to tree age, level of past site disturbance, rainfall interception and absorption, and presence and extent of native or exotic species.

A variety of methods were used to delineate the forest boundaries and calibrate their designation into the three crown sizes. The process began through examining a significant area of the county to determine the range of tree crown sizes. A number of public access sites and forests, visually accessible from the road, were inspected to evaluate forest conditions. At these sites the diameter-at-breast-height (dbh) was estimated for canopy trees. The range in tree dbh associated with the three crown classes was generally as follows—small crown size class < 12” dbh; medium crown size class 12-18” dbh; and large crown size class > 18-36” dbh, which matched the findings of the Boone County Forest Quality Assessment.

Another method used to help delineate the forests into size classes was to compare aerial photographs of Campbell County from 1954 and 2004. Forested areas in 2004, which were not observed on the 1954 photographs (due to agriculture, land clearing, etc.), were unlikely to have grown into the large crown class (>18”dbh) in 50 years. Consequently, forested areas that developed since 1954 were primarily delineated as small crown

forests. In contrast, forested areas that appeared to possess large crowns in both 1954 and 2004 were likely kept in the large crown class. This comparison was cautiously conducted due to the prevalence of logging in the county and the rapid growth rates for some tree species on certain soils (e.g., deep floodplain soils). Forest cover data from the historical aerial photographs greatly substantiated the presence (and boundaries) of older, higher quality forests.

In some instances, topography was also used to help draw boundaries between crown classes. In general, flat land and mild to moderate slopes tended to be cleared of trees for past farming activities, or were clear-cut or selectively cut more often than those on steep slopes. Consequently, boundaries between different size crown classes were often marked by topographic changes. As a result, for areas in which differences between crown sizes were less distinct, topographic changes were used to assist in the delineation.

It was determined early on in the project that the project definition for a forest was limiting the results. The project definition states that a forest will only be delineated if it is over 5 acres. In performing our initial field reconnaissance, the CAE found that many of Campbell County's Large Crown Forests fall below the five-acre size limitation and therefore would not be mapped. To avoid this situation, the CAE excluded a size limitation on the forests, but continued to eliminate fencerows, narrow tree-lined property boundaries, residential landscaping, and street trees.

Final Field Reconnaissance

Once the forests were delineated and categorized into large, medium, and small crown classes, the CAE performed final field reconnaissance to confirm the forest boundaries and tree crown size classifications. Field reconnaissance was completed through countywide road surveys, field inspections of public woodland areas, and the visitation of private large crown woodlands. With assistance from the Campbell County Conservation District, we contacted over 125 landowners of Large Crown Forests. We visited eleven properties at the landowner's invitation. In these forests, CAE ecologists further evaluated forest quality through five general criteria—tree dbh, size of forest unit, native species diversity, percentage of exotic plant species, and the occurrence of rare species or habitats. A summary report describing the forest resources and management recommendations was provided to each of the landowners.

Assessment Limitations

The most current aerial photographs available for this study were from 2004. It is apparent that some limited alterations to the forests have taken place in the subsequent years. In 2007, new aerial photographs were taken, but at the time of the assessment the Northern Kentucky Area Planning Commission had not yet made them publicly available.

RESULTS

County Summary

The results from Forest Quality Assessment indicate that approximately 39,781 acres or 42% of Campbell County is forested. The results are shown in Table 1 and Map 1 is displayed in Appendix A. Of this forest, 87% (34,461 acres) is small crown, 12% (4,694 acres) is medium crown, and 2% (626 acres) is large crown. The total forested land cover is similar to the other two counties in Northern Kentucky that have had forest quality assessments completed (Boone, 2000 and Kenton, 2004). Kenton County had 41% forest cover and Boone County had 38% forest cover. Campbell County, however, has the lowest acreage of large crown forest (Campbell 626 acres, Kenton, 1,801 acres, and Boone 2,867 acres), which is 0.07% of the County's total land area.

Table 1: Forest Quality Coverage in Campbell County

Canopy Cover Type	Area (acres)	% of Total Canopy Cover	% of Campbell County Land Area
Small Crown	34,461	87%	36%
Medium Crown	4,694	12%	5%
Large Crown	626	2%	0.7%
Total	39,781		42%

Watersheds Summary

The Forest Quality Assessment results for each watershed in the county are shown in Table 2 and the watershed boundaries are shown on Map 2 in Appendix A. Of the nineteen watersheds in Campbell County, Ohio River and Willow Creek have the highest percent cover of forest, 52% and 47% respectively. The watersheds of Ohio River, Twelvemile, and Licking River have the most forest, 9,298 acres, 7,921 acres, and 6,389 acres respectively. The Licking River watershed has the most Large Crown Forest at 214 acres, followed by the Ohio River watershed at 160 acres.

Table 2: Forest Quality Coverage in Campbell County by Watershed

Watershed	Land Area of Watershed (acres)	Forested Acres in Watershed	Percent of Watershed Forested	Small Crown		Medium Crown		Large Crown	
				Acres	% of Forest	Acres	% of Forest	Acres	% of Forest
Brush Creek	3702	1219	33	1065	87	148	12	6	1
Flagg Spring Creek	3323	1556	47	1291	83	239	15	26	2
Fourmile Creek	6905	3086	45	2719	88	309	10	58	2
Lick Branch	1593	548	34	430	78	114	21	4	1
Licking River	15964	6389	40	5403	85	772	12	214	3
Ohio River	17873	9298	52	4232	46	834	9	160	3
Owl Creek	2478	1025	41	919	90	93	9	13	1
Phillips Creek	12721	5381	42	4795	89	562	11	24	1
Plum Creek	3012	1402	47	1330	95	71	5	1	0.1
Pond Creek	4453	1520	34	1251	82	243	16	26	2
Riffle Creek	3411	1417	42	1274	90	133	9	10	0.3
Scaffold Creek	1494	582	39	521	90	55	9	7	1
Stepstone Creek	33	2	0.1	2	100	0	0	0	0
Tenmile Creek	2318	939	41	865	92	64	7	11	1
Tug Creek	1991	886	45	818	92	66	8	2	0.2
Twelvemile Creek	19229	7921	41	6912	87	957	12	51	1
Willow Creek	1248	588	47	571	97	15	3	2	0.3

Municipalities and Unincorporated Areas Summary

The Forest Quality Assessment results for each municipality are shown in Table 3 and individual Forest Quality Assessment maps for each municipality are provided in Appendix A. Of the thirteen municipalities in Campbell County, Crestview and Melbourne have the highest percent cover of forest, 44% and 40% respectively. The cities of Fort Thomas, Alexandria, and Cold Springs have the most forest, 1,146 acres, 992 acres, and 981 acres respectively. Fort Thomas has the most Large Crown Forest at 86 acres, followed by Melbourne at 22 acres. Melbourne also has the highest percentage of its forest as Large Crown at 22%. The unincorporated areas of the county are 42% covered in forest, of which 448 acres are Large Crown.

Table 3: Forest Quality Coverage in Campbell County by Municipality

Municipality	Land Area of Municipality (acres)	Forested Acres in Municipality	Percent of Municipality Forested	Small Crown		Medium Crown		Large Crown	
				Acres	% of Forest	Acres	% of Forest	Acres	% of Forest
Alexandria	3495	992	28	894	90	94	10	5	1
Bellevue	597	99	17	94	95	5	5	0.2	0.04
California	145	35	24	31	89	2	4	2	2
Cold Spring	2954	981	33	928	95	48	5	5	1
Crestview	100	44	44	43	97	1	3	0	0
Dayton	1234	245	20	219	89	26	11	1	0.2
Fort Thomas	3661	1146	31	863	75	198	17	86	8
Highland Heights	1431	368	26	286	78	74	20	7	2
Melbourne	530	210	40	114	54	50	24	47	22
Mentor	367	80	22	69	87	10	13	0	0
Newport	1910	293	15	275	94	15	5	2	1
Silver Grove	1052	201	19	131	65	64	32	6	3
Southgate	916	345	38	320	93	25	7	0.4	0.1
Wilder	2557	692	27	625	90	50	7	17	2.5
Woodlawn	32	5.7	18	4.9	85	0.8	14	0.02	0.3
Unincorporated	81282	34044	42	29565	87	4031	12	448	1

DISCUSSION

General Discussion

Through the Forest Quality Assessment, we have been able to categorize Campbell County's 39,781 acres of forest into crown size classes (small, medium, and large). The crown size is important in that it signifies that Campbell County's forests are not all alike, and in fact they vary widely in age and ecological quality. The crown size of a forest is a general indication of its age, as older trees tend to be larger, and its ecological quality, as mature forests tend to have higher species diversity and less invasive plants. As the assessment indicates, large crown forests are very rare in Campbell County due to historic land use. Although all forests are valuable, the rarity and ecological value contained in the Large Crown Forests, signifies that they should be treated differently when it comes to planning, conserving and developing the County's forests.

Small Crown Forests

Although 42% of the land area in Campbell County was forested in 2004, the majority of the forest is in the small crown size class (87%). The majority of the Small Crown Forests in Campbell County are less than 50 years old (less than 12" dbh). These forests have likely developed from lands that were deforested and farmed earlier in the century, and abandoned after World War II as people shifted from agricultural lifestyles. In addition to having smaller trees, these areas typically have low native plant species diversity, high amounts of invasive exotic plants, and few or no rare plant species. Most of the trees that presently exist in the Small Crown Forests tend to be weedy species like black locust, box-elder, red elm, white ash, red cedar, white mulberry, hackberry, and honey-locust. Unfortunately, the shrub layer is heavily dominated by the invasive shrub, Amur honeysuckle, especially in the northern portion of the county. Invasive exotics like Amur honeysuckle can have detrimental effects on native habitats by quickly colonizing and out-competing native vegetation (i.e., retarding natural forest succession).

Photo 1: Small Crown Forests like this one are dominated by black locust, box-elder, and invasive plants.

Major disruption of the soil profile (through erosion of topsoil, plowing, bulldozing, etc.) can also result in a substantial loss of the native seed bank, which can adversely affect future succession of the forest. In addition, fragmentation of the landscape has produced more forest edge (and more light entering the forest), favoring certain exotic species like Amur honeysuckle. These exotic species in turn produce great quantities of seed that is easily dispersed in the vicinity. Since many of the higher quality trees produce heavy, short-distance dispersing seeds, it takes a long time for such species to migrate to isolated Small Crown Forests. Many of the spring wildflowers that are characteristic of mature forests also disperse seed very short distances (some only a foot or two each year by way of native ants). Species like trillium, bloodroot, bellwort, trout lily, wild ginger, spring beauty, Dutchman's breeches, and squirrel corn take an extremely long time to reappear in new forests, especially if forests are isolated. As a result of extreme topsoil loss and other major soil disturbances, many of the Small Crown Forests in Campbell County will likely take centuries to develop into forests of high ecological quality and integrity.

