

Guiding Growth – Healthy Watersheds: **Woodard Creek Basin** Water Resource Protection Study



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Guiding Growth – Healthy Watersheds

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1. Introduction

Overview: Guiding Growth – Healthy Watersheds

Woodard Creek and the land surrounding it and its tributaries was one of three Thurston County basins identified for a focused study as part of the *Guiding Growth – Healthy Watersheds* program. Thurston County is located at the southern end of Puget Sound, and boasts a wealth of natural resources, including large forested areas and many streams and water bodies. In part, we owe our relatively good water quality to the fact that the county is less developed than other urbanized areas in the Puget Sound region. Thurston County is also home to the state capitol and the metropolitan area surrounding the cities of Olympia, Lacey, and Tumwater. It is one of the fastest growing counties in Washington State. According to the 2013 population forecast developed by Thurston Regional Planning Council (TRPC), we can expect an additional 120,000 people to move into our region between 2010 and 2035.

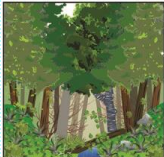
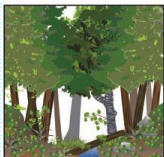
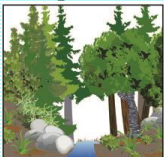
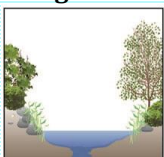

This growth will bring many benefits to the economy and residents of Thurston County, yet there are downsides to such a rapid increase in population and the demand for new homes, roads, and services that it entails. Development in sensitive areas can damage or disrupt important ecosystem services provided by our watersheds, including the filtering and purification of water, regulation of water flows, protection from floods, and creation of habitat for plants and animals. Careless development in these areas could lead to lakes, streams, and beaches that are unhealthy and unusable for both people and wildlife. One response is to plan for this growth by identifying ecologically important areas at a landscape scale, and considering how development can occur in a way that preserves the ecosystem services that are important within specific watersheds.

Project Background

Thurston County teamed with TRPC and the cities of Olympia, Tumwater, and Lacey to integrate watershed science into local policies. The aim of the study was to investigate ways to accommodate projected population growth while preserving water resources in areas impacted by that growth. This collaborative effort is funded by a grant from the U.S. Environmental Protection Agency, as part of that agency's efforts to protect and restore water quality in Puget Sound. The project initially focused on areas within the Totten, Eld, Budd/Deschutes, Henderson, and Nisqually Reach watersheds (Map 1). The watershed planning process began in 2010 and includes the following stages, several of which are detailed in accompanying documents:

Evaluating Current Basin Conditions

In Phase One of this project, stream basins within the Totten, Eld, Budd/Deschutes, Henderson, and Nisqually Reach watersheds were categorized by their current conditions:

Intact 	<p>Intact basins have little to no impervious surfaces (<2% basin-wide), a nearly complete forest canopy (>80% basin-wide), and vegetated riparian corridors (>90%). Water bodies are in excellent condition, with no water quality violations and a high B-IBI score (>41).</p>
Sensitive 	<p>Sensitive basins have minimal impervious area (2-10% basin-wide), considerable forest cover (65-80% basin-wide), and riparian corridors with few breaks in protective buffers (75-90% vegetated). Water bodies are in good condition, meeting most water quality standards, and have a high B-IBI score (36-41).</p>
Impacted 	<p>Impacted basins are moderately urbanized (10-25% total impervious area), with some remaining forest cover (45-65%). Riparian corridors are cleared in many places (only 60-75% vegetated) and water quality is fair, with some impairments and lower B-IBI scores (28-35).</p>
Degraded 	<p>Degraded basins are urbanized (25-40% total impervious area) with limited remaining forest canopy (30-45%) or vegetated riparian areas (30-60%). Water quality is poor, with multiple impairments and very low B-IBI scores (28-35).</p>
Highly Degraded 	<p>Highly degraded stream basins generally have poor water quality and support a low diversity of aquatic species. Impervious cover is generally over 40% and forest cover is generally less than 30%. No Thurston County stream basins fall into this category.</p>

Project Stages

1. Evaluate basins based on current conditions and risk from future growth. The results of this evaluation are detailed in a separate report, *BASIN EVALUATION AND MANAGEMENT STRATEGIES FOR THURSTON COUNTY* (TRPC). This report reviews recent research about the impacts of urbanization on water quality and watershed health and provides an assessment of the current condition of 69 basins within Thurston County that drain to Puget Sound, classifying each as intact, sensitive, impacted, or degraded (see sidebar). This assessment was based on monitoring and land cover data as well as watershed processes. It also details the potential impacts of future growth on each of those basins, using projections of impervious surfaces and loss of forest lands.
2. Select three at-risk basins for detailed study. Based on the results of the basin evaluation and the availability of sufficient data for hydrologic modeling, the project team recommended three key basins for further attention: McLane Creek, Black Lake, and Woodard Creek Basins. Section 2 of this report includes a narrative depiction of the current conditions, threats, and management goals for Woodard Creek basin.
3. Analyze future land-use scenarios. Section 3 of this report includes a description of the scenarios developed and a summary of the results of the hydrologic modeling. A more detailed account of the modeling methodology and results is included in a separate report, *HYDROLOGIC MODELING IN SUPPORT OF WATERSHED BASED LAND USE PLANNING IN THURSTON COUNTY* (NHC 2014).

