IDENTIFYING FOOD DESERTS ACCESS TO HEALTHY FOOD IN THE PUGET SOUND REGION

PUGET SOUND FOOD SYSTEM ASSESSMENT

REGIONAL FOOD POLICY COUNCIL
& UNIVERSITY OF WASHINGTON
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PREPARED FOR THE REGIONAL FOOD POLICY COUNCIL
at the Puget Sound Regional Council

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PROJECT BACKGROUND

This project represents the final product of a twenty-week graduate studio course in the Department of Urban Design and Planning at the University of Washington's College of Built Environments. The studio team members come from a range of backgrounds, including urban planning, urban design, architecture, landscape architecture, real estate development, and public affairs and policy.

The Regional Food Policy Council enlisted the University of Washington studio team to identify and pursue research topic areas examining the regional food system. The Council sought to meet two major goals: creating a common knowledge base among Council members about the region's food system and informing the development of early action items on the Council's work plan.

During the first half of this project, the studio team produced a report describing the current state of the food system in the central Puget Sound region, composed of King, Pierce, Snohomish, and Kitsap counties. Through compiling this initial conditions report, the team developed a thorough understanding of five components of the region's food system (production, processing, distribution, consumption, waste stream) and four other topics that impact, and are impacted by the region's food system (the environment and tribes, restaurants, and comprehensive plans). The team compiled existing data on each topic and identified strengths, challenges, and outstanding questions, culminating with a presentation to the Regional Food Policy Council on March 11, 2011.

During the second half of this project, the studio, in partnership with Regional Food Policy Council staff, prioritized six more specific topics for further study based on the findings from the initial conditions report. Each topic addresses an emerging issue in the food system, gaps in existing data, and policy or programmatic needs identified jointly with the Regional Food Policy Council. The studio team employed a variety of research methods, including field data collection, archival research, policy scans, geospatial analysis, case studies, and interviews with food systems stakeholders. Each element of the project is a standalone report and is described in more detail below.

REGIONAL FOOD POLICY COUNCIL HISTORY AND CONTEXT

The Regional Food Policy Council, chaired by Seattle City Council President Richard Conlin, comprises 30 members representing all parts of the food system as well as government, social justice, anti-hunger, educational, and economic development organizations. The Regional Food Policy Council is housed within the Puget Sound Regional Council, the federally recognized Metropolitan Planning Organization for the central Puget Sound region, serving King, Pierce, Snohomish, and Kitsap counties. The Regional Food Policy Council is a working advisory committee that reports to the Puget Sound Regional Council's Executive Board and provides regional structure and coordination on food system issues.

The Regional Food Policy Council's formation reflects from the incorporation of the food system into the planning lexicon, as planners and policymakers are increasingly aware of the food system's widespread influence on the economy, environment, and society. Since convening its first public meeting in September 2010, the Regional Food Policy Council has established its vision, goals and mission statements, and is currently developing its future work plan.

Regional Food Policy Council Vision and Mission

Vision: The Regional Food Policy Council envisions a thriving, inclusive and just local and regional food system[1] that enhances the health of: people, diverse communities, economies, and environments.

Mission: The Regional Food Policy Council develops just and integrated policy and action recommendations that promote health, sustain and strengthen the local and regional food system, and engage and partner with agriculture, business, communities and governments in the four-county region.

Regional Food Policy Council Goals

- **Agriculture**: strengthen the economic vitality and viability of farming and promote a vibrant community of farmers; maximize opportunities for farming across scales; preserve land for farming.
- **Economic Development**: advance regionally-scaled infrastructure; enhance economic viability of local and regional food systems; support living-wage jobs and occupations.
- **Education**: foster education about and understanding of food, agriculture and environmental protection; facilitate outreach and education among elected leaders and communities.
- **Environment**: promote sustainable agriculture and protect the environment.
- **Equity**: promote equity and access to affordable, nutritious food; strengthen local and regional food systems and increase community food security.
- **Health**: improve public health through food access, nutrition and production; improve the health, safety, and welfare of workers and worker rights and reduce environmental health risks.
- **Policy**: connect local and regional efforts with statewide, national, and international efforts to strengthen local and regional food systems; develop model policies for use by jurisdictions in support of all goals; sustain Regional Food Policy Council.

1 The food system is the network of people and activities connecting growing and harvesting, processing, distribution, consumption, and residue utilization, as well as associated government and non-government institutions, regulations and programs.

OVERVIEW OF REPORTS

FOOD PRODUCTION

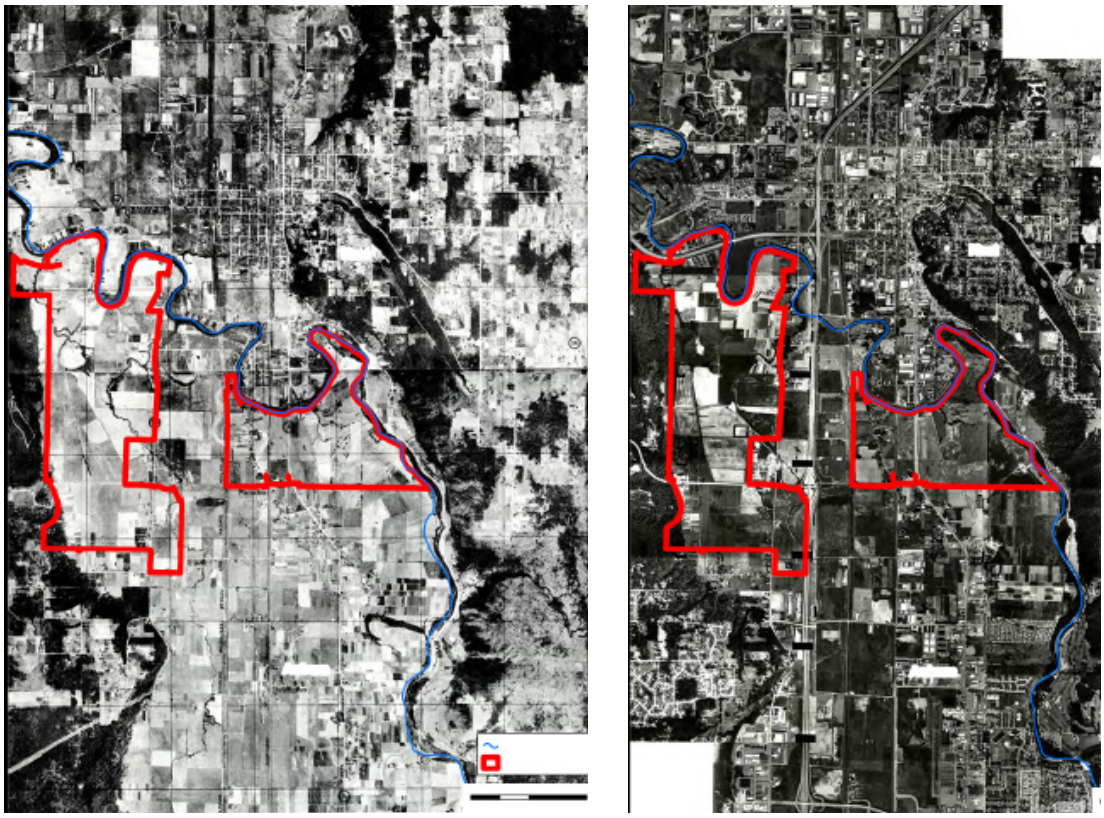
The Food Production report comprises three distinct sections: Rural Agriculture, Fisheries, and Urban Agriculture.

Rural Agriculture

Rural agriculture is a large component of the food system within the central Puget Sound region. This section explores how each county inventories farmland. In an effort to advance the Regional Food Policy Council's *agriculture* goal, which includes farmland preservation, this section identifies key steps to understanding how farmland is classified throughout the region.

Major findings from this report include:

- Each county in the central Puget Sound region uses different tools to inventory agricultural land, including Open Space Tax Classification, windshield surveys, and community outreach.
- Each of these tools offers benefits and limitations. For example, windshield surveys can provide an accurate survey of crop types but consume large amounts of staff time. The Open Space Tax Classification method (allowing owners of farm and agricultural land to have their property valued at current use rather than highest and best use) enables counties to identify farms whose land owners want to save money on taxes, but some farmland owners do not desire the land use restrictions and criteria associated with this classification.
- If each county uses similar data collection methods, the Regional Food Policy Council could have a better understanding of rural agriculture across the central Puget Sound region. It would be helpful for the Regional Food Policy Council to convene managers of county agricultural data collection to share best practices. Additionally the Regional Food Policy Council can support uniform data collection and suggest base farmland data that each county can collect.



The change in agriculture lands in King County from 1944 to 1989

Additionally, the studio team provided a geographic analysis of land cover patterns in three time periods: 1944, 1989-1991 (pre-Growth Management Act), and 2001-2002 (post-Growth Management Act). This analysis demonstrates visually how land use has changed in response to the policies in place during those time periods. Aerial photography shows urban and suburban development near the borders of county-designated agricultural lands. Alongside designated agricultural lands, the maps demonstrate infill of non-designated, undeveloped lands between the early 1990s and early 2000s. This visual analysis articulates the history of rural farmlands and the development pressures that cause land use change.

Fisheries

The state of fisheries has changed greatly since the early 1900s, but minimal data is currently available on the precise role of commercial fishing in the central Puget Sound region. Today, fewer fishing vessels have a home port in the region, the estimated value of the fisheries has decreased, and the average ex-vessel[2] price per pound for Puget Sound's iconic salmon is less than in 1950. The purpose of this report is to further the Regional Food Policy Council's *economic development* goal through an inventory of commercial fishing vessels, as a starting point, to better understand the economic impact the local fishing fleet has on the region.

Major findings from this report include:

- In recent years, there has been an overall decrease in the number of commercial fishing vessels the central Puget Sound region.

2 Ex-vessel prices are the amount a commercial vessel makes when it unloads its catch, rather than how much is received at market

- Economic impact studies of the Port of Seattle's Fishermen's Terminal show that a fishing vessel has a significant impact on the region's economy. For example, *The 2007 Economic Impact of the Port of Seattle*, prepared by Martin Associates (2009) estimates one purse seiner (a type of commercial fishing boat) contributes approximately $220,000 annually. A commercial crabber contributes approximately $550,000 annually.
- The number of commercial fishing vessels with a home port at Fishermen's Terminal in Seattle declined from 370 to 250 vessels between 2003 and 2007.
- Similarly, the number of jobs these commercial vessels supported declined from 5,524 to 3,424 jobs between 2003 and 2007.
- This decline impacts the local economy: in 2003 the vessels at Fishermen's Terminal brought in $179.6 million to local businesses, compared to only $43.8 million in 2007.
- It is difficult to determine the number of fishing vessels moored in each of the four counties, due to the nature of how the Washington Department of Licensing collects data. As a result, it is difficult to clearly understand what social and economic impacts these fishing vessels have on their home ports and markets in the region (beyond the recent economic impact study of Fishermen's Terminal in Seattle).
- Efforts could be taken to ensure that the region maintains a large fleet. Instead, a combination of factors has caused fisherfolk to relocate from the region or quit fishing altogether. Many vessels are moving north to the Port of Bellingham where local officials have realized the benefit of having a large fleet and are lowering moorage rates, enhancing amenities, and providing convenient access to nearby processors and icehouses.

Urban Agriculture

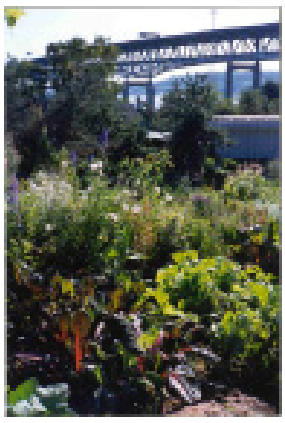
This section uncovers opportunities for urban agriculture in the central Puget Sound region that coincide with the Regional Food Policy Council's goals of *agriculture, economic development, education, environment, equity* and *health*. The studio team examined urban agriculture based on the Community Food Security Coalition's definition, in which urban agriculture "refers to the production, distribution and marketing of food and other products within the cores of metropolitan areas...and at their edges." The studio team focused its research primarily on the five metropolitan cities in the region as designated under *VISION 2040*—Bellevue, Bremerton, Everett, Seattle, and Tacoma—but believes the framework and methodologies it created can be extended to smaller suburban cities for future assessment.

The goals of this section are:

- To broaden Regional Food Policy Council's understanding of the potential scope of urban agriculture in North America
- To explore the current practicies in the central Puget Sound region
- To identify where area comprehensive plans can address urban agriculture
- To identify future opportunities for more urban agriculture regionally

Major findings from this report include:

- North American urban agriculture takes many forms beyond traditional community gardening, including backyard garden programs for food-insecure residents, prison gardens, and commercial rooftop farms.
- Each of the five metropolitan cities (Bellevue, Bremerton, Everett, Seattle, Tacoma) addresses urban agriculture in different ways (e.g., through city ordinances, specific codes/zones, and plans). Tacoma has the most detailed comprehensive plan and urban agriculture-related policy coverage, which may serve as a model for other cities in the region.
- The studio team proposes a new methodology, based on existing land use data and aerial photography, to determine potential sites for implementing urban agriculture. This site assessment considers:
    - environmental characteristics (e.g., steep slopes and other ecological barriers),
    - community needs (e.g., residential density and proximity to existing community gardens),
    - accessibility factors (e.g., parking availability and pedestrian access), and
    - differences in land use ownership (e.g., private, public, and institutional lands).



From Left to Right:
University Of Washington Tacoma - Giving Garden

Urban Chickens

University P-Patch

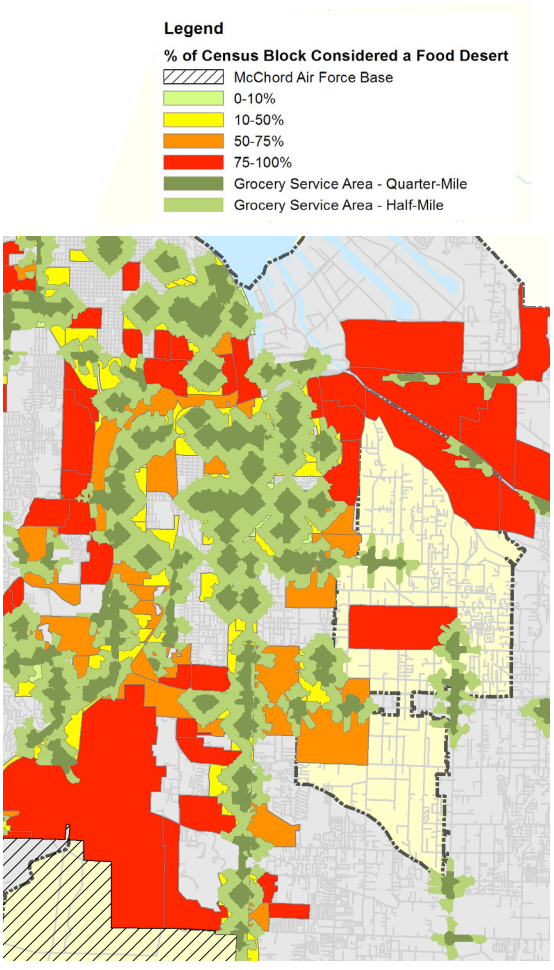
FOOD DESERTS

Food deserts are areas "with limited access to affordable and nutritious food, particularly such an area composed of predominantly lower-income neighborhoods and communities," according to the 2008 U.S. Farm Bill. This report focuses on identifying food deserts in the central Puget Sound region, with a focus on how transportation networks can aid or interfere with access to healthy food. The studio team further defined access to "affordable and nutritious food" through availability of the following food retail outlets:

1. Full-service grocers, which provide access to a full range of healthy food
2. Specialty foods outlets, which provide access to some healthy foods but not a full range (butcher, bakery, etc.)
3. Cultural grocers, which provide ethnically significant food access points

The studio team employed a geographic information systems analysis to locate census blocks lacking the specified food retail outlets within a quarter mile from bus stops in King, Pierce, Snohomish, and Kitsap Counties. The analysis incorporates data on bus line and stop data, income, vehicle ownership, locations of elderly populations, and locations of the three types of grocers described above.