There are, however, some small crown forests in Campbell County that are of higher ecological value. Small Crown Oak Forests dominated by white oak and black oak are developing particularly in the south central portion of the county. Likewise, Small Crown Mesic Hardwood Forests dominated by sugar maple are present on the eastern and western portions of the county. These higher quality, Small Crown Forests are apparently more abundant in Campbell County than Boone County, perhaps because of less soil disturbance and the presence of unglaciated soils.

Medium Crown Forests

Medium Crown Forests are those forests that are made up of trees that are between twelve and eighteen inches dbh. Campbell County has 4,694 acres of Medium Crown Forests, which represents 12% of the forest cover. In this medium crown size class there are some older disturbed forests that, like the small crown forests, are growing from abandoned fields and have little

Photo 2: Many Medium Crown Forests in Campbell County have good biological diversity.

biodiversity. Our field surveys, however, indicate that most of the Medium Crown Forests are made up of forests that have grown back after disturbances that did not significantly alter the topsoil (selective logging, pasture, etc.) and, as a result, are closer to the Large Crown Forests in ecological quality and value. These are typically Mesic Hardwood Forests and Oak Forests. The Mesic Hardwood Forests are dominated by a mixture of tree species that include sugar maple, red oak, Shumard oak, American beech, Ohio buckeye, and white ash. Drier south- and west-facing slopes are dominated by Oak Forest, especially in the southern portion of the county. These forests are typically dominated by white oak and black oak but also contain chinkapin oak, red oak, shagbark hickory, and pignut hickory.

Large Crown Forests

Large Crown forests are those forests that are made up of trees that are over eighteen inches dbh. Campbell County has 626 acres of Large Crown Forests, which represents 2% of the forest cover. The Large Crown Forest tracts ranged in size from 0.6 to 34 acres. These forests are generally of high ecological value with significant biological diversity in distinct canopy, subcanopy, shrub, and herbaceous layers. These Large Crown Forests differ significantly from the Small Crown Forests that often lack many of the tree and wildflower species native to the area and are infested with thickets of invasive plant species from Europe and Asia. The high quality Large Crown Forest is a complex community of large, widely spaced trees, native shrubs, and delicate wildflowers, growing on undisturbed soils teaming with beneficial microbes and fungi. While ancient forests once spanned most of the Eastern US, there are very few examples left today. This study shows that Campbell County's rare Large Crown Forests still harbor the vast biological diversity of those presettlement forests, and therefore deserve special consideration.

Photo 3: Large trees and low invasive plant cover are typical of the Large Crown Forests.

Forests are important for many reasons including air quality improvement, stormwater reduction, noise buffering, energy conservation, and increased water holding capacity of the soil, which reduces flooding. Large Crown Forests also act as biological refugium for a host of plants and animals that require higher quality habitat than exists in the Medium and Small Crown Forests. For example, the relatively rare American ginseng plant only occurs in rich woodlands with deep topsoil and thick shade. Its seeds are dispersed by gravity, meaning they fall off the plant and grow in clumps near the parent. Only occasionally are the seeds transported any significant distance by birds such as wild turkeys. In Campbell County, ginseng is only found in high quality Large Crown Forests. With out the presence of these forests, ginseng will not be available to repopulate any of the Medium and Small Crown Forests as they mature and develop deeper topsoil. This is the case for hundreds of native plants that inhabit the mature forests of Campbell County.

Although uncommon, the Large Crown Forests are found in both the north and south of Campbell County. The majority of these exceptional forests are found along the Ohio River and the Licking River, where historic land clearing and agriculture was probably not as intensive.

Most of the large crown forests located in upland areas, especially on northern and eastern (facing) slopes, are Mesic Hardwood Forest. These forests are dominated by a mixture of tree species that include sugar maple, American beech, tulip-tree, Shumard oak, red oak, shagbark hickory, bitternut hickory, Ohio buckeye, yellow buckeye and basswood. The shrub layer is typically dominated by pawpaw, spicebush and black-haw. Drier south- and west-facing slopes are dominated by Oak Forest, especially in the southern portion of the county. These forests are typically composed of white oak, black oak, chinkapin oak, red oak, shagbark hickory, pignut hickory and ironwood. Common shrubs include flowering dogwood, witch-hazel and gray dogwood.

In the valley areas, the Large Crown Forests are composed of Bottomland Forest. These forests are dominated by silver maple, red maple, green ash, cottonwood, sycamore and black willow. Some of the common shrubs include elderberry, bladdernut and black-haw. Although Mesic Hardwood Forests typically have the highest diversity of native herbs (due to large amounts of spring ephemerals), nearly all the Large Crown Forests assessed have herbaceous layers with medium to high native species diversity. One forest surveyed along the Licking River had over 70 species of native herbs.

Forest Quality Assessment Limitations

Certain generalizations can be made about the forest quality of each crown size class, however, within each category there can be a relatively broad range of forest quality. For example, a forest may have large crowns but because of extensive selective cutting, off-road vehicle disturbance, or grazing, the overall forest quality may be reduced. Likewise, there may be some Small Crown Forests occurring on relatively undisturbed soils that may have higher overall forest quality (and higher habitat restoration potential) than forests with larger crown sizes. This situation is relatively common in the southern part of the county where young oak forests are growing. Some disturbed forests recover faster than others simply because there are available seed sources in adjacent woodlots.

This assessment focuses only on forested lands, it does not deal with street trees or residential tree cover. Also, it does not address timber quality, quantity, or marketability. The *Forest Quality Data Layer* produced by this project is to be used as a general guide for assessing forests for any type of landscape-level planning. Since forest quality delineations were conducted from aerial photographs, precise forest quality boundary determinations would require additional field investigations. The forest quality mapping is general in nature and should be roughly compared to the mapping of soil series types typical of county soil maps. The soil series map provides a general guideline where particular soil types occur, but specific delineations of soil-type boundaries requires on-site field determinations. The forest layer, however, is subject to rapid changes over time and should be updated periodically.

Concluding Remarks

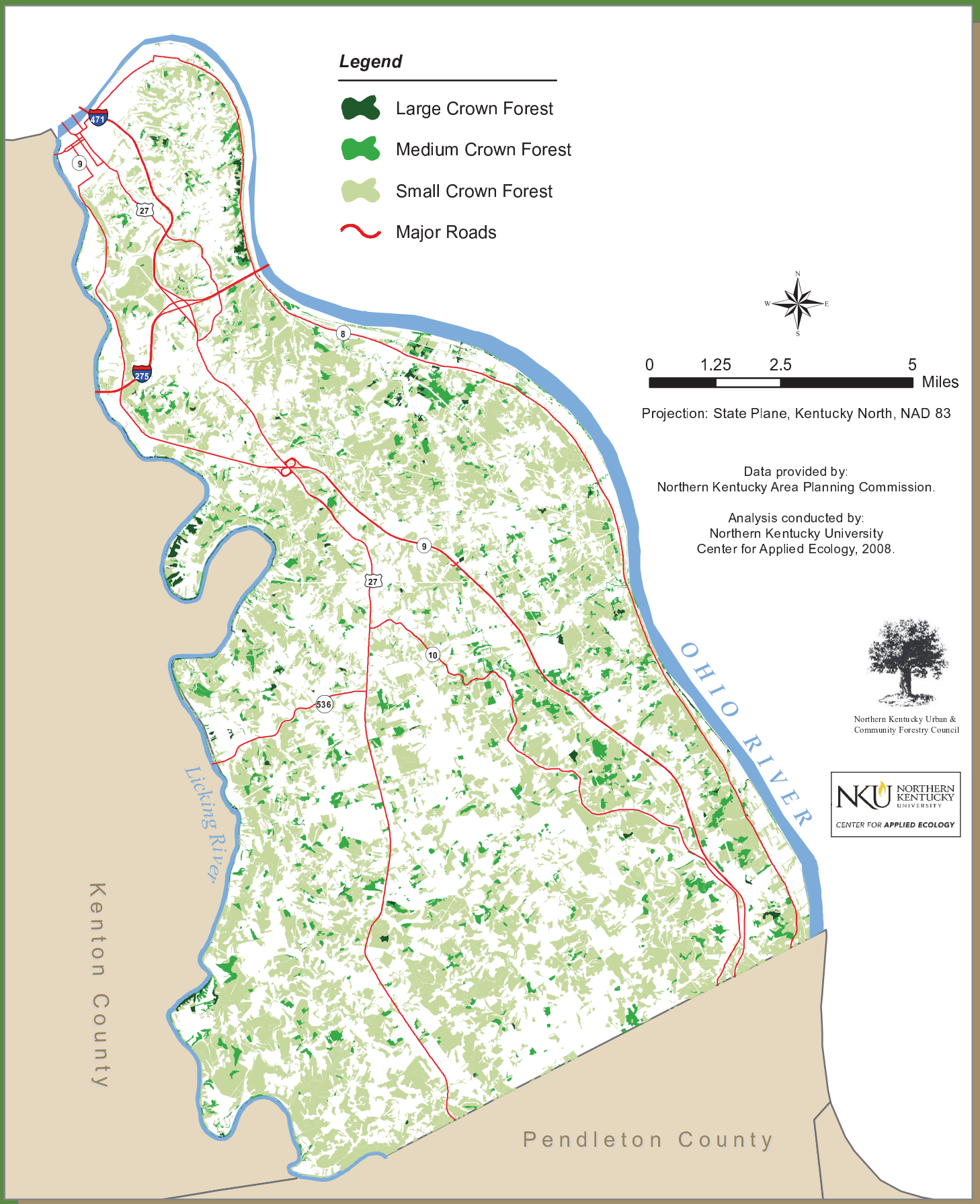
Although all forests are valuable sources of clean water, clean air, wildlife habitat, and flood control, it is evident that there is a significant difference in the ecological quality of forests based on their age and history of human impacts. Because of the slow rate of topsoil development and plant dispersal, this difference may mean hundreds of years in maturity levels. The 626 acres of Large Crown Forests in Campbell County represent the last of the ancient forests that once covered this area. Their presence provides the possibility that as our other 39,154 acres of Small and Medium Crown Forests mature they will be able to take on the form and function of high quality ecological systems.

This countywide forest quality assessment is an important first-step to include forest resources into the planning and decision-making process in Campbell County and it completes the forest inventories of the three northern counties (Boone, Kenton, and Campbell). As it takes centuries for forests to attain high ecological quality and function, it is important to promote the significance of our existing urban forests and the need for wise planning, conservation, and management of this resource for today and future generations. The cooperating partners of this project encourage all organizations, agencies, businesses and individuals to make full-use of the assessment information. The *Forest Quality Data Layer* produced by this project as a GIS shape file will be available to the public through the Campbell County and Municipal Planning and Zoning Commission and the Northern Kentucky Area Planning Commission.

