Thurston County

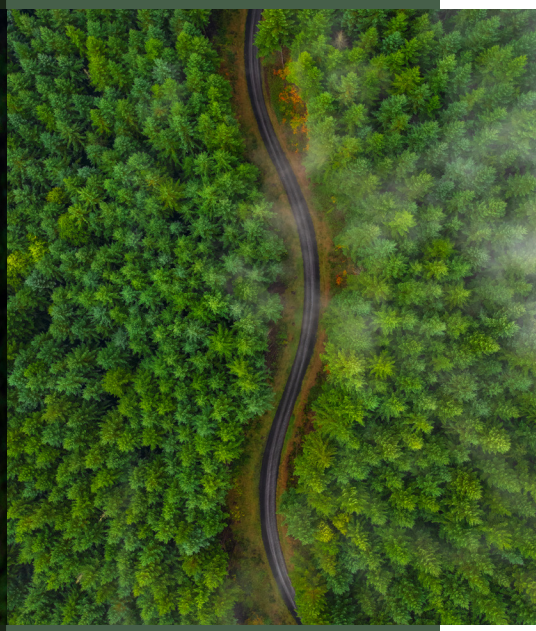
Tree Canopy Report

Revised September 2025

Claire Swearingen
Associate Planner

Whitney Emge
GIS Analyst II

Lara Tukarski
Community Engagement Specialist



THURSTON COUNTY
WASHINGTON
SINCE 1852

Executive Summary

Tree canopy refers to the layer of leaves, branches, and stems that covers the ground when viewed from above. A tree canopy assessment helps communities make smarter decisions by showing where trees are already growing--and where there is room to add more.

The Thurston County Tree Canopy Assessment outlined in this report offers more than just a snapshot of tree canopy coverage in rural areas--it also provides insight into other landcover types, conversion risk, and opportunities for tree canopy restoration. This information can help the County and its regional partners prioritize restoration efforts and better apply tools to prevent permanent forest loss. It also sheds light on how forests and prairies are connected across the County's landscape, helping to guide efforts to protect and restore these important ecosystems. This data is currently informing the Thurston County Comprehensive Plan update and guiding research focused on riparian habitat protection.

Table of Contents

In the future, this tree canopy assessment may help the County and other regional planning partners:

Introduction

The Thurston County Tree Canopy Assessment is the first study in our region to look specifically at rural tree canopy at a countywide scale. It focuses specifically on rural areas because they offer the best opportunities for tree canopy conservation and restoration—thanks to more open land, fewer people, and less development pressure. Incorporated cities and urban growth areas (UGAs) were not included in this analysis. The study identifies key conservation priorities that support a wide range of goals, like protecting wildlife habitat, improving water quantity and quality, sequestering carbon, and supporting the local economy.

Data from this analysis can inform decisions related to forest management, salmon recovery and habitat restoration, watershed hydrology, flood control, carbon sequestration, and wildlife habitat. Regional, municipal, and community or nonprofit groups may also find this report useful.

In 2011 a tree canopy study was completed for the UGAs of Lacey, Olympia, and Tumwater. The study showed that 32% of the land in these areas is covered by tree canopy and offered the following recommendations for next steps:

- Complete a tree canopy assessment for unincorporated lands.
- Set a county-wide tree canopy coverage goal.
- Map areas with potential for tree canopy restoration.

Since then, remote sensing technology has significantly improved and state requirements for land use data have become more thorough. With support from grant funding and a partnership with the City of Olympia in 2022, Thurston County worked with the University of Vermont to analyze tree canopy data using LiDAR imagery from 2017 and 2021. The study achieved 97% accuracy—an improvement over the 80% accuracy reported in 2011. County staff also contributed by refining and analyzing Geographic Information System (GIS) data. Appendix A includes the full methodology, along with a detailed list of maps, data layers, and analytical tools.

Maps, Tables, and Findings

Tree Canopy Extent

Figure 1 shows the percentage of tree canopy cover throughout Thurston County using a grid of 250-acre hexagons. Standardizing the area this way makes it easier to compare tree canopy coverage across the County, rather than relying on individual parcels that vary widely in size. This map highlights over 250,000 acres of tree canopy and shows where tree cover is most concentrated—61% percent of the rural county is covered with tree canopy. It also identifies other County areas that can influence tree canopy coverage, including those zoned for long term forestry practices, military bases, Tribal reservations, and public forests.

Figure 1: Tree Canopy

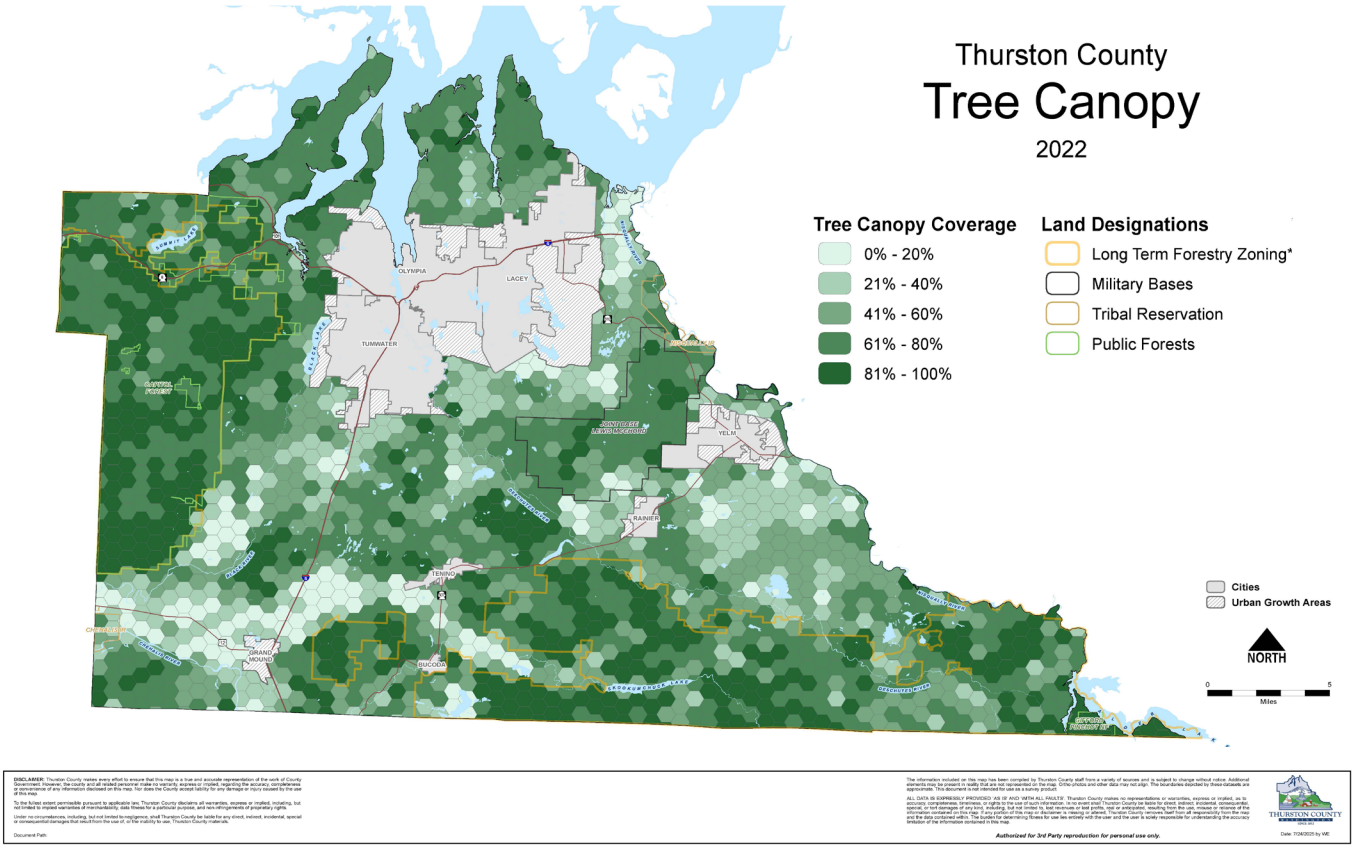


Figure 1. This map shows the percent of tree canopy coverage in 250-acre hexagons in unincorporated Thurston County, excluding UGAs. This map also includes boundaries for Long Term Forestry zones, military bases, and Tribal reservations. These are all major regulatory factors that influence tree canopy coverage, and the regulation of forest management.

Table 1 shows approximate acreages of land cover types across rural Thurston County. Land cover refers to the physical features of a landscape as seen from above—like trees, grass, water, buildings, or pavement. This offers a clear picture of how the land is used, the condition of our ecosystems, and where there may be environmental concerns like flooding or pollution.

Table 1: Landcover Types and Extent

Landcover Type	Acres	% Coverage
Tree Canopy	250,800	61%
Grass/Shrubs	132,200	32%
Bare Soil	5,400	1%
Water	5,900	1%
Building	3,200	1%
Road/Railroad	6,500	2%
Other Paved Surface	4,400	1%
Total County Acres	**408,400**	

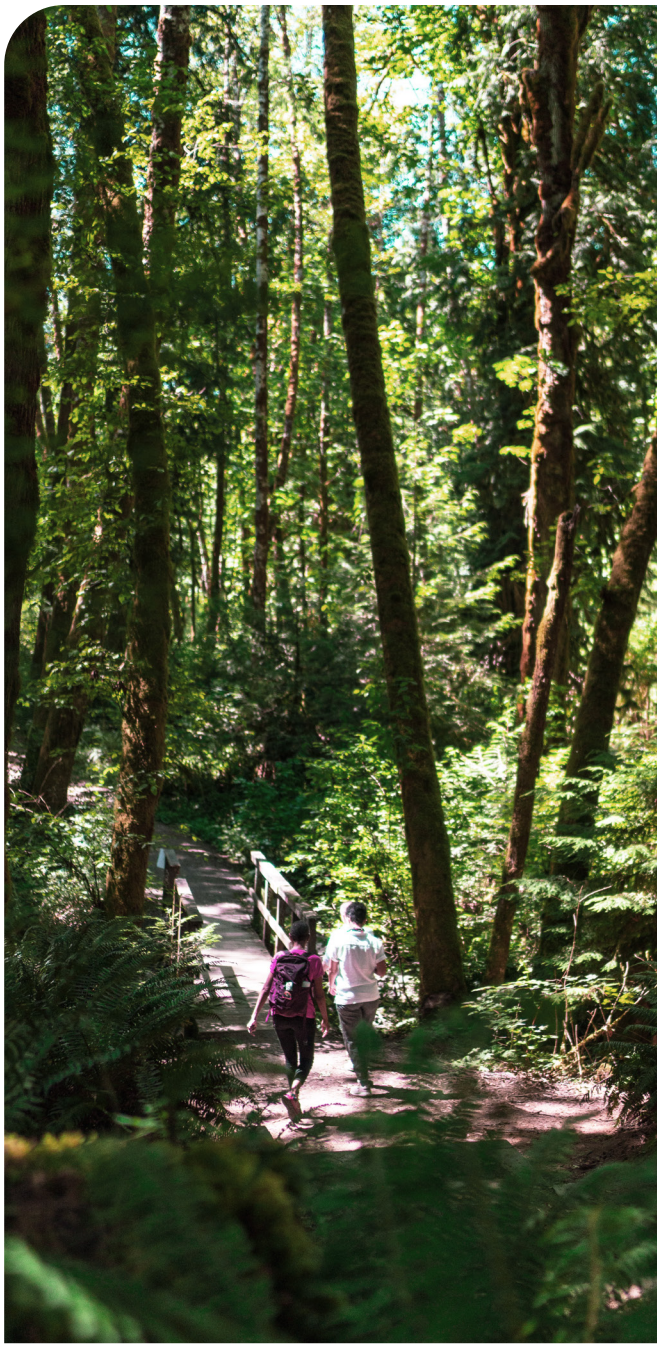
Table 1. Land cover types in unincorporated Thurston County (excluding incorporated cities and urban growth areas) by acreage and percent of total. Numbers are rounded for clarity and legibility.

Tracking land cover changes over time is especially helpful for local governments. It can show how changes to vegetation and land use can be regulated to better support ecosystem health. Land cover data also helps monitor issues like rising temperatures, habitat loss, water quality and availability, and flooding. The 2022 University of Vermont study analyzed several land cover types beyond tree canopy, including:

1. Tree canopy
2. Grass shrubs
3. Bare soil
4. Water
5. Buildings
6. Roads and railroads
7. Other paved surfaces

Maps showing where each landcover type is located can be found in **Appendix A**. Details on the methodology for how the data was classified can be found in **Appendix B**.

Understanding land cover is an important part of figuring out where forest restoration could be most effective or how different parts of the landscape support overall ecological health. Studying land cover alongside other landscape features can help identify the best strategies for protecting and restoring tree canopy. As with all the data in this report, this information should be used in combination with the best available science and sound land management practices when informing forest-related policies or decisions. The bare soil map, included in the landcover maps in **Appendix A**, highlights an area with a high percentage of bare soils in the northeast corner of the county. This is the Billy Frank Jr. Nisqually National Wildlife Refuge. While it appears as "bare soil" in the data, it is a healthy intertidal zone and estuary—full of ecological value, not damaged or degraded land.



Land Use and Conversion Risk

Exploring land use alongside tree canopy and land cover helps us understand where tree canopy might be at risk of loss due to conversion. In this study, land use refers to the activities zoning allows on the land, regardless of the current use. Residential zones—including all rural residential zones, Limited Areas of More Intense Rural Development (LAMIRD) zones, and the McAllister Geologically Sensitive Area--hold the largest share of the County's tree canopy at about 48%. Areas zoned for long-term forestry, intended to protect commercial forests, have the second largest tree canopy percentage at 43%. Government, agriculture, open space, education, industrial and commercial zones represent small portions of the tree canopy in Thurston County, together accounting for less than 9% of the total canopy area. **Figure 2** shows tree canopy coverage in residential zones. Tree canopy maps for all land use zones are included in **Appendix A**.

Figure 2: Tree Canopy in Residential Zoning

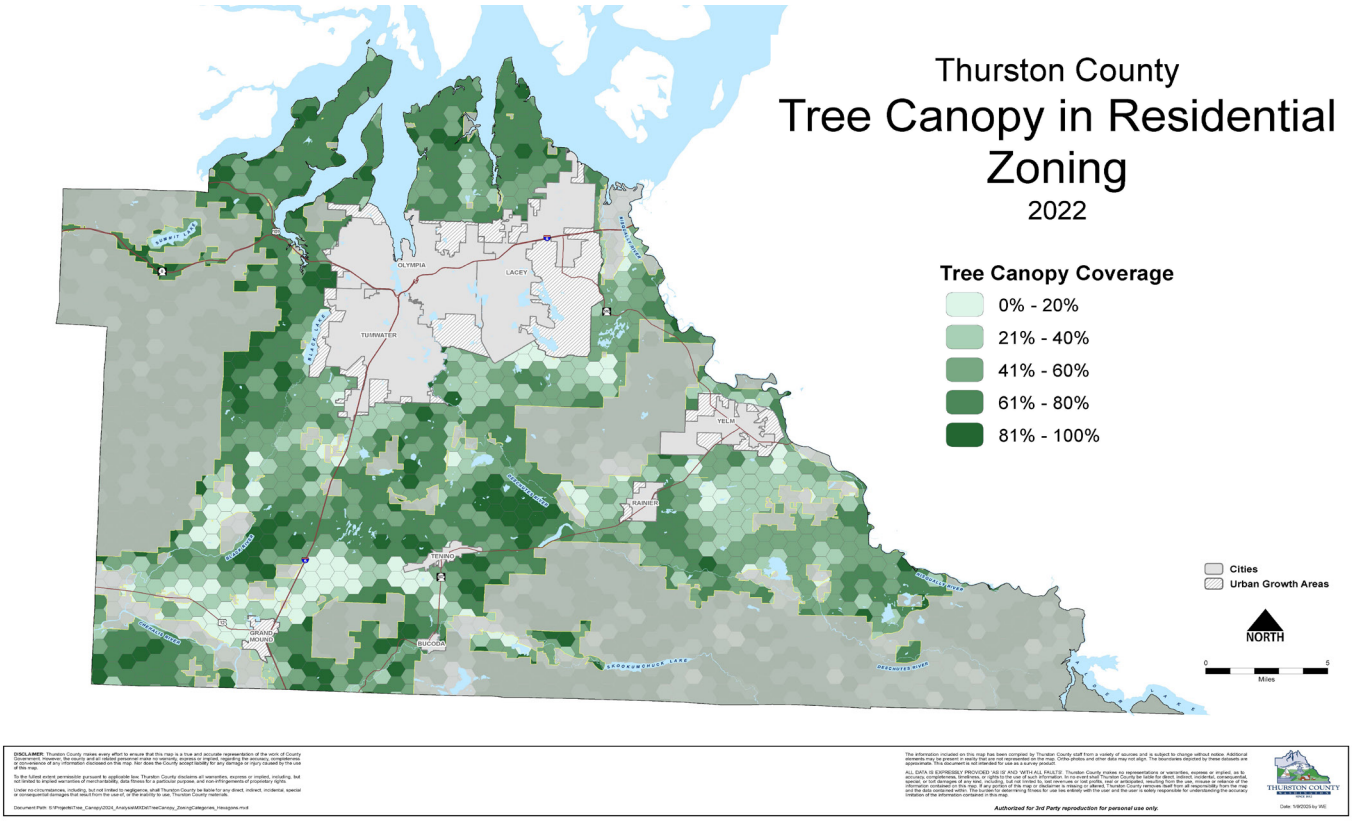


Figure 2. Tree Canopy in Residential Zoning. This map highlights tree canopy coverage hexagons on lands zoned for residential uses.

Table 2: Tree Canopy Coverage by Zoning Type

Land Use Type	Total Acres	% Use Type	Tree Canopy Acres	% Use Type Tree Canopy	% County Tree Canopy
Residential	221,300	54%	120,900	55%	48%
Forestry	142,600	35%	108,500	76%	43%
Government	18,600	5%	13,000	70%	5%
Open Space	7,100	2%	3,600	47%	1%
Agriculture	15,900	4%	3,600	22%	1%
Education	1,000	0.2%	900	87%	0.3%
Commercial	700	0.2%	100	16%	0.04%
Industrial	400	0.1%	100	35%	0.05%
Total	**407,600**		**250,700**		

Table 2. This table provides the total number of acres and acres of land covered by tree canopy for each of 8 land use types in Thurston County. See Appendix A for a complete list of the zoning types and how they were categorized. Numbers are rounded for clarity and legibility, see appendices for exact numbers.

To better understand forest vulnerability, the Thurston Regional Planning Council (TRPC) developed a conversion risk map series (**Appendix E**) to highlight rural or forested lands most at risk of conversion to other uses. The TRPC study found that 5-acre lots are most susceptible to conversion away from forested lands. As shown in **Table 3** below, these smaller parcels are covered by tree canopy on 50% of the combined area they make up. While these parcels account for just 8% of the County's total tree canopy, they face the highest risk of clearing—making them a key focus for targeting tree canopy conservation efforts.