Example of Food Desert Analysis



Major findings from this report include:

- Urban cores tend to have greatest access
- Urban peripheries are facing food access challenges
- Transit lines have a substantial effect on food access
- Bring together community groups and government to best address local concerns and situations

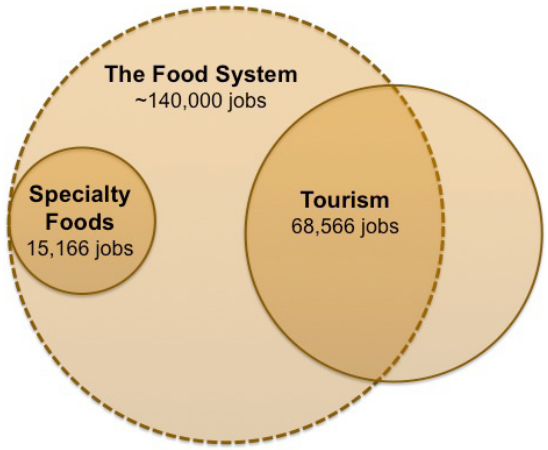
Policy considerations to improve access include:

- Coordinate transit systems with food access points
- Educate riders on location of grocery stores
- Promote community level programs including farmers markets, community gardens, mobile food carts

This report is intended to serve as a starting point for future efforts to monitor and address food deserts in the region. The hope is for this work to be easily replicable as the Regional Food Policy Council moves forward with its *equity, health, and policy* goals.

WAGES

In order to advance the Regional Food Policy Council's *economic development* goal of supporting living wage jobs, this report seeks to understand the current state of food system employment. The production, processing, and retail sectors of the food system provide about 165,000 jobs in the central Puget Sound region in 2009. The analysis reveals that the majority of these jobs do not provide a living wage, which is the wage rate necessary to meet minimum standards of living. This report also presents key considerations for supporting economic development through the creation of living wage jobs in the food system as possible ways to address this challenge.



The number of jobs in various job sectors in the Central Puget Sound Region

Major findings from this report include:

- About 80 percent of non-farm food system workers earn wages below the lowest living wage standard used in this report ($13.33 per hour, tips included).
- The lowest paid occupations are bussers as well as counter, cafeteria, coffee, and concessions servers. All make about $9.25 per hour and number about 23,000, a significant share of regional food system employment.
- The highest paid occupations are purchasing agents and food scientists. Both make roughly $29 per hour, though these occupations account for less than 0.2 percent of the 165,000 workers in the regional food system.

FOOD HUBS

This report provides guidance for policymakers and food systems stakeholders on food hubs, an emergent tool intended to sustain small and midscale farmers, to promote regional economic development, and to fulfill demands for locally and regionally produce food in a more efficient way. The U.S. Department of Agriculture's working definition of a food hub is "a centrally located facility with a business management structure facilitating the aggregation, storage, processing, distribution, and/or marketing of locally/regionally produced food products."

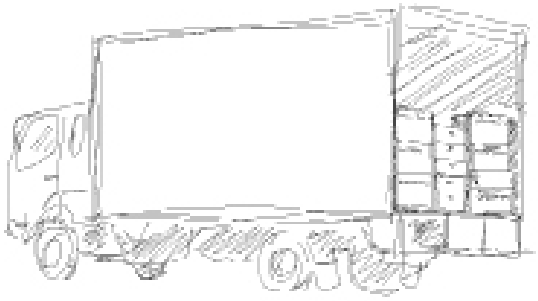
Food hubs may help advance the Regional Food Policy Council's *agriculture* goal by focusing on support for small and midscale farmers, which may in turn provide incentives to preserve farmland and improve the regional viability of farming. Food hubs may also help to advance the *economic development* goal by providing employment opportunities in the areas they serve and opening up access to new retail and wholesale markets that smaller farmers struggle to reach.

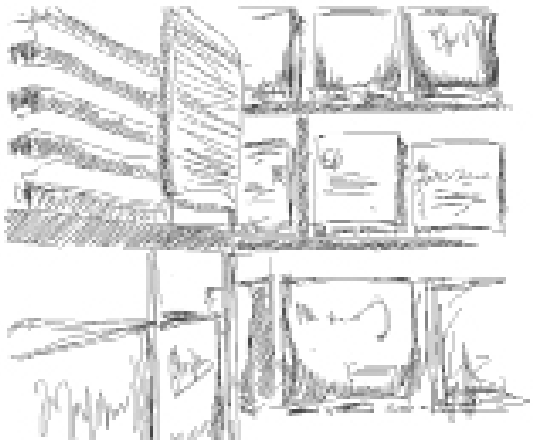
Major findings from this report include:

- Food hubs are gaining national momentum, as evidenced by U.S. Department of Agriculture's extensive and growing work on the topic in concert with local food systems organizations nationwide. More than 100 food hubs exist nationwide, averaging more about $1 million in annual sales. More than half started within the last five years.

- Food hubs typically have three major components:
    1. wholesale aggregation/distribution,
    2. active coordination with food producers, and
    3. permanent facilities.
- Some food hubs provide additional services, such as space for wholesale and retail vendors, health and social service programs, community kitchens, and community meetings.
- Key considerations in starting a food hub include demand for locally and regionally produced food, creativity with funding, seamless systems for distribution and sales, careful market analysis, and review of policies to determine whether financial or regulatory incentives may aid food hub development.
- The planned Everett Farmers Market in Everett, Washington, which combines retail and wholesale sales of agricultural products, commercial kitchen facilities, distribution, education, and other elements, offers lessons for planning future regional food hub efforts.
- Two detailed case studies illustrate how food hubs have developed in two areas that share some of the central Puget Sound region's demographic and physical characteristics: the Local Food Hub, a non-profit food aggregator, distributor, and educational farm located in Charlottesville, Virginia; and The Wedge, a cooperative business with a retail store, distribution warehouse and educational farm located in Minneapolis, Minnesota.
- In recent years, all four counties in the central Puget Sound region have identified various barriers for smaller farmers, ranging from marketing and economic development to access to commercial kitchens to mechanisms for garnering wholesale clients. Food hubs may help to meet these needs while filling demonstrated consumer demands for locally and regionally produced food.

Core Food Hub Components: Distribution, Warehousing and Aggregation, Processing, and Retail Sales





POLICY

This report is intended to provide information to policymakers, food systems stakeholders, and advocates that can guide future action and policy development. The aim of this section is twofold:

- To increase communication, information-sharing, and education about policy work and policy opportunities region-wide
- To provide relevant model food systems policy language for use in support of the Regional Food Policy Council goals

As a whole, this report aims to advance the *policy* and *education* goals of the Regional Food Policy Council. First, this report summarizes policies contained in countywide plans that specifically address food system activities. Next, this report provides sample comprehensive plan and municipal code language for a variety of food systems activities. Jurisdictions can tailor these policies to their individual needs and situations. Then, this report discusses policies related to three food system topics: agricultural land preservation, food processing for economic development, and on-farm alternative energy production.

Major findings from this report include:

- There are small and simple policy changes that municipalities can make as a first step to enable food systems activities:
    - including food systems goals in comprehensive plan elements;
    - creating a streamlined permit for small farmers markets;
    - enacting food systems-supportive resolutions;
    - establishing farmers markets as approved land uses;
    - establishing community gardens as approved land uses or open space sub-districts;
    - enabling interim, temporary, or vacant land use agreements for community gardening or urban agriculture uses; and
    - establishing "healthy food zones" near schools.
- Agricultural land preservation policies are best understood in the context of a "package" of ten policy tools that work best when used in combination with each other. These tools are:
    - Agriculture zoning
    - Agriculture districts
    - Comprehensive plans
    - Conservation easements
    - Differential assessment of farmland
    - Private land trusts
    - Purchase of development rights
    - Right-to-farm law
    - Transfer of development rights
    - Urban growth boundaries
- Local food processing facility development and renovation can be enhanced by applying for and supporting the continuation of underutilized U.S. Department of Agriculture funding resources, such as the Community Facilities Fund.
- Encouraging government procurement of locally-grown foods increases processing demand by midscale farms as well as funding available for processing facility development (e.g. food hubs).
- Technical assistance and incentives can assist the agricultural community with undertaking renewable energy and energy efficiency projects.

ROAD MAP TO A GREENER RESTAURANT

Because the restaurant industry is a major component of the food system, it is important to consider the role of restaurants in achieving environmental, economic, and social goals. Developed in partnership with Seattle Chefs Collaborative, the *Road Map* provides guidance for new and existing restaurants on how to become more aware and responsive to sustainability issues. Users of the *Road Map* will find information and resources in six topic areas: food sourcing, water use, energy and the built environment, waste management, cleaning green, community and economy issues. The *Road Map* includes links to local resources that serve as supplementary material to the recommendations and incentives that the aforementioned categories offer. The completion of the *Road Map* signifies the first step in providing outreach to area restaurants; Seattle Chefs Collaborative will use the *Road Map* as the basis for future communication and marketing initiatives.

Major components of the *Road Map*:

- There are 35 self-assessment questions for restaurant operators covering the six topic areas. Examples of questions include "Do you compost food and other organic waste?" and "Do you use non-toxic cleaning products?"
- Each question contains at least two action items that restaurants can implement along with at least one resource, often more, that helps restaurants to think about sustainability. Examples of action items include giving food waste to farmers for animal feed and making your own non-toxic cleaning products.
- The *Road Map* provides region-specific resources, such as information about rebates offered by area cities, links to local harvest schedules, and local entrepreneurs who are involved with sustainable restaurants.
- The icons next to each question indicate at least one benefit—economic, environmental, or social—that can be achieved by taking the actions listed; many questions have multiple benefits.

CONCLUSION

The common thread binding this project's eight distinct reports is attention to the Regional Food Policy Council's goals. The reports described above:

- provide new qualitative and quantitative data,
- identify social and economic implications of this project's work,
- offer policy ideas, and
- suggest needs for future work where applicable.

The intent is to provide information that will assist Regional Food Policy Council members as they work toward their vision and mission of developing "just and integrated policy and action recommendations" toward a "thriving, inclusive and just local and regional food system." The reports can stand alone and need not be read in any particular order. However, reading the entire set can provide an understanding of challenges and opportunities in the food system that is as diverse as the central Puget Sound region itself.

View the studio team's full reports at http://courses.washington.edu/studio67/psrcfood.

INTRODUCTION

Residential concentrations of low-income residents and poor access to healthy food are commonly labeled as "food deserts." Definitions for the term vary and some disagree with the use altogether. The phrase was first applied in the late 1990s by policy advocates and researchers in the United Kingdom to describe disadvantaged urban areas with poor access to retail food outlets[1]. Use of "food deserts" in North America began in 2003 by Blanchard to describe rural areas of Mississippi that were outside of supermarket service areas, and over the past decade the term has become more widely used.[2] The United States Department of Agriculture (USDA) recognizes a food desert as "an area in the United States with limited access to affordable and nutritious food, particularly such an area composed of predominately lower income neighborhoods and communities[3]," the USDA's definition of "access" relates to transportation, income and geographic proximity, as defined in the 2008 Farm Bill.[4]

The purpose of this study is to demonstrate problematic access areas to healthy food in the central Puget Sound region with a focus on transportation networks and how they aid or interfere with this access. Potential food deserts are identified based on transportation ability, the prevalence of low income residents, and compare this to the health and socio-economic conditions in this area. Residents in some areas of the region have limited opportunity to purchase fresh, nutritious food due to economic and transportation constraints, which can lead to poor diets and adverse health such as obesity, heart disease and diabetes. The U.S. Public Health Service has identified obesity of a leading health concern with disparities in conditions existing between gender, race/ethnicity and socioeconomic status. Also, diabetes has been increasing in African-Americans, Hispanic-Americans, and individuals with lower incomes and education.[5] By identifying locations with low access to healthy foods this study may assist in developing a regional strategy to counter the presence and therefore effects of food deserts.

Population projections continue to climb in the Puget Sound region, it is expected that we will welcome another 1.7 million additional people by the year 2040.[6] This estimated growth further increases the need to address this problem in a timely manner, the sooner we can work to combat food deserts across the region the few people will be affected both now and into the regions future.

The use of the term "food desert" has stirred contention between food policy advocates. Ladonna Redmond, a community food security activist in Chicago and president of The Institute for Community Resource Development, a non-profit community based organization that helps residents in urban communities access healthy food, states that she dislikes the term "food desert" because it "describes lack in a way that indicates that the solution is outside of the community labeled a food desert," and to change the food system people must change the way they talk about it.[7] While recognizing that the term "food deserts" is unaccepted by some and that a concrete, universal definition does not exist, this report recognizes "food deserts" as a way to describe low-income areas with poor access to food based on its verification by the federal government in the USDA report to congress in 2009. Although this report uses the USDA applied definition of food deserts, measures of

access and health conditions differ in its methodologies, which will be discussed later.

Despite varying differences in definitions and methods, the purpose of identifying food deserts is for jurisdictions to identify socially marginalized areas with poor food access, the resulting health impacts, and build solutions through policies and programs. Results of this report are intended to support the Puget Sound Regional Council's (PSRC) Regional Food Policy Council (RFPC) goals and policies to provide food security for underserved communities. A variety of programs to help provide better access to healthy food in low-income communities have already been developed in jurisdictions throughout the United States; some of these programs can serve as potential solutions to food deserts existing in the central Puget Sound Region. Further details of these programs will be discussed later in the report.

Connection To Regional Food Policy Goals

Food deserts speak to the systemic problems throughout the food system, demonstrating the weak links in the regional food system that may need closer review and attention. It is through this identification that this component of this report is a tool towards achieving the goals set forth by the RFPC. By identifying the location of food deserts (as defined by this report) the RFPC will be able to make more educated decisions on where efforts related to equity, policy, health improvements, and education are needed.

- *Equity:* In locating poor access to affordable and nutritious food in relation to transit, the studio team has highlighted locations where the RFPC's goal to, "promote equity and access to affordable, nutritious food; strengthen local and regional food systems and increase community food security" are not being met.
- *Health:* When affordable and nutritious food is not easily accessible there arise concerns that residents are at greater risk for not getting the nutrition they need, another goal of the RFPC.
- *Policy:* By providing policy options for the RFPC in their regional role in supporting jurisdictional coordination across the county to best address the concerns of the regional food system.
- *Economic Development:* By addressing areas of inadequate healthy food access the studio team has also identified areas that should receive closer attention as possible future locations for any number of healthy food outlets which could best serve residents in the area.

LITERATURE REVIEW

Previous research was reviewed to develop the methods used in this report. Key studies include the New York City Department of Planning's "Going to the Market: New York City's Grocery Store and Supermarket Shortage,"[8] Junfeng Jiao 's dissertation, "Built Environments, Grocery Shopping Travel Behavior, and Food Deserts,"[9] for the University of Washington Urban Design and Planning PhD program, Brian Ho-Yin Lee's dissertation "Accessibility and Location Choice: Innovations in Measurement and Modeling,"[10] for the University of Washington's Urban Design and Planning PhD program and the United States Department of Agriculture (USDA) report to Congress, "Access to Affordable Food: Measuring and Understanding Food Deserts and Their Consequences."[11] The following summarizes that work and its relationship to the methods for measuring access to healthy food and defining food deserts.