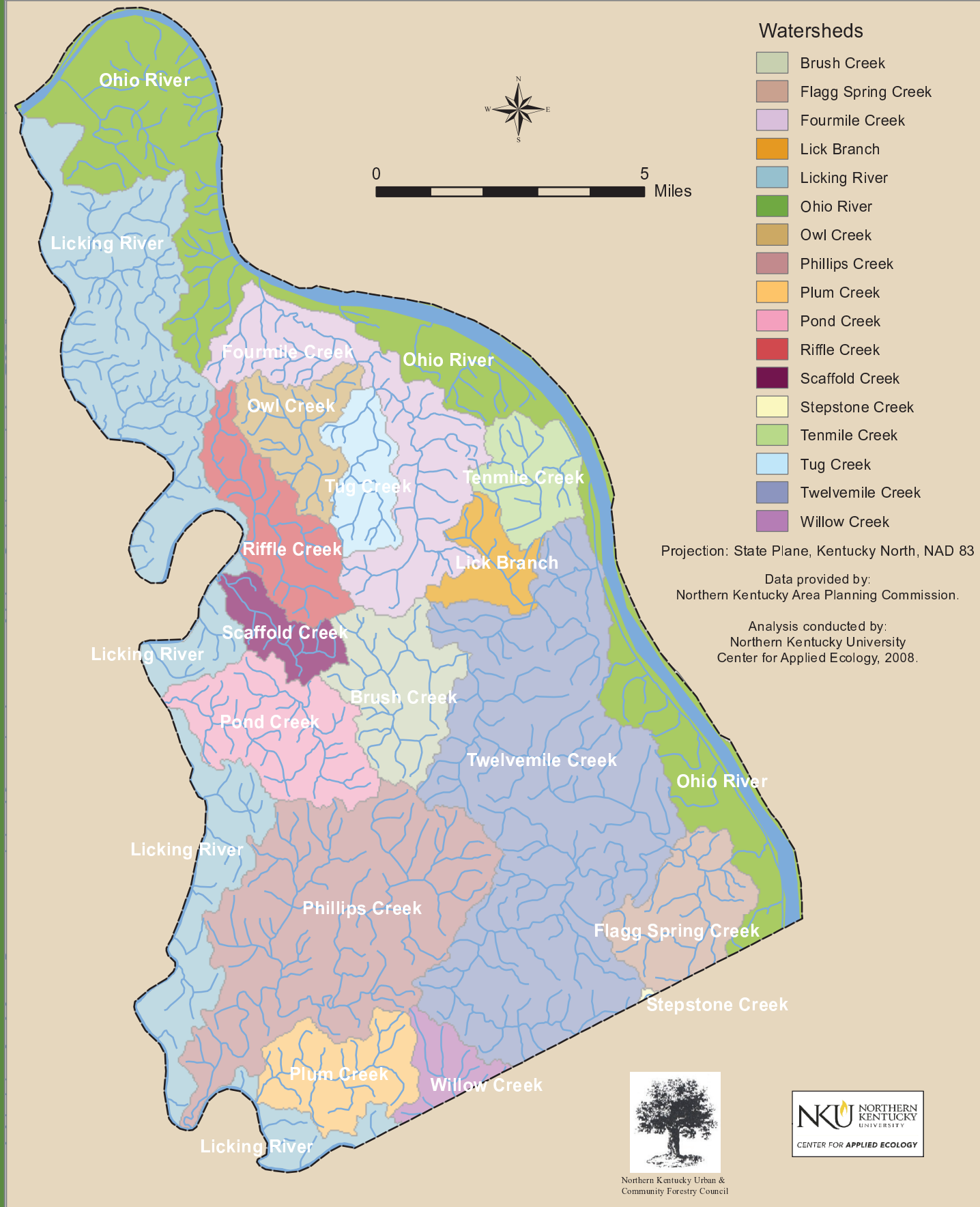
Appendix A

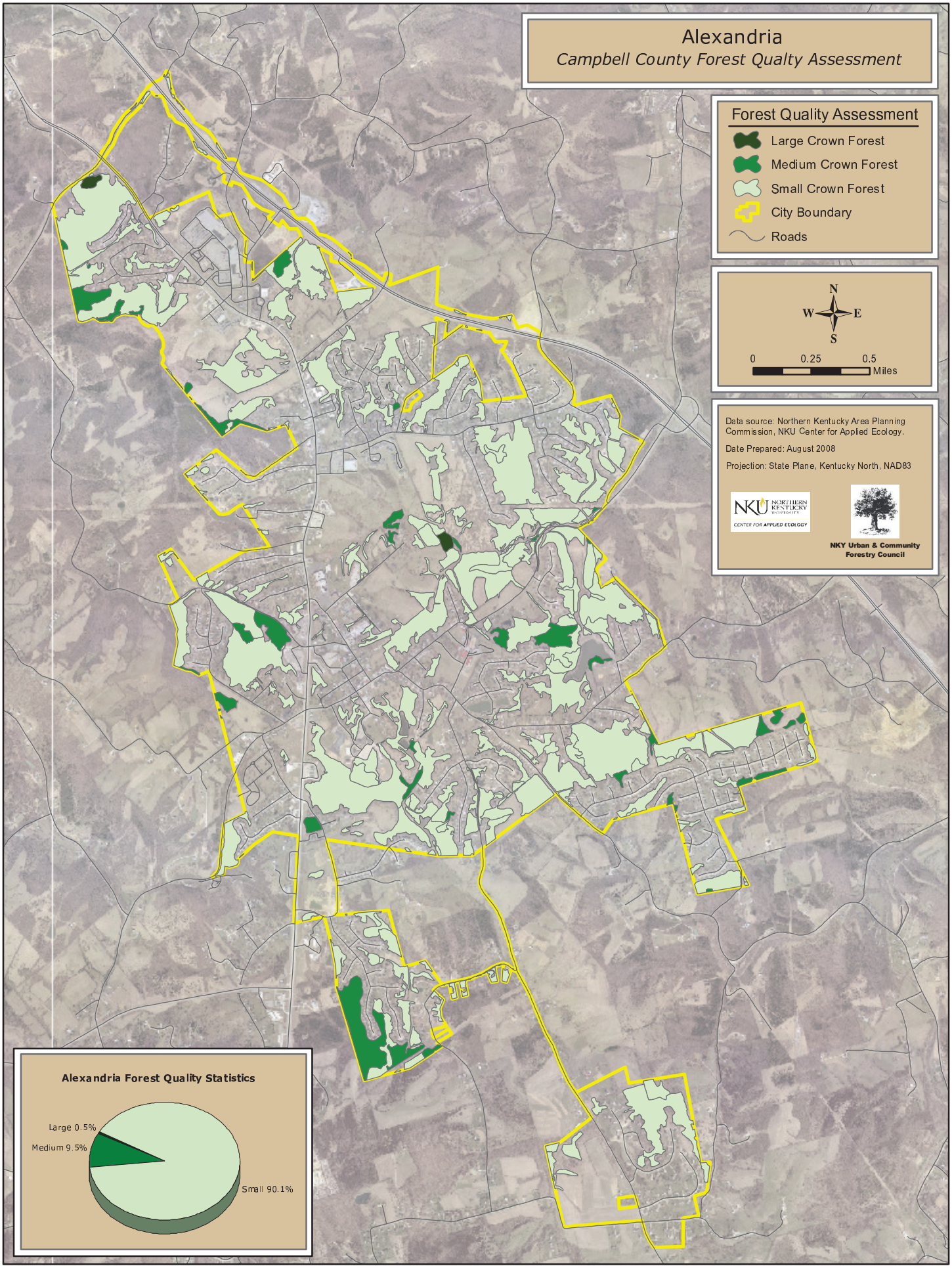
Maps

Map 1: Campbell County Forest Quality Assessment



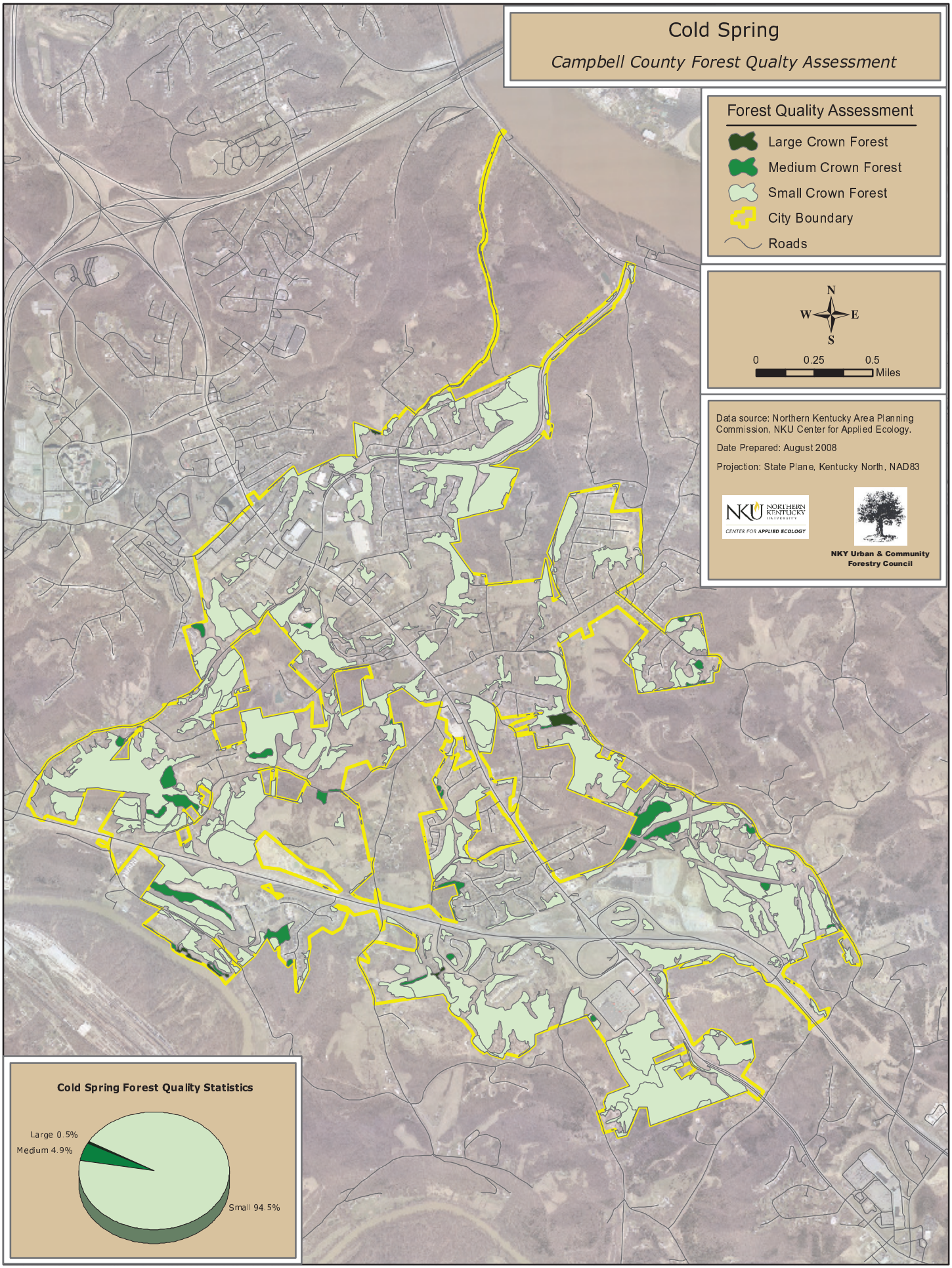
Map 2: Campbell County Watershed Boundaries