As shown in **Table 3**, nearly three quarters of the existing canopy occurs on lots over 20 acres.

Table 3: Tree Canopy Coverage by Parcel Size

Parcel Size	Total Acres	% Total	Tree Canopy Acres	% Tree Canopy	% County Tree Canopy
< 5 Acres	44,000	11%	20,800	47%	8%
5-20 Acres	77,700	19%	40,700	52%	16%
> 20 Acres	280,500	70%	186,000	66%	74%
Total	**402,200**		**247,500**		

Table 3. This table provides the total number of acres, acres of tree canopy, and percent of tree canopy for each of three parcel size categories (<5acres, 5-20 acres and >20 acres) in Thurston County. Numbers are rounded for clarity and legibility, see appendices for exact numbers.

This study also considers the important role of land ownership in tree canopy restoration potential. For this study, public lands include local, state, and federally owned lands within Thurston County. As shown in **Table 4**, two-thirds of the County's tree canopy area is held in private ownership.

Table 4: Tree Canopy Coverage by Land Ownership Type

Ownership	Total Acres	% of Total	Tree Canopy Acres	% Tree Canopy	% Total County Tree Canopy
Private Lands	292,900	72%	170,700	58%	68%
Public Lands	100,300	25%	74,700	74%	30%
Tribal Lands	3,700	1%	3,700	54%	1%
Right-of-Way	11,400	3%	11,400	29%	1%
Total	**408,300**				

Table 4. This table provides the total number of acres, percent of the total, extent of tree canopy, and percent of tree canopy in each of the ownership categories: private lands, public lands, tribal lands and right-of-way. Numbers are rounded for clarity and legibility, see appendices for exact numbers.

While this report offers valuable insights to support conservation efforts and conversion risk management, forest conversion in Thurston County is primarily managed through the Forest

Lands Conversion Ordinance (TCC Chapter 17.25). This ordinance requires the County to review proposals involving Class IV-General forest practices, conversion option harvest plans (COHP), certain Class I forest practices, and the removal of development moratoria regulated under the Washington State Forest Practices Act. In general, these activities involve some kind of conversion away from forested lands. In 2024, the County also adopted tree conservation practices (TCC Chapter 17.27) which complement the Forest Lands Conversion Ordinance to strengthen tree canopy retention. The intent of these sections of the Thurston County Code is to preserve tree canopy, prevent unlawful harvest and conversion of forests, and provide a framework for the administration of these regulations that is transparent and easy to use.

Additional planning and policy tools also exist to protect working forest lands from conversion. Commercial forests and small-acreage timber tracts may benefit from current use classifications authorized by the state legislature (RCW 84.34). These programs offer tax reductions to enrolled parcels in exchange for keeping the land in forestry use.

Potential Tree Canopy Restoration

Several planning documents have highlighted the importance of monitoring tree canopy and developing regulations to help protect County forests from conversion. For example, the Thurston County Comprehensive Plan includes a goal of no net loss for commercial forest lands, and the Thurston Climate Mitigation Plan recommends specific tree canopy targets. To meet these goals, solid baseline data is needed to understand how forest canopy is changing over time.

Past efforts have also contributed to the understanding of tree canopy restoration potential in Thurston County. The Carbon Sequestration white paper published by the Thurston Regional Planning Council in 2023 states that the most effective way to sequester carbon is by protecting existing trees in Thurston County and incentivizing reforestation, and identifies areas for potential tree canopy restoration.

This tree canopy assessment looked at several factors to determine restoration suitability, including absence of tree canopy and current land use. Lands with existing competing uses were classified as having low restoration potential. These include prairie soils identified in the Thurston County Habitat Conservation Plan and areas with potential agricultural activity based on Voluntary Stewardship. **Figure 3** identifies lands with the lowest percentage of existing tree canopy with no associated agriculture activities or prairie soils as having the highest restoration potential. Lands with the highest percent of existing tree canopy and lands that were associated with prairie soils or current agricultural activities were assigned a low restoration potential. This data will help Thurston County and its conservation partners determine where to focus reforestation efforts in the future.

Figure 3: Potential Tree Canopy Restoration

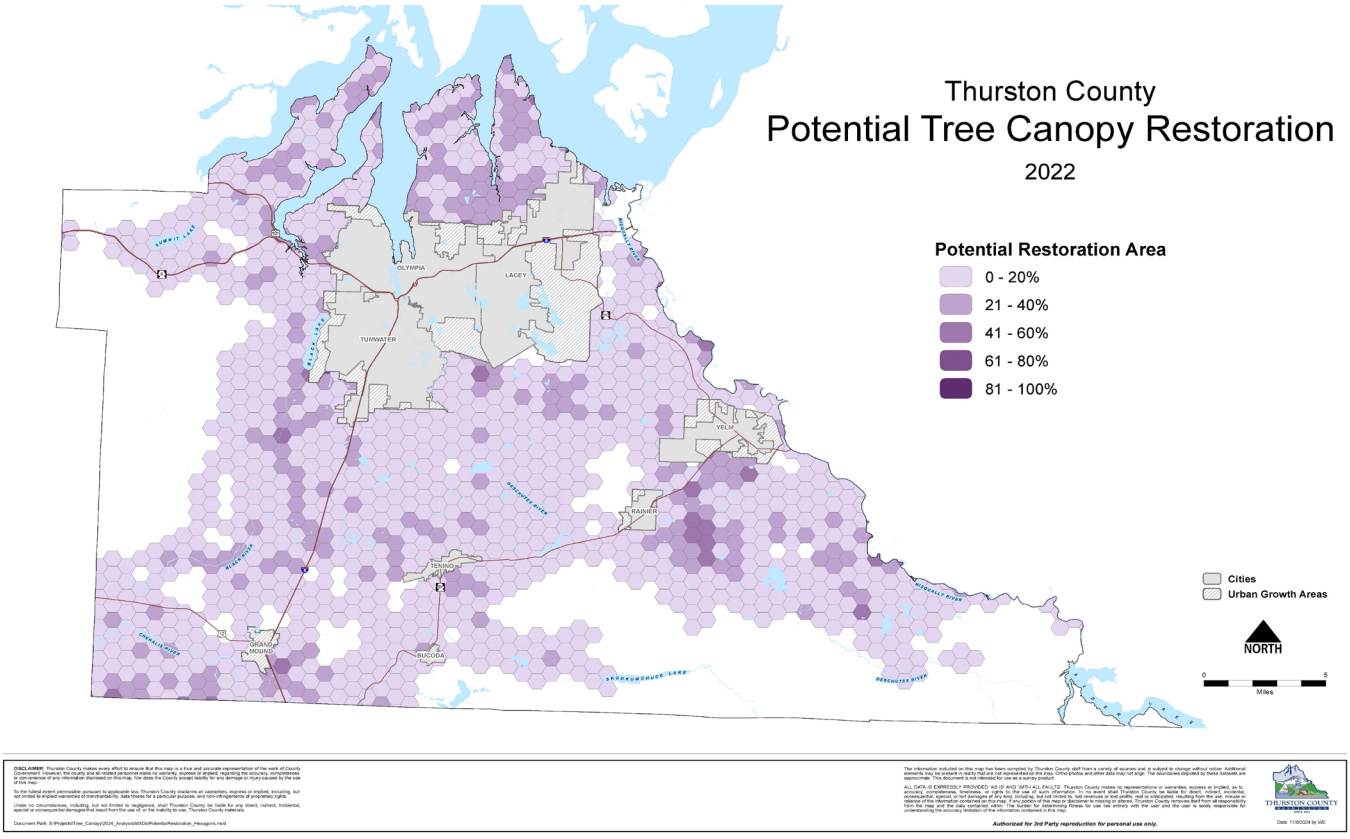


Figure 3. This map shows areas of high, medium and low potential for tree canopy restoration. Low range indicates areas that have over 66% tree canopy, medium range indicates areas that have 33-66% tree canopy, and high range indicates areas that have less than 33% tree canopy. Lands with prairie soils (USDA, 2009) and existing agriculture practices (TC GeoData, 2023) were also classified as low potential.

Tree Canopy and Prairies

It is important to note that dense tree canopy may not be desirable in all settings, even in places with little or no tree cover. For example, most soils in Thurston County can support trees, but prairie soils are actively protected because of the unique habitats they support—

especially white oak savannahs. Oak trees play a special role in these prairie landscapes, but planting tree species that aren't associated with prairie habitat in these areas can harm them. Oaks grow slowly and often struggle to compete with faster-growing tree species like Douglas fir.

Figure 4: Tree Canopy on Prairie Soils

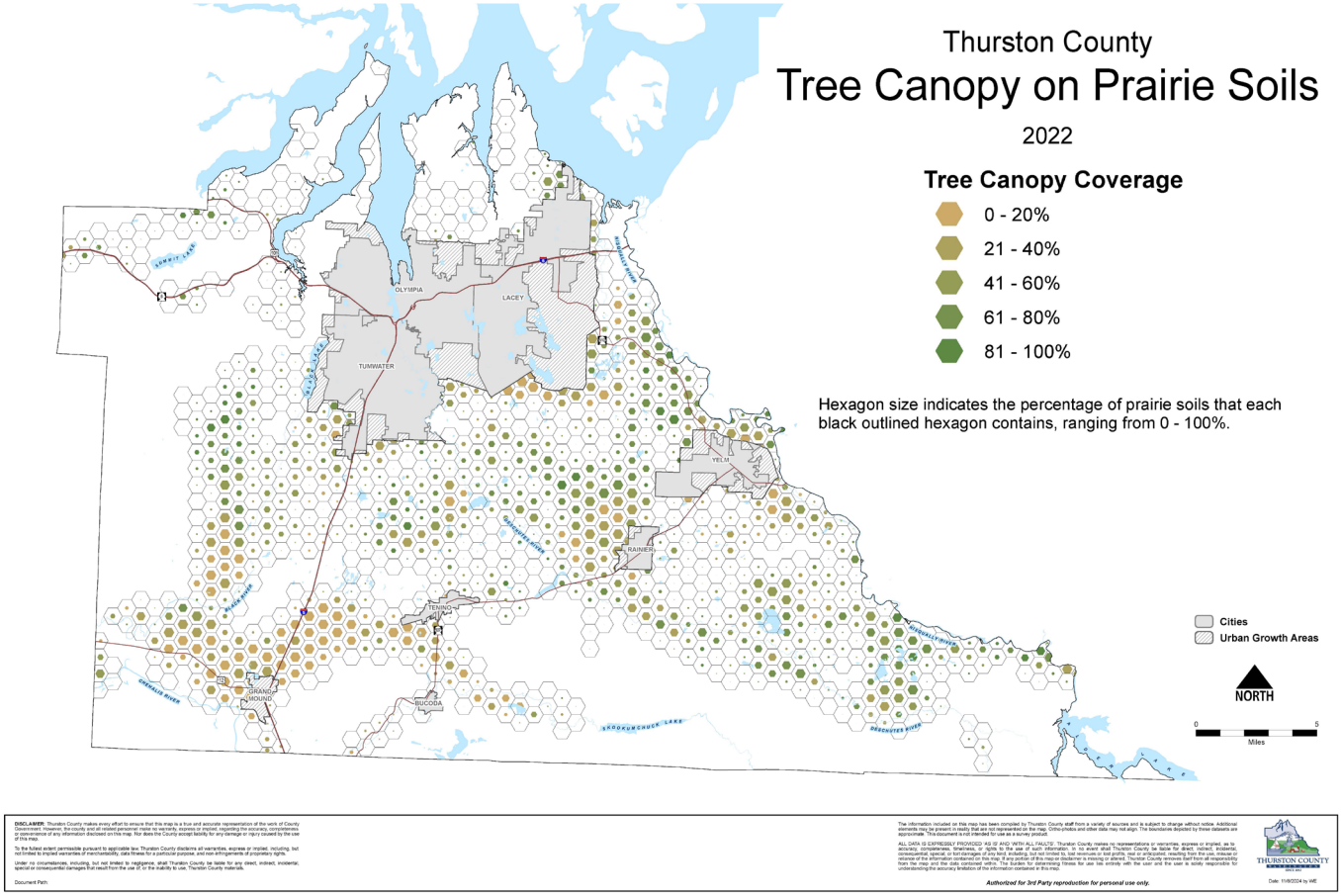


Figure 4. This map shows the extent of prairie soils (HCP data) and encroachment of trees demonstrated in percentages of tree canopy cover.

Prairie habitats are protected by both state and local regulations, and they hold deep cultural significance. Indigenous peoples have stewarded these lands since time immemorial, using traditional knowledge and practices to foster the health and resilience of prairie ecosystems. **Figure 4** maps prairie soils alongside possible tree canopy encroachment. The color of each hexagon represents the level of tree canopy coverage, while its size reflects the extent of prairie soils in that area. For example, a small green hexagon would indicate low prairie soil presence with high tree canopy, which is more ideal than a large green hexagon suggesting significant forest encroachment on valuable prairie habitat.

Figure 5 highlights the relationship between forests and prairies in Thurston County by showing restoration potential for both prairie habitat and tree canopy. This map reveals the gradual encroachment of forests into prairie lands over time—a change largely driven by the forced removal and loss of traditional Indigenous food systems and land stewardship practices. According to *Salish Magazine* and research by Storm and Shebitz (2006), Coast Salish peoples have long cared for South Sound oak prairies using controlled burns and other traditional land management, food cultivation, and harvesting practices. Without this careful

management, fast-growing non-prairie woody plant species like Douglas fir have moved in, displacing native prairie plants and trees. While prairie restoration may sometimes require reducing tree cover, it doesn't mean losing ecological value. Prairies are vibrant, biodiverse habitats that support many threatened and endangered species of plants, animals, and invertebrates. Prairie vegetation systems also have the potential to sequester carbon from the atmosphere. Because sequestration happens in the root systems, this is a kind of carbon sequestration that is particularly resilient to fires.

Figure 5: Potential Tree Canopy and Prairie Soil Restoration

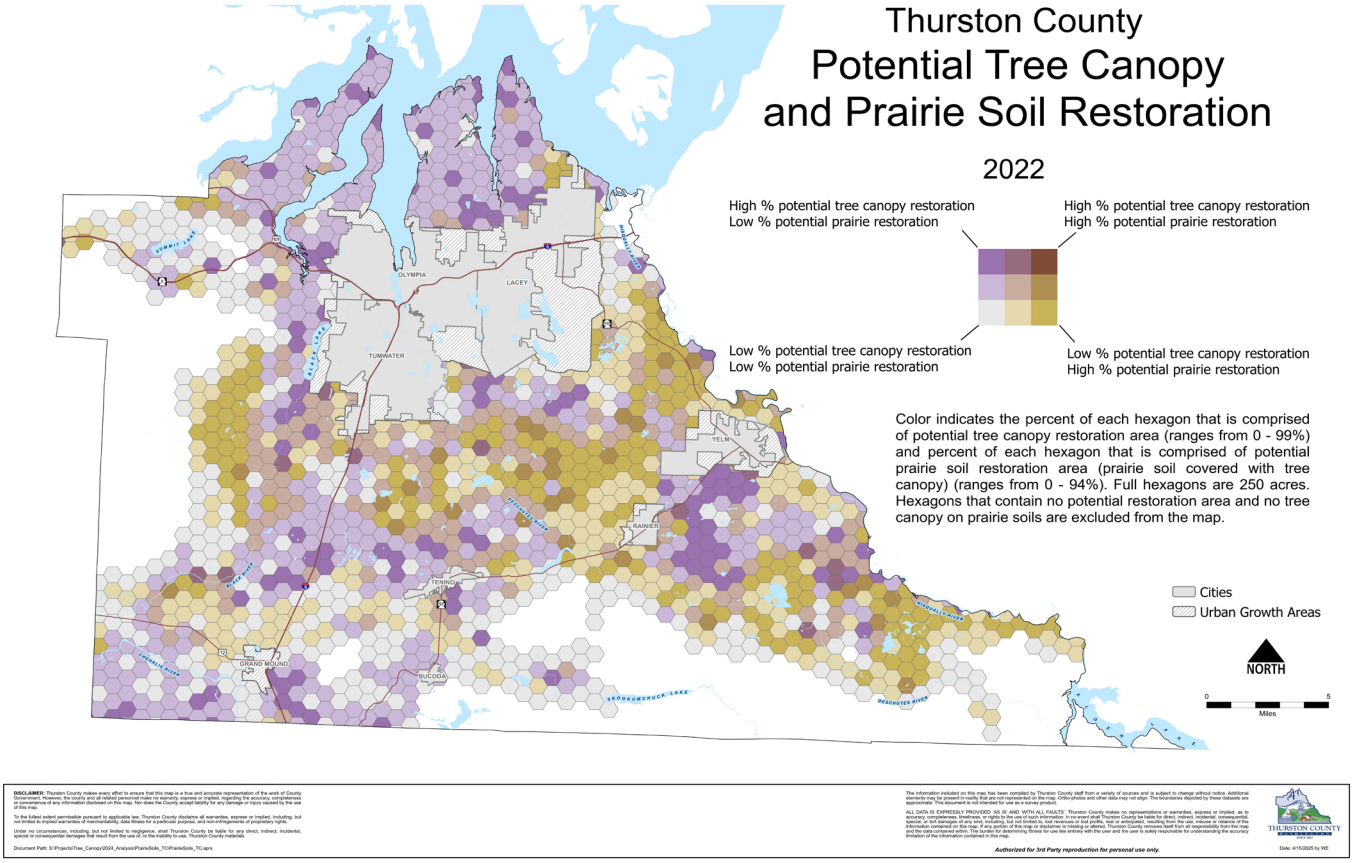


Figure 5. This map shows areas with tree canopy restoration potential compared to areas with prairie habitat restoration potential.

Environmental Factors (WRIAs and Critical Areas)

Watersheds

Watersheds are areas of land where all water drains into a common basin—like a river, lake, or stream. The amount of tree cover in a watershed is key to the function of that system. Converting forest land to other uses can impact both the quantity and quality of the water downstream. In fact, tree canopy and riparian canopy (trees growing along streams and rivers) are the two strongest indicators of stream health at a watershed scale. (DeGasperi et. al. 2018) Trees can also improve soil stability by reducing erosion and the risk of landslides. For this reason, this study investigated the tree canopy in all Water Resource Inventory Areas (WRIAs) within Thurston County.

Forests that border riparian areas like rivers, lakes, and streams play vital ecological roles, influencing water quality, regulating water temperature, and supporting habitat for a wide

range of species. Shade from trees in riparian forests helps cool streams, which is especially important for reducing the impacts of climate change on aquatic wildlife. Riparian forests also contribute large woody debris like fallen branches or trees that help regulate stream temperature, create deeper and more varied pools, and shape more complex stream channels. Together, these functions enhance the quality and diversity of aquatic habitat. (Quinn et. al. 2018)

Mapping tree canopy by WRIA helps identify areas where conserving and maintaining tree canopy can make the most difference. Further analysis to determine the impacts of forest management, policies, and regulations on local watersheds would add even more value. When combined with the water quality monitoring data already collected by Thurston County, this information can offer deeper insights into current challenges related to water quality and availability.