The USDA report was conducted in 2009 and is one of the most comprehensive studies of food deserts to date. With growing concern that poor access to healthy food in low-income neighborhoods leads to poor diets, increasing obesity rates, diabetes and heart disease, the USDA was instructed to identify possible food deserts and characterize the socioeconomic and health conditions of these areas. In response, a one year study was performed "to assess the extent of areas with limited access to affordable and nutritious food, identify characteristics and causes of such areas, consider how limited access affects local populations and outline recommendations to address the problem."[12]

Conclusions from the report include:

- 4.1 percent of the U.S. population living in low-income areas has low access to a supermarket or large grocery store.
- Based on a study that evaluated food items purchased from 40,000 households across the U.S., supermarkets and large grocery stores have lower prices than smaller stores.
- Easy access to all food, rather than lack of access to specific healthy food may be a more important factor for explaining increases in obesity.
- Understanding the market conditions that contribute to differences in access to food is critical to the design of policy interventions that may be effective in reducing access limitations.
- The current state of research is insufficient to conclusively determine whether some areas with limited access have inadequate access.[13]

Where the USDA evaluates food deserts on the national scale, Jiao's dissertation focuses on access specifically to King County, Washington. His measure of access also uses multiple travel modes and differences in food cost. Similar to the USDA report, supermarkets are used as a location of healthy food.

A food desert was defined as an area with three characteristics: a block group that had 30 percent or more of its residents without access to a car, more than 40 percent of its population are below two times the poverty line, and is outside a 10 minute

walking distance (0.5 network miles) of a supermarket.

Results of the analysis determined that *people in King County have good access to food and there were no apparent food deserts by his definition*.[14]

Like Jiao's research, Brian Lee's dissertation also focuses on access in King County. Although his paper is directed more towards developing a prototype to measure transit access at the parcel level rather than identifying food deserts, his model and focus on King County transit is pertinent to our research. Furthermore, the second chapter, "Parcel-Level Measure of Public Transit Accessibility" uses travelling to grocery stores as an example of accessibility.

In 2008 the Housing, Economic, and Infrastructure Planning Division of the New York City Planning Department conducted a study of supermarket need within the city. The study was done with assistance from the New York City Food Policy Coordinator, the New York City Economic Development Corporation and Department of Health. To evaluate supermarket need, an index was developed to determine the areas in the city with the highest level of diet related diseases and largest populations with limited opportunities to purchase fresh foods.

The determination of need was based on high population density, low car ownership, low incomes, high rates of diabetes, high rates of obesity, low consumption of fresh fruits and vegetables, low share of fresh food retailers defined as supermarkets, meat markets, fish and seafood markets and fruit and vegetable markets and capacity for new stores. Results showed that the city has a large shortage of supermarkets and neighborhood grocery stores and nearly 16 percent of New Yorkers live in high need areas.[15]

METHODOLOGY

This section provides a brief description of the steps taken to identify food deserts in the central Puget Sound region. Each step was a complex process and therefore has been described in detail within Appendix FD-1 and Appendix FD-2.

- Define what the study team will be referring to as residences
- Define healthy food retailers using the Food and Nutritional Service (FNS) database as our source (see Appendix FD-1 for methodology and limitations)
- Define what was a walkable distance for pedestrians or those using transit through network analysis, which is explained below (Network analysis limitations in appendices)
- Geocode and map grocery stores (see Appendix FD-2)
- Denote "good" or "poor" access residential areas based on their distance to grocery stores or to a transit route that would transport them to a grocery store.
- Since food deserts are defined as areas of low-income, Census blocks with more than 40 percent of low-income households were then identified and mapped
- Additionally we then mapped demographic data on age and vehicle ownership
- Areas with poor access and low-income were recognized as food deserts, and an analysis on the mapped results was reviewed

Network Analysis

Most previous food desert analyses consider the distance of accessibility only 'as the crow flies'—linear radii from a central point that disregard the physical network of streets that constrain movement in developed places. By conducting a network analysis, the one-quarter and one-half mile service areas generated for each store more accurately reflect the street distance to a grocery store, in other words how far someone actually walks to get there such as turning corners and going around obstacles such as large buildings, natural geography and so on. In other words, network analysis more clearly and accurately depicts how food is actually accessed, taking into account the necessary paths one would need to maneuver to reach their destination. There remain some limitations regarding the accuracy of this analysis, which will be addressed below, but the use of a network analysis represents an improvement in the accuracy of catchment area delineation as compared to traditional circular radii.

Figure FD-1: Network v. Euclidean Distance

The network analysis process consisted of two separate phases, both involving service area analysis. The first phase involved determining the walkable service areas (one-quarter and one-half miles) centered around grocery stores, while the latter involved identifying walkable service areas of one-quarter mile around bus stops. These two processes were conducted for each of the four counties, with Kitsap being the only county not to have a transit component conducted because of time constraints. By considering both walkable distance around grocers and walkable distance around bus stops, we were able to determine not only where food deserts of the typical sort exist, which is to say those focused on walking access to grocers, but we were also able to determine how transit services impact the size, location, and other characteristics of the region's food deserts.

ANALYSIS AND RESULTS

The following section includes a series of maps delineating the location of food deserts within Pierce, King, Snohomish and Kitsap County and an analysis of the results. Additional maps showing the elderly population and car ownership in food desert areas are located in Appendix FD-5.

Figure FD-2: Location of Food Deserts in Pierce County

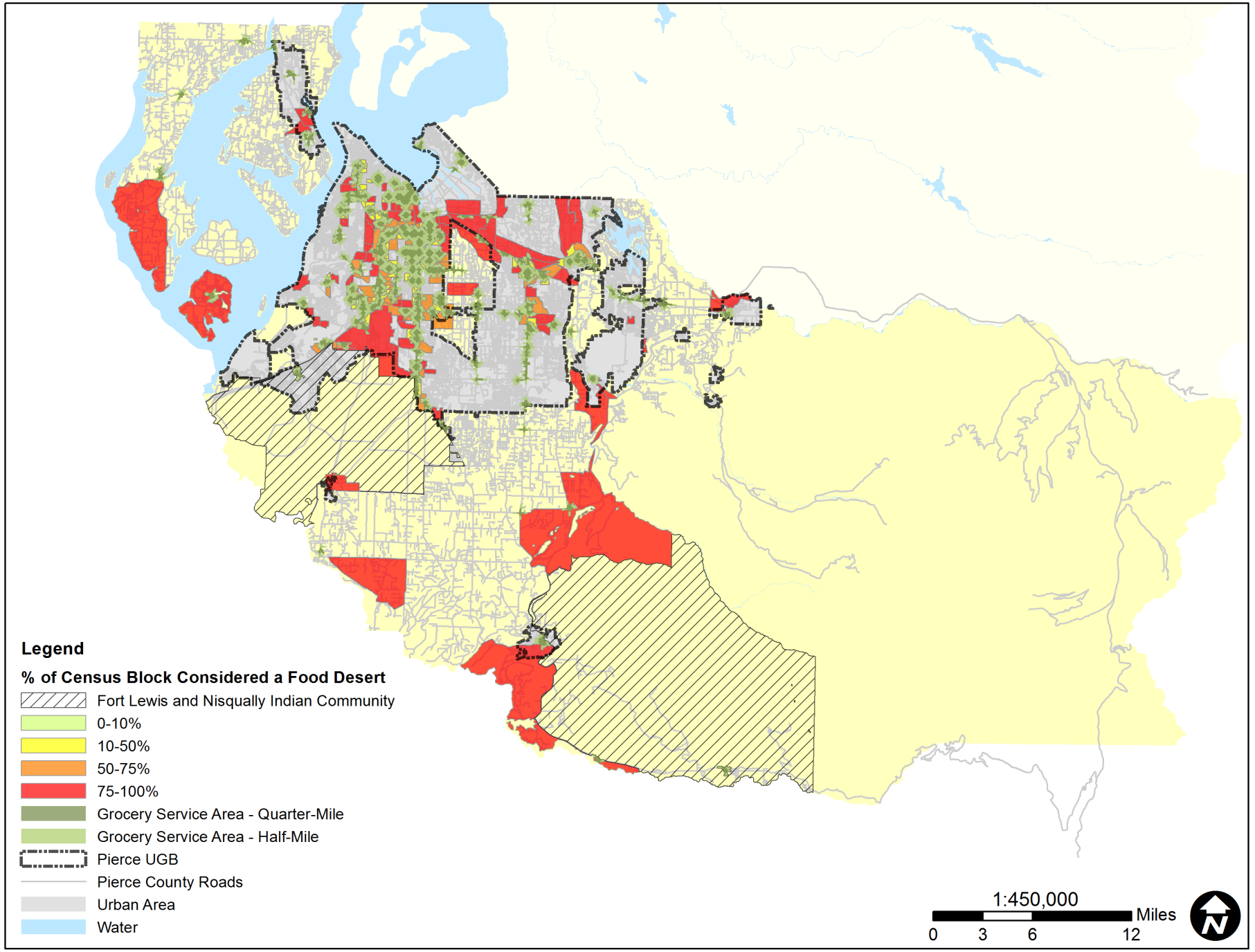


Figure FD-3: Location of Food Deserts in Tacoma

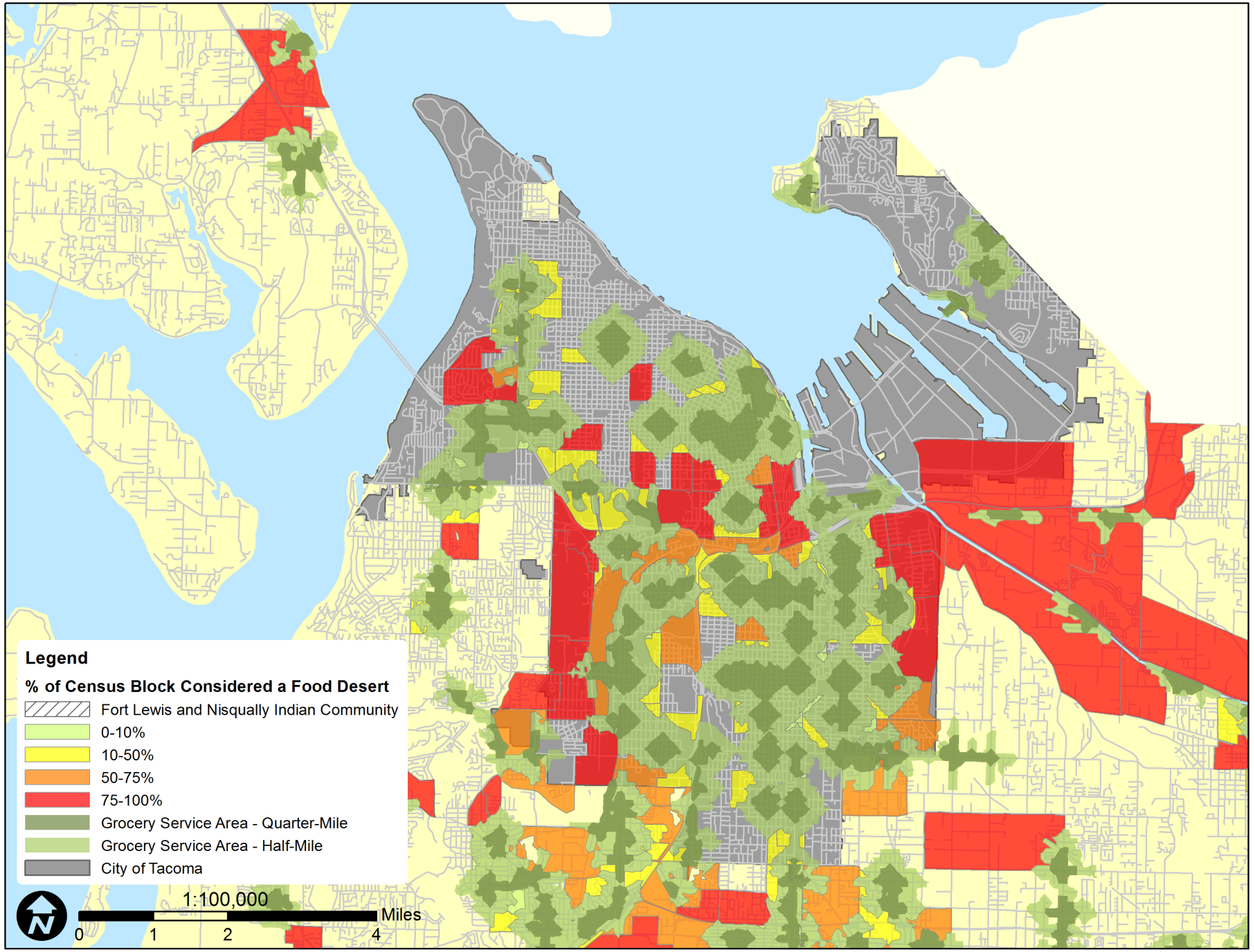
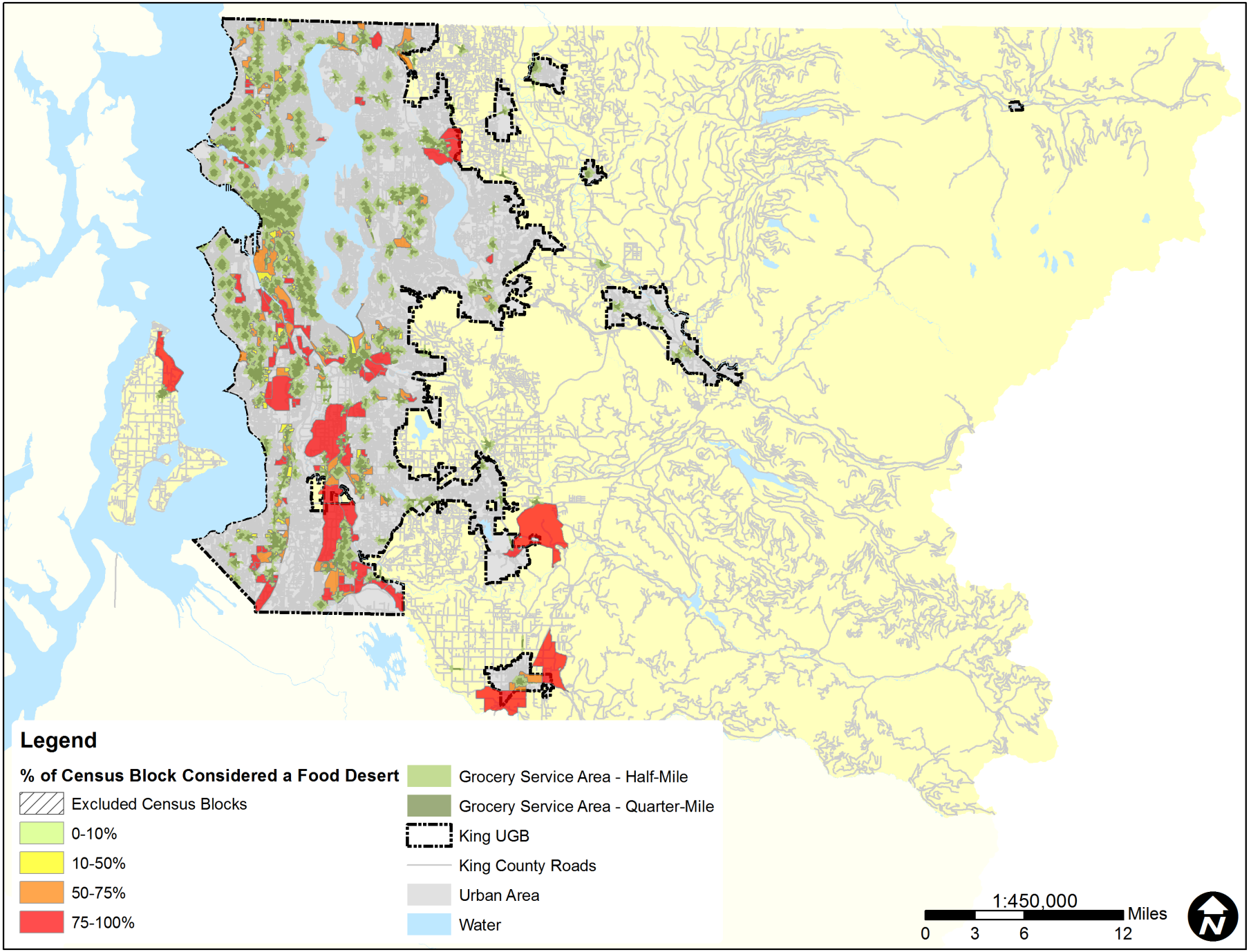