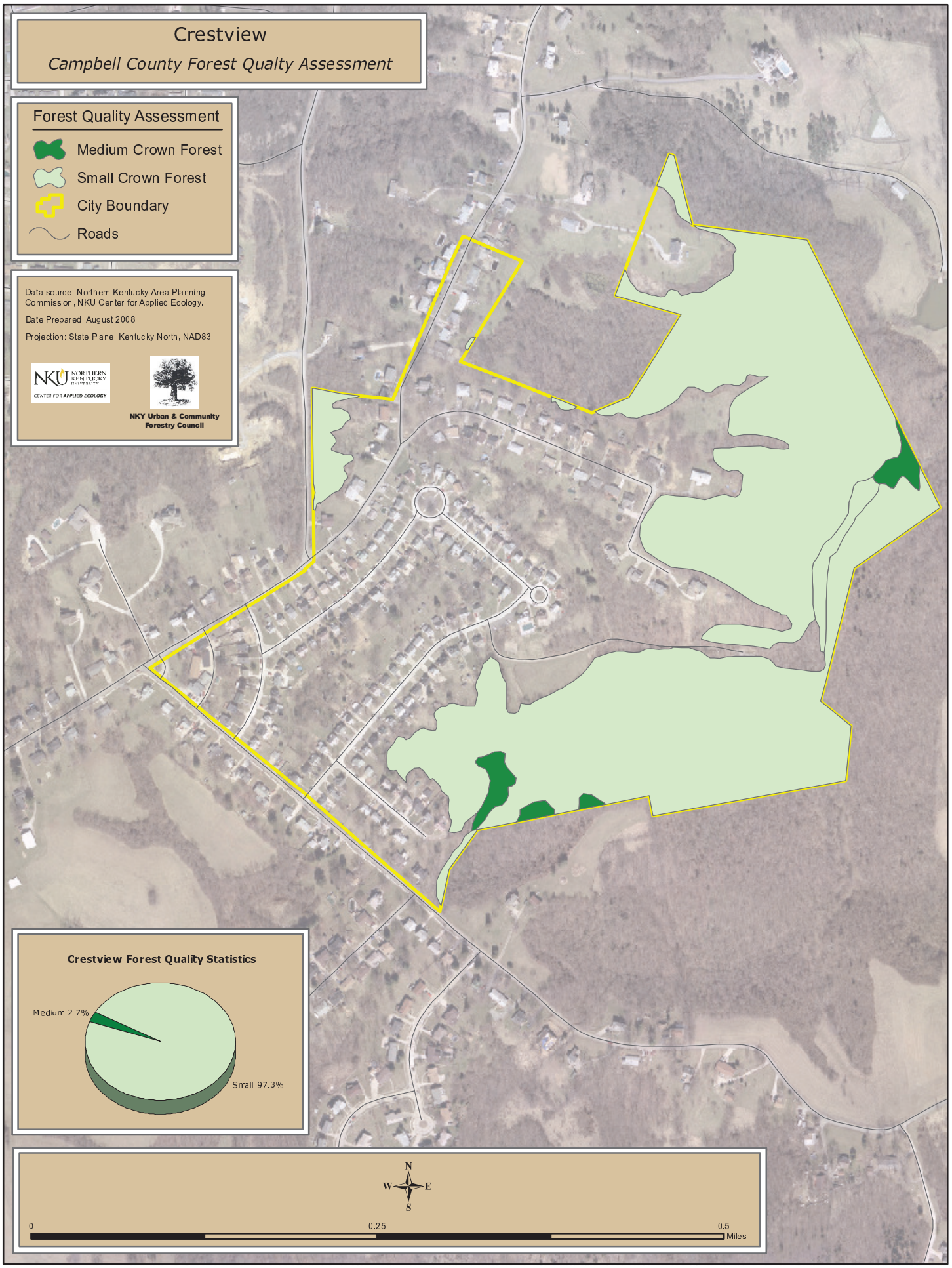



Alexandria
Campbell County Forest Quality Assessment
Forest Quality Assessment
Large Crown Forest
Medium Crown Forest
Small Crown Forest
City Boundary
Roads
N
W
E
S
0
0.25
0.5
Miles
Data source: Northern Kentucky Area Planning Commission, NKU Center for Applied Ecology.
Date Prepared: August 2008
Projection: State Plane, Kentucky North, NAD83
NKU NORTHERN KENTUCKY UNIVERSITY
CENTER FOR APPLIED ECOLOGY
NKY Urban & Community Forestry Council
Alexandria Forest Quality Statistics
Large 0.5%
Medium 9.5%
Small 90.1%


Bellevue
Campbell County Forest Quality Assessment
Forest Quality Assessment
Large Crown Forest
Medium Crown Forest
Small Crown Forest
City Boundary
Roads
N
W
E
S
0
0.25
0.5
Miles
Data source: Northern Kentucky Area Planning Commission, NKU Center for Applied Ecology.
Date Prepared: August 2008
Projection: State Plane, Kentucky North, NAD83
NKU NORTHERN KENTUCKY UNIVERSITY
CENTER FOR APPLIED ECOLOGY
NKY Urban & Community Forestry Council
Bellevue Forest Quality Statistics
Large 0.04%
Medium 4.6%
Small 95.2%

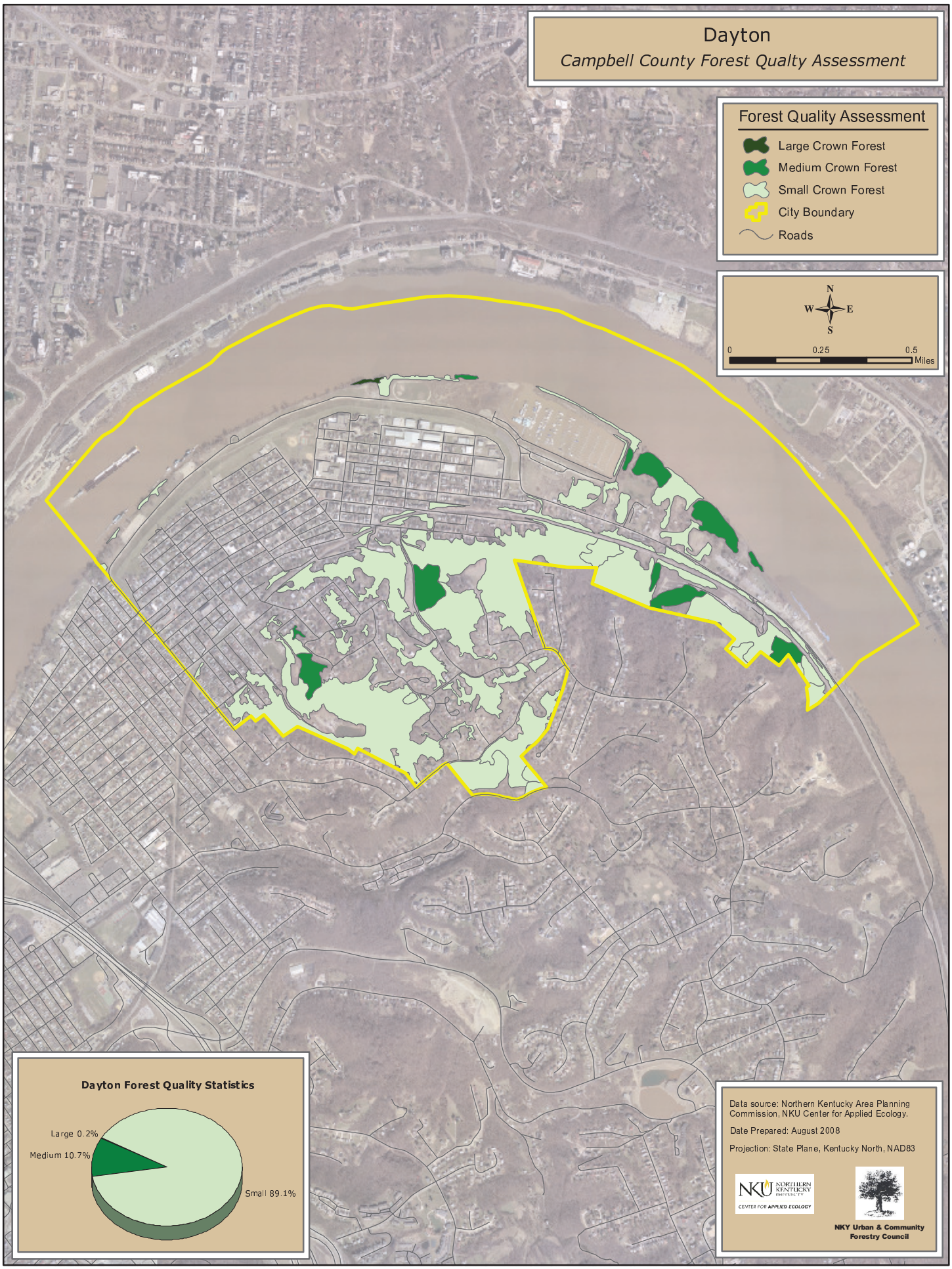

California
Campbell County Forest Quality Assessment
Forest Quality Assessment
Large Crown Forest
Medium Crown Forest
Small Crown Forest
City Boundary
Roads
Data source: Northern Kentucky Area Planning Commission, NKU Center for Applied Ecology.
Date Prepared: August 2008
Projection: State Plane, Kentucky North, NAD83
NKU NORTHERN KENTUCKY UNIVERSITY
CENTER FOR APPLIED ECOLOGY
NKY Urban & Community Forestry Council
California Forest Quality Statistics
Large 1.6%
Medium 4.6%
Small 93.8%
N
W
E
S
0
0.25
0.5
Miles