Figure 6: Water Resource Inventory Area Tree Canopy

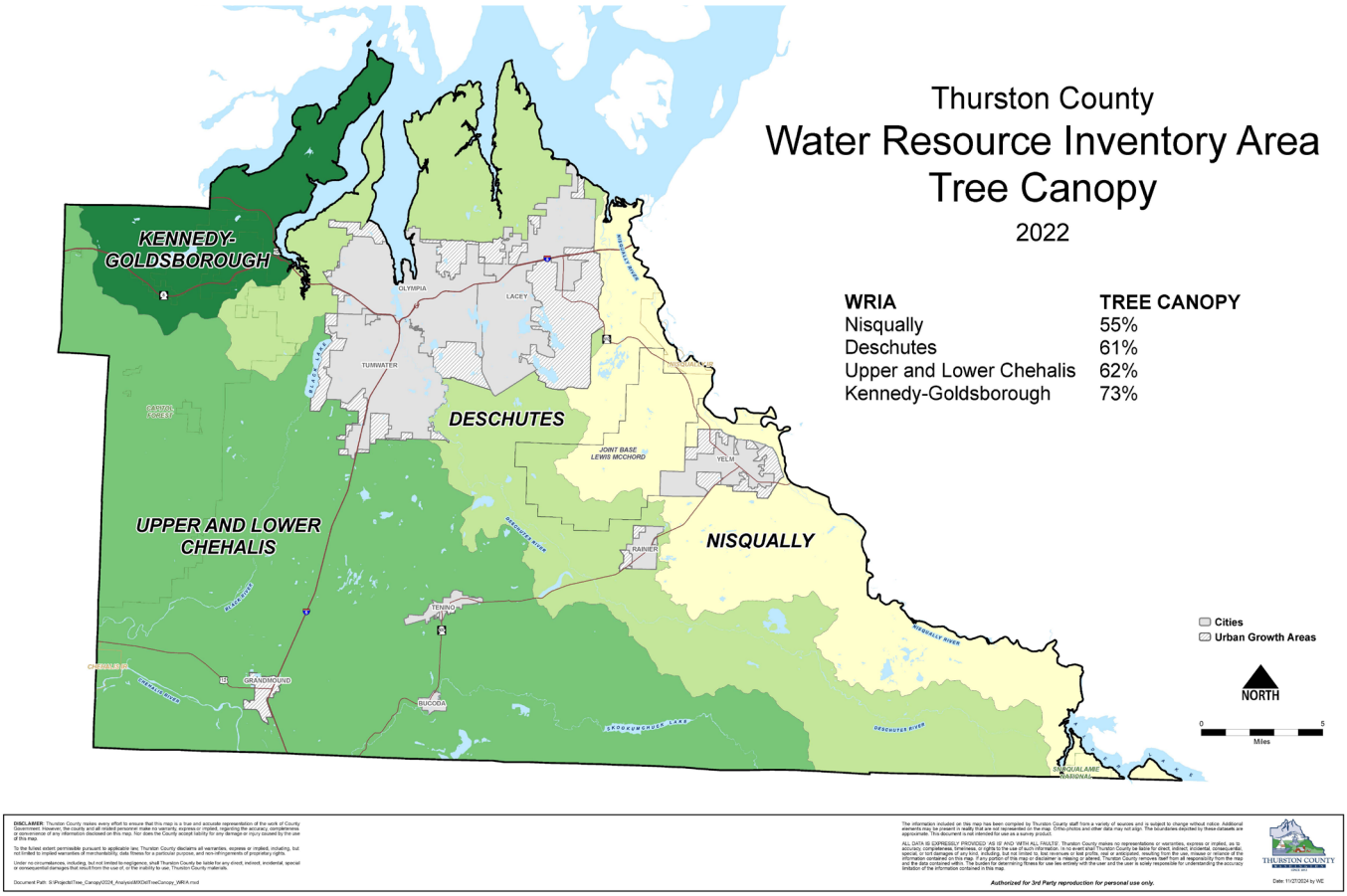


Figure 6. This map shows the tree canopy extent by Water Resource Inventory Area (WRIA), or watershed. Basins documented in this study include Totten Inlet, Eld Inlet, Henderson Inlet, West Capitol Forest, Black River, Chehalis River, Skookumchuck River, Budd Inlet/Deschutes River, and the Nisqually River.

Critical Areas

Forested lands in Thurston County benefit from protections that are often built into regulations for critical areas and shorelines. As part of this report, mapped wetlands, Shoreline Master Program (SMP) jurisdiction, Washington Department of Fish and Wildlife Priority Habitats Species areas, FEMA 100-year flood zones, and slopes greater than 15% were combined as a

a single layer to represent critical areas in unincorporated Thurston County. The relationship between these areas and tree canopy is shown in **Table 5**. These critical area designations provide some protections against timber harvest and forest land conversion.

Table 5: Tree Canopy in Protected Environmental Areas

Critical Areas Protection	Total Acres	Tree Canopy Acres	% Critical Areas Tree Canopy	% County Tree Canopy
Wetlands, Current SMP, Priority Habitat Species Areas, 100 Year Flood Zones, Slopes >15%	286,900	188,000	66%	75%

Table 5. This table provides the total number of acres, extent of tree canopy, and percent of tree canopy in areas protected by other environmental regulations. Numbers are rounded for clarity and legibility, see appendices for exact numbers.

Beyond the protections provided by critical areas regulations, forest conversion in Thurston County is also managed though the Forest Conversion Ordinance (TCC Chapter 17.25). When forests are converted, the activity must comply with this ordinance—a landowner can either submit a Conversion Option Harvest Plan or apply for a Class-IV Forest Practices permit. Both options must also meet the County's Tree Conservation Practices (TCC Chapter 17.27). These potions of the County code require property owners to plan for tree retention and meet replanting targets when forests are converted. To encourage landowners to keep undeveloped resources lands with high conservation value, the County also offers an incentive through the Open Space Tax Program. This program provides property tax relief for those choosing to maintain undeveloped land with significant conservation value.

Uses, Limitations, and Future Considerations

Timber harvest cycles make it challenging to accurately track tree canopy on areas used for long-term forestry. Since long term forestry areas are regularly harvested and replanted, it can be hard to get an accurate snapshot of the tree canopy at any given time. In this assessment, all vegetation under eight feet was classified as something other than tree canopy. Areas that were recently harvested will therefore show up in this category for several years, until the newly planted or regenerating trees grow tall enough to be counted as formal canopy. As a result, this category may represent more forest land than the data suggests.

This data should not be used to determine forest health, estimate carbon credit values, or guide parcel-level management decisions. The data is not scaled for those purposes and applying it that way could lead to unhelpful over-generalizations. The techniques used in this assessment, combined with detailed manual quality control, produced a dataset with at least 95% accuracy. Most of the remaining errors occurred in the land cover analysis. Because landscapes are constantly changing, there will always be some difference between the time aerial images are captured and when the final data is published.

This report can help guide long-range efforts to protect, restore, and manage forest health in Thurston County. The maps and tables shared here highlight areas that may be priorities for different types of land management and conservation work, supporting the rich mosaic of County ecosystems. This data may be useful in applying for conservation or restoration grants, shaping programs like the Thurston County Habitat Conservation Plan, and developing regulatory tools for local tree canopy conservation. It can also support efforts by regional governments, non-profits, and community groups, including projects focused on carbon sequestration planning and prairie restoration.

Looking ahead, this data may also be a useful resource for wildfire planning by helping identify where fire breaks or defensible spaces would be most effective. Understanding the connections between forests, prairies, and wildfire will be key as that work continues.

References

DeGasperi, C.L., R.W. Sheibley, B. Lubliner, C.A. Larson, K. Song, and L.S. Fore. 2018. Stormwater Action Monitoring Status and Trends Study of Puget Lowland *Ecoregion Streams: Evaluation of the First Year (2015) of Monitoring Data*. Prepared for Washington State Department of Ecology Stormwater Action Monitoring Program by King County in collaboration with Washington Department of Ecology, U.S. Geological Survey, and Puget Sound Partnership. Science and Technical Support Section, Water and Land Resources Division, Seattle, WA.

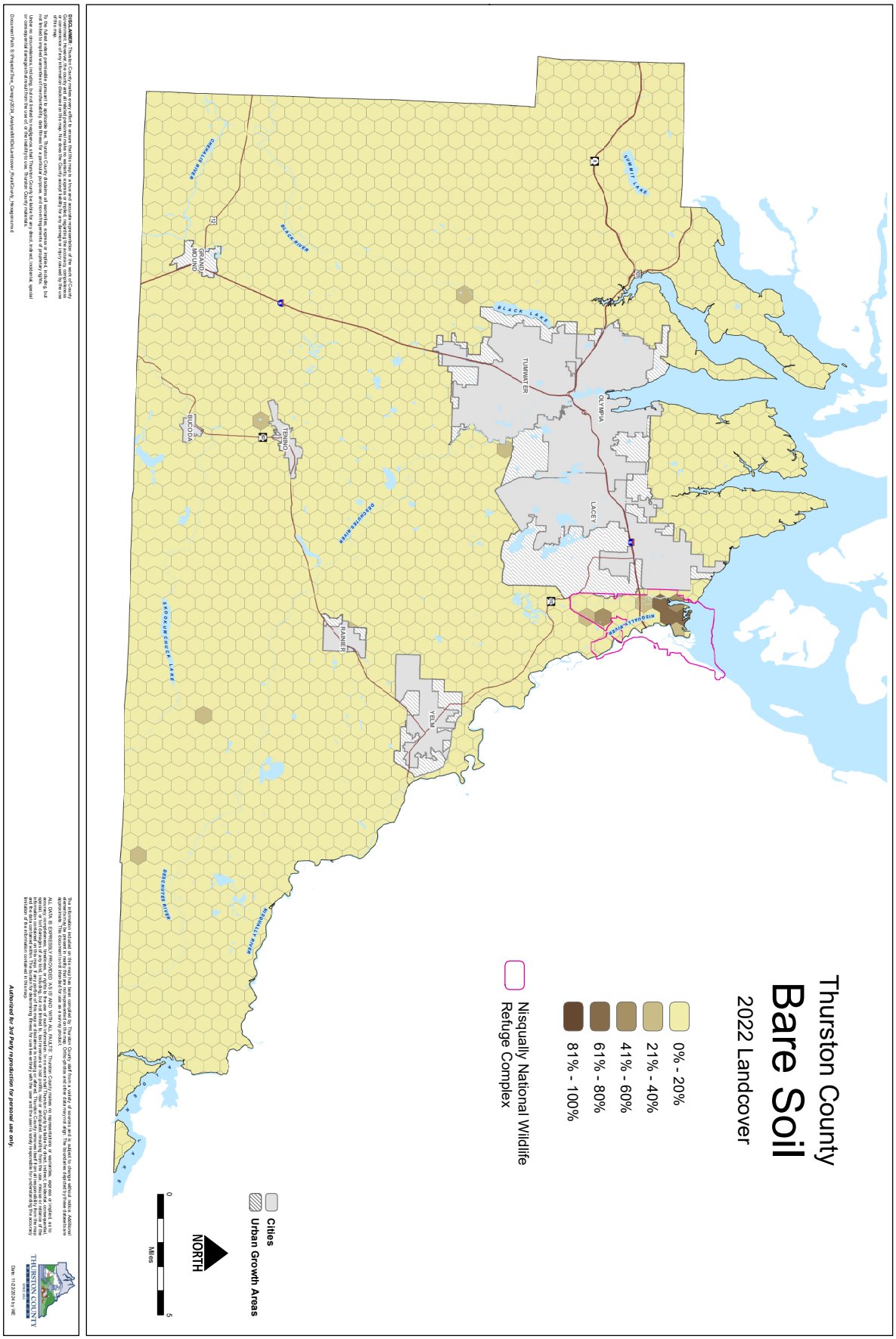
Hamman, S. Spring 2021. *Bringing Back the Riches of the Prairies.* Salish Magazine. https://salishmagazine.org/riches-of-the-prairies/#:~:text=Pacific%20Northwest%20prairies%20and%20oak,surface%20burning%20and%20regular%20harvests

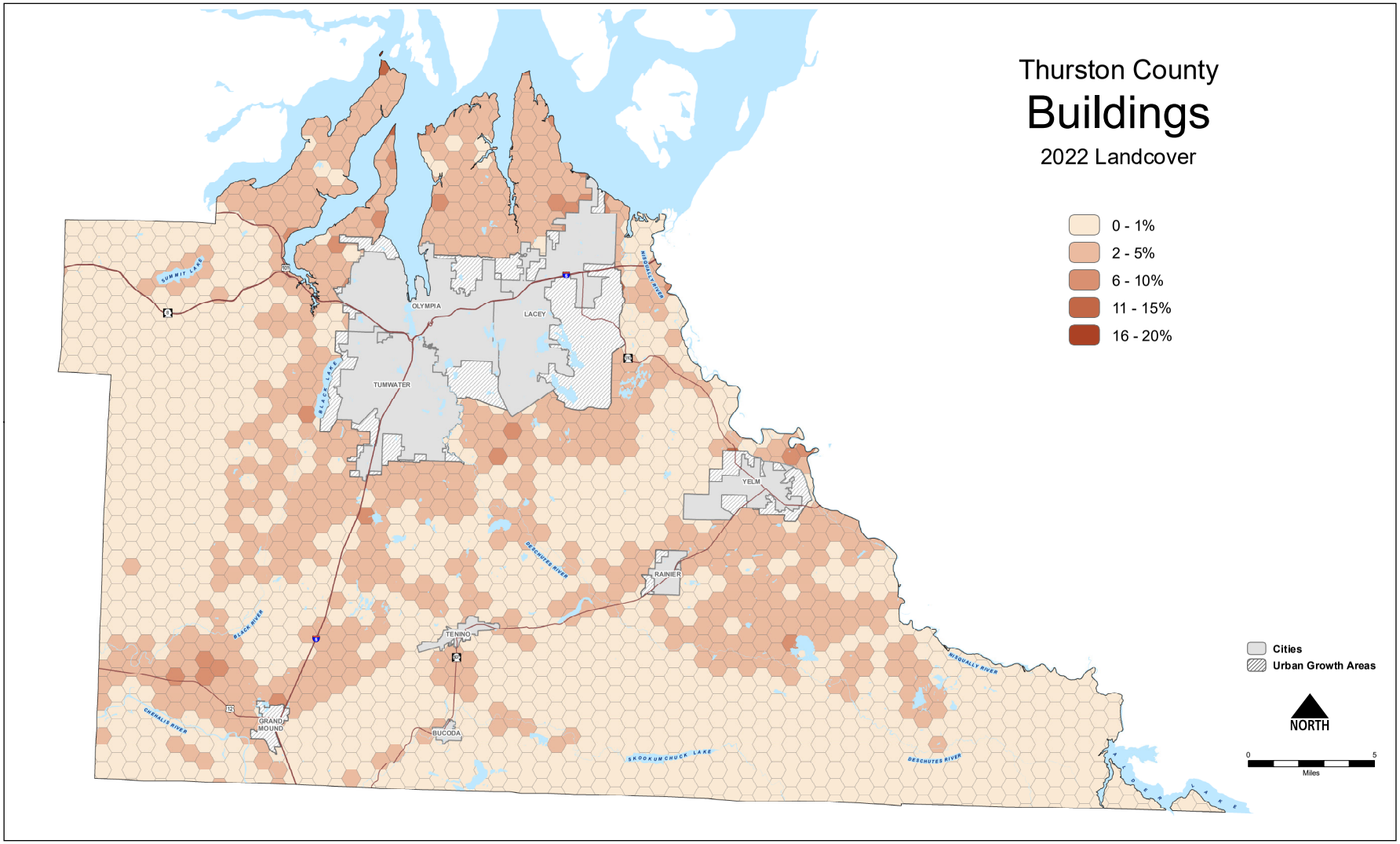
Larsen, E.M., and J.T. Morgan. 1998. *Management Recommendations for Washington's Priority Habitats: Oregon White Oak Woodlands.* Washington Department of Fish and Wildlife, Olympia, WA. 37 pp.

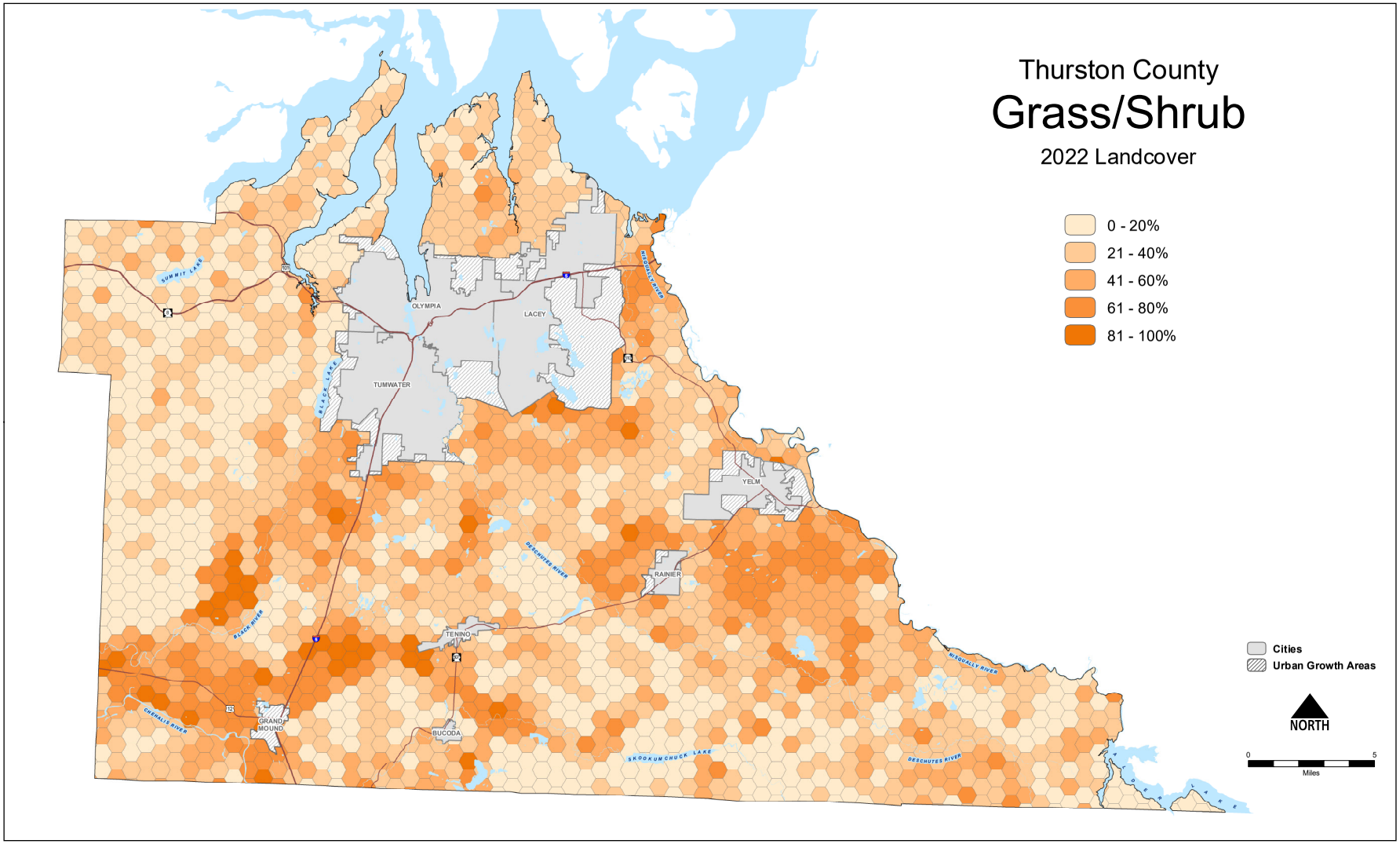
Quinn, T., G.F. Wilhere, and K.L. Krueger, technical editors. 2020. *Riparian Ecosystems, Volume 1: Science Synthesis and Management Implications.* Habitat Program, Washington Department of Fish and Wildlife, Olympia, WA.