Figure FD-4: Location of Food Deserts in King County



King County

Figure FD-5: Location of Food Deserts in Seattle

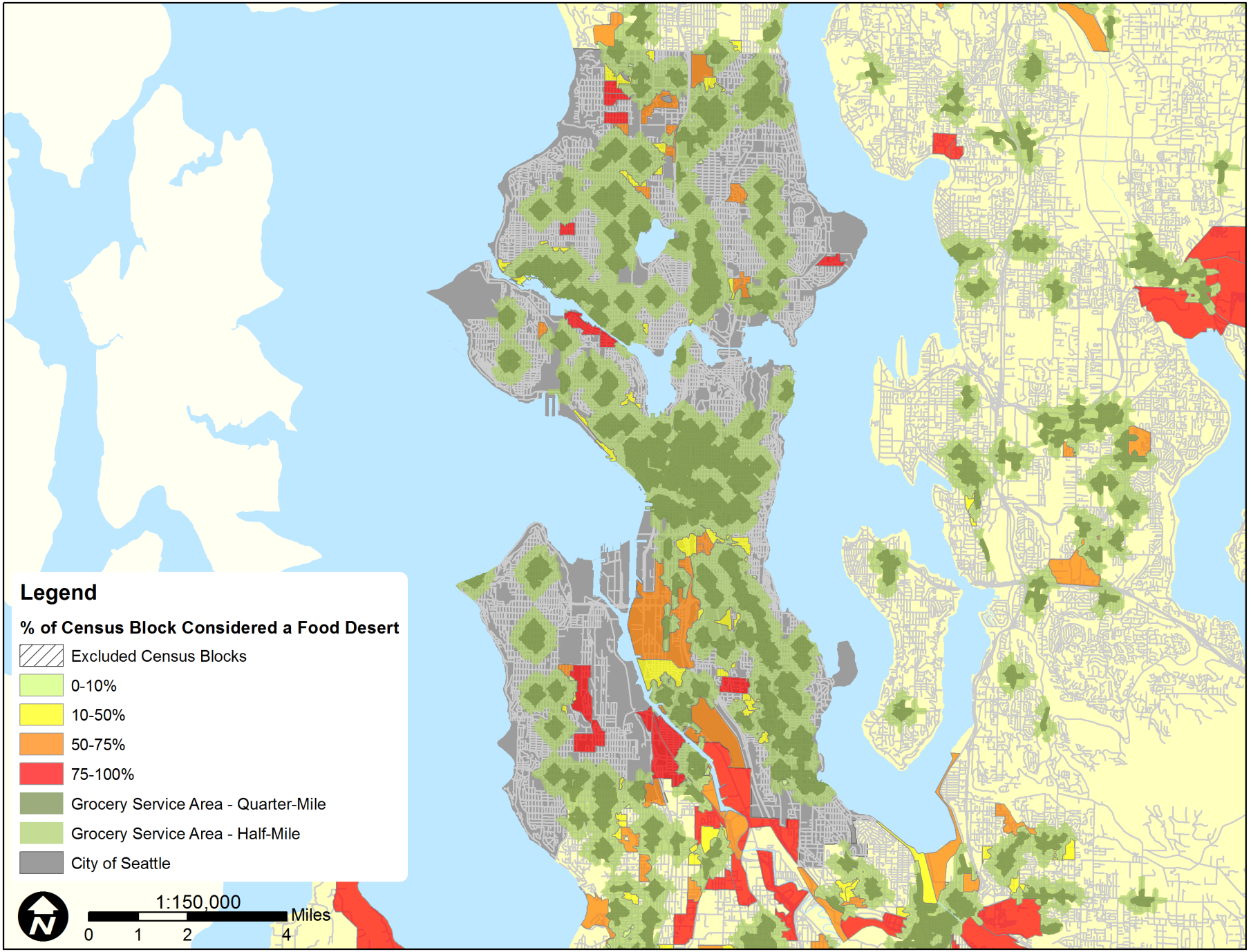
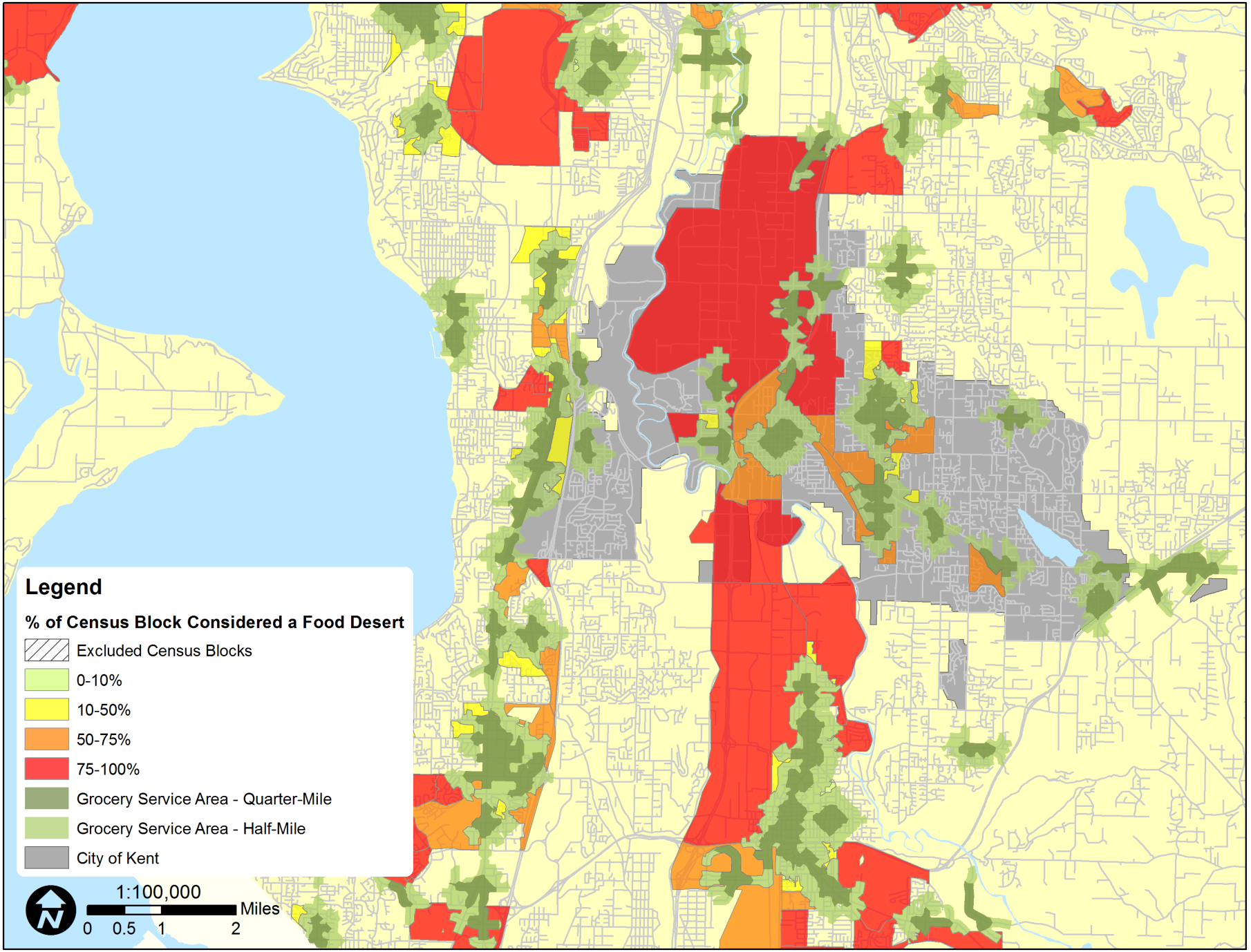
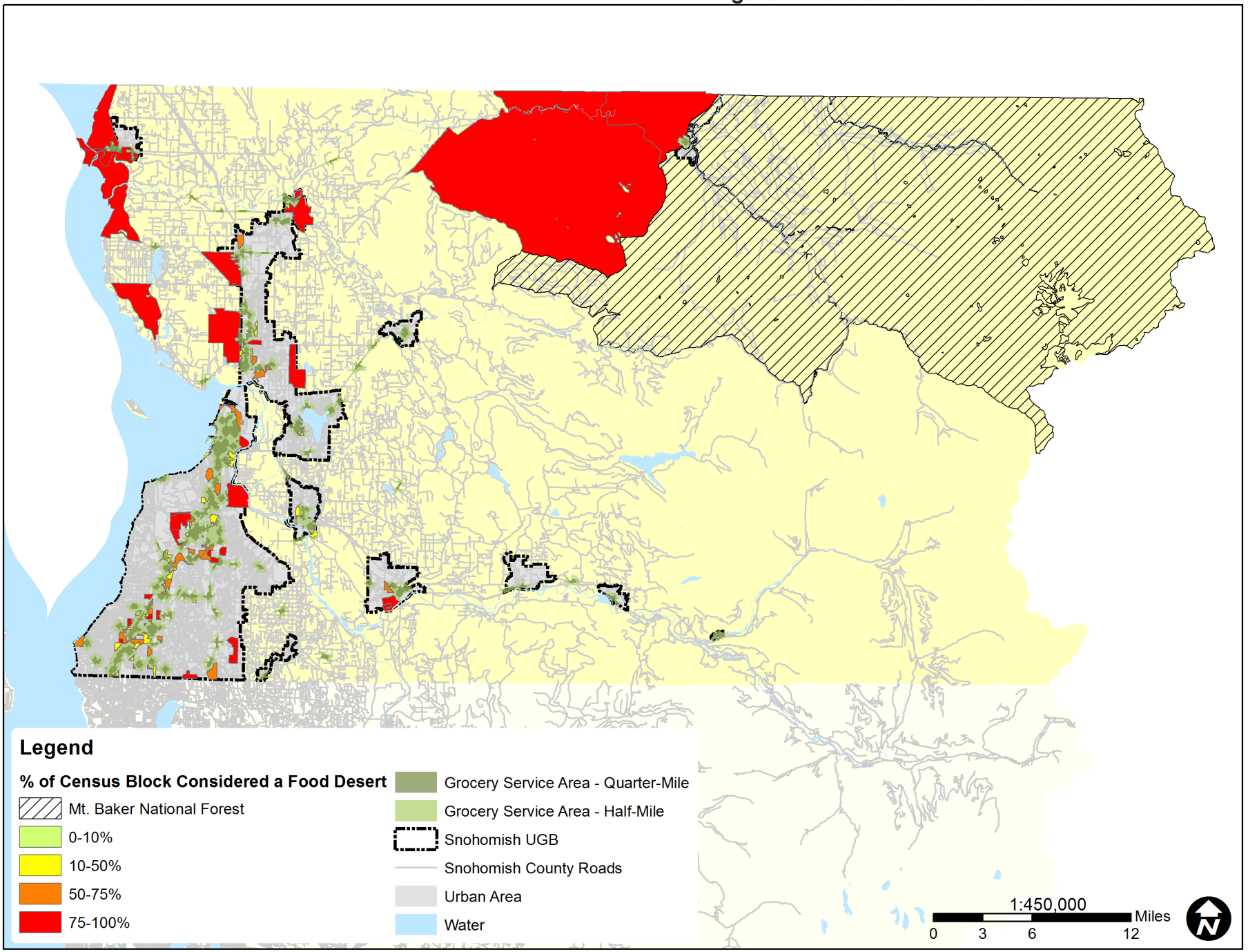