Cold Spring
Campbell County Forest Qualty Assessment
Forest Quality Assessment
Large Crown Forest
Medium Crown Forest
Small Crown Forest
City Boundary
Roads
N
W
E
S
0
0.25
0.5
Miles
Data source: Northern Kentucky Area Planning Commission, NKU Center for Applied Ecology.
Date Prepared: August 2008
Projection: State Plane, Kentucky North, NAD83
NKU NORTHERN KENTUCKY UNIVERSITY
CENTER FOR APPLIED ECOLOGY
NKY Urban & Community Forestry Council
Cold Spring Forest Quality Statistics
Large 0.5%
Medium 4.9%
Small 94.5%


Crestview
Campbell County Forest Qualty Assessment
Forest Quality Assessment
Medium Crown Forest
Small Crown Forest
City Boundary
Roads
Data source: Northern Kentucky Area Planning Commission, NKU Center for Applied Ecology.
Date Prepared: August 2008
Projection: State Plane, Kentucky North, NAD83
NKY Urban & Community Forestry Council
Crestview Forest Quality Statistics
Medium 2.7%
Small 97.3%
N
W
E
S
0
0.25
0.5
Miles

Dayton

Campbell County Forest Qualty Assessment



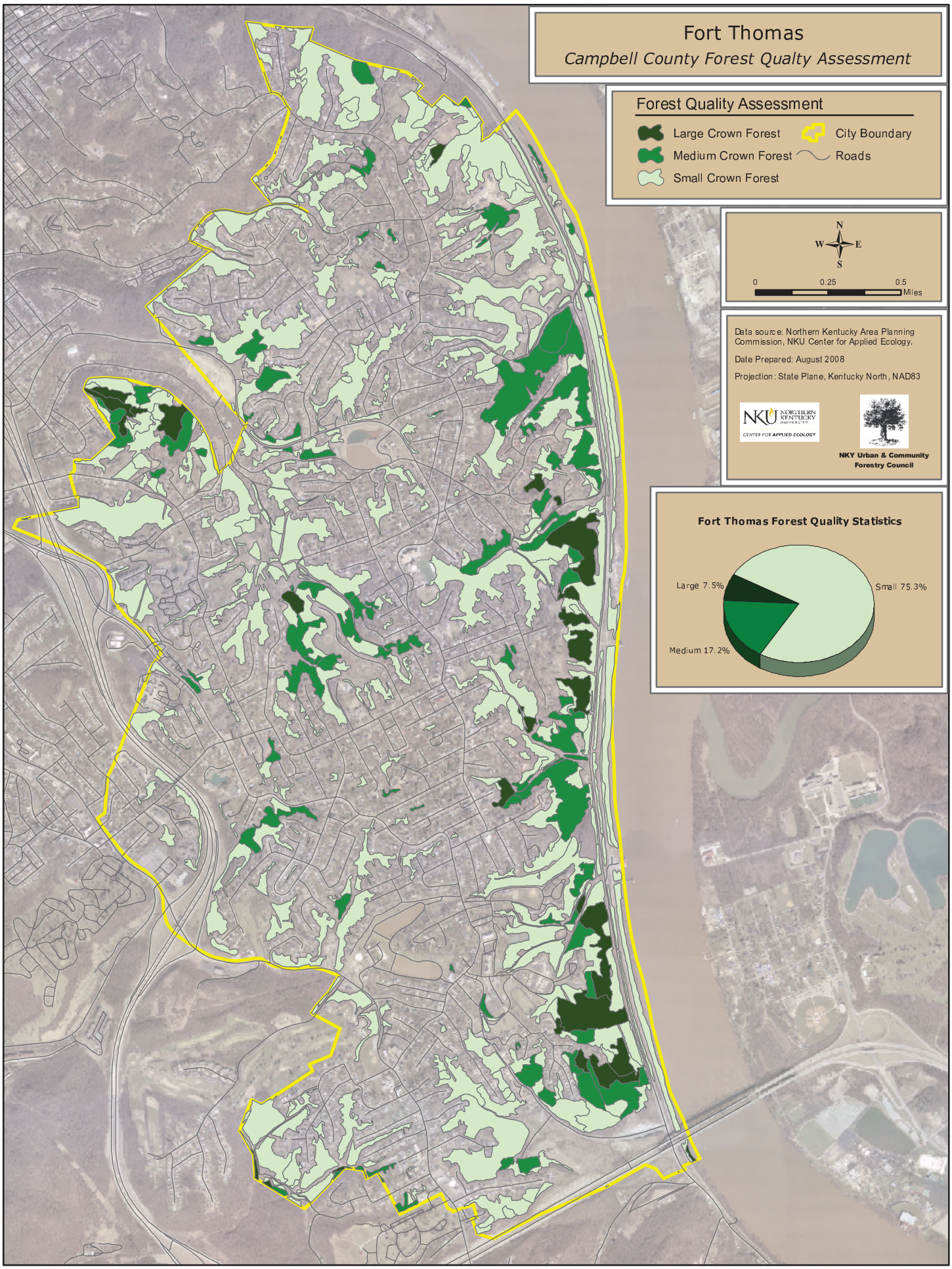
Data source: Northern Kentucky Area Planning Commission, NKU Center for Applied Ecology.

Date Prepared: August 2008

Projection: State Plane, Kentucky North, NAD83

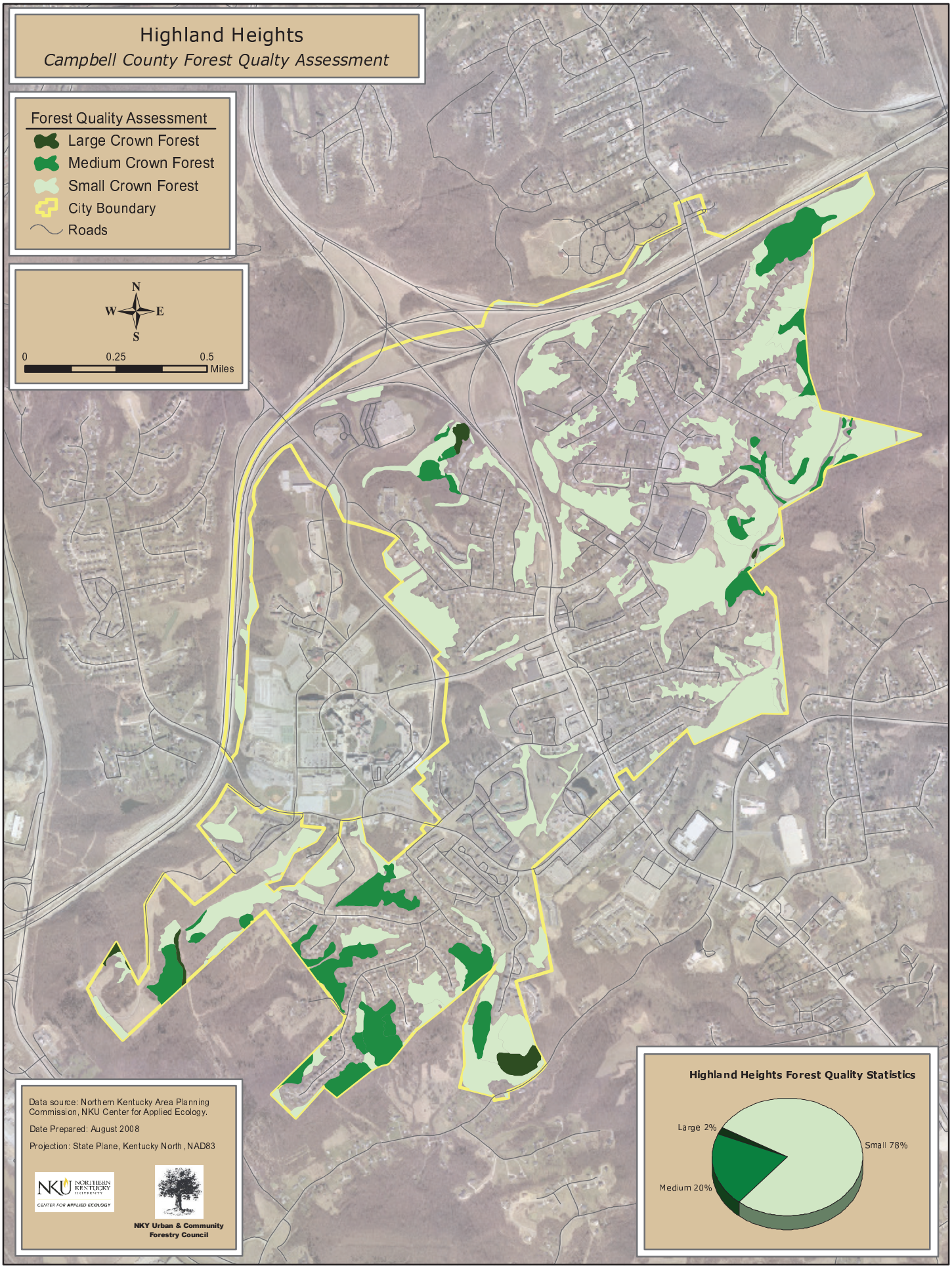
NKU Northern Kentucky University
Center for Applied Ecology

NKY Urban & Community Forestry Council


Fort Thomas
Campbell County Forest Qualty Assessment
Forest Quality Assessment
Large Crown Forest
Medium Crown Forest
Small Crown Forest
City Boundary
Roads
N
W
E
S
0
0.25
0.5
Miles
Data source: Northern Kentucky Area Planning Commission, NKU Center for Applied Ecology.
Date Prepared: August 2008
Projection: State Plane, Kentucky North, NAD83
NKU NORTHERN KENTUCKY UNIVERSITY
CENTER FOR APPLIED ECOLOGY
NKY Urban & Community Forestry Council
Fort Thomas Forest Quality Statistics
Large 7.5%
Small 75.3%
Medium 17.2%