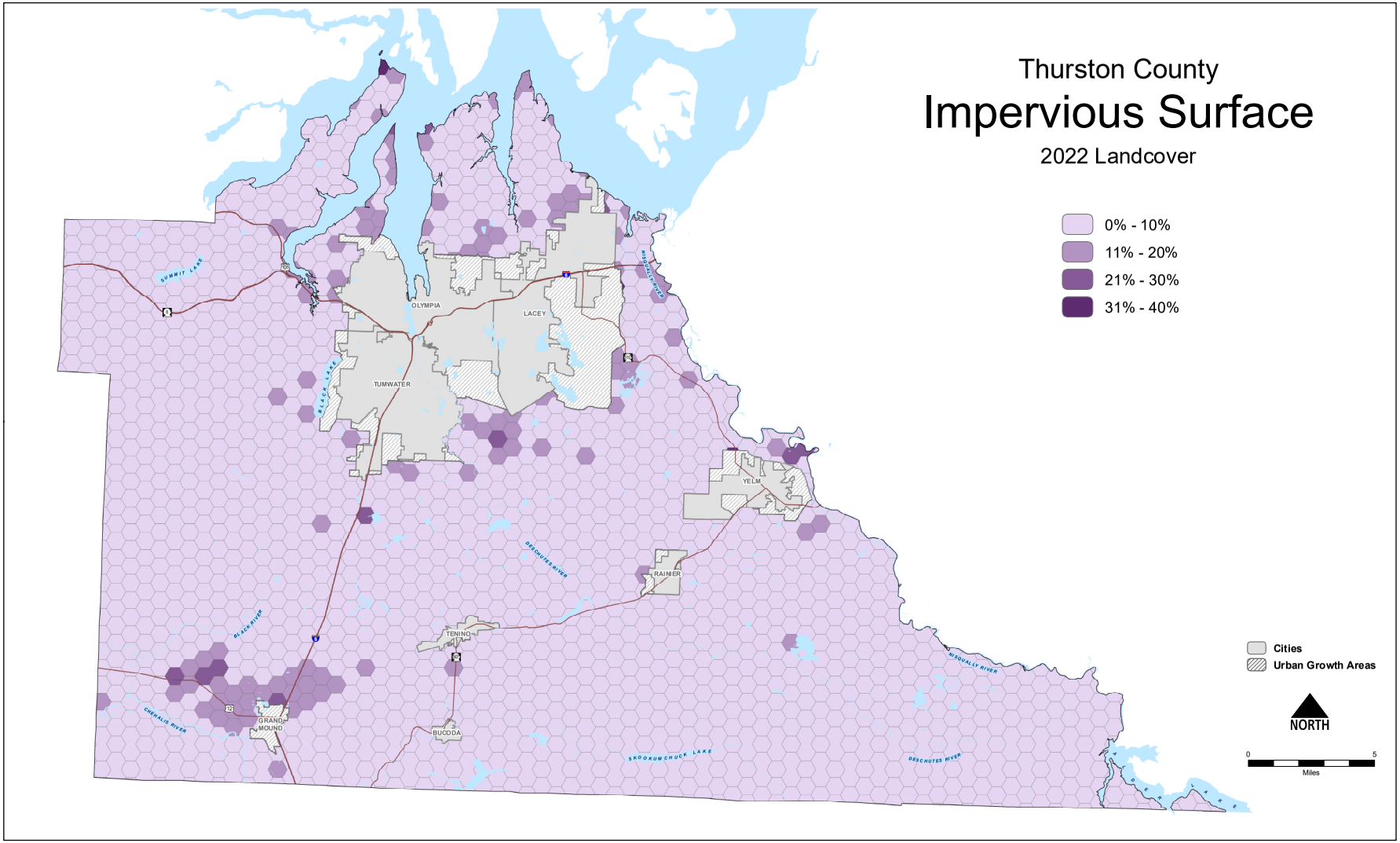
Storm, L., & D. Shebitz, n.d. E*valuating the purpose, extent, and ecological restoration applications of Indigenous burning practices in southwestern Washington.* Ecological Restoration, North America, 24(4), 256–268. https://doi.org/10.3368/er.24.4.256