Figure FD-6: Location of Food Deserts in Kent



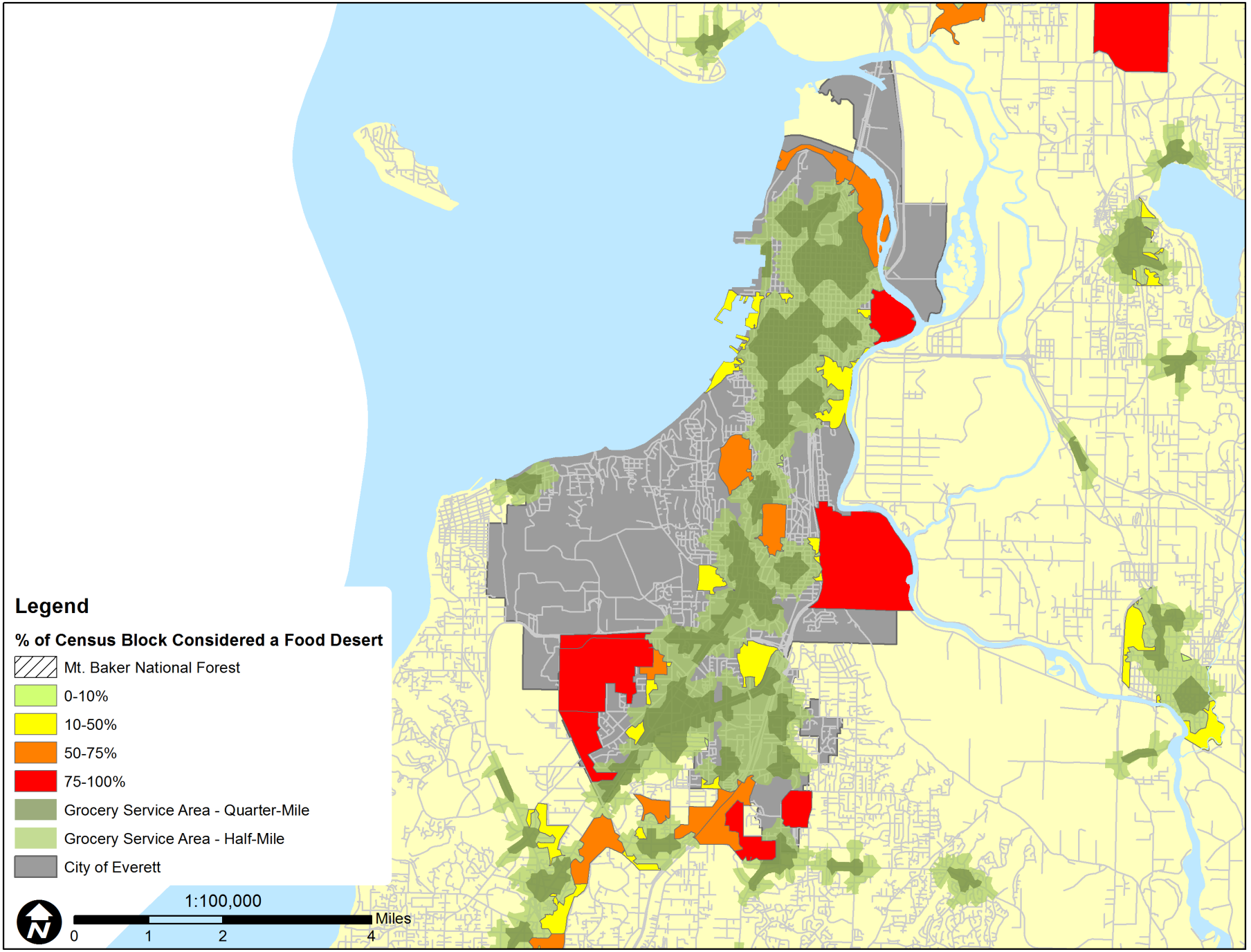
Snohomish County

Figure FD-7: Location of Food Deserts in Snohomish County



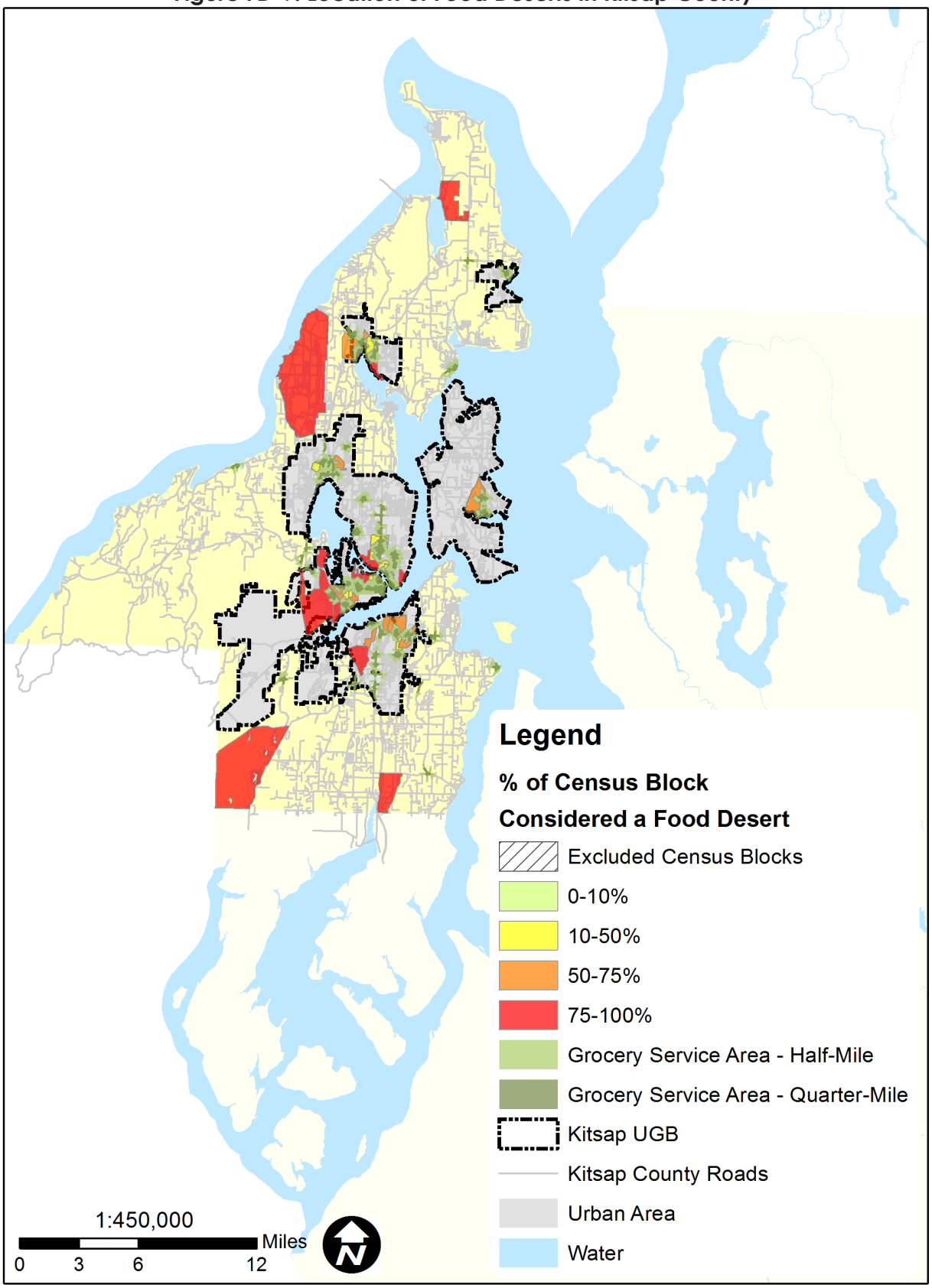
Snohomish County

Figure FD-8: Location of Food Deserts in Everett



Kitsap County

Figure FD-9: Location of Food Deserts in Kitsap County



Kitsap County

Figure FD-10: Location of Food Deserts in Bremerton

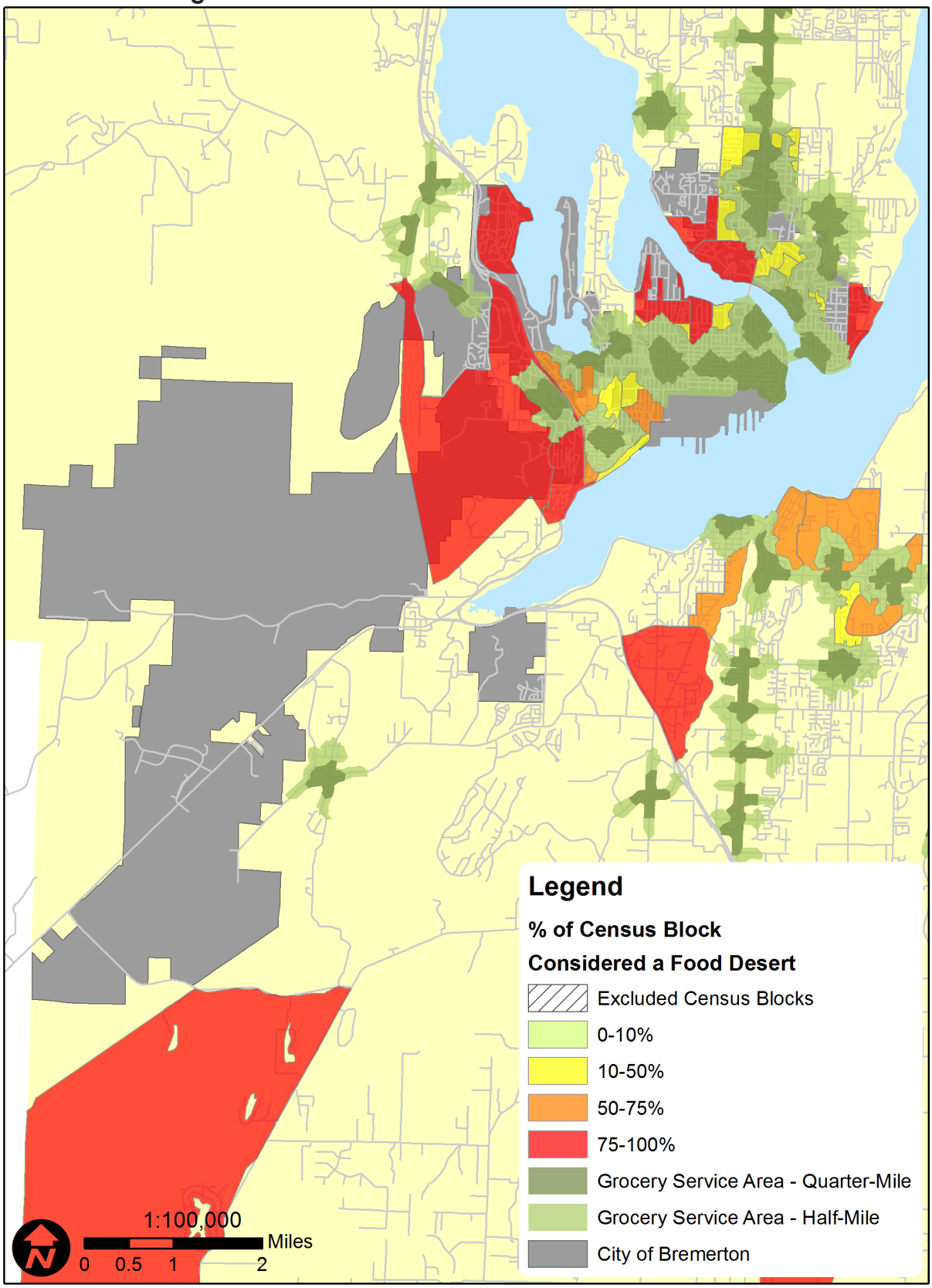


Figure FD-2 shows that large portions of food deserts are located both outside and within the urban growth boundary in Pierce County. Food deserts outside the urban growth boundary are located near the Fort Lewis and Nisqually Indian Community and Anderson Island. Locations of food deserts within the urban growth boundary exist in the City of Tacoma, which is illustrated in Figure FD-3.

Food deserts are predominately located in urban areas of King County. Concentrations of food deserts are greatest in the southern section of Seattle, Tukwila, Renton and Kent as evidenced in Figure FD-4. Figures FD-5 and FD-6 delineate food deserts in the City of Seattle and Kent to provide a closer look of these areas.

The majority of food deserts in Snohomish are located outside the urban growth boundary as depicted in Figure FD-7. A large portion of the county's food desert area is located on the eastern border of the Mt. Baker National Forest, but the this area may lack significance because the map shows evidence of nearly any roads, alluding to possibility that a very small population is affected by poor access to healthy food. Food deserts within the urban growth boundary are located in the south section of Everett, which is illustrated in Figure FD-8.

Figure FD-9 shows that the largest areas of food deserts in Kitsap County are located just outside of the north and south section of the urban growth boundary. Food deserts within the urban growth boundary are predominately located in the City of Bremerton, which is delineated in Figure FD-10.

The following tables show the population and number of households that exist in food deserts that lack walking access to healthy food retailers and both walking access and transit access to healthy food retailers. Table FD-2 also shows the reduction in the population and number of households within food desert areas when transit service is accounted for. Pierce and King County have the highest number of people and households living in food deserts, which can be attributed to both counties having greater populations than Snohomish and Kitsap County, although the latter two counties have higher percentages of households and population living in food deserts.

Table FD-2 shows that transit service significantly reduces the population and amount of households living in food deserts in Pierce, King and Snohomish County. Transit has a greater effect on food deserts in King and Pierce County, which could be attributed to larger rural food deserts in Snohomish County, where transit service is not provided. Results of transit impacts on food deserts in Kitsap County are not provided because of time constraints.

Table FD-1: Food Desert Population Outside of Walking Distance

% of Census block as FD	Population	% of Total Pop	# of Household Units	% of Total HH Units	Elderly
King County					
50-75	50,879	2.6%	23,564	2.8%	5,892
75-100	74,515	3.9%	34,393	4.1%	9,293
Total	125,394	6.5%	57,957	6.9%	15,185
Snohomish County					
50-75	17,212	2.4%	8,208	2.9%	2,566
75-100	26,243	3.7%	11,464	4.1%	4,105
Total	43,455	6.1%	19,673	7.0%	6,672
Pierce County					
50-75	28,912	3.6%	12,510	3.9%	3,352
75-100	79,097	9.9%	33,472	10.4%	8,169
Total	108,009	13.6%	45,982	14.2%	11,521
Kitsap County					
50-75	7,562	3.0%	3,580	3.5%	1,256
75-100	23,221	9.2%	8,183	8.0%	2,077
Total	30,783	12.3%	11,763	11.4%	3,333

Note: Calculations for county populations and household units are based on U.S. Census Bureau figures.[16]

Table FD-2: Food Desert Population Outside of Transit Service and Walking Distance

% of Census block as FD	Population	Reduction of FD Pop	# of Household Units	Reduction of FD HH
King County				
50-75	29,292	42%	13,304	44%
75-100	46,372	38%	21,476	38%
Total	75,664	40%	34,780	40%
Snohomish County				
50-75	11,070	36%	5,247	36%
75-100	19,349	26%	8,399	27%
Total	30,419	30%	13,646	31%
Pierce County				
50-75	16,744	42%	7,276	42%
75-100	49,017	38%	20,891	38%
Total	65,761	39%	28,167	39%

CONCLUSIONS

Analyses of each county within the central Puget Sound region indicates differentiation county to county in regards to how transit relates to food deserts. One critical factor in this relationship is whether food deserts are predominantly located within or outside of the UGA. In both King and Pierce Counties, the consideration of transit results in a significant reduction in the acreage of the census blocks considered food deserts. Conversely, in Snohomish County, the majority of food deserts are not impacted by transit as they are located outside of the UGA where transit is much more limited if present at all. This suggests that when attempting to determine the best solution for improving accessibility to food, each county faces different conditions and should therefore consider approaching solutions differently.

Due to the studio team being not having adequate time to analyze Kitsap's transit system as it relates to food deserts in the county, the team does recommend that a similar analysis be conducted on the county. In all four counties there are numerous factors to take into consideration in analyzing food access by transit which is not discussed in this report but should be taken into account including, headway times, typography such as steep hills which would impede pedestrians from using a street especially while carrying groceries, infrastructure conditions as well as numerous other factors which affect the experience of using transit to access food.

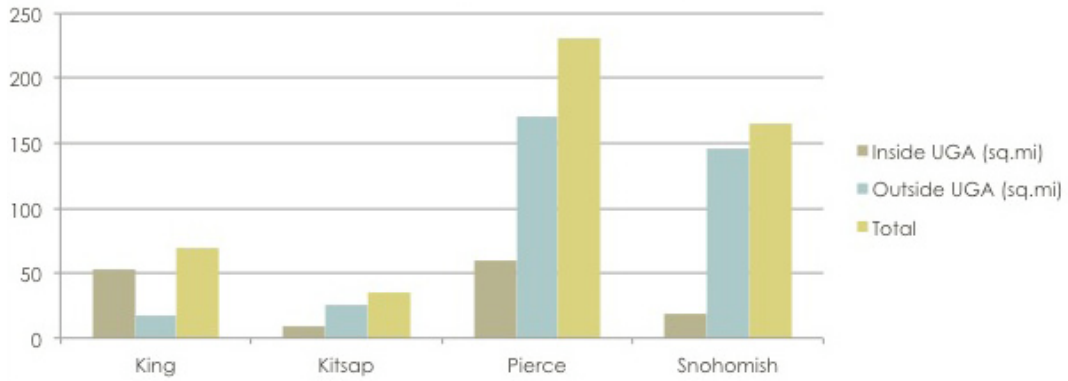
By mapping elderly residents within food deserts the studio team serve to provide the Puget Sound Regional Council with data on where one portion of at risk individuals resides in relation to food deserts across the region. Each county's elderly population respectively comprises 10.7 percent in King County, 9.8 percent in Snohomish County, 10.8 percent in Pierce County, and 13.3 of Kitsap County of the total population. The maps created in this report do indicate that there may be concerns around elderly access to healthy affordable food. Elderly access to food is one example of an issue that may best be addressed through a partnership with local community groups that are currently engaged with the elderly population.
A similar analysis to the one done in this study could be facilitated to indicate if there are other demographics that have a large portion of their residents living in food deserts.

Vehicle ownership across the region is consistently high and does not appear to be a significant barrier to food access. What this data does tell us is that a large majority of the central Puget Sound region, whether low income or not relies on vehicle ownership for their transportation needs.

The studio teams' food desert population analysis denotes that between 6.9 percent and 14.2 percent of households live within food deserts when transit is not a consideration. This number decreases by 30- 40 percent when transit is factored into the equation in Pierce, Snohomish and King Counties. This percentage differential decreases the total households located in food

deserts within these three counties from 123,612 to 76,593, indicating the importance of transit service as a factor in mitigating the impacts of food deserts on the central Puget Sound region residents.

Figure FD-11 Rural v. Urban Food Desert Area



Roles of Puget Sound Regional Council

***Assess*:** Different levels of access of residences to healthy food in low-income communities can be assessed throughout the region by using methods established in this report. The location of and severity of food deserts can be more accurately determined using the methods used in this report, given more time and resources.

***Advocate*:** The Puget Sound Regional Council can advocate for the reduction of food deserts by taking steps to educate both jurisdictions and the public about what food deserts are, why they are important and other cities that are taking measures to alleviate issues associated with poor food access in low-income communities. Steps could also be taken to raise food access concerns to transportation agencies, which can assist in improving transit access to healthy food by tailoring transit timing, and routes. The Puget Sound Regional Council can raise awareness that food deserts is a national issue recognized by the federal government, as well as funding opportunities to provide better access to healthy foods. Funding opportunities include the United States Department of Agriculture Community Food Project Competitive Grant Program, which help low-income communities develop innovative approaches to improve their food system.[17]

***Educate*:** Puget Sound Regional Council can educate both jurisdictions and the public on the issues presented in the Advocate section by posting food desert information on their website and conducting presentations and discussions on the topic. The studio group also felt it would be useful for bus routes to advertise access routes to healthy food options so residents would be more aware that a route could connect them with healthy shopping access points.