Highland Heights

Campbell County Forest Quality Assessment



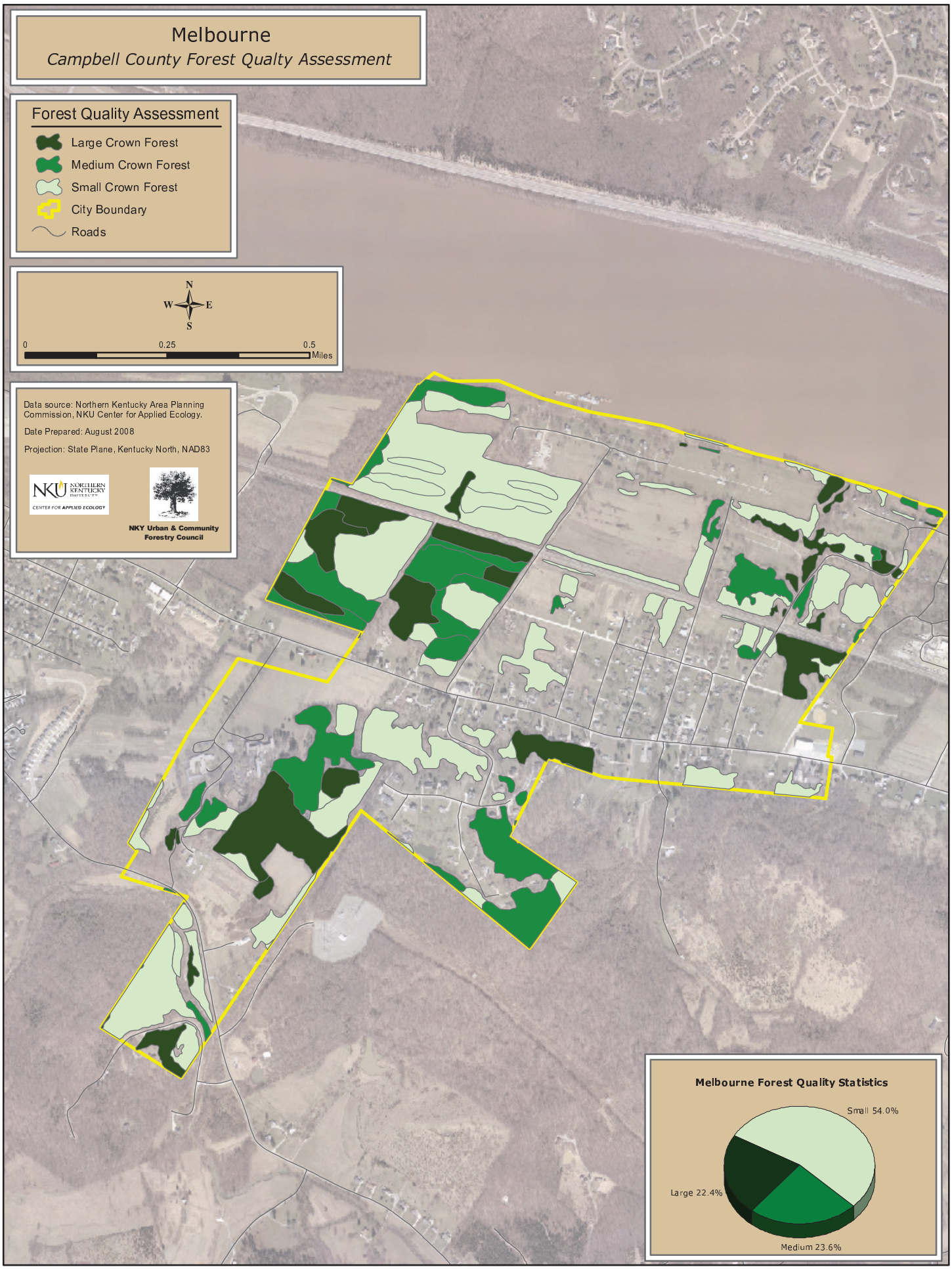
Data source: Northern Kentucky Area Planning Commission, NKU Center for Applied Ecology.

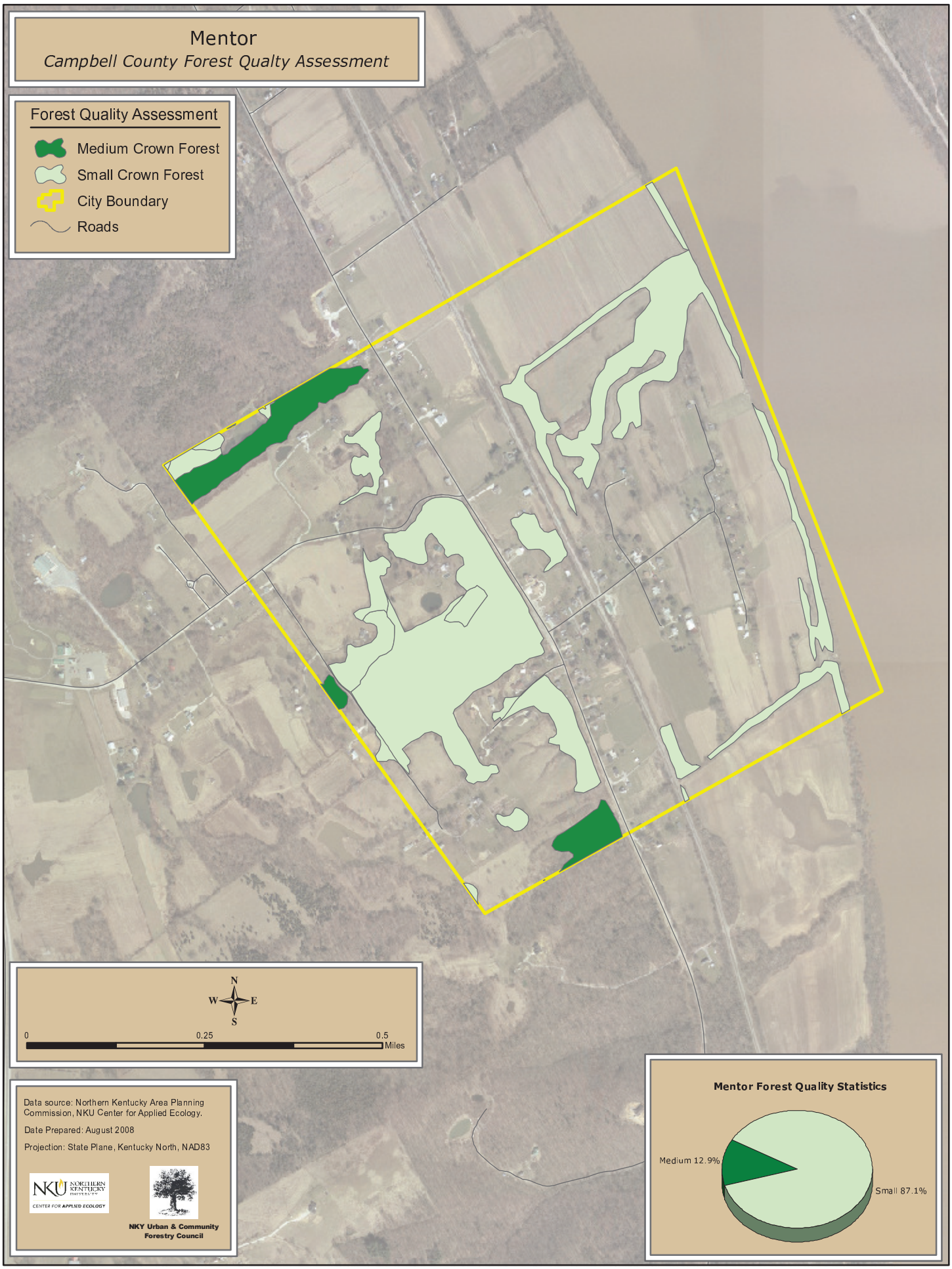
Date Prepared: August 2008

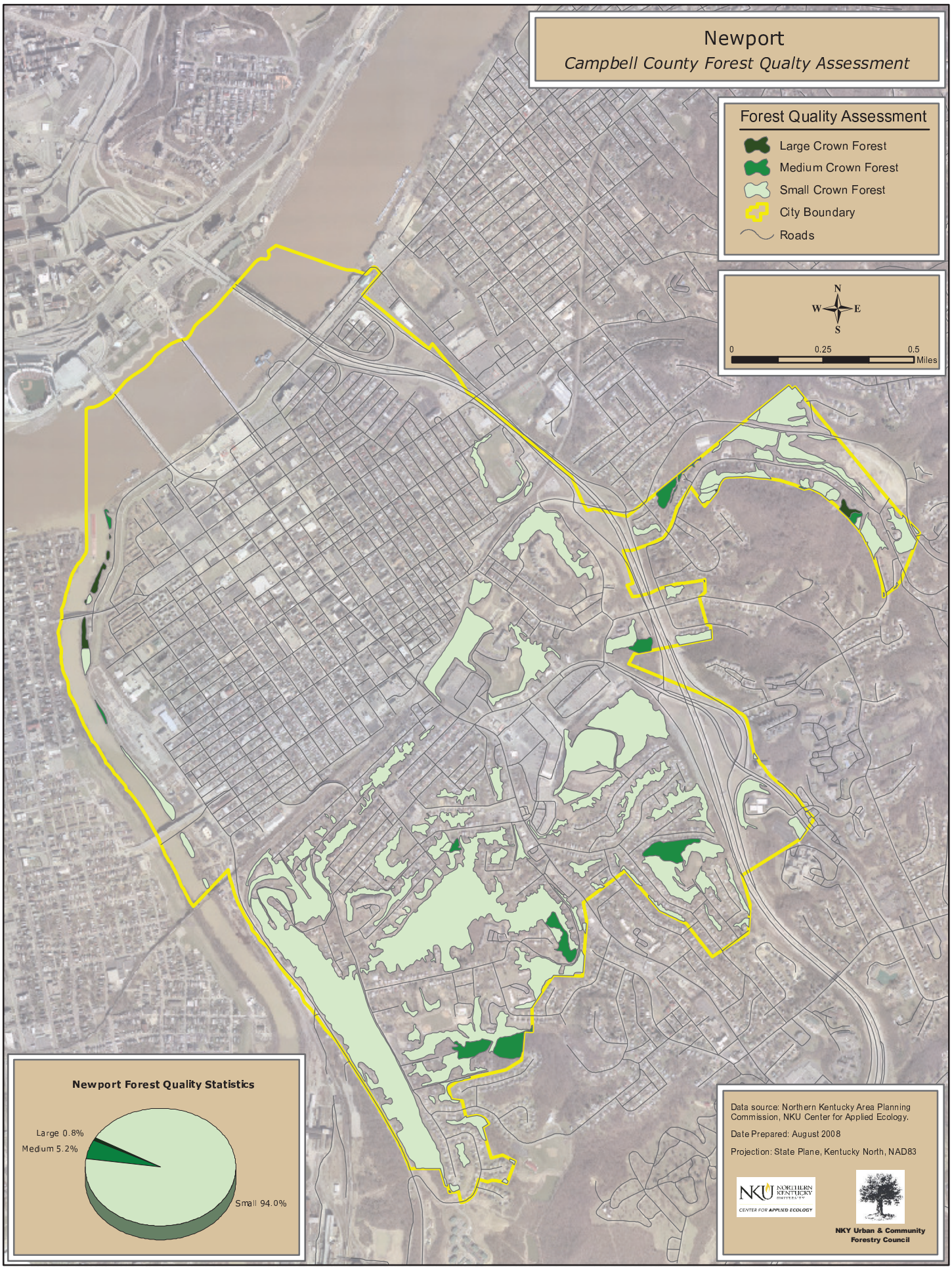
Projection: State Plane, Kentucky North, NAD83