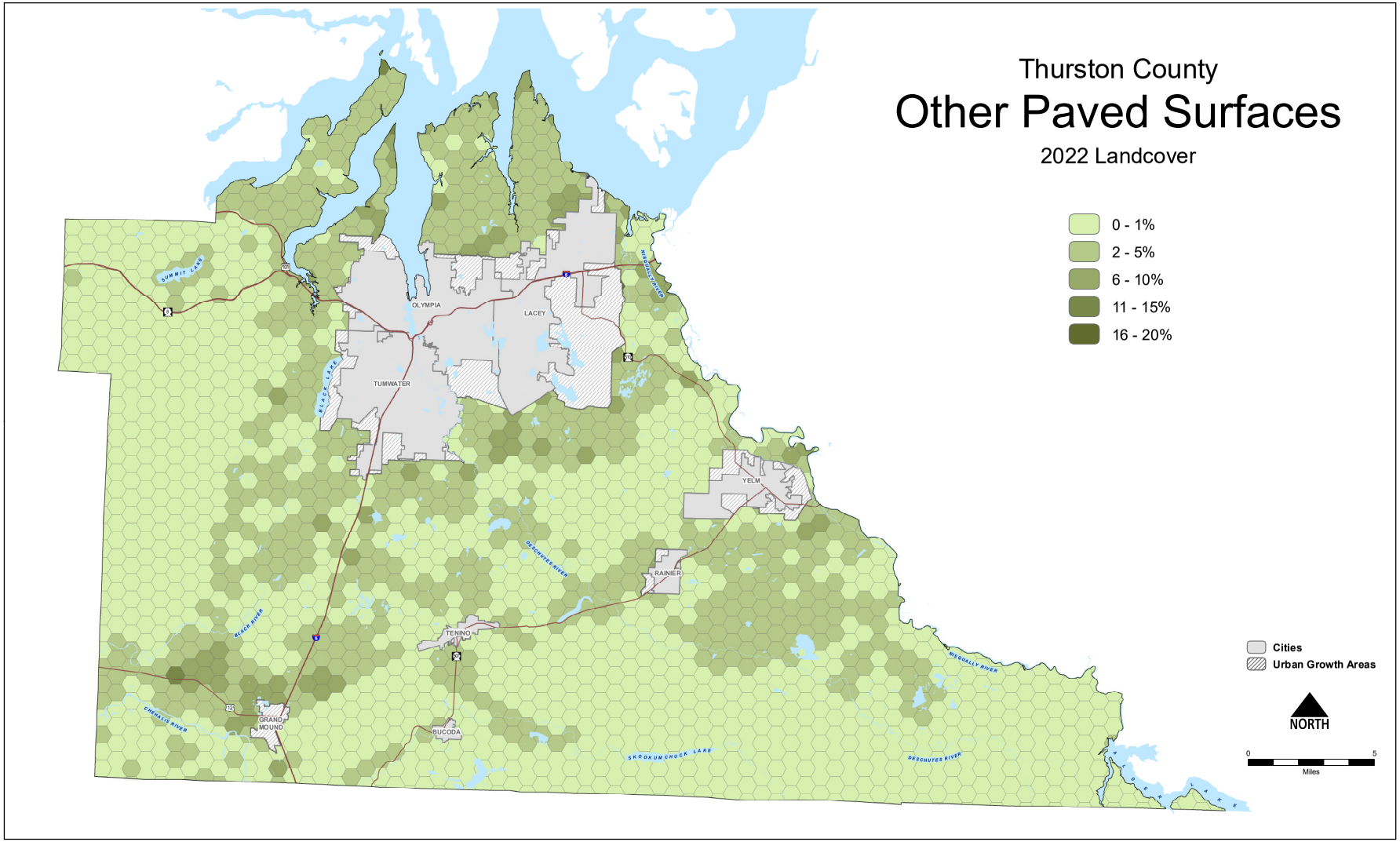
Appendix A: Maps

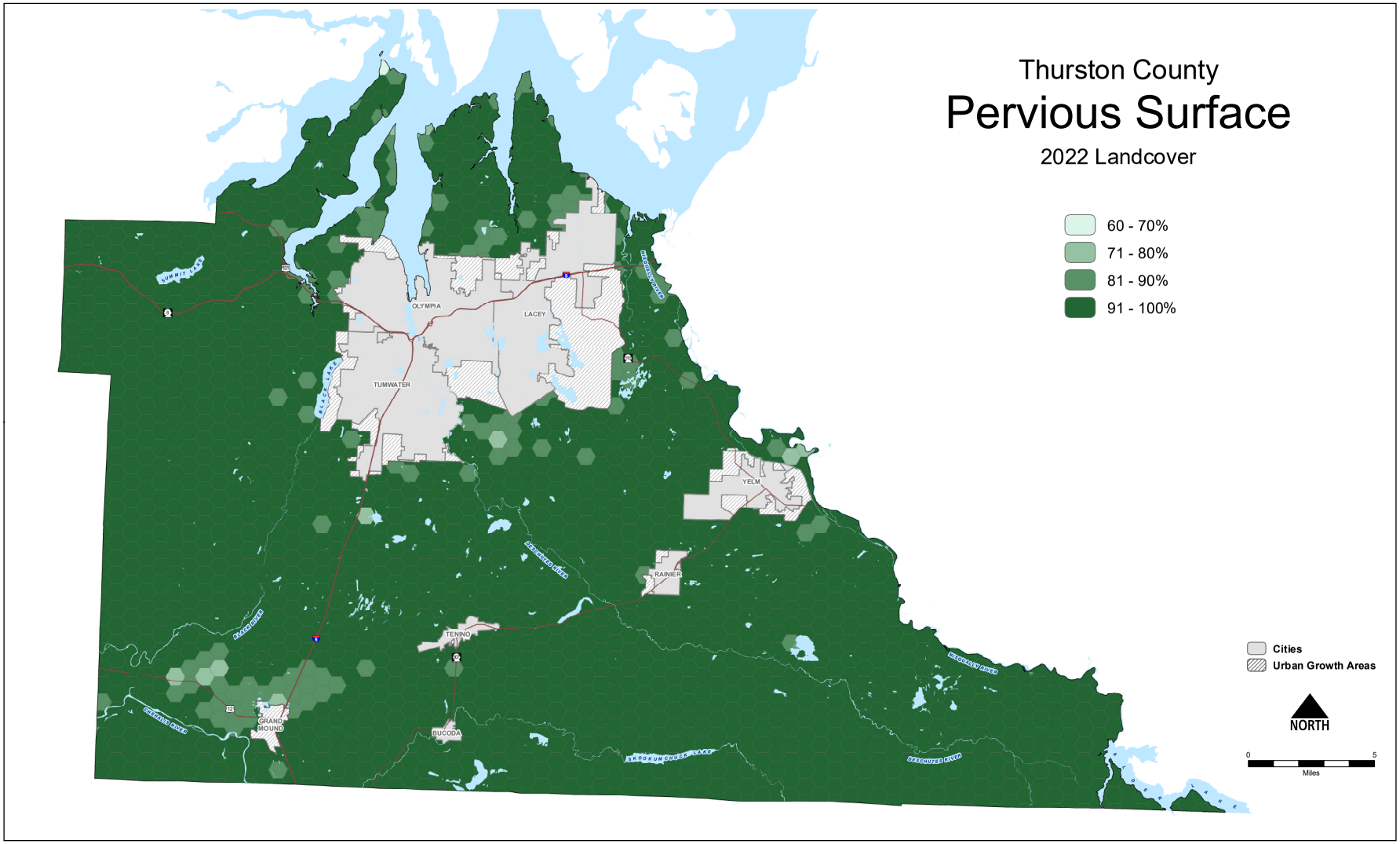


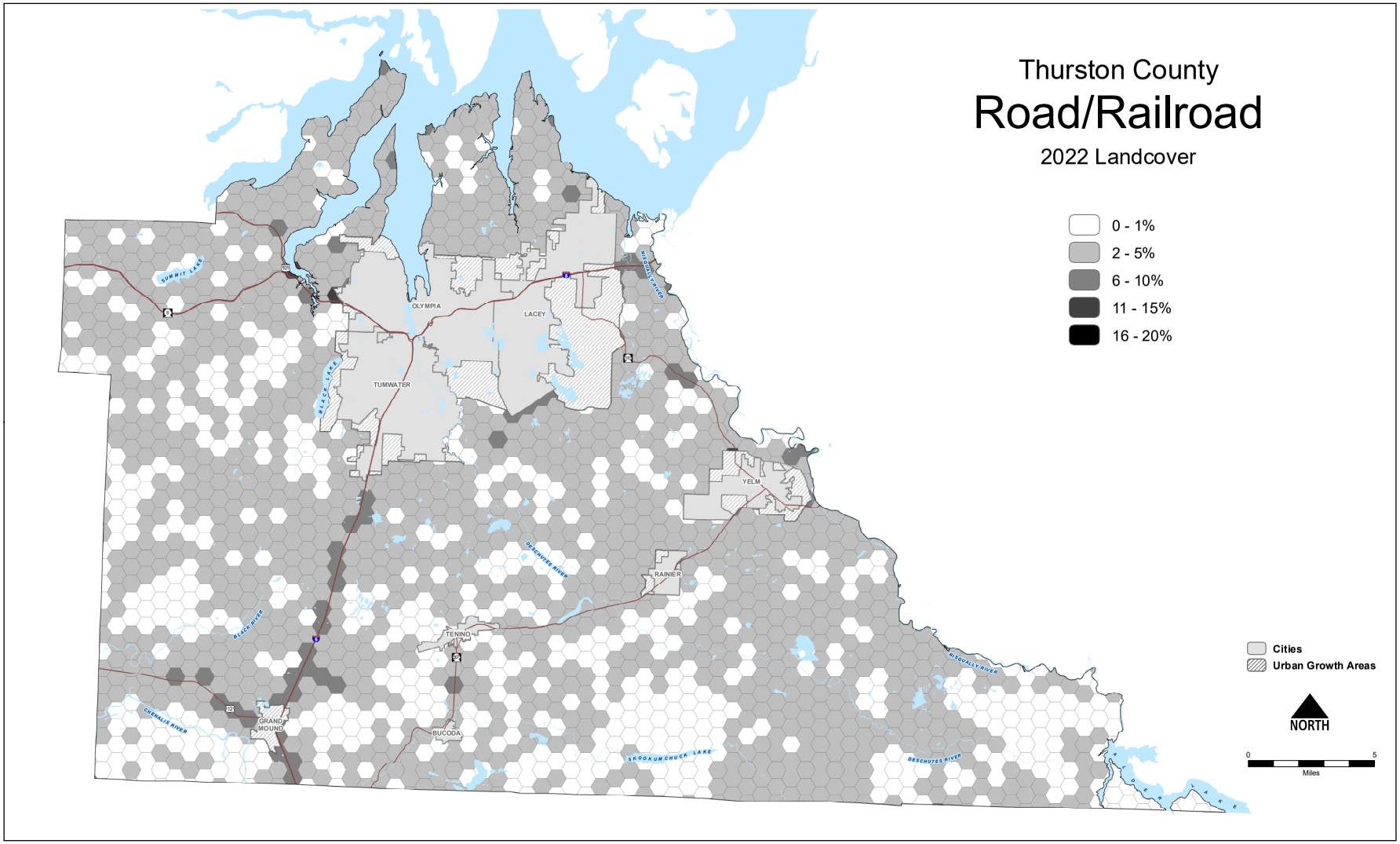


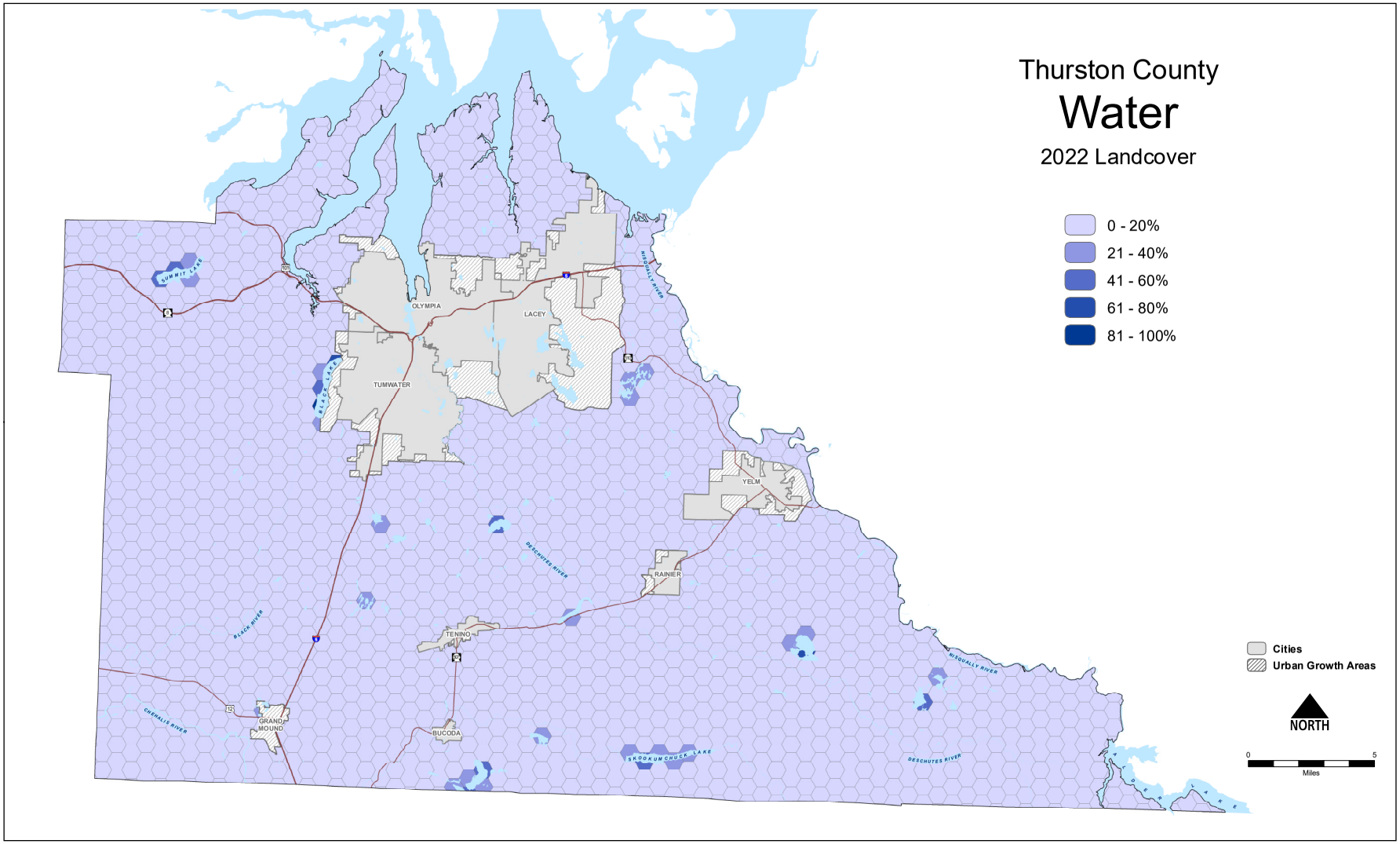


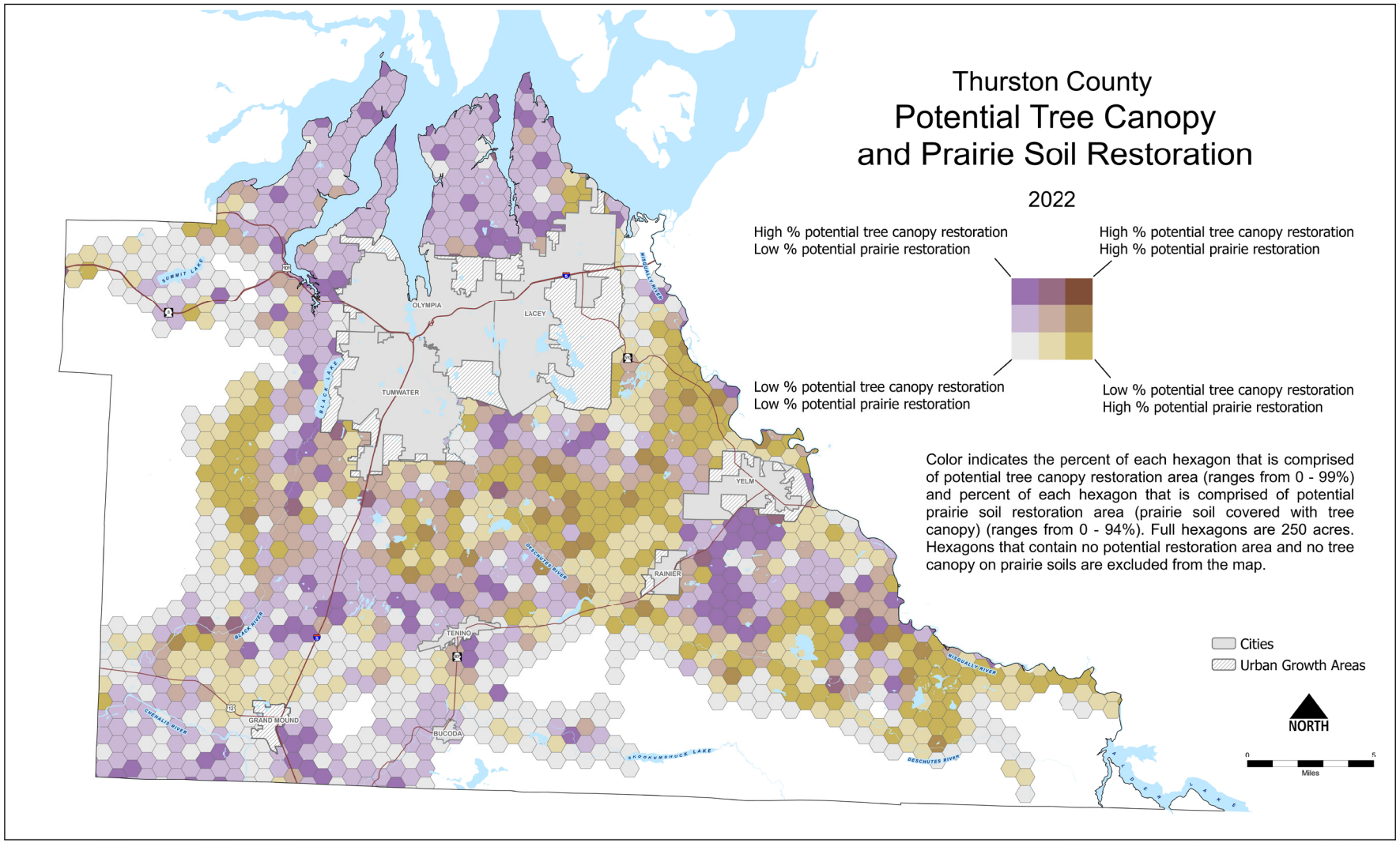


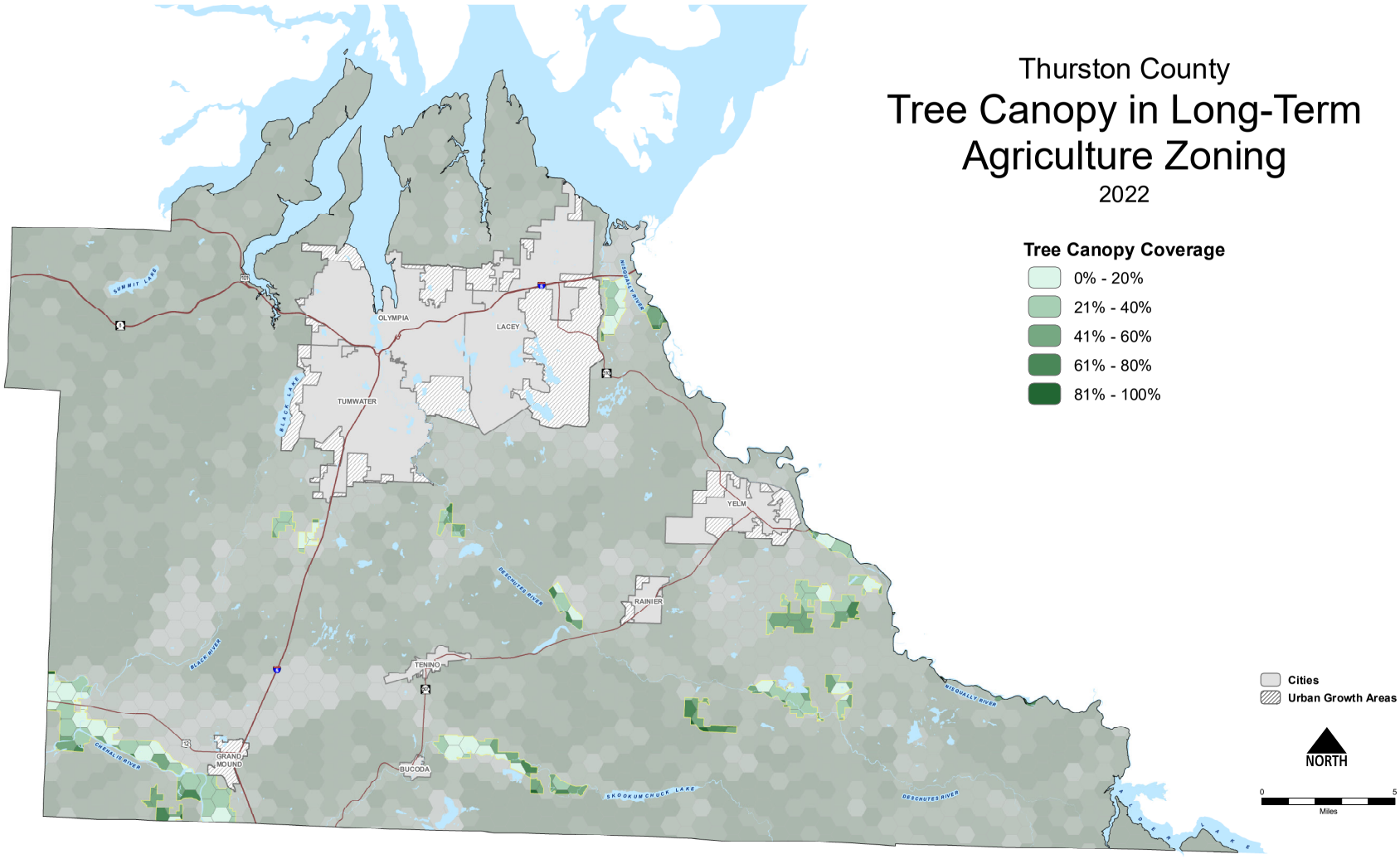


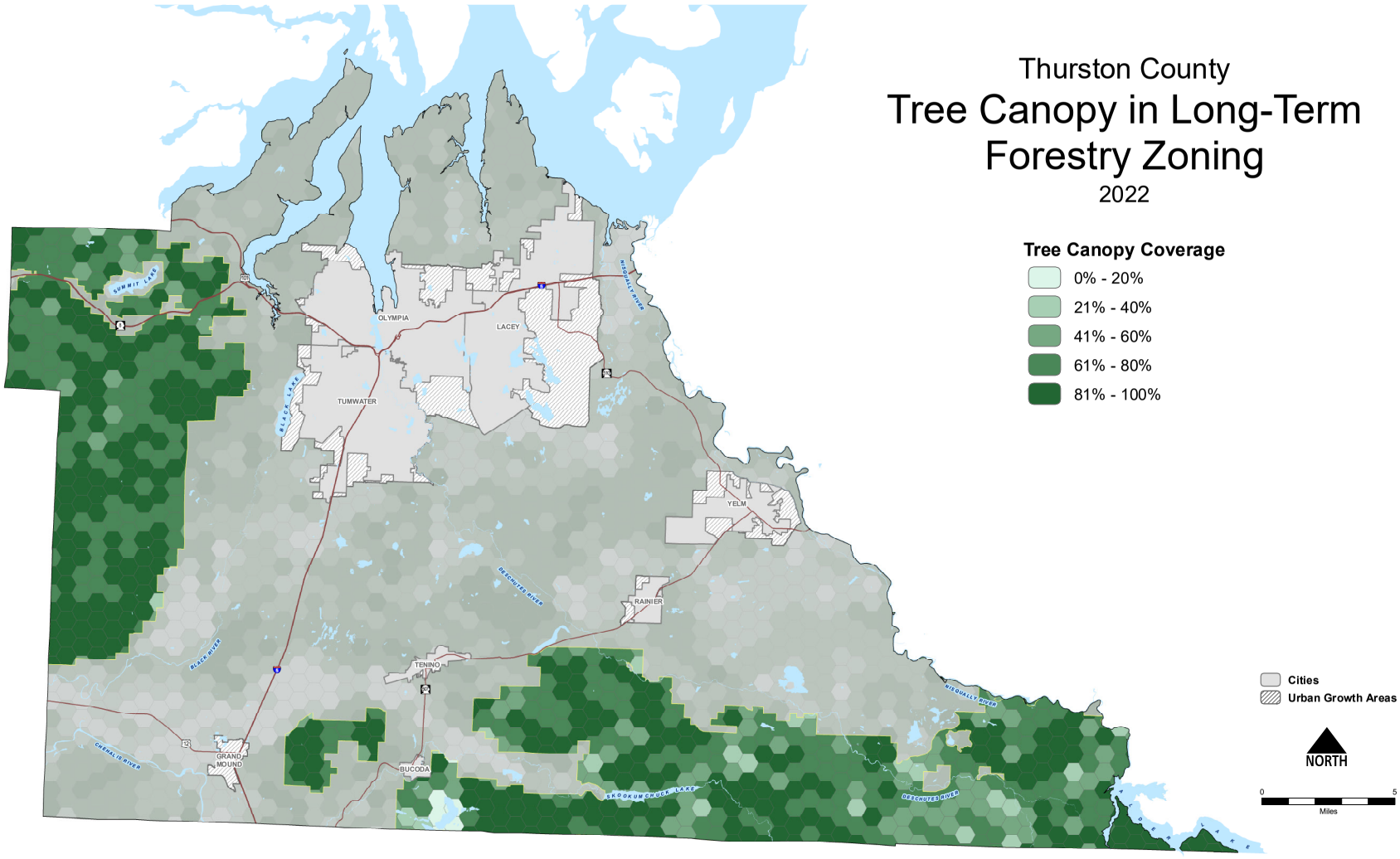


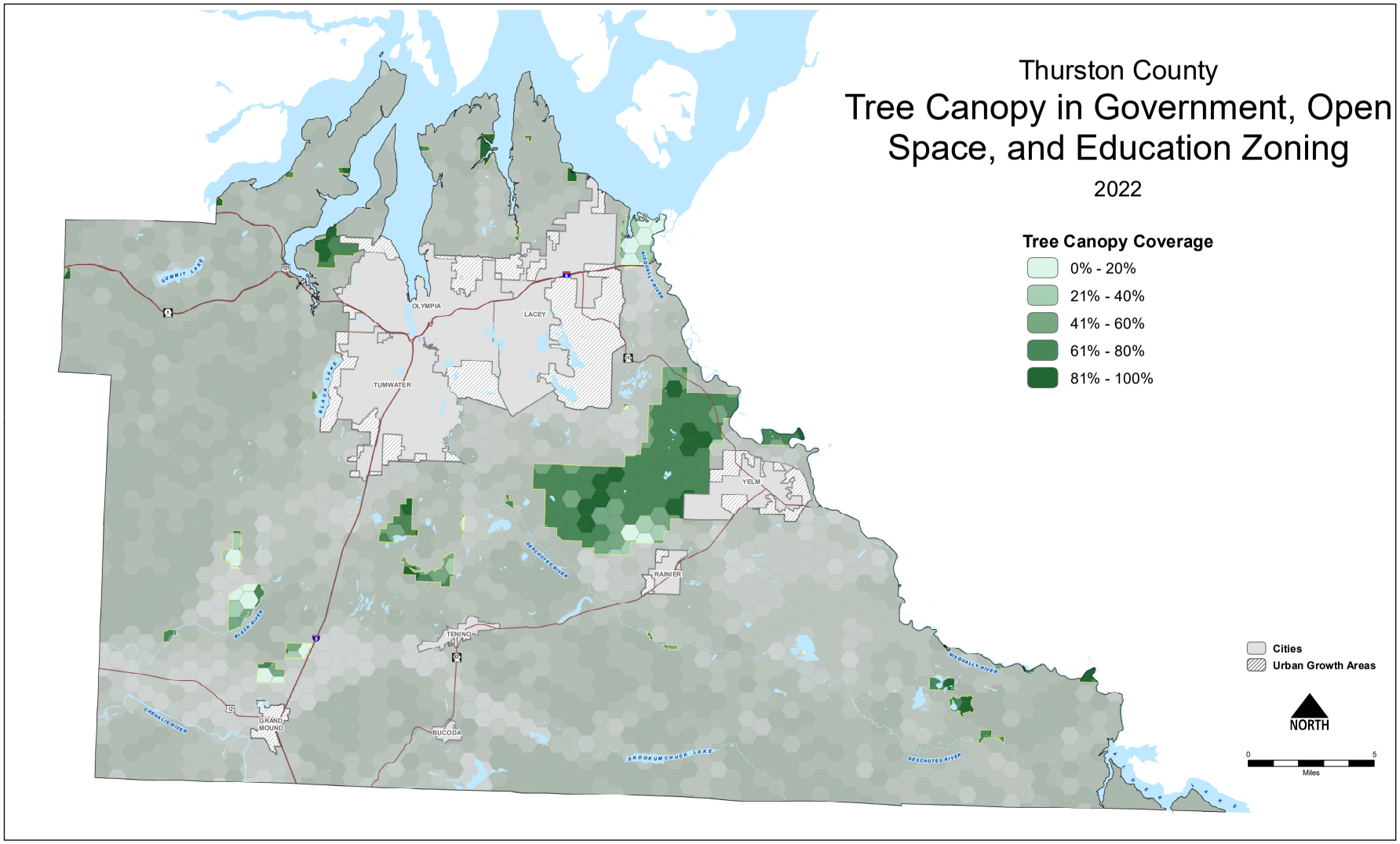


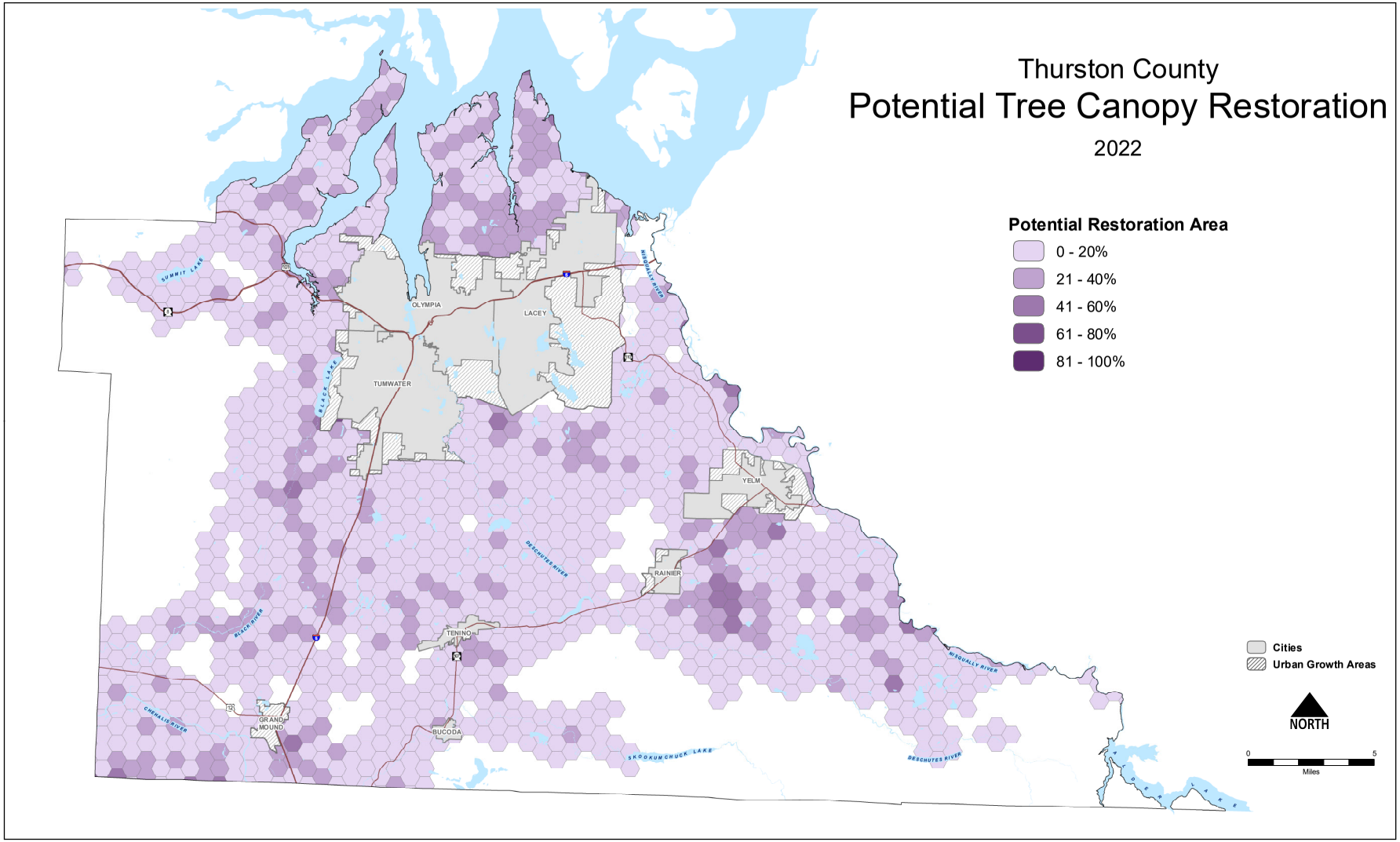


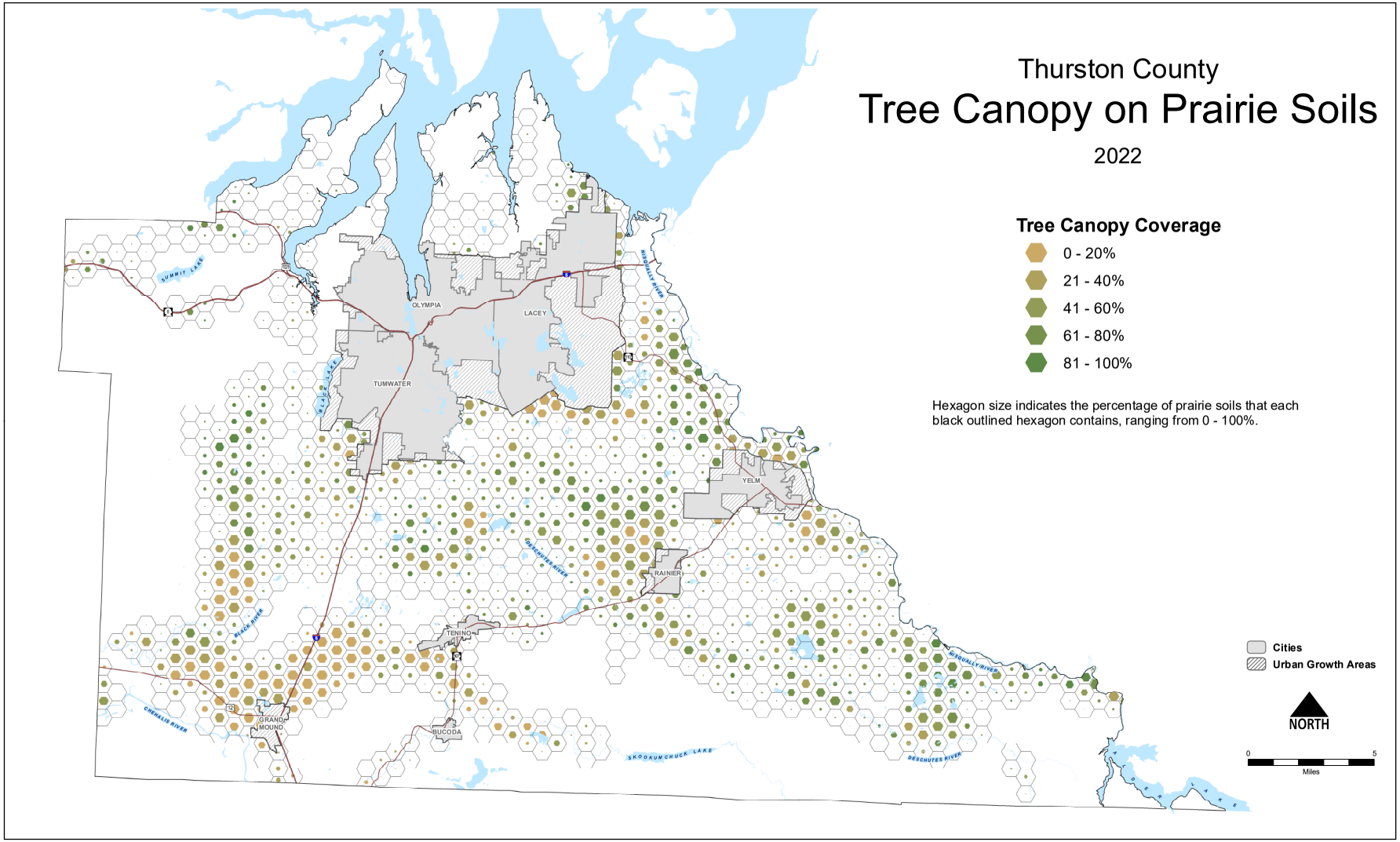


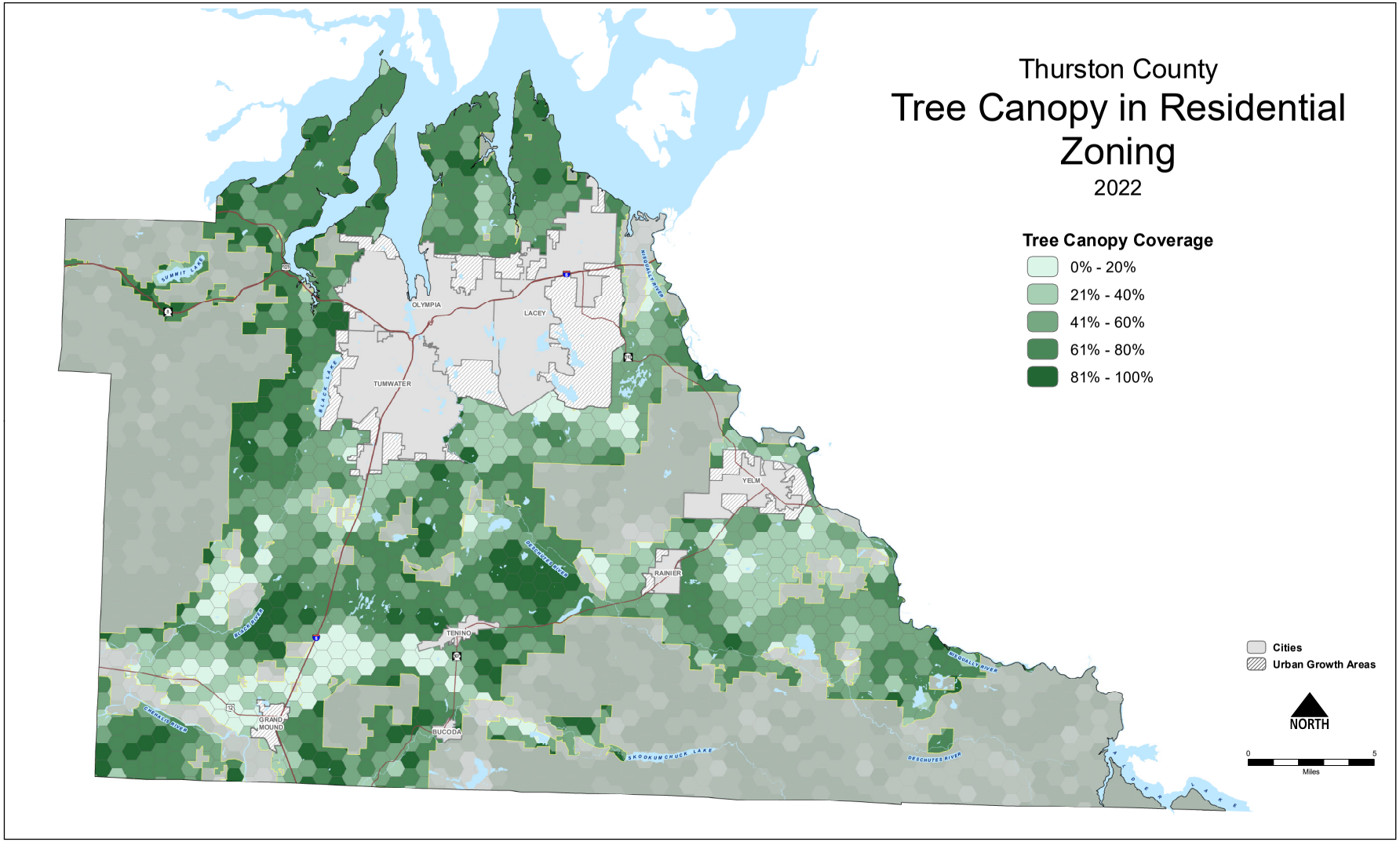


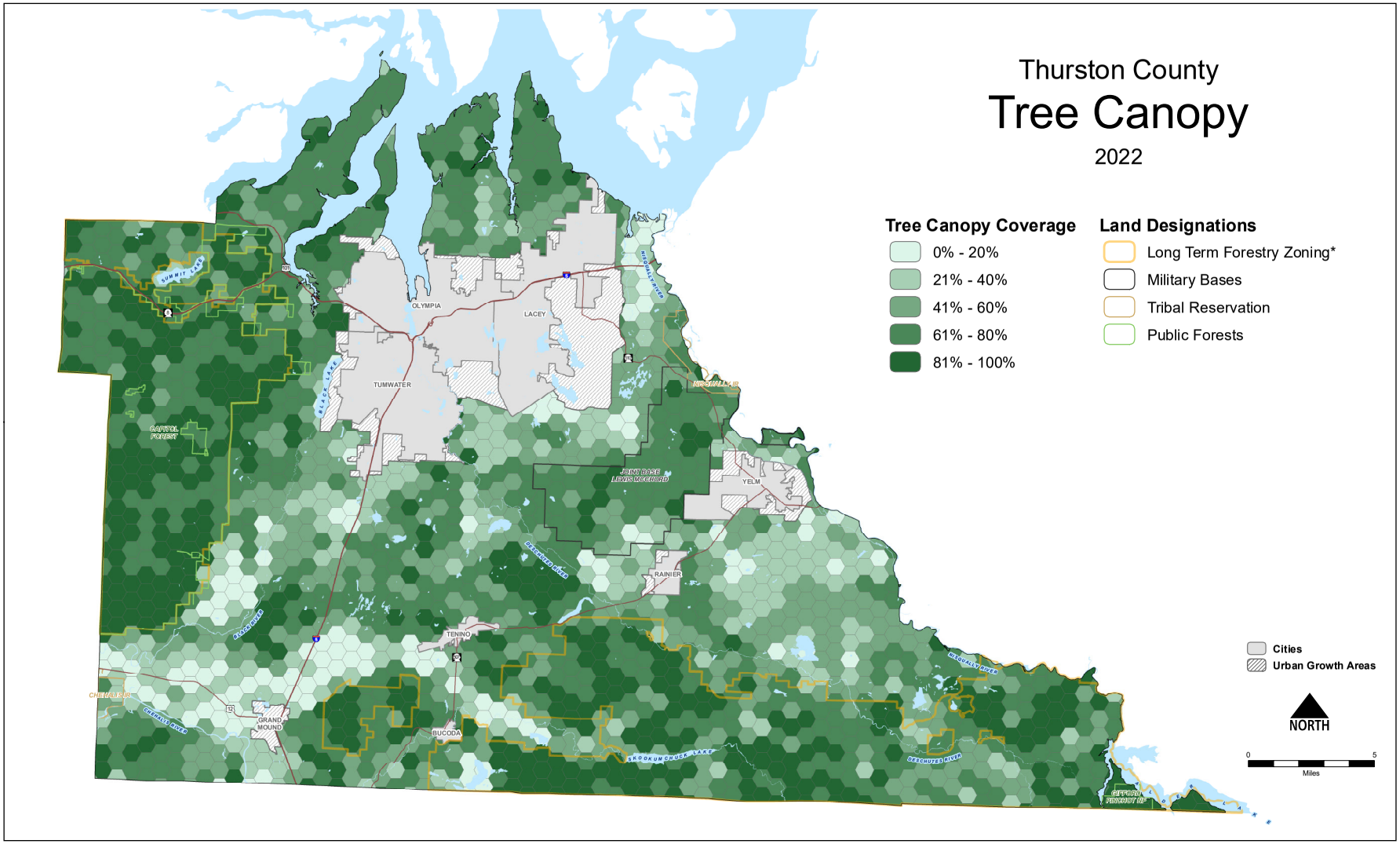


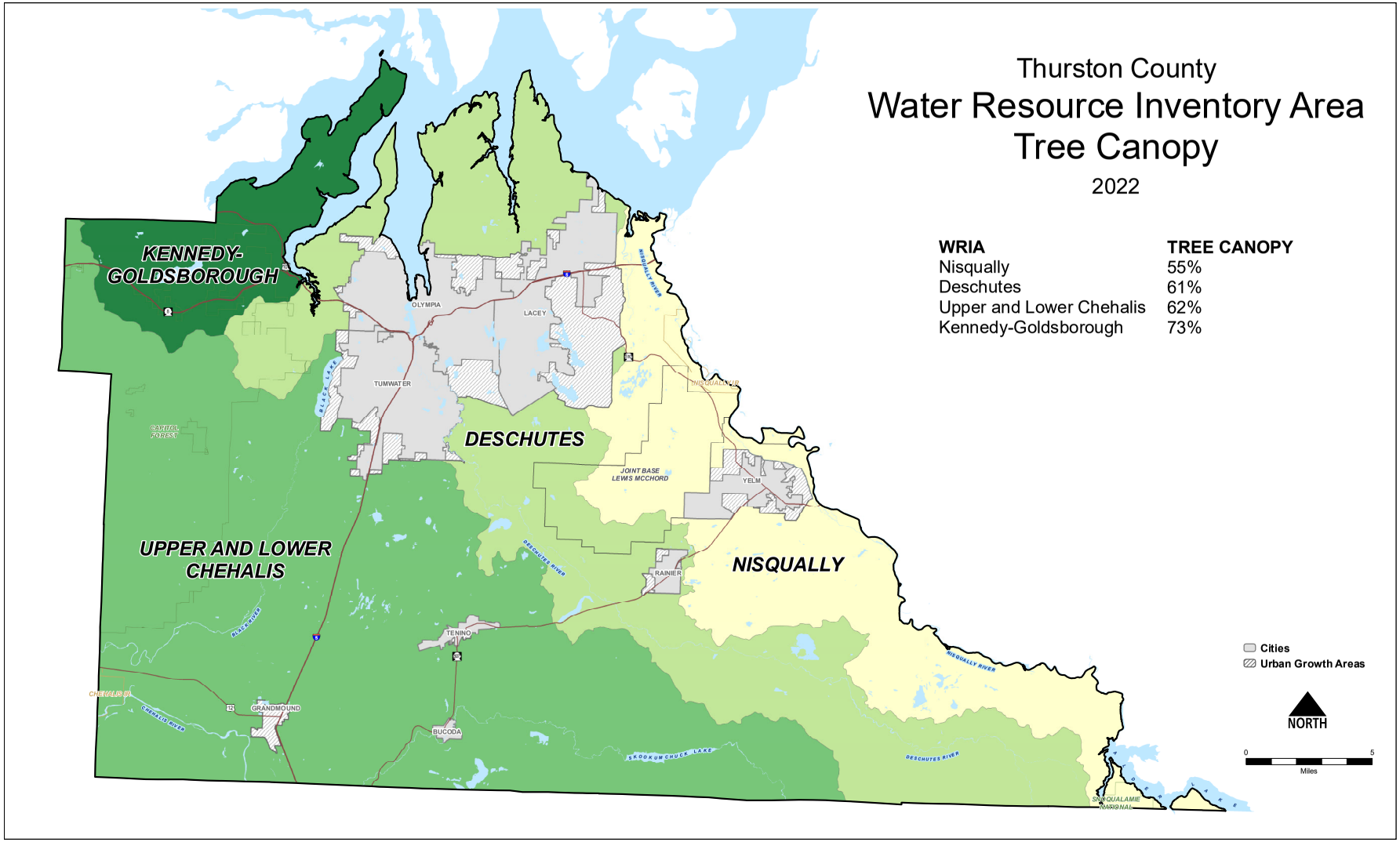












Appendix B: Workflow Documentation

2022 Tree Canopy Workflow Documentation

Last Updated on 10/27/2025 by WE

Consultant's Methodology

The figures provided by the consultant are based off a high resolution landcover raster data layer. This data layer was created using 2021 LiDAR data and 2021 NAIP imagery. Each cell in the layer is assigned a landcover type. All cells designated as "tree canopy" in a particular extent of interest were summed and divided by the total number of cells in the extent of interest, resulting in the percent of the extent that is comprised of tree canopy. The consultant used a "top-down" approach, so if tree canopy appeared above another landcover type (such as a building), the cell was assigned the value of "tree canopy."

Additional Analysis Methodology

The consultant used automated techniques to create a spatial data layer of "Tree Objects," which are the approximated delineation of a tree's branches and leaves derived from LiDAR data.

For tree canopy acreage calculations beyond what the consultant provided, the GIS Analyst "clipped" the Tree Objects data to the extent of interest (i.e., the extent of interest acts as a cookie cutter), calculated the total acres of Tree Objects in the extent of interest, and divided that number by the total area in acres of the extent of interest to derive the percent of the extent of interest that is composed of tree canopy.

Maps

% Tree Canopy in County

- This map uses data provided by the consultant with no additional analysis.

% Landcover Series

- These maps use data provided by the consultant with no additional analysis.

% Tree Canopy by Watershed

- This map uses data provided by the consultant with no additional analysis. Percent tree canopy for each watershed includes cities.
- Calculated % of the current SMP that is within City boundaries.
    - Result: 8.5%

Potential Tree Canopy Restoration

- Tree canopy data: This map uses data provided by the consultant with no additional analysis.