***Make Policy Suggestions*:** Policies that have been used to alleviate food deserts include improving existing food retailers and encouraging new stores in areas with limited access through incentive programs, promoting community-level programs such as farmers markets, community gardens or mobile food carts, improving public

transportation routes in areas with limited access or providing transportation subsidies to low-income residents, and considering access to healthy food in land use planning and zoning decisions, such as location of public housing near grocery stores. [18]

Leverage Communication Across Sectors: Improved communication and cooperation between health departments and planning departments would provide a better assessment of food deserts. Health departments have the potential to provide more reliable data on healthy food locations by surveying types of food sold by retailers applying for permits. Planning departments can use this data to provide a better measurement of where food deserts exist and levels of diet-related health concerns in these areas. Further the Puget Sound Regional Council may find it beneficial to work with the Washington State Department of Health to provide increased public access to GIS data for analysis by other organizations.

Further Research

Ultimately, the culmination of this report should be thought of as only the first step in the process of thoroughly addressing the existence of food deserts in the central Puget Sound region. Dedicating additional time and resources can help to alleviate some of the limitations acknowledged in this report, including such issues as uncertainty about the accuracy and/or comprehensiveness of the FNS database used as the basis for this analysis. Beyond simply addressing this report's limitations, however, there are also several areas of further research that could have been conducted as part of this report but which exceeded the ability of the studio team given the time and resources available.

Perhaps most notable is the interest in examining diet-related health data across the region to determine if any spatial relationship exists between access to healthy food—or the lack thereof—and health conditions such as obesity, diabetes, and heart disease. By overlaying this data with maps of areas of low healthy food access, it would allow for analysis of whether a relationship between the two exists. Obesity rates are on the rise in all four counties of the central Puget Sound region. Rates of obesity range from 21.4 percent to 29.5 percent of the entire population as of 2008. Meanwhile, between six and eight percent of the population has diabetes, and between 32 and 33 percent of the population has high cholesterol.[19]

While many counties have published maps of health data geographically across their individual county, raw shapefile data is currently not accessible through County Department of Health Offices, nor through the Washington State Department of Health as the data is proprietary. Therefore, while the studio team was able to gather data on prevalence of food related diseases, the appropriate data files could not be accessed to demonstrate a full analysis of the possible relationships within the central Puget Sound region of food deserts to diet related disease rates. With improved access to this data, researchers moving forward could more easily conduct analysis of whether there is a strong relationship between diet related disease and food deserts across the region. This would provide an even stronger rationale for where to focus attention on food deserts.

In addition to Washington Department of Health, this health data is also collected by The Behavioral Risk Factor Surveillance System (BRFSS). The areas that BRFSS uses are based on metropolitan areas, which contain 500 or more responses, and are not related to zip code or census tract and therefore are not usable in our analysis.[20] Given a greater span of time and access to further health data it would be pertinent to include food related health impacts within the food desert analysis.

Further research could also be conducted with regards to transit access by additionally considering travel time, service schedules and headways, and determining what stores are served by which routes. This latter point in particular could prove useful if such information were then published with route information as a means of helping to connect residents to healthy food by means they may not have known were available to them. The consideration of headways and schedules would be useful in determining if the access suggested by the analysis in this report can reasonably be considered 'adequate', as someone required to travel an hour or more by bus to reach a grocer may not be considered to have satisfactory access.

In any event, efforts should be made to communicate directly with the neighborhoods and communities living with poor access to healthy food to determine how they cope with their situations, how they believe their situations might best be improved, and how the Regional Food Policy Council can be involved in facilitating such improvements. Though additional research may lead to modification of the particular boundaries of areas considered food deserts in the region, this report provides a sound basis from which to begin considering the problem and can serve as a valuable tool in targeting action and policy to those areas with significant need.

Appendix FD-1: Identifying and Sorting Grocers

To identify the location of grocers in the Central Puget Sound region that provide access to healthy food items, a range of stores were filtered from the Food and Nutritional Service (FNS) database provided by the Washington State Department of Social and Health Services. Grocers listed in the FNS database are all businesses in King, Pierce, Snohomish and Kitsap County that accept food stamps. Information of business type, county, city, name, address and phone number are provided for each establishment. While it is possible to use other data sources such as the Department of Health data, demonstrated by Junfeng Jiao's dissertation, "Built Environments, Grocery Shopping Travel Behavior, and Food Deserts," given the time restraints of this report it was most beneficial to work with a more accessible data set.

Because the purpose of this study is to determine the access of residents to healthy food, businesses that provide little or no food products which are unprocessed, low in sugars, or saturated fats were filtered from the list. Since some stores provide a full range of healthy food items and others specialize in specific types of foods, grocers were also categorized in the filtering process. Each store is labeled as either an ethnic grocer, a specialty store, or a full grocer.

When addressing categorizing food access, it became clear that it would be inappropriate to lump all food access into one all-inclusive category of food locations. Our attempt was to demonstrate access to foods that support a healthy lifestyle -- fresh produce, protein sources, dairy goods, and whole grains -- and as such we needed to distinguish between stores that do and do not distinguish between these types of food. To address this issue we subdivided food access points into four color-coded categories:

FG, Full-Service Grocer (Green) –access to a full range of healthy food
SF, Specialty Foods (Blue) –access to some healthy foods but not a full range (butcher, bakery, etc.)
CG, Cultural Grocer (Purple) – ethnically significant food access points
NA, Not Applicable (Red) – not a healthy access point

The first step of the filtering process involved identifying entire business type categories established by Social and Health Services to keep or eliminate. The following categories were eliminated:

DR:	Delivery Route	GL:	Group Living
MD:	Meals Delivery	MC:	Military Institution

The following categories were kept and categorized as full grocers:

FM:	Farmers Market	SE:	Seafood
FV:	Fruits and Veg Spec Store	SM:	Supermarket
LG:	Large Grocer	SS:	Superstore

Stores in the remaining categories were difficult to categorize because they consisted predominately of small to medium size grocers and ethnic food stores with ambiguous names (Lee's Oriental Mart, Ty Ty). Also, not all categories could be identified because symbol definitions were not available for unexplained reasons such as typos and/or new categories.[21] To filter these businesses, methods were established to categorize each store by name. All stores that included the following words in the business name were removed from the dataset:

- Mart
- Mini
- Video
- Casa
- Discount
- Smoke
- Restaurant
- Deli

the rationale behind this decision was that "restaurant" and "casa" generally refer to eat in or take out food retailers, and "deli", "smoke", "mini", "video", "discount", and "mart" generally refer to small retail outlets in which food is a small portion of sales and the food that is sold does not fit within our discussed definition of healthy options.

Also excluded were drug stores, chain convenience stores, such as 7-Eleven, gas stations and any other names that indicated the business lacked healthy foods, such as dollar stores.

Names that included the following words were labeled as specialty stores:

- Meat
- Bakery (Panaderia)
- Seafood
- Butcher (Carneceria)
- Fruits and Vegetables

Also included in this category were small grocers that included the words produce, market, food and grocery. Medium and larger stores containing these words were labeled as full grocers.
Grocery stores with names that suggested food products were from or serve populations specific to regions outside of the United States and/or included languages other than English were identified as ethnic grocers.

Grocery Database Limitations

While the FNS Food Stamp Database provides the basis for analysis, it must be noted that it is not the most comprehensive dataset available to compile all of the region's grocery stores. The database includes the vast majority of the region's grocers, but

there are omissions, at least in part because some grocery outlets do not accept food stamps. Conversely, there are stores in the database that are no longer in business, despite the database being updated in March 2011.

Given that the FNS database contains over 3,600 records, correcting either of these flaws would be a large task beyond our scope. Further, while sorting the database it became evident that some stores have multiple records, sometimes with minor variations in spelling or address, which may have resulted in multiple points being generated for a single store by the automatic geocoding. As long as these were geocoded to the same location, this should not affect the network analysis, but it represents an inaccuracy in the database.

Geocoding and Mapping Grocers

Appendix FD-2: Technical GIS Analysis

To map the location of food retail outlets, the revised grocer database first had to be geocoded, which was accomplished using GIS software.[22] Several iterations of the geocoding process were run with varying settings to obtain optimal accuracy while minimizing the number of records left unmatched due to trivial differences, such as a spelling error, incorrect zip code for an otherwise accurate address, or other similar errors. Striking such a balance was important because the four-county grocery database contains over 3,600 records, and a perfectly-strict matching scheme resulted in several hundred unmatched records, each of which would then need to be manually geocoded individually.

Geocoding Limitations

Despite considerable efforts to geocode the grocers database with as much accuracy as possible, there are some notable limitations. For example, we cannot attest to the absolute accuracy of the automatic geocoding results; though the addresses in the grocery database were matched to addresses in the GIS street network database, the matched point may be up to a couple hundred feet away from the store's actual location. While this may introduce some error, it is likely to typically be minor, as a check of several dozen matches showed that they typically fall within the same block as the correct location.

Geocoding Process

Table FD-3: Geocoding Sensitivity Analysis Results

Geocode Options		Geocode Test Interations											
		Geo_50		*Geo_75*		*Geo_85*		*Geo_90*		*Geo_95*		*Geo_100*	
Settings	Spelling Sensitivity	50		75		85		90		95		100	
	Minimum Candidate Score	50		75		85		90		95		100	
	Minimum Match Score	50		75		85		90		95		100	
		20 feet		20 feet		20 feet		20 feet		20 feet		20 feet	
		3%		3%		3%		3%		3%		3%	
Results	Matched	3336	98%	3285	97%	3262	96%	3223	95%	3025	89%	2960	87%
	Tied	12	0%	10	0%	17	1%	6	0%	3	0%	2	0%
	Unmatched	40	2%	93	3%	109	3%	159	5%	360	11%	426	13%

We deemed the results of the Geo_90 run to be optimal for our purposes, with which only 160 records remained unmatched and the matched results proved to be reliable. To manually geocode each of the unmatched results, several tactics were utilized. First, the *Find Location* tool was used, with several permutations of the unmatched addresses searched to determine if minor variations would improve the software's recognition of the intended address sufficiently to be mapped automatically. Examples of such variations include removing direction prefixes and suffixes (e.g. N, S) from addresses, correcting spelling errors (e.g. 'Min' corrected to 'Main'), and

omitting the city name to account for the potential of it being incorrect (one store listed in the FNS database as being in Bothell is actually in Kenmore). If these attempts failed to achieve a match, the same addresses were searched using the online mapping websites Google Maps and Bing Maps. If a store's location could be clearly and irrefutably ascertained from this map imagery, this location was found in GIS and a point was manually placed in the store's location. Locations for a few stores could not be found using any of these methods, so these were regrettably removed from the analysis.

Network Limitations

Though network analysis represents a significant improvement over circular catchment area analysis, there exist a number of limitations to this analysis that result primarily from limitations in data quality and time. One notable limitation is that the street network data sets do not contain elevation data, which therefore makes it impossible to distinguish between intersecting road lines that actually cross (as in an at-grade intersection) and those that do not actually cross (as in the case of a highway overpass), resulting in the potential that some service areas include calculated walking paths that do not actually exist. Another limitation arises from the use of a street network dataset rather than a sidewalk network, necessary because the latter does not exist in a current, complete form across all four counties.

Appendix FD-4: Demographics

Three demographic variables are used in this study; income, age and vehicle ownership. Identifying low-income areas is necessary to map locations of food deserts, as the quality of having a high percentage of low-income residents is one of the defining characteristics of a food desert. Including vehicle ownership and age variables will help to illustrate areas where individual mobility may be impaired, thereby representing especially vulnerable populations that may require particular attention. Demographic data is extracted from the 2000 Census.

Income

The standard for food stamps will be used to define the low-income households because healthy food retail location is based on grocers who accept food stamps. The income guideline for families who are able to get food stamps is as follows:

The gross income guideline for families with children under the age of 19 is 200 percent of the federal poverty level, based on family size. The 2000 federal poverty level is shown in Table 1. Since 2000 Census data is used for this analysis, the federal poverty level of year 2000 is also used. This standard is commensurate with the standards of USDA report.

Table FD-4: 2000 Federal HHS Poverty Guide line

Size of Family Unit	48 States and DC	Alaska	Hawaii
1	$8,350	$10,430	$9,590
2	$11,250	$14,060	$12,930
3	$14,150	$17,690	$16,270
4	$17,050	$21,320	$19,610
5	$19,950	$24,950	$22,950
6	$22,850	$28,580	$26,290
7	$25,750	$32,210	$29,630
8	$28,650	$35,840	$32,970
For Each Additional Person	$2,900	$3,630	$3,340

Since the 2000 Census figures are aggregated data, the size of each household unit cannot be applied to each household. U.S. Department of Housing and Urban Development four-person household low-income limits are designated as the standard household size, therefore we use this measure for our analysis.[23] Based on Table FD-4, four-person households with annual incomes below $17,050 are eligible for food stamps. Using a standard of twice the poverty level, households with an annual income less than $34,100 are considered low-income areas in this food desert analysis.

2000 Census income classes are illustrated in Table FD-5. Since $ 34,100 is the income threshold, Class 1 to 6, from $0 to $ 34,999, are characterized as low income classes for our study. Figure 1 and Figure 2 describe the distribution of low-income households in Pierce County.

Table FD-5: Pierce County 2000 Census Data HH Income Class

Income class	Household income
1	Less than $10,000
2	$10,000 to $14,999
3	$15,000 to $19,999
4	$20,000 to $24,999
5	$25,000 to $29,999
6	$30,000 to $34,999
7	$35,000 to $39,999
8	$40,000 to $ 44,999
9	$50,000 to $59,999
10	$60,000 to $74,999
11	$75,000 to $99,999
12	$100,000 to $124,999
13	$125,000 to $149,999
14	$150,000 to $199,999
15	$200,000 or more

Source: Data dictionary, U.S. Census Bureau, Census 2000

Age

Food desert areas are compared with the distribution of the elderly population because they have less physical mobility. The elderly population is defined as residents that are 65 years or above, based on average retirement age in 2000.

Vehicle Ownership

Levels of vehicle ownership are illustrated to identify food deserts that lack the ability to use automobiles to access healthy food.

Appendix FD-4: Interviews

In obtaining data for this report the studio group interviewed numerous individuals currently involved in food access research.

Health Data

Information related to what health data is available was obtained in great part through interviews and correspondence conducted with members of country health staff including: Nadine Chan and Nadine McGroder from King County Health Department, Jane Ballard of the Snohomish Department of Health, Mark Serafin from the Snohomish County Department of Health, Marilyn Sitaker from the Chronic Disease and Prevention Unit of Washington State Department of Health, Rhonda Perozzo from the Office of Community Assessment at the Tacoma Pierce County Health Department, and Dennis McDermot from Washington State Department of Health.

Each of the above individuals were contacted to obtain GIS health data which could be over-layed onto our network analysis maps. It was through speaking with each person that it became clear that while this data does exist it was not widely available.

Food Retailer Database

The database including name and location of all food retailers accepting food stamps in the central Puget Sound region was provided via email by Kara Martin from Urban Food Link. Kara obtained the information from contacts at the Washington State Department of Health and Social Services.

Methodology and Data Collection

We interviewed Junfeng Jiao who is the Ph.D. in urban planning at the University of Washington. Jungfeng Jiao's dissertation is related to grocery shopping travel behavior and food desert, making his assistance a valuable asset to our study. The interview was divided into two parts: data access and methodology.

Data
1) Supermarkets data
§ Junfeng Jiao used Public Health Seattle& King County supermarket permit records within King County. The UFL classification which considers chain establishments nationally or regionally is used. Chain establishment include a broad selection of food. Even though this data has high quality, he recommended using other data because it is difficult to get allowance from public health department and it is expected to take long time. By getting a sense from his UFL classification, we applied that classification when we sorted and organized our grocery store data later.

2) Individual travel and socioeconomic data
§ Junfeng Jiao used Grocery shopping travel data and the travelers' socioeconomic characteristics
§ Junfeng Jiao utilized Seattle Obesity Study (SOS) telephone survey including questions about diet quality, food shopping habits and expenditures, physical activity , food insecurity, perception of neighborhood and access, transportation to work and

school, health and body weight, and demographics
§ Coming up with some idea from his data set, we developed our topics for studio class by relating our results(food accessibility) to other health data(obesity..)