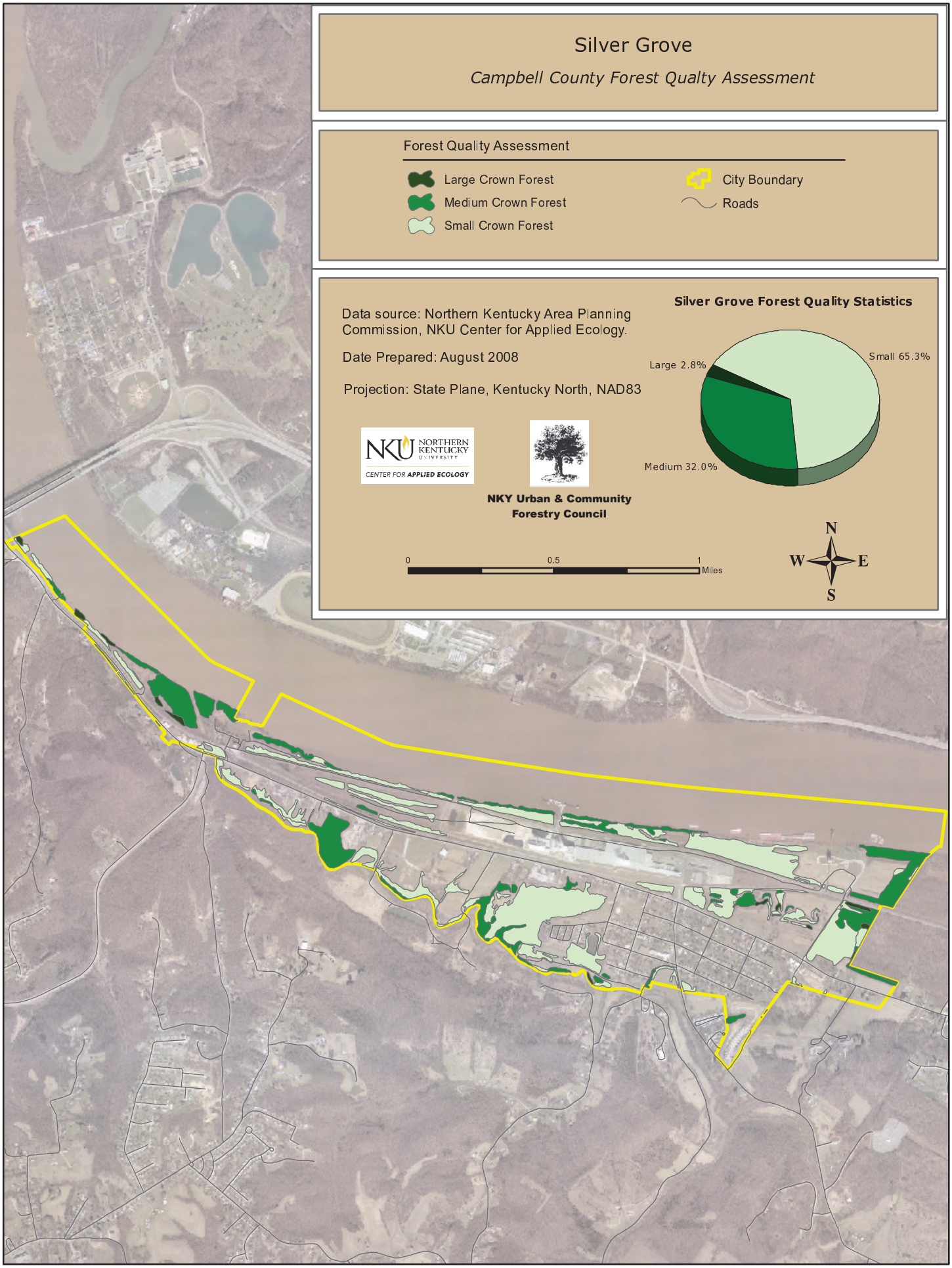
NKU Northern Kentucky University
Center for Applied Ecology