- Prairie Soils data: The Prairie Soils layer is a subset of the USDA NRCS soils data created September 2009.
- Estimated Agriculture Activities data: The Estimated Agriculture Activities layer is the 2023 Voluntary Stewardship Program (VSP) baseline layer:

  > The Voluntary Stewardship Program (VSP) baseline data layer was created by identifying parcels that are estimated to have agricultural activities using the following criteria: parcels that contain at least 7,200 square feet of 2022 WSDA crop data, parcels that have an Assessor's Use Code of '81' (Agriculture, not classified under current use law) or '83' (Agriculture classified under current use chapter), and state and/or federally owned parcels that are under contract for haying/grazing. The baseline layer excludes areas that are not in Thurston County jurisdiction, including Cities, Tribal reservations, military installations, and any parks and County or State-Owned conservation properties.

Tables

% Tree Canopy by Public/Private Land Ownership

- Excludes Cities
- This table shows a summary of the total acres of tree objects by various extents within the County: public lands, Right-of-Way, private lands, UGAs, County with UGAs, and County without UGAs.
- Public Lands: Public lands were identified the following methods:
  1) Included parcels from TRPC's land use data with the following land use codes:

     11.1 Undeveloped land: Government
     2.1.2 Parks, Preserves and Open Space: State Parks
     2.1.3 Parks, Preserves and Open Space: Local Parks
     2.4 Parks, Preserves and Open Space: Natural Areas and Preserves (public)
     3.2 Natural Resources: Forestry (public)
     5.2 Government/Institutional: Federal – Civilian
     5.4 Government/Institutional: State
     5.4 Government/Institutional: Local
     5.7 Government/Institutional: Tribal

  2) Removed any parcels with an Owner Name that was a private citizen name where the parcel was not within a government land boundary.
  3) Used the following query on Thurston County Parcels to identify additional parcels that were not picked up by TRPC data and added them to the selected parcels above:

     OWNER_NAME IN('YELM COMMUNITY SCHOOLS' , 'WEST THURSTON REGIONAL FIRE AUTHORITY' , 'WASHINGTON-EVERGREEN STATE COLLEGE' , 'WASH ST UNIVERSITY' , 'WASH ST PARKS & REC COM' , 'WASH ST HISTORICAL SOCIET' , 'WASH-STATE PARKS & RECREATION' , 'WASH-STATE OF' , 'WASH-SCHOOL LAND' , 'WASH-PUBLIC LANDS' , 'WASH-PARKS DEPT' , 'WASH-PARKS COMMISSION' , 'WASH-GEN ADMN' , 'WASH-FOREST BOARD' , 'WASH-FISHERIES DEPT' , 'WASH-FISH & WILDLIFE SVC' , 'WASH-DEPT WILDLIFE' , 'WASH-DEPT OF TRANS' , 'WASH-DEPT OF NAT RES' , 'WASH-DEPT NAT RES' , 'WASH-DEPT FISH &

WILDLIFE' , 'WA STATE DNR' , 'WA STATE DEPT OF TRANSPORTATION' , 'WA STATE DEPARTMENT OF NATURAL RESOURCES' , 'WA HE LUT INDIAN SCHOOL' , 'WA DEPT OF TRANSPORTATION' , 'WA DEPT NATURAL RESOURCES' , 'WA DEPARTMENT OF FISH AND WILDLIFE' , 'WA-STATE OF' , 'WA-DEPT OF NATURAL RESOURCES' , 'USA TRUST FOR TRIBES OF THE CHEHALIS RES' , 'USA IN TRUST FOR THE CONFED. TRIBES OF CHEHALIS RES' , 'USA IN TRUST FOR NISQUALLY INDIAN TRIBE' , 'USA FISH & WILDLIFE SERVICE' , 'USA - IN TRUST SQUAXIN ISLAND TRIBE' , 'USA-TRUSTEE NISQUALLY INDIAN' , 'USA-TRUST THOMAS BROWN' , 'USA-TRUST FOR NISQUALLY INDIAN TRIBE' , 'USA-TRUST FOR NISQ IND TR' , 'USA-TRUST FOR MARTIN SAMPSON' , 'USA-TRUST FOR CHEHALIS TRIBE' , 'USA-TRUST-MARGARET IYALL' , 'USA-TRUST' , 'USA-FOREST SERVICE' , 'USA-FISH & WILDLIFE SERVICE' , 'USA-DEPT OF FISH & WILDLIFE' , 'USA-BUR OF SPORT FISHERIES' , 'USA-ARMY' , 'USA' , 'US TRUST FOR CHEHALIS TRIBE' , 'US FISH & WILDLIFE' , 'US DEPT OF FISH & WILDLIFE SERVICE' , 'UNITED STATES OF AMERICA IN TRUST FOR THE CONFEDERATED TRIBES OF THE CHEHALIS RESERVATION' , 'UNITED STATES OF AMERICA IN TRUST' , 'UNITED STATES OF AMERICA' , 'UNITED STATES FISH & WILDLIFE SERVICE' , 'TUMWATER SCHOOL DISTRICT #33' , 'TUMWATER SCHOOL DIST #33' , 'THURTON COUNTY FIRE PROTECTION DIST 9' , 'THURSTON, COUNTY OF - TAX TITLE' , 'THURSTON, COUNTY OF-WATER & WASTE MGMT' , 'THURSTON, COUNTY OF-ROADS' , 'THURSTON, COUNTY OF-PARKS' , 'THURSTON, COUNTY OF' , 'THURSTON, COUNTY' , 'THURSTON COUNTY WATER & WASTE MGT' , 'THURSTON COUNTY ROADS' , 'THURSTON COUNTY PARKS AND RECREATION' , 'THURSTON COUNTY FIRE PROTECTION DIST. # 8' , 'THURSTON COUNTY FIRE DISTRICT NO 6' , 'THURSTON COUNTY FIRE DISTRICT 9' , 'THURSTON COUNTY' , 'THURSTON CO P U D #1' , 'THURSTON CO FIRE DISTRICT #9' , 'THE NISQUALLY INDIAN TRIBE FEDERALLY RECOGNIZED' , 'THE NISQUALLY INDIAN TRIBE' , 'THE COUNTY OF THURSTON' , 'THE CONFEDERATED TRIBES OF THE CHEHALIS RESERVATION' , 'TENINO SCHOOL DISTRICT #402' , 'STATE OF WASHINGTON-WA STATE PATROL' , 'STATE OF WASHINGTON' , 'STATE OF WA DEPT OF TRANSPORTION' , 'STATE OF WA DEPT OF NAT RESOURCES' , 'STATE OF WA DEPT OF FISH & WILDLIFE' , 'STATE OF WA - GAME DEPT.' , 'SQUAXIN ISLAND TRIBE' , 'SCHOOL DISTRICT NO 49' , 'SCHOOL DISTRICT #401' , 'SCHOOL DISTRICT #33' , 'SCHOOL DISTRICT #324' , 'SCHOOL DISTRICT #307' , 'SCHOOL DISTRICT #3' , 'SCHOOL DISTRICT #2' , 'SCHOOL DISTRICT #111' , 'ROCHESTER SCHOOL DISTRICT' , 'PORT OF TACOMA' , 'PORT OF OLYMPIA' , 'OLYMPIA SCHOOL DISTRICT #111' , 'NORTH THURSTON SCHOOL DIST' , 'NORTH THURSTON PUBLIC SCHOOLS' , 'NISQUALLY TRIBE' , 'NISQUALLY INDIAN TRIBE' , 'INDIAN LAND' , 'GRIFFIN SCHOOL DIST NO 324' , 'GRAYS HARBOR, COUNTY OF' , 'FIRE DISTRICT #9' , 'FIRE DISTRICT #8' , 'FIRE DISTRICT #6' , 'FIRE DISTRICT #5' , 'FIRE DISTRICT #4' , 'FIRE DISTRICT #3' , 'FIRE DISTRICT #2' , 'FIRE DISTRICT #17' , 'FIRE DISTRICT #16' , 'FIRE DISTRICT #14' , 'FIRE DISTRICT #13' , 'FIRE DISTRICT #12' , 'FIRE DISTRICT #11' , 'DEPARTMENT OF TRANSPORTATION' , 'DEPARTMENT OF NATURAL RESOURCES' , 'COUNTY OF THURSTON - PARKS' , 'CONFEDERATED TRIBES OF THE CHEHALIS RESERVATION' , 'CONFEDERATED TRIBES OF THE CHEHALIS RES' , 'CONFEDERATED TRIBES OF CHEHALIS' , 'CONFEDERATED TRIBES-CHEHALIS' , 'CONFEDERATED TRIBE OF THE CHEHALIS RESERVATION' , 'CITY OF TUMWATER' , 'CITY OF TENINO' , 'CITY OF TACOMA' , 'CITY OF OLYMPIA' ,

'CITY OF LACEY' , 'CITY OF CENTRALIA' , 'CHEHALIS INDIAN RESERVATION' , 'BUREAU LAND MANAGEMENT')

- Right-of-Way: ROW was identified using ROW and Railroad ROW land use types from the TRPC Land Use layer (data from April 1, 2022).
- Private Lands: Private Lands were identified by erasing Cities, Public Lands, and ROW from the County Border layer. The remaining land was considered private land.

% Tree Canopy by Zoning

- Excludes Cities and UGAs
- Uses the Zoning boundaries data provided by the consultant

% Tree Canopy by Parcel Size

- Excludes Cities
- Categorized County parcels by size (less than 5 acres, 5-20 acres, and greater than 20 acres) based on Assessor data and calculated the percent of land in those three categories that is tree canopy.

Extent of Tree Canopy Regulated by Critical Areas and SMP

- Excludes Cities
- Critical areas include combined Wetlands, Proposed SMP (approved by BoCC Dec 2023), Priority Habitats Species Areas (DFW), FEMA 100 Year Flood Zones, and Steep Slopes A (slopes >15%).

% Tree Canopy by Current SMP

- Excludes Cities

Landcover Summary

- Excludes Cities
- The landcover raster provided by the consultant was converted to a polygon data type. The total area in acres of each landcover type was divided by the total area in acres of the County (excluding Cities) to find the percent of the County that is comprised of that landcover type.

Appendix C: Data Products Index

2023 TREE CANOPY PRODUCTS

RASTER DATASETS

Landcover	Pixel/grid layer of land use categories where each cell is assigned a land cover value (tree canopy, water, buildings, roads, other paved surfaces, bare soil, grass/shrub).
Coniferous and Deciduous	Pixel/grid layer of tree type where each cell is assigned a value of either coniferous or deciduous.

POINT DATASET

Tree Centroids — Points representing the estimated location of the central point of each tree.

Field Name	Definition
Height	Calculated from the tree centroid using the 98th quantile of the LiDAR nDSM height to reduce outlier values
Radius	Calculated from the tree centroid using the formula ((Area)/P)^0.5

POLYGON DATASETS - EXTENTS

Polygon data of extents intended to join to tables in section below. Display the boundaries for various extents within the county and can be joined to a corresponding table (listed below) to view the landcover or tree canopy calculations for that extent.

Thurston County
Cities
Urban Growth Areas
Zoning
Parcels

Categorized by property type:

Residential	Tide Lands	Commercial	Board Equalization
Land Only	Retail	Industrial	Golf Course
Building Only	Restaurants & Taverns	Mixed	Mobile No Land/Park
Condo Unit	Office	Personal	Medical & Veterinary
Mobile Home	Service	Condo Common	Nursing Assisted Living
Multi Family	Warehouse	Shore Lands	Hospital Surgery Center
Apartments	Lodging	Mineral Rights	Designated Forest LD
Agricultural	Operating Prop	Boathouse	Farm & Agricultural
Recreation	Transportation	Mobile/RV Parks	Open Space
Oyster Lands	Exempt	Other	Timberland

NPDES
Basins
Basins Watershed
Equity Index Burden Level
250 Acre Hexagons

POLYGON DATASETS - TREE DATA

Tree Objects — Tree objects are the approximated delineation of a tree's branches and leaves.

Field Name	Definition
Height	Calculated from the tree centroid using the 98th quantile of the LiDAR nDSM height to reduce outlier values
Radius	Calculated from the tree centroid using the formula ((Area)/P)^0.5

Tree Crowns	Tree crowns are defined as circles that fitted to the approximated radius of a tree's branches and leaves.

Field Name	Definition
Height	Calculated from the tree centroid using the 98th quantile of the LiDAR nDSM height to reduce outlier values
Radius	Calculated from the tree centroid using the formula ((Area)/P)^0.5

TABLE DATASETS

Landcover Metrics	Land cover metrics are presented in the attribute table as both absolute area (in map units) and relative area (percentage of land area) of each land cover class for all features.

Field Name	Definition
Road/Railroad Area	Area of roads in map units
Grass/Shrub Area	Area of grass/shrub in map units
Tree Canopy Area	Area of tree canopy in map units
Pervious Surface Area	Area of pervious surfaces in map units
Other Paved Surface Area	Area of non-road paved surfaces in map units
Building Area	Area of buildings in map units
Bare Soil Area	Area of bare soil in map units
Water Area	Area of surface water in map units
Impervious Surface Area	Area of impervious surfaces in map units
Road/Railroad Percentage	Roads as a percentage of land area
Grass/Shrub Percentage	Grass/shrub as a percentage of land area
Tree Canopy Percentage	Tree canopy as a percentage of land area
Pervious Surface Percentage	Pervious surfaces as a percentage of land area
Other Paved Surface Percentage	Non-road paved surfaces as a percentage of land area
Building Percentage	Buildings as a percentage of land area
Bare Soil Percentage	Bare soil as a percentage of land area
Water Percentage	Surface water as a percentage of land area
Impervious Surface Percentage	Impervious surfaces as a percentage of land area
Total Area	Total land area in map units

Tree Canopy Metrics	How much tree canopy currently exists and amount of land where it is biophysically feasible to establish tree canopy on.

Field Name	Definition
Existing Tree Canopy %	Existing TC as a percentage of land area
TC Existing Area	Area of Existing TC in map units
TC Land Area	Land Area
TC Possible-Impervious Percent	Possible-impervious TC as a percentage of land area
TC Possible-impervious Area	Area of Possible-impervious TC in map units
TC Possible Percent	Possible TC as a percentage of land area
Possible Tree Canopy - Vegetation %	Possible-vegetation TC as a percentage of land area
TC Possible Area	Area of Possible TC in map units
TC Possible-vegetation Area	Area of Possible-vegetation TC in map units

Appendix D: Data Tables

TREE CANOPY SUMMARY

% TREE CANOPY BY ZONING*

Does not include Cities or UGAs

Thurston County Expanded Zoning Codes*	Zoning Acres	Tree Canopy Acres	% Tree Canopy	% of County Tree Canopy	Use Type	Land Use Type Acres	Land Use Type Tree Canopy Acres	Land Use Type % Tree Canopy	Land Use Type % County Tree Canopy
LONG TERM AGRICULTURE	14,892	3,480	23%	1%	Agriculture	15,876	3,559	22%	1%
NISQUALLY AGRICULTURE	984	79	8%	0%					
ARTERIAL COMMERCIAL	11	1	5%	0%	Commercial	655	101	16%	0%
HIGHWAY COMMERCIAL	50	9	18%	0%					
NEIGHBORHOOD CONVENIENCE COMMERCIAL	45	8	17%	0%					
RURAL COMMERCIAL	549	84	15%	0%					
MAJOR EDUCATIONAL INSTITUTION	981	852	87%	0%	Education				0%
LONG TERM FORESTRY	142,580	108,481	76%	43%	Forestry				43%
MILITARY RESERVATION	18,552	12,958	70%	5%	Gov				5%
RURAL RESOURCE INDUSTRIAL	390	135	35%	0%	Industrial				0%
PUBLIC PARKS TRAILS AND PRESERVES	7,720	3,599	47%	1%	Open Space				1%
RESIDENTIAL LAMIRD 1/1	5,110	2,403	47%	1%	Residential	221,284	120,938	55%	48%
RESIDENTIAL LAMIRD 1/2	3,516	1,942	55%	1%					
RESIDENTIAL LAMIRD 2/1	3,659	1,232	34%	0%					
RURAL 1/10	5,095	2,466	48%	1%					
RURAL 1/20	14,460	8,308	57%	3%					
RURAL RESIDENTIAL 1/5	4,282	2,309	54%	1%					
RURAL RESIDENTIAL RESOURCE 1/5	174,077	97,609	56%	39%					
URBAN RESERVE 1/5	1,776	887	50%	0%					
MCALLISTER GEOLOGICALLY SENSITIVE AREA	9,311	3,782	41%	2%					
TOTAL ACRES*:	**408,038**	**250,623**		**100%**					**100%**

*The County border and Zoning border do not align perfectly in some areas, resulting in a 307 acre difference in total County without Cities or UGAs acres (408,345) and total Zoning Acres (408,038), and a 129 acre difference in total County Zoning tree canopy acres (250,623) and total County tree canopy acres (250,752, from the landcover results table at end).

% TREE CANOPY IN COUNTY

Does not include Cities or UGAs

Extent	Extent Acres	Tree Canopy Acres	% of Extent that is Tree Canopy
County without Cities or UGAs	408,345	250,752	61%

% TREE CANOPY IN PUBLIC/PRIVATE LANDS

Does not include Cities or UGAs

Extent	Extent Acres	Tree Canopy Acres	% of Extent that is Tree Canopy	% Rural County Tree Canopy
Public Lands	100,310	74,727	74%	30%
Private Lands	292,909	170,669	58%	68%
Tribal Lands	3,689	2,005	54%	1%
ROW and Other	11,438	3,350	29%	1%

% TREE CANOPY BY PARCEL SIZE

Does not include Cities or UGAs

Parcel Size	Extent Acres	Tree Canopy Acres	% of Parcel Areas that is Tree Canopy	% Rural County Tree Canopy
< 5 Acres	44,005	20,752	47%	8%
5-20 Acres	77,661	40,651	52%	16%
> 20 Acres	280,490	185,990	66%	74%

% TREE CANOPY IN CRITICAL AREAS AND SMP

Does not include Cities or UGAs

Critical Areas	Extent Acres	Tree Canopy Acres	% of Critical Areas that is Tree Canopy	% Rural County Tree Canopy
Wetlands, Current SMP, Priority Habitat Species Areas, 100 Year Flood Zones, Slopes >15%	286,877	188,037	66%	75%

% TREE CANOPY IN CURRENT SMP

Does not include Cities or UGAs

Extent	Extent Acres	Tree Canopy Acres	% of Current SMP that is Tree Canopy	% Rural County Tree Canopy
Current SMP	34,867	13,153	38%	5%

% TREE CANOPY IN VSP

Does not include Cities or UGAs

Extent	Extent Acres	Tree Canopy Acres	% of VSP Parcels that is Tree Canopy	% Rural County Tree Canopy
VSP Parcels	62,572	17,898	29%	7%

% TREE CANOPY IN PRAIRIE SOILS

Does not include Cities or UGAs

Extent	Extent Acres	Tree Canopy Acres	% of Prairie Soils that is Tree Canopy	% Rural County Tree Canopy
USDA Prairie Soils	101,720	47,386	47%	19%

% TREE CANOPY IN UGAS

Does not include Cities

Extent	Extent Acres	Tree Canopy Acres	% of Critical Areas that is Tree Canopy
Grand Mound	982	159	16%
Lacey	9,113	2,831	31%
Olympia	3,883	1,673	43%
Rainier	321	165	51%
Tenino	67	35	53%
Tumwater	2,637	1,213	46%
Yelm	2,370	637	27%

LANDCOVER SUMMARY

Does not include Cities or UGAs

Landcover Type	Acres	% Coverage
Tree Canopy	250,752	61%
Grass/Shrubs	132,186	32%
Bare Soil	5,366	1%
Water	5,933	1%
Building	3,224	1%
Road/Railroad	6,528	2%
Other Paved Surface	4,351	1%
Total County Landcover Acres*:	**408,340**	

*The County border and landcover border do not align perfectly in some areas, resulting in a 5 acre difference in total County acres (408,345) and total County landcover acres.