Methodology

1) Geocoding
§ The food permit records from Public Health Seattle & King County were geo-coded to the King County Parcel data based on their address. Since the automatic geocoding process left 10 percent of total data unmatched, he manually geocoded them. We did geocode in the same way he did, and we also got about 10% unmatched data. We still did not decide how to deal with these data.

2) Accessibility
§ Since he took into account diverse transport modes, we obtained advice about food accessibility related to transit. He created the ten-minute bus service area and selected the quarter mile distance for people to walk to a bus stop from groceries. Since we had a plan to use network analysis, he gave some resources which cover the network analysis and recommended dissertations in terms of methodology.

Appendix FD-5: Additional Maps

Pierce County

Figure FD-12: Elderly Population in Pierce County Food Deserts

Figure FD-13: Vehicle Ownership in Pierce County Food Deserts

King County

Figure FD-14: Elderly Population in King County Food Deserts

Figure FD-15: Vehicle Ownership in King County Food Deserts

Snohomish County

Figure FD-16: Elderly Population in Snohomish County Food Deserts

Figure FD-17: Vehicle Ownership in Snohomish County Food Deserts

Kitsap County

Figure FD-18: Elderly Population in Kitsap County Food Deserts

Figure FD-19: Vehicle Ownership in Kitsap County Food Deserts

Figure FD-12: Elderly Population in Pierce County Food Deserts

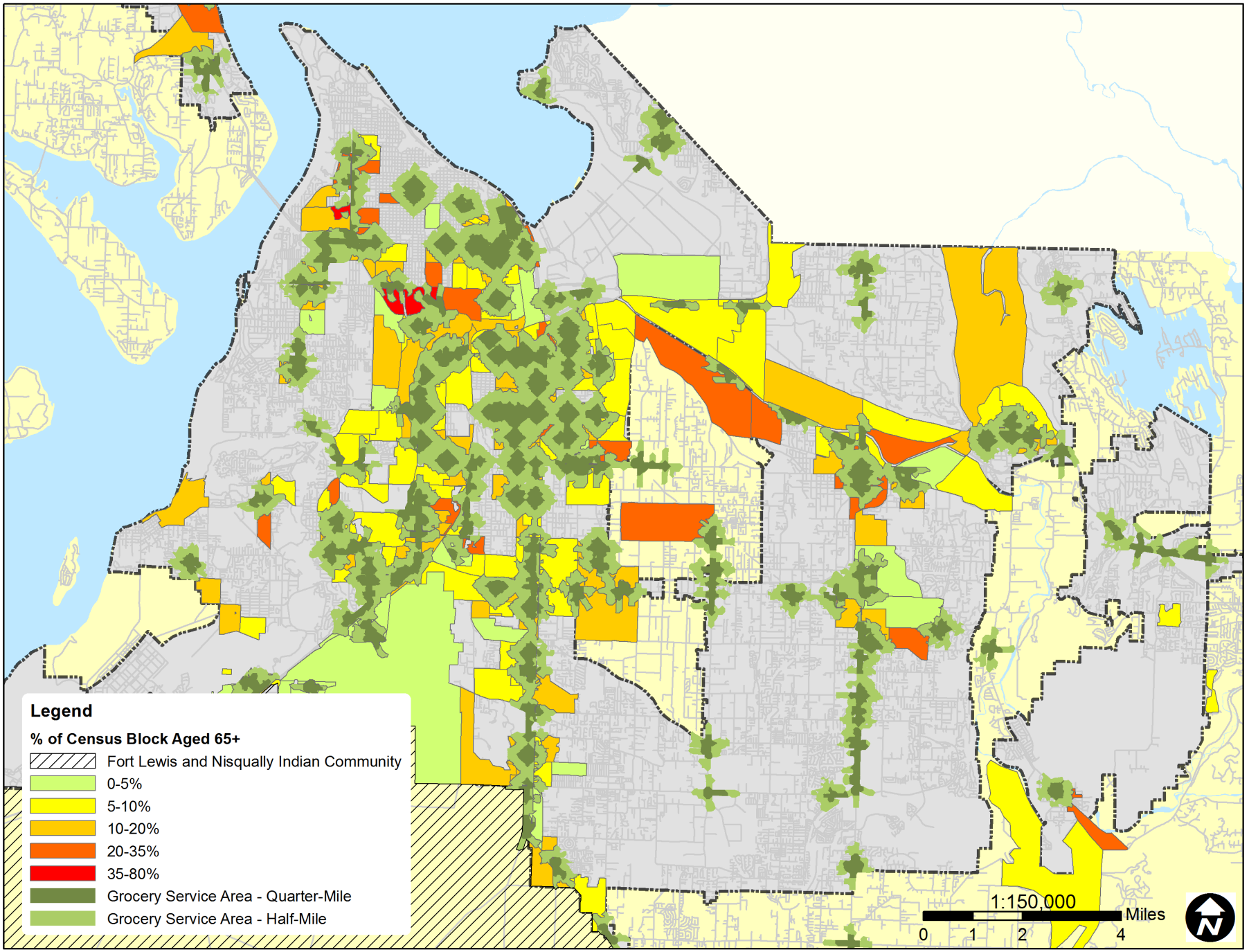


Figure FD-13: Vehicle Ownership in Pierce County Food Deserts

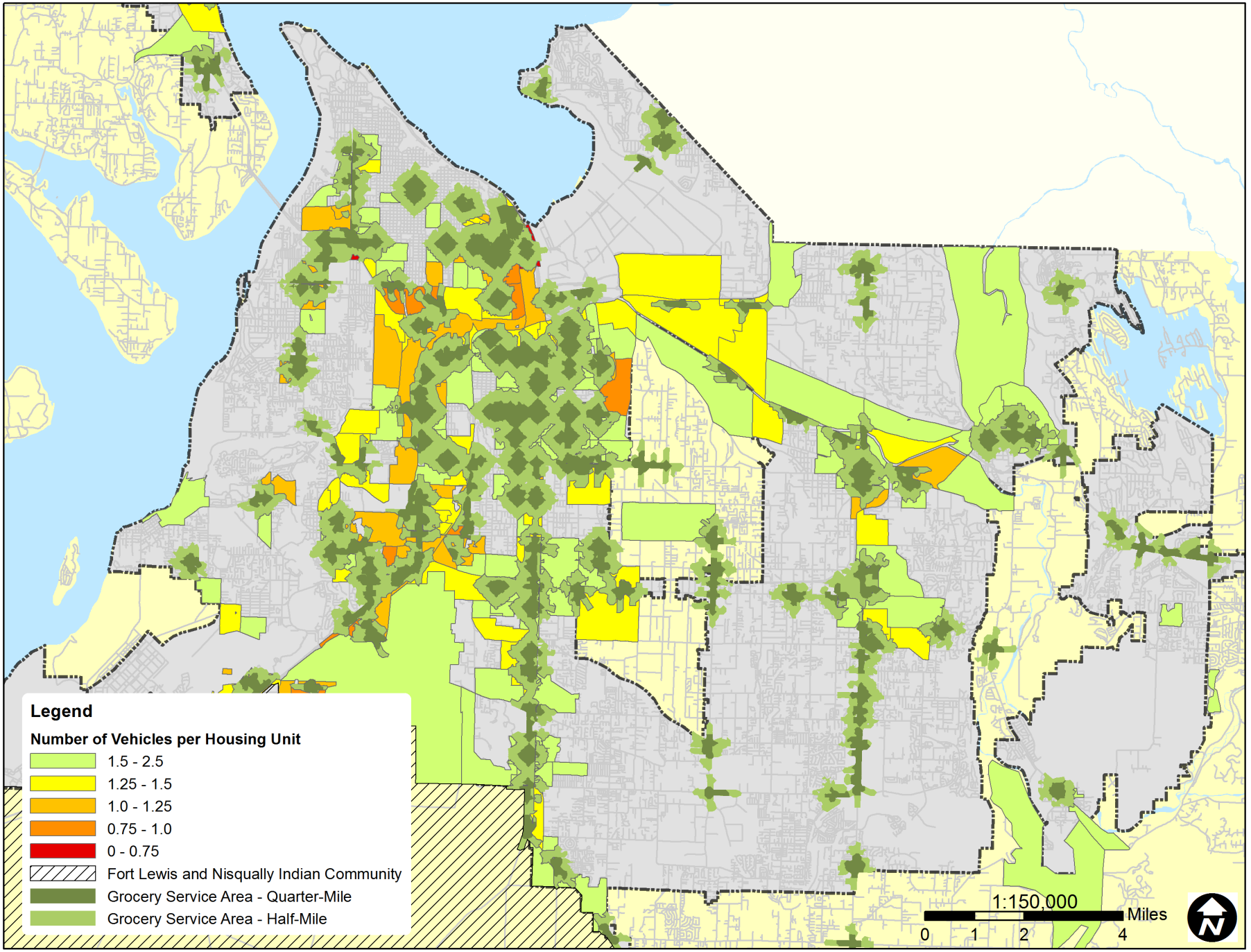


Figure FD-14: Elderly Population in King County Food Deserts

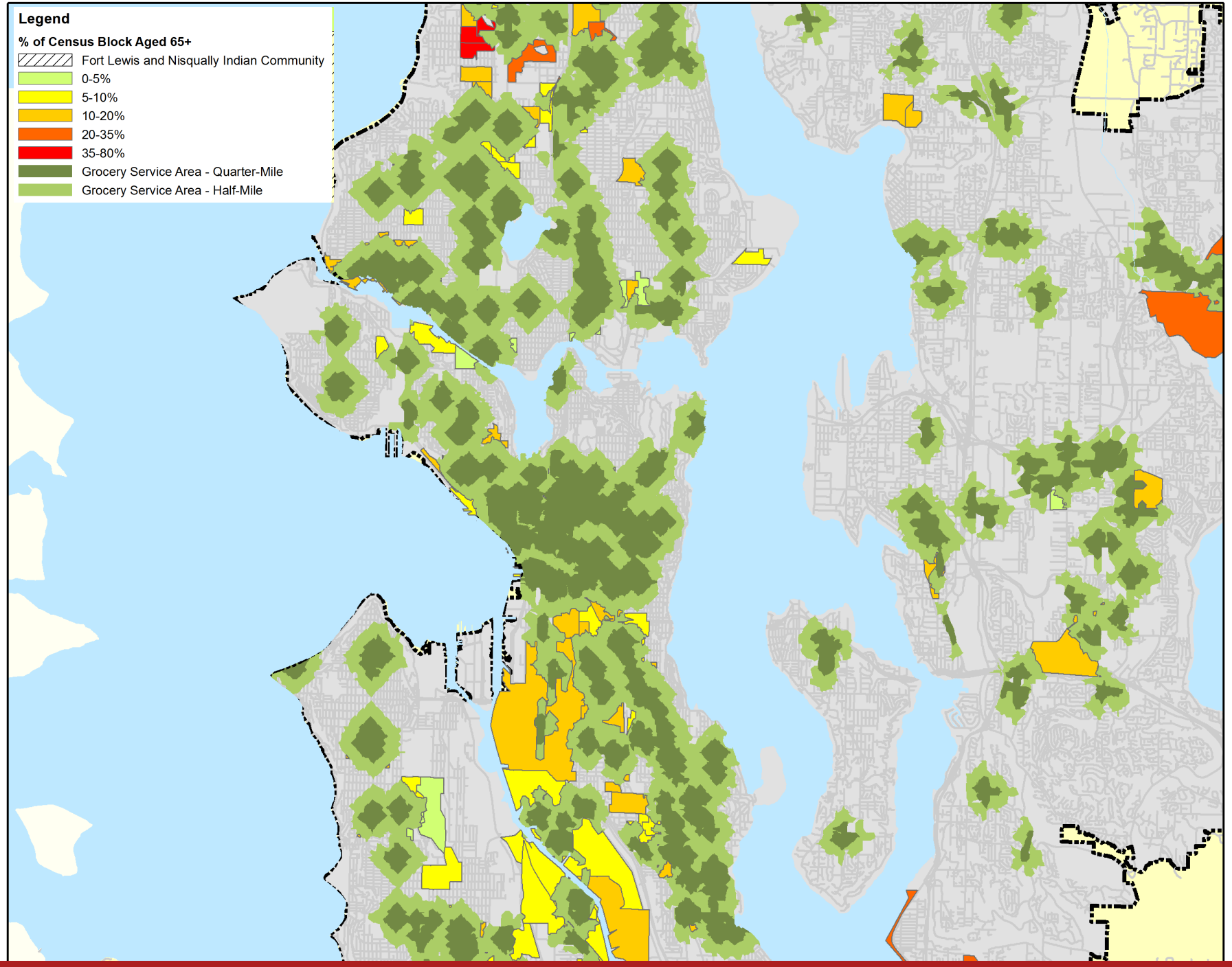


Figure FD-15: Vehicle Ownership in King County Food Deserts

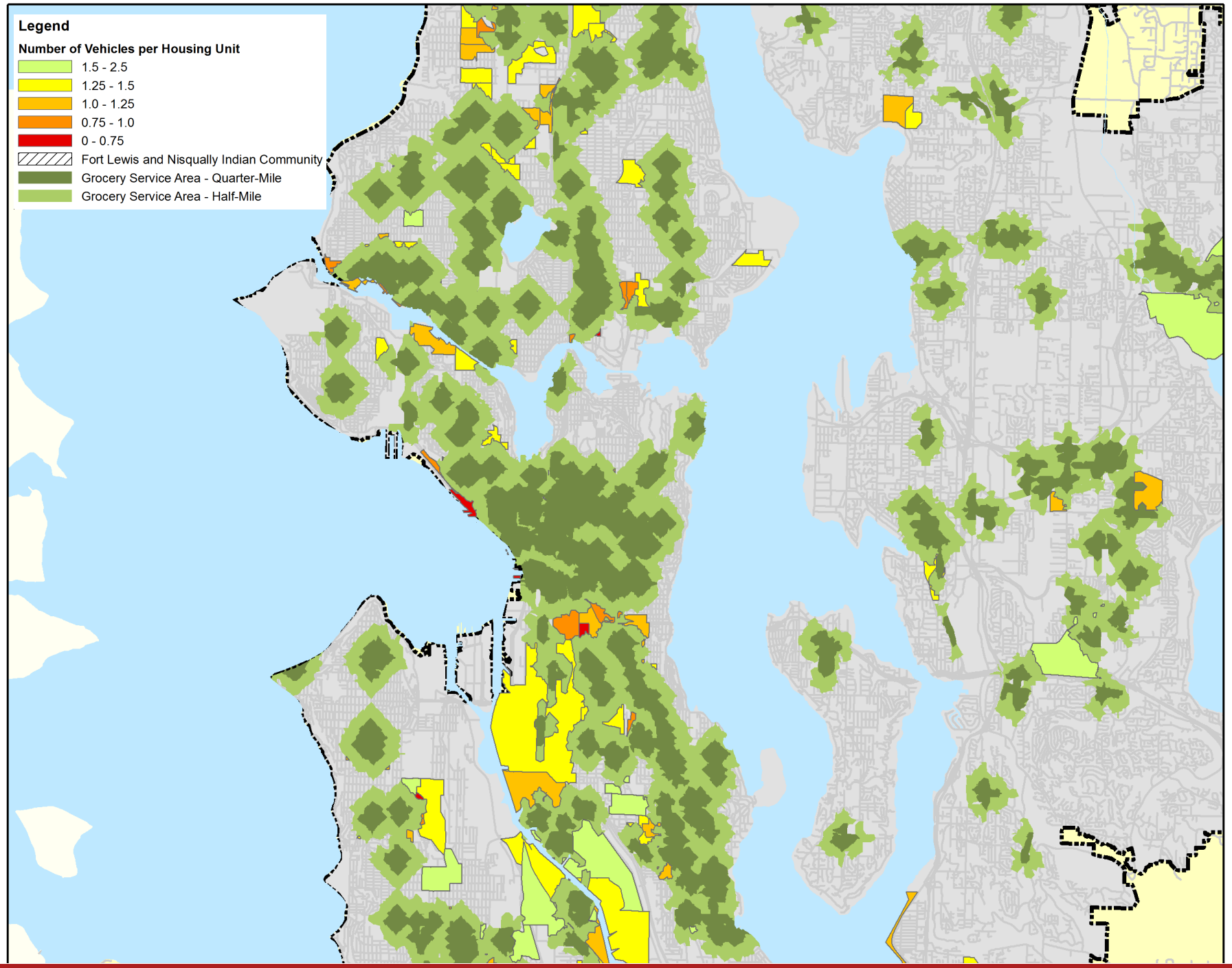


Figure FD-16: Elderly Population in Snohomish County Food Deserts

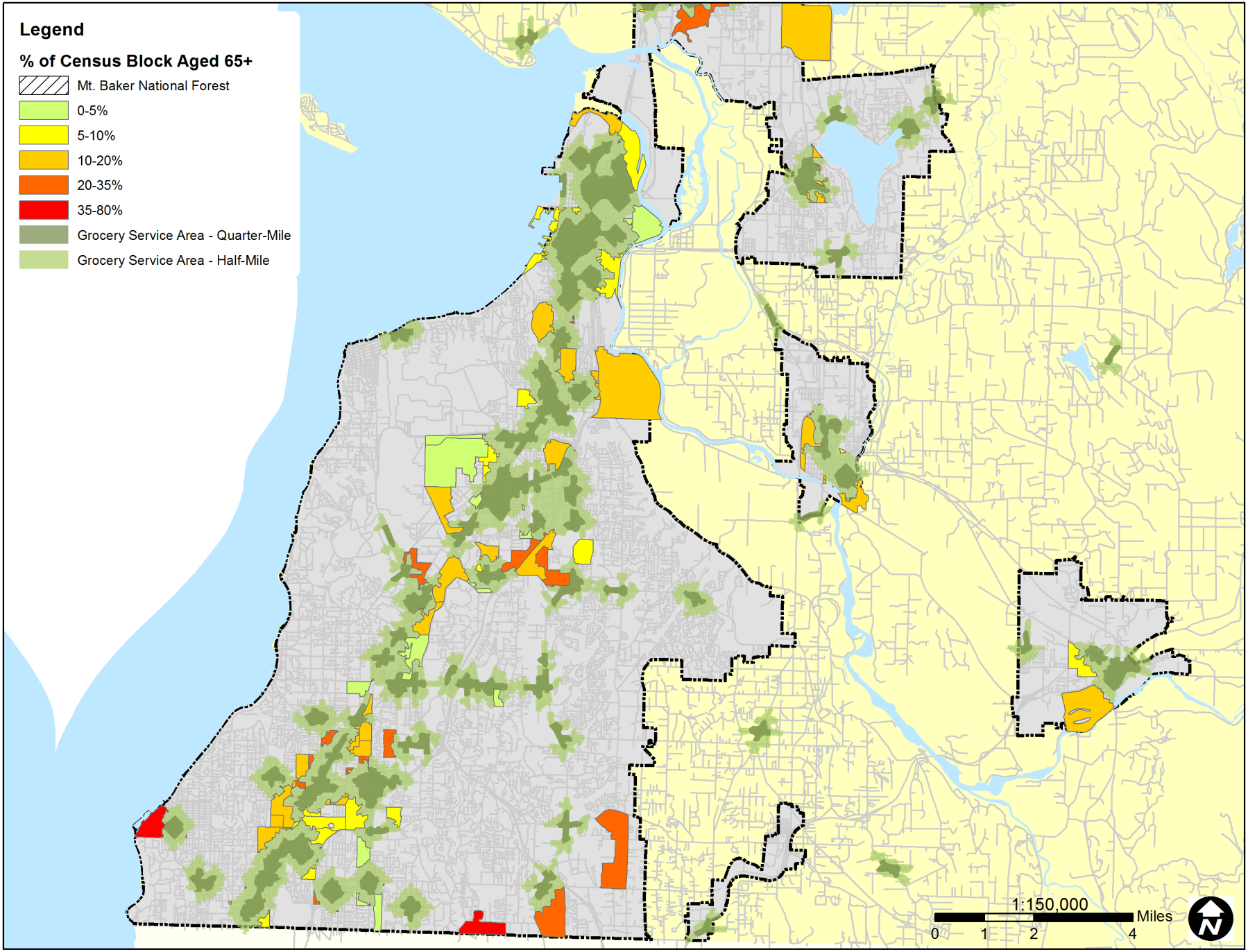


Figure FD-17: Vehicle Ownership in Snohomish County Food Deserts

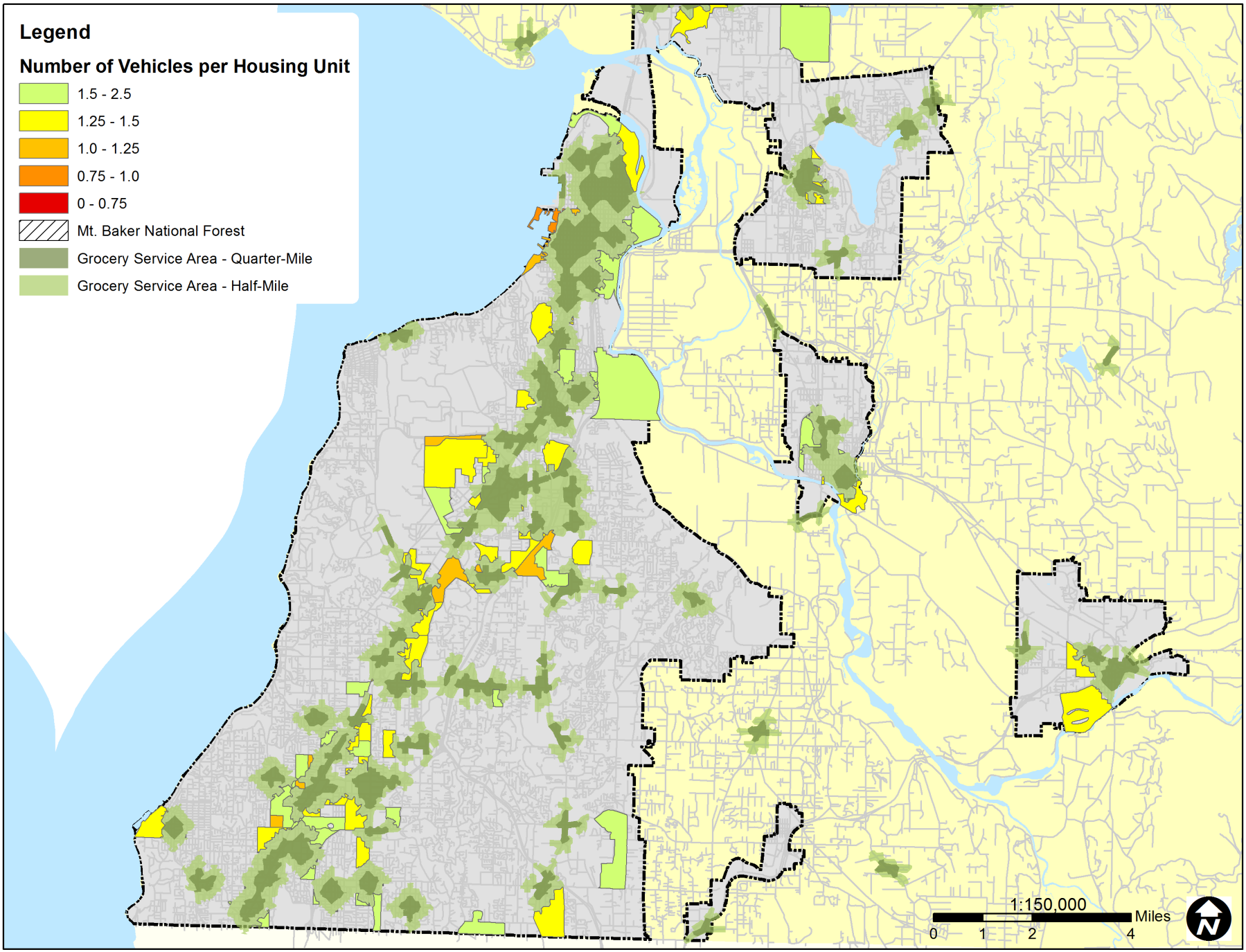


Figure FD-18: Elderly Population in Kitsap County Food Deserts

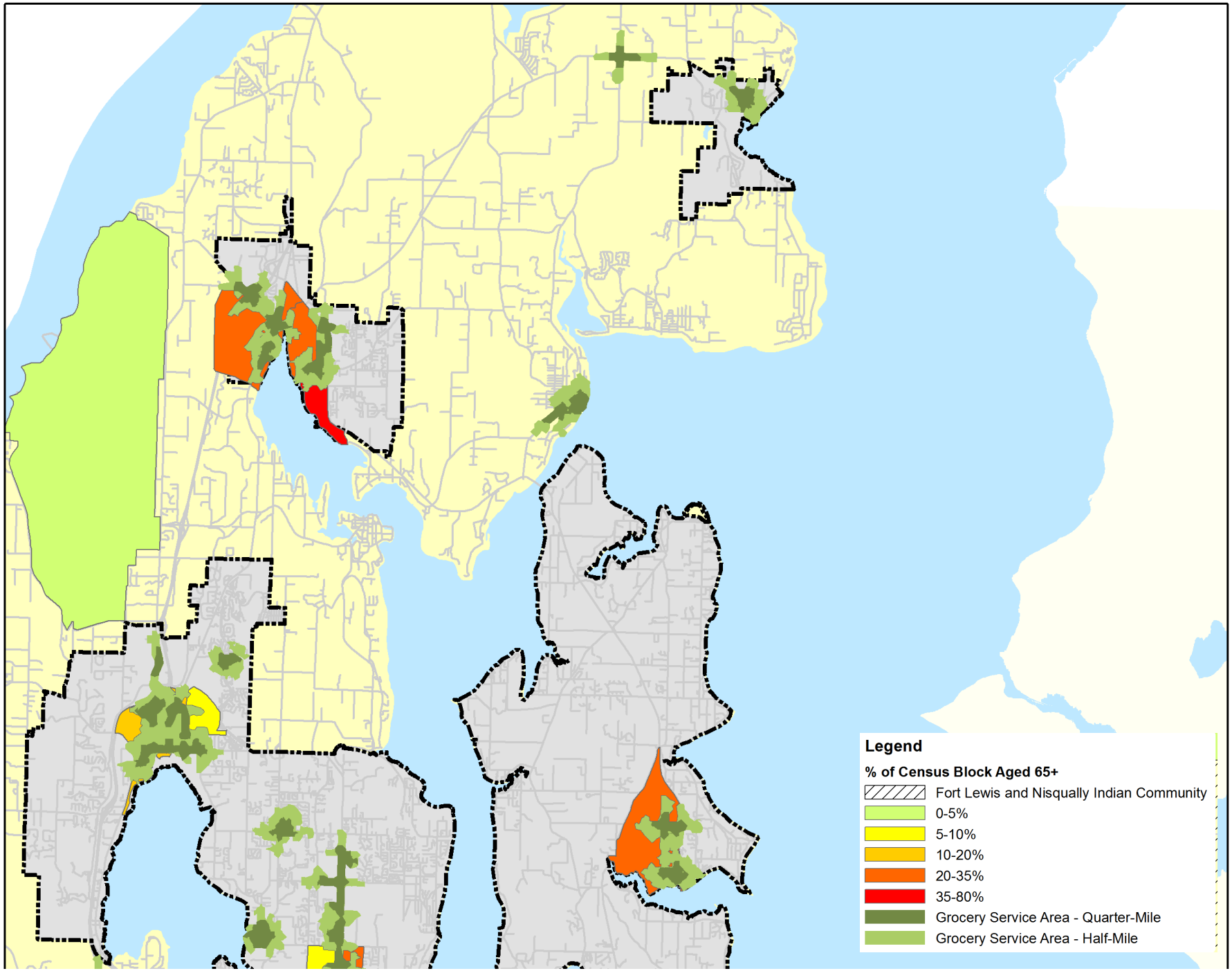
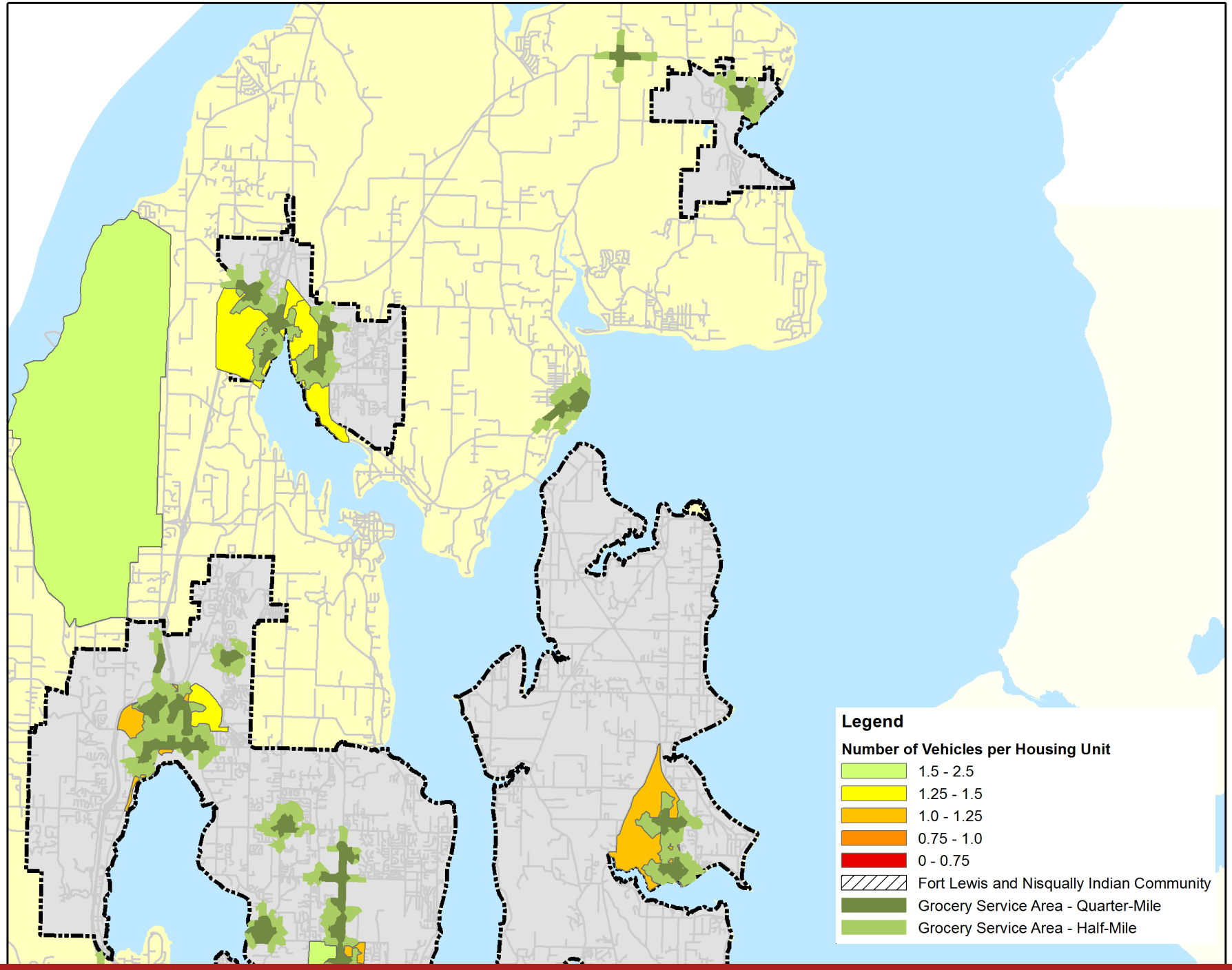


Figure FD-19: Vehicle Ownership in Kitsap County Food Deserts



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