4. Develop recommended changes to management policies. Section 4 of this report includes a set of recommended policy changes for the Woodard Creek basin, based on the results of the modeling work and land use analysis.
5. Adopt and implement changes to land use practices. Although this report recommends a preferred management approach and Section 5 includes suggested next steps for making the identified policy changes, each local jurisdiction will determine how best to apply the results in their communities using their own public process. The long-term success of this effort depends on continued regional coordination as well as public outreach and support.
6. Monitoring/Adaptive management. The effectiveness of the policies developed and implemented through this project will be evaluated in future phases of this study.

Project Goals


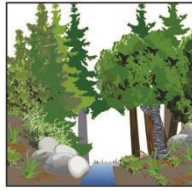
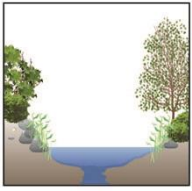
The *Guiding Growth – Healthy Watersheds* project was begun with the understanding that preventing damage to our watersheds is less expensive and often more effective than paying to restore natural forest cover and stream flow conditions after they have been extensively altered. Rather than focus on restoring the most degraded areas, the focus of this project is to prevent basins that are categorized as “intact” or “sensitive” from becoming “impacted,” and to prevent basins that are categorized as “impacted” from becoming “degraded.” The approach taken by the project team has been to look at landscape patterns from a basin-scale and determine the goals and policies that make sense based on the current conditions and future potential of that basin (Table 1).

The strategies identified for achieving these goals include:

- Focusing new development in existing urban areas
- Guiding growth away from identified sensitive or critical habitats
- Reducing the impacts of growth through low impact development and stormwater regulations

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TABLE 1: SUMMARY OF MANAGEMENT GOALS BASED ON EXISTING BASIN CONDITIONS.

	Basin and In-Stream Current Conditions		
	Sensitive	Impacted	Degraded
Management Goals:			
Basin-wide Conditions to support properly functioning Water Flow and Water Quality			
Protect basin-wide conditions ¹	Yes	Functions already impacted	Functions already degraded
Restore basin-wide conditions	Yes	Possibly	Probably not achievable
Maintain existing basin-wide conditions	Yes	Yes	Yes
Critical Habitats Functions (Shorelines, Wetlands, Riparian Corridors)			
Protect critical habitats:	Yes	Yes	Yes
Restore critical habitats:	Yes	Possibly	Less likely although it is dependent on the size / uniformity of basin conditions ²
Water Quality			
Minimize downstream pollutants from new growth:	Yes	Yes	Yes
Improve water quality – lower existing pollutant levels:	Yes	Yes	Yes
Water Flow (Flooding)			
Minimize increase in peak flows	Yes	Yes	Yes
Improve water flow conditions where degraded	Yes	Yes	Yes

¹ Basin conditions – mainly related to land use and land cover characteristics such as urbanization and impervious area, forest cover, and other land uses that effect in-stream conditions.

² Some basins may have large patches of intact or sensitive areas where restoration will be successful. Each basin must be evaluated for local conditions.

Planning Process

This basin study was conducted by a project team that included staff from Thurston County's Planning and Water Resources departments, TRPC, U.S. Environmental Protection Agency, and Northwest Hydraulic Consultants. The basin scenarios and management recommendations were developed with the input and assistance of planning and public works staff from the cities of Olympia, Tumwater, and Lacey, and the Squaxin Island Tribe, as well as members of the Municipal Stormwater Technical Advisory Committee for Thurston County (StormTAC), and the WRIA 13 Salmon Habitat Workgroup.

A Scientific Advisory Team (SAT) was convened to review technical decisions and products at key points during the project, including the data used for the project, the basins selected, and the modeling results. The SAT included technical experts from Cambria Science and Communication, Washington State Department of Ecology, King County, and the Squaxin Island Tribe.

Public Engagement

Thurston County solicited input from basin residents and other interested parties throughout the course of the project. In August and September of 2013, Thurston County and TRPC distributed a survey to property owners and residents in the three basins to assess the community's awareness and interest in water resource issues, and their preferences in developing management policies that affect the future of the basins. The results of the survey for Woodard Creek basin are detailed below, in Section 2.

On March 12, 2014, the County hosted a Water Resource Community Workshop for residents of the Woodard Creek basin at South Bay Elementary School. Those who attended were given a presentation with background on water resource issues in the Woodard Creek basin and the watershed planning work. Participants provided feedback on what management goals should be prioritized for the basin, and on specific places that they considered worthy of attention.

On October 22, 2014, the County hosted a second workshop for residents and interested parties at the Thurston County Public Health Building on Lilly Road. The workshop included a presentation describing the alternative future scenarios developed for the project, an overview of the preliminary modeling results, and a discussion about the draft management options discussed in Section 3 of this report.

Additional opportunities for public feedback on the project and recommendations will be provided as this report is reviewed by the Thurston County Planning Commission and Board of County Commissioners in the spring and summer of 2015.

Relationship to Regional Goals

While the results included in this basin study apply specifically to the Woodard Creek basin, this watershed planning project also supports the goals and strategies outlined in several ongoing regional efforts, as detailed below:

Puget Sound Partnership Indicators and Targets

The Puget Sound Partnership is the state agency charged with coordinating the recovery of Puget Sound. The agency has identified a set of 21 key ecosystem indicators to help track progress toward their recovery goals, and the Partnership's Leadership Council has adopted specific targets for many of these indicators. This basin study and the management policies recommended support several of these indicators and targets.

Indicator: Freshwater Quality

- By 2020, at least 50% of all monitoring stations with suitable data have Freshwater Water Quality Index scores of 80 or higher.
- By 2020, achieve a decrease in the number of impaired waters (303(d) list) in Puget Sound freshwaters.
- By 2020, 100% of Puget Sound lowland stream drainage areas monitored with baseline B-IBI scores of 42-46 or better retain these "excellent" scores and mean B-IBI scores of 30 Puget Sound lowland drainage areas improve from "fair" to "good."

Indicator: Land Cover & Land Development

- By 2020, average annual loss of forested land cover to developed land cover in non-federal lands does not exceed 1,000 acres per year and 268 miles of riparian vegetation are restored or restoration projects are underway.
- By 2020, the proportion of basin-wide growth occurring within urban growth areas is at least 86.5% (equivalent to all counties exceeding goal by 3%) and all counties show an increase over their 2000-2010 percentage.
- Basin-wide, by 2020, loss of vegetation cover on indicator land base over a 5-year period does not exceed 0.15% of the 2011 baseline land area.

What are Urban Growth Areas?

Local cities and counties in Washington State plan under the Growth Management Act (GMA). In Thurston County, jurisdictions have worked together to designate urban growth areas (UGAs). These are the areas that already have, or are planned to receive, urban services such as sewer, in the future.

Thurston County's first urban growth boundary agreement was established in 1983 for the north county areas, and later revised in 1988. In the early 1990s growth boundaries were established county-wide. Since that time the urban growth boundaries have been adjusted slightly. Overall, the area designated for urban growth has been reduced by over 1,000 acres, or around 1.7% in the last 20 years.

Thurston County's urban growth areas include the incorporated areas (cities and towns), the unincorporated urban growth areas within and around the cities and towns, and the unincorporated Grand Mound area.

Sustainable Thurston

Thurston Regional Planning Council's Sustainable Thurston plan, *CREATING PLACES—PRESERVING SPACES: A SUSTAINABLE DEVELOPMENT PLAN FOR THE THURSTON REGION*, adapts the Puget Sound Partnership's 2020 freshwater quality target and sets the following target for the Thurston County region in 2035:

- Protect small stream basins that are currently ranked as “intact” or “sensitive,” and improve and restore as many as possible “impacted” stream basins.

The Sustainable Thurston plan also sets two land-use priority targets, which will help the region protect water quality, as well as reduce vehicle miles traveled and related greenhouse gas emissions:

- By 2035, 72% of all (new and existing) households in our cities, towns, and unincorporated growth areas will be within a half-mile (comparable to a 20-minute walk) of an urban center, corridor, or neighborhood center with access to goods and services to meet some of their daily needs.
- Between 2010 and 2035, no more than 5% of new housing will locate in the rural areas, and 95% will be within cities, towns, unincorporated growth areas, and tribal reservations. Rural areas include land outside of the cities, towns, unincorporated urban growth areas and tribal reservations.
 - Supporting target: No net loss of farmlands, forest lands, prairie habitats (in addition to environmentally critical areas that are currently protected) while providing for a range of densities within rural Thurston County.

2. Basin Description

Overview

Woodard Creek basin (Figure 1; Map 2) is located in central Thurston County; it includes a mix of urban and rural areas and is crossed by Interstate-5, a major transportation corridor in the region. The basin surrounds Woodard Creek, the second-largest stream flowing into Henderson Inlet.

The hydrology of the area has been extensively modified by development