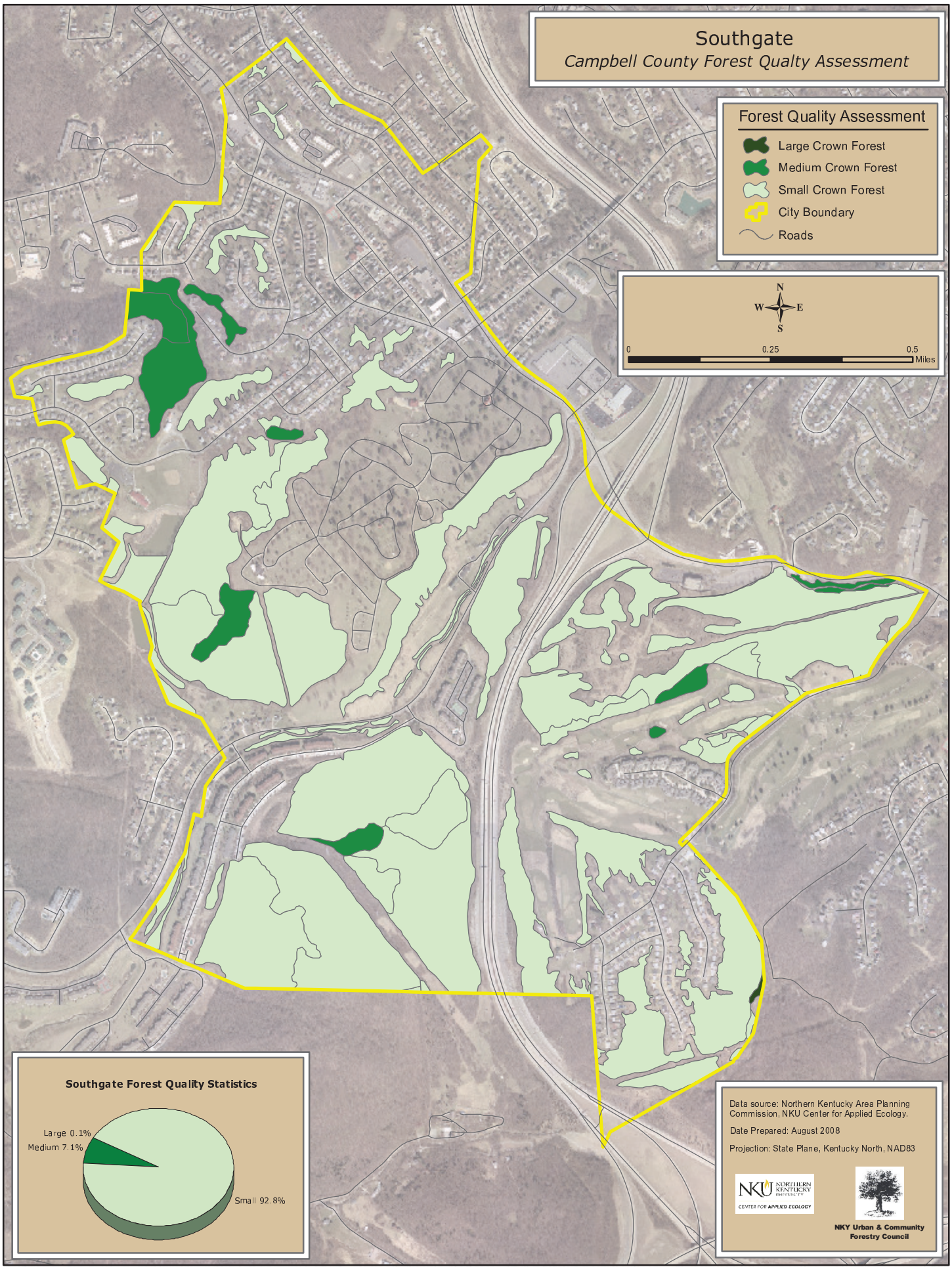
NKY Urban & Community Forestry Council

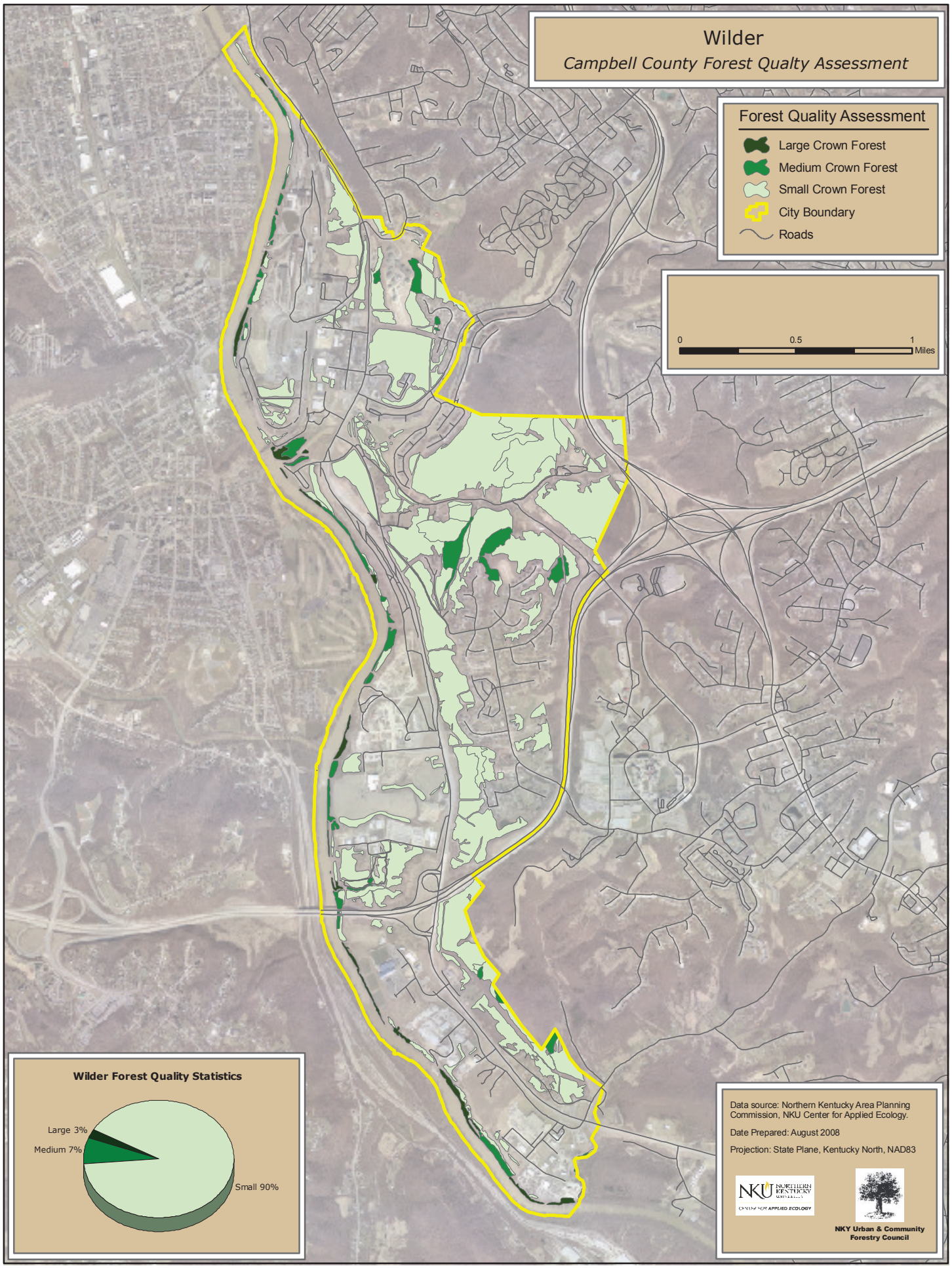

Melbourne
Campbell County Forest Qualty Assessment
Forest Quality Assessment
Large Crown Forest
Medium Crown Forest
Small Crown Forest
City Boundary
Roads
N
W
E
S
0
0.25
0.5
Miles
Data source: Northern Kentucky Area Planning Commission, NKU Center for Applied Ecology.
Date Prepared: August 2008
Projection: State Plane, Kentucky North, NAD83
NKU NORTHERN KENTUCKY UNIVERSITY
CENTER FOR APPLIED ECOLOGY
NKY Urban & Community Forestry Council
Melbourne Forest Quality Statistics
Small 54.0%
Large 22.4%
Medium 23.6%

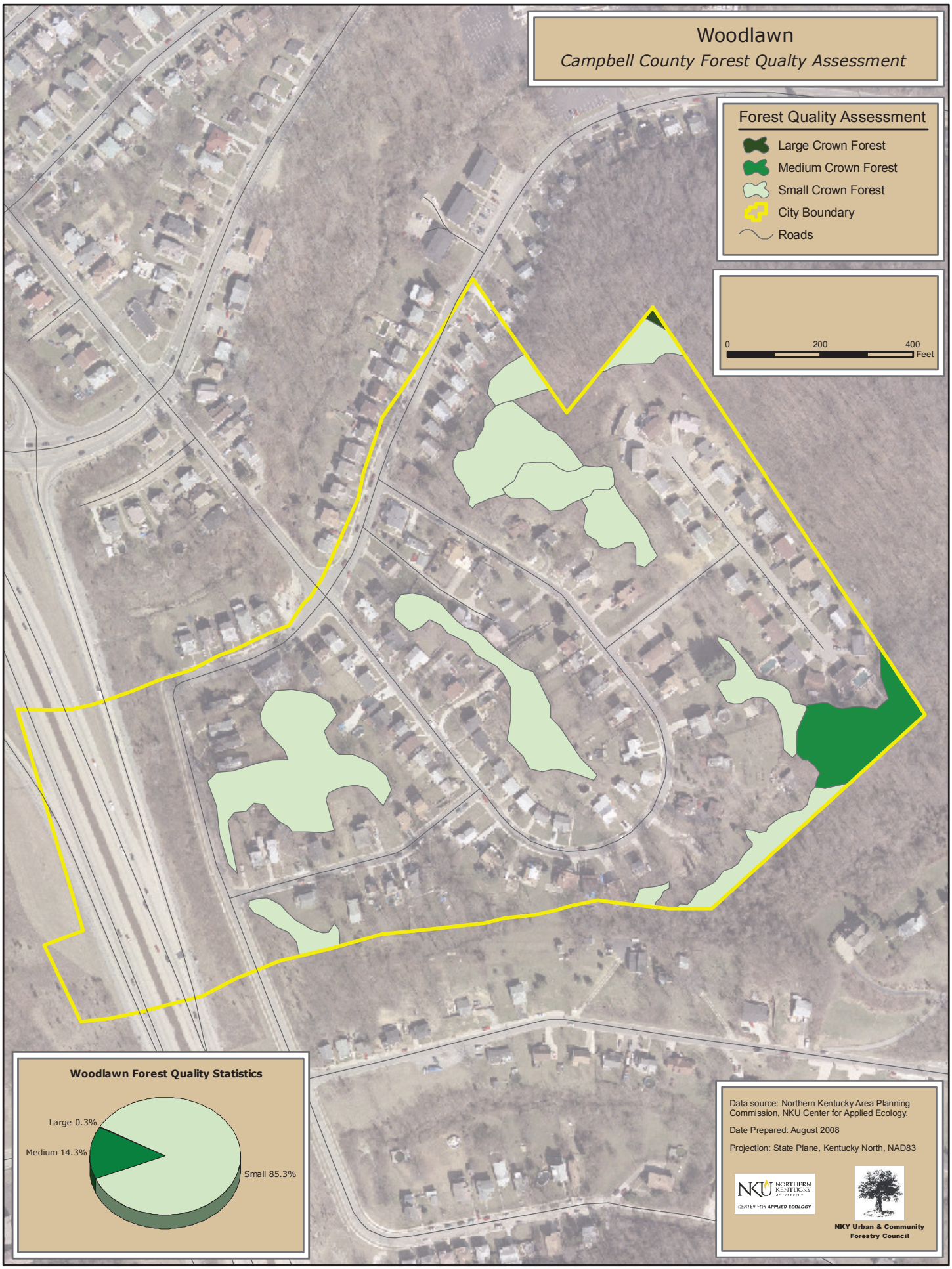

Mentor
Campbell County Forest Quality Assessment
Forest Quality Assessment
Medium Crown Forest
Small Crown Forest
City Boundary
Roads
N
W
E
S
0
0.25
0.5
Miles
Data source: Northern Kentucky Area Planning Commission, NKU Center for Applied Ecology.
Date Prepared: August 2008
Projection: State Plane, Kentucky North, NAD83
NKU NORTHERN KENTUCKY UNIVERSITY
CENTER FOR APPLIED ECOLOGY
NKY Urban & Community Forestry Council
Mentor Forest Quality Statistics
Medium 12.9%
Small 87.1%


Newport
Campbell County Forest Quality Assessment
Forest Quality Assessment
Large Crown Forest
Medium Crown Forest
Small Crown Forest
City Boundary
Roads
N
W
E
S
0
0.25
0.5
Miles
Newport Forest Quality Statistics
Large 0.8%
Medium 5.2%
Small 94.0%
Data source: Northern Kentucky Area Planning Commission, NKU Center for Applied Ecology.
Date Prepared: August 2008
Projection: State Plane, Kentucky North, NAD83
NKU NORTHERN KENTUCKY UNIVERSITY
CENTER FOR APPLIED ECOLOGY
NKY Urban & Community Forestry Council


Silver Grove
Campbell County Forest Qualty Assessment
Forest Quality Assessment
Large Crown Forest
Medium Crown Forest
Small Crown Forest
City Boundary
Roads
Data source: Northern Kentucky Area Planning Commission, NKU Center for Applied Ecology.
Date Prepared: August 2008
Projection: State Plane, Kentucky North, NAD83
NKU NORTHERN KENTUCKY UNIVERSITY
CENTER FOR APPLIED ECOLOGY
NKY Urban & Community Forestry Council
Silver Grove Forest Quality Statistics
Large 2.8%
Small 65.3%
Medium 32.0%
0
0.5
1
Miles
N
W
E
S


Southgate
Campbell County Forest Quality Assessment
Forest Quality Assessment
Large Crown Forest
Medium Crown Forest
Small Crown Forest
City Boundary
Roads
N
W
E
S
0
0.25
0.5
Miles
Southgate Forest Quality Statistics
Large 0.1%
Medium 7.1%
Small 92.8%
Data source: Northern Kentucky Area Planning Commission, NKU Center for Applied Ecology.
Date Prepared: August 2008
Projection: State Plane, Kentucky North, NAD83
NKU NORTHERN KENTUCKY UNIVERSITY
CENTER FOR APPLIED ECOLOGY
NKY Urban & Community Forestry Council


Wilder
Campbell County Forest Qualty Assessment
Forest Quality Assessment
Large Crown Forest
Medium Crown Forest
Small Crown Forest
City Boundary
Roads
0
0.5
1
Miles
Wilder Forest Quality Statistics
Large 3%
Medium 7%
Small 90%
Data source: Northern Kentucky Area Planning Commission, NKU Center for Applied Ecology.
Date Prepared: August 2008
Projection: State Plane, Kentucky North, NAD83
NKU NORTHERN KENTUCKY UNIVERSITY
CENTER FOR APPLIED ECOLOGY
NKY Urban & Community Forestry Council


Woodlawn
Campbell County Forest Quality Assessment
Forest Quality Assessment
Large Crown Forest
Medium Crown Forest
Small Crown Forest
City Boundary
Roads
0
200
400
Feet
Woodlawn Forest Quality Statistics
Large 0.3%
Medium 14.3%
Small 85.3%
Data source: Northern Kentucky Area Planning Commission, NKU Center for Applied Ecology.
Date Prepared: August 2008
Projection: State Plane, Kentucky North, NAD83
NKU NORTHERN KENTUCKY UNIVERSITY
CENTER FOR APPLIED ECOLOGY
NKY Urban & Community Forestry Council

Appendix B

Photographs

Photo 4: CAE staff used digital aerial photographs, field surveys, and historical photographs to delineate the forest parcels.

Photo 5: The Small Crown Forests typical of Campbell County had a thick understory of the invasive shrub Amur honeysuckle (Lonicera maackii).

Photo 6: The Small Crown Forests also included cedar woodlands that have very little biological diversity.

Photo 7: While the biological diversity in the Medium Crown Forests tended to be higher than the Small Crown Forests, there was typically a presence of invasive plants.

Photo 8: This Medium Quality Forest had good biological diversity, which indicates that when it was last cut the soil was not heavily disturbed.

Photo 9: This Large Crown Mesic Hardwood Forest was dominated by sugar maple.

Photo 10: Large Crown Forests with high ecological quality have identifiable canopy, subcanopy, shrub, and herbaceous layers.