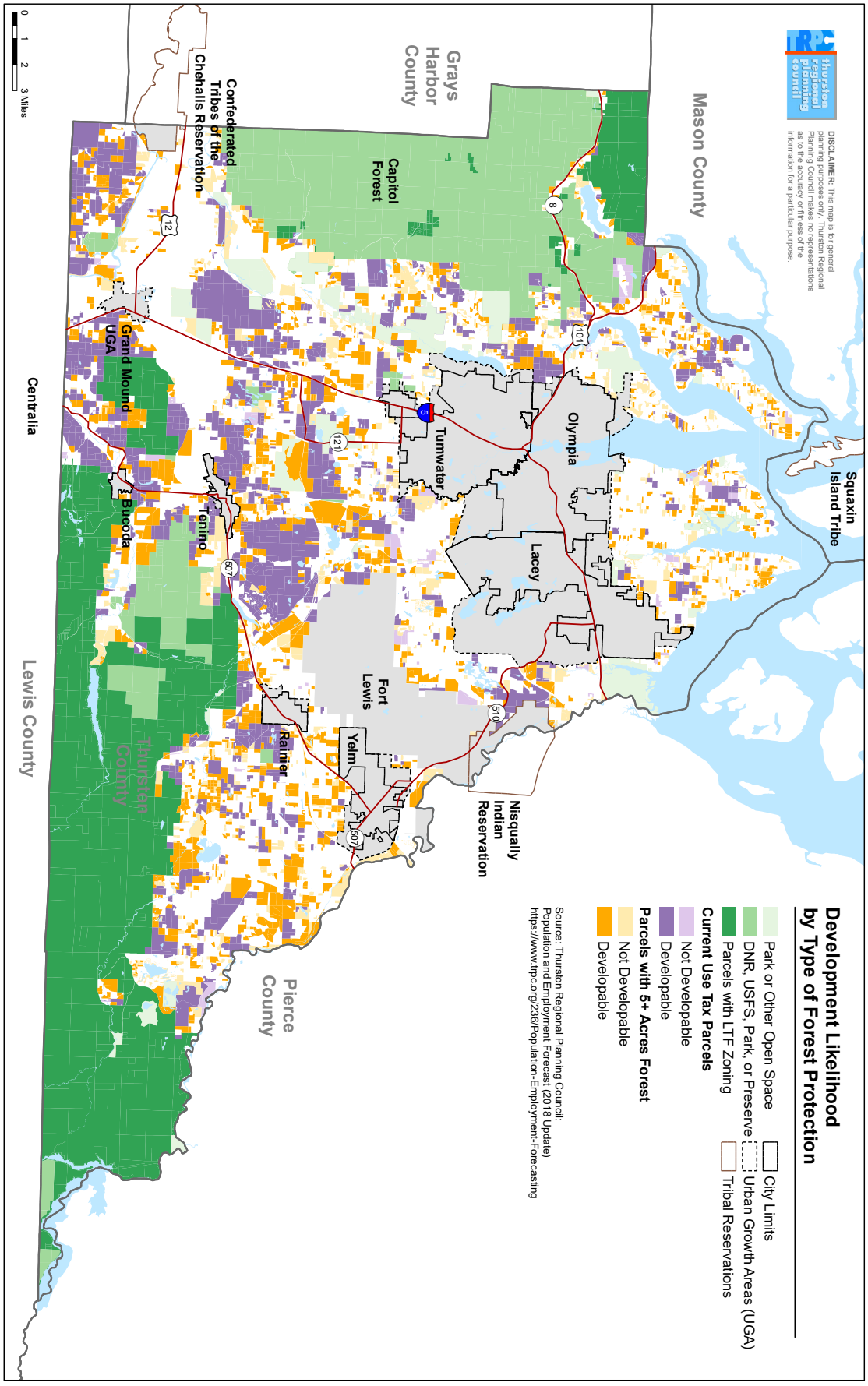
Potential Restoration Area	Acres
Bare Earth/Grass/Shrub landcover, excluding VSP parcels, WSDA Crops, LTF zoning, prairie soils, and Nisqually National Wildlife Refuge	33,187

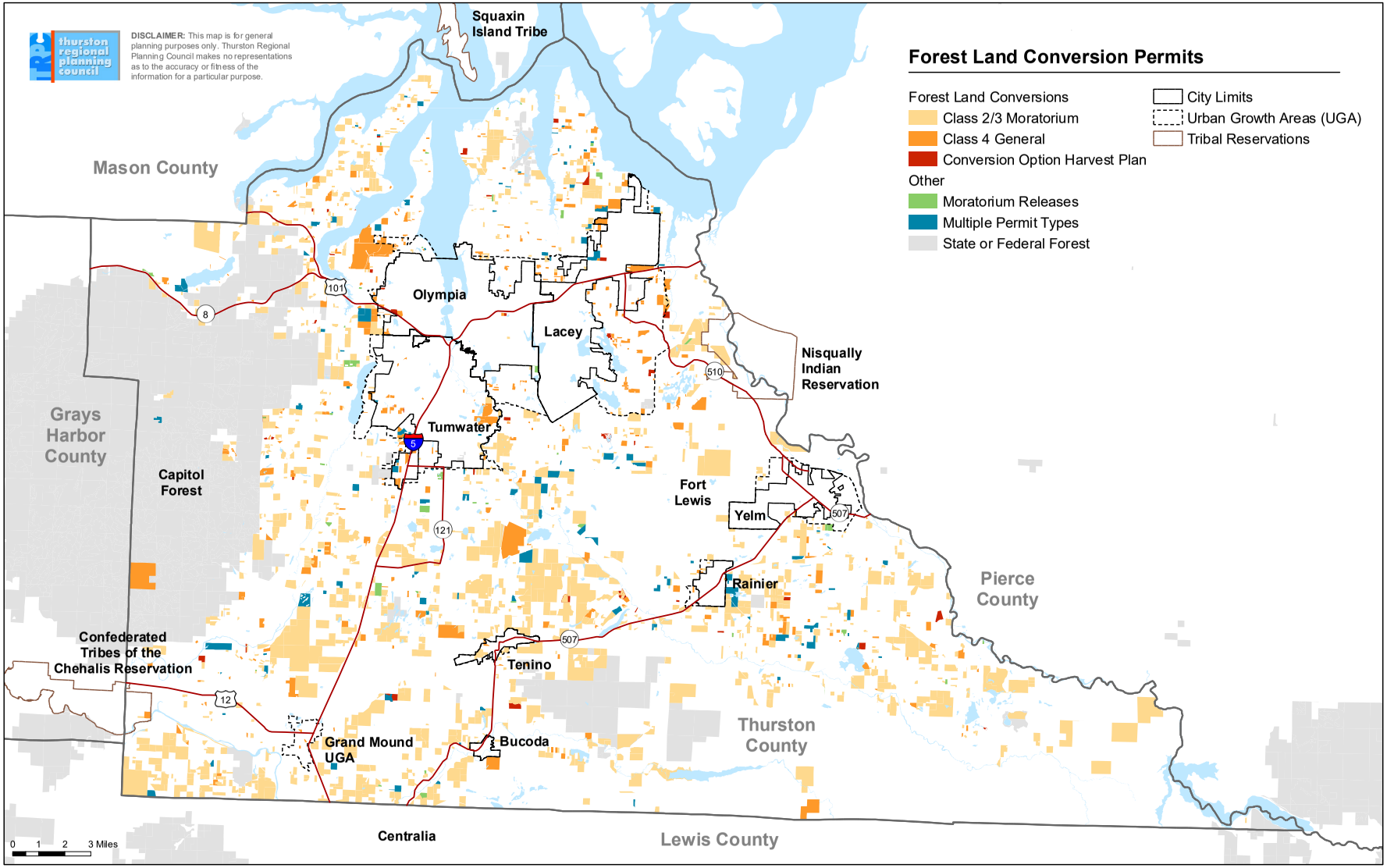
Long-Term Forestry Zoning Landcover	Acres	% Coverage
Tree Canopy	108,481	76%
Grass/Shrubs	29,713	21%
Bare Soil	1,573	1%
Water	1,146	1%
Building	12	0%
Road/Railroad	1,601	1%
Other Paved Surface	52	0%
Total LTF Landcover Acres*:	**142,578**	

*The LTF Zoning border and landcover data do not align perfectly in some areas, resulting in a two acre difference in total zoning acres (142,580) and total LTF landcover acres.

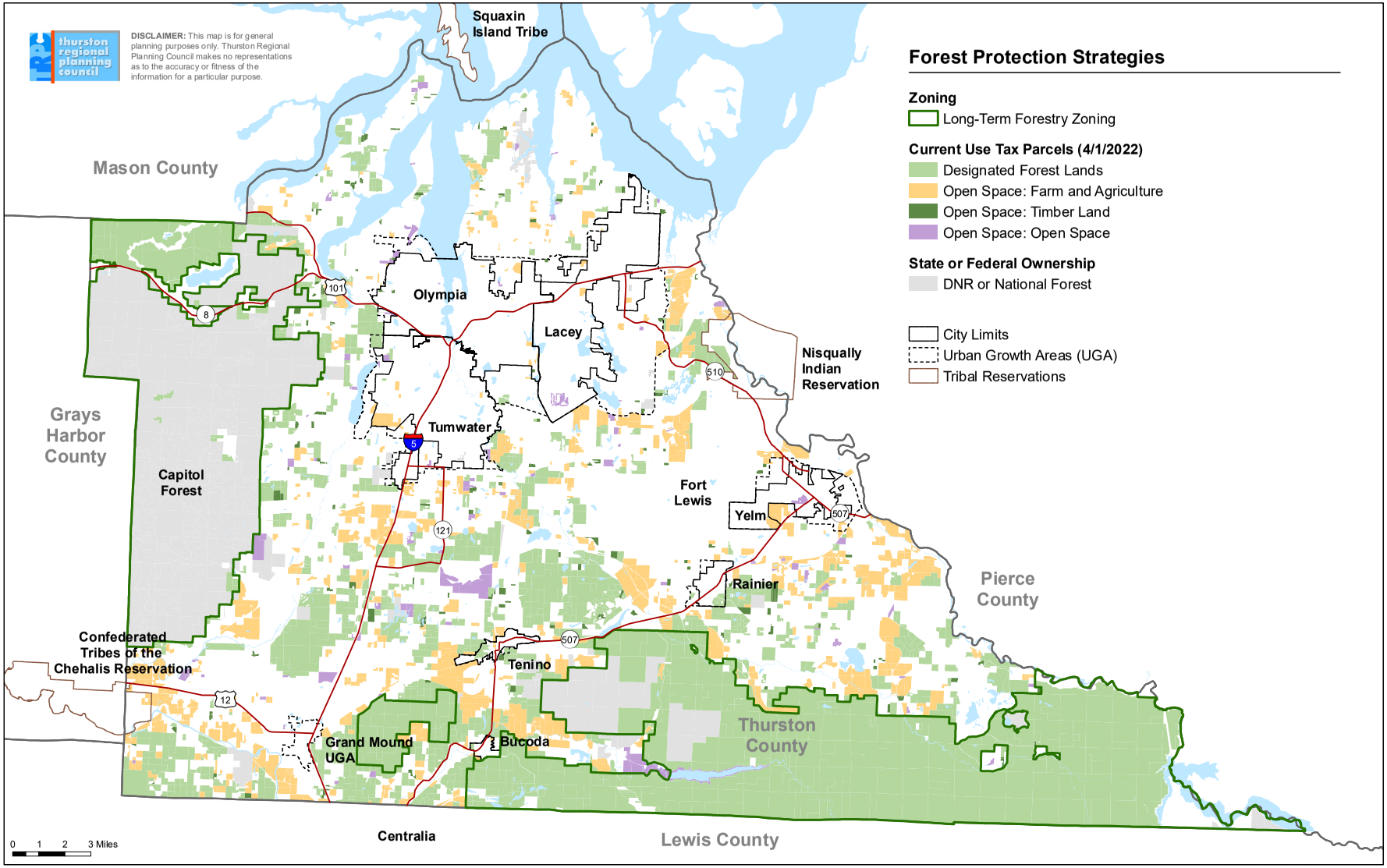
Nisqually National Wildlife Refuge Landcover	Acres	% Coverage
Tree Canopy	2,800	45%
Grass/Shrubs	2,257	36%
Bare Soil	871	14%
Water	61	1%
Building	33	1%
Road/Railroad	187	3%
Other Paved Surface	63	1%
Total NNWR Landcover Acres:	**6,272**	

Appendix E: TRPC Conversion Risk Map Series

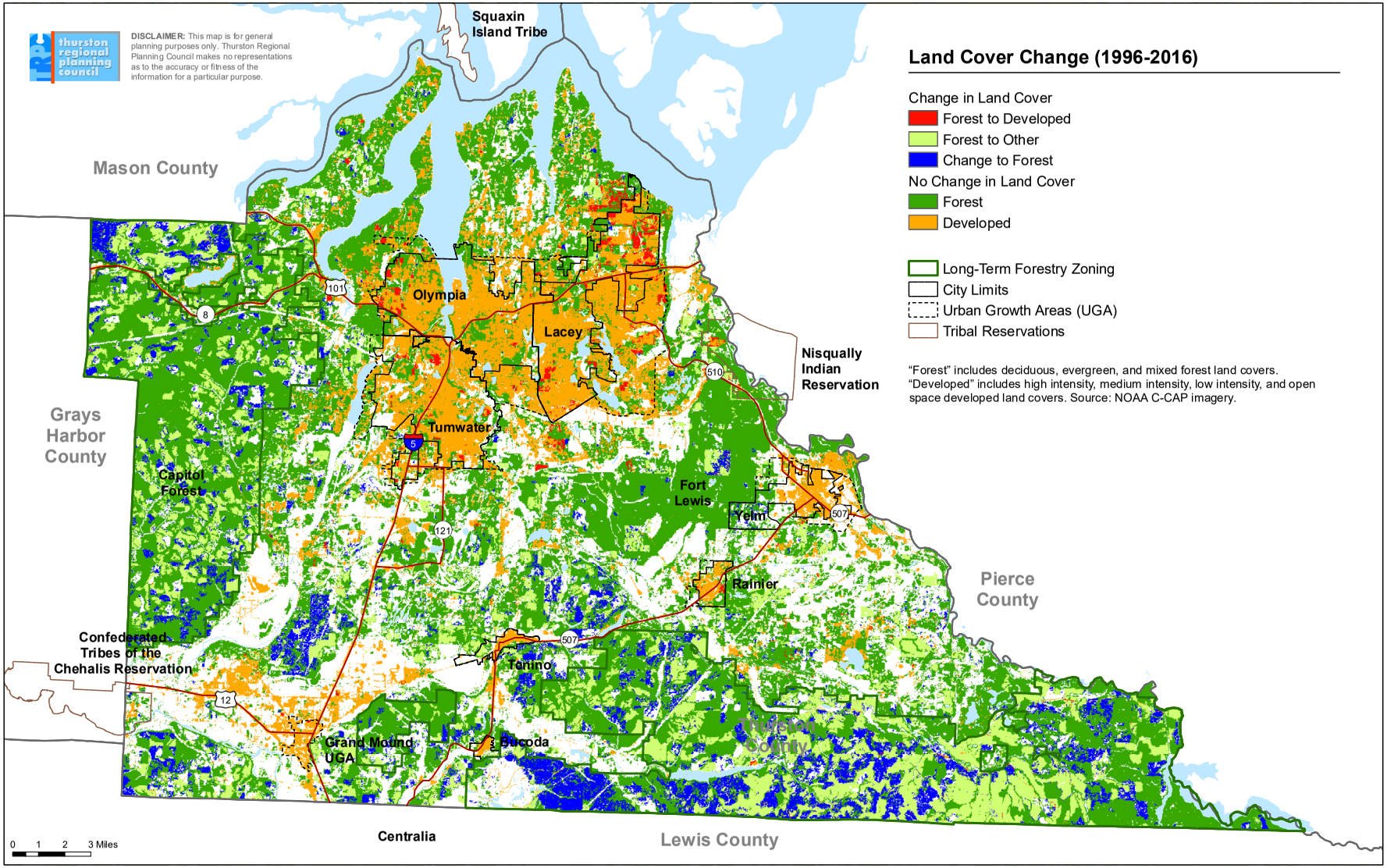




C:\Users\whitney.emge\Documents\ArcGIS\Packages\Forest Conversion Parcels_E8FA1B3B-2B11-4F6E-9ADF-953065DC1086\v107\Forest Conversion Parcels.mxd



8/8/2025 | C:\Users\whitney.emge\Documents\ArcGIS\Packages\Forest Protection_C424BBB9-43C0-4B87-9674-4338EF00490D\v107\Forest Protection.mxd


thurston regional planning council
DISCLAIMER: This map is for general planning purposes only. Thurston Regional Planning Council makes no representations as to the accuracy or fitness of the information for a particular purpose.
Land Cover Change (1996-2016)
Change in Land Cover
Forest to Developed
Forest to Other
Change to Forest
No Change in Land Cover
Forest
Developed
Long-Term Forestry Zoning
City Limits
Urban Growth Areas (UGA)
Tribal Reservations
"Forest" includes deciduous, evergreen, and mixed forest land covers.
"Developed" includes high intensity, medium intensity, low intensity, and open space developed land covers. Source: NOAA C-CAP imagery.
Squaxin Island Tribe
Mason County
Olympia
Lacey
Tumwater
Nisqually Indian Reservation
Grays Harbor County
Capitol Forest
Fort Lewis
Yelm
Rainier
Pierce County
Confederated Tribes of the Chehalis Reservation
Tenino
Grand Mound UGA
Bucoda
Thurston County
Centralia
Lewis County
0 1 2 3 Miles
8/8/2025 | C:\Users\whitney.emge\Documents\ArcGIS\Packages\Land Cover Change_AD3439DF-A237-4510-BAC0-FB8D173E038F\v107\Land Cover Change.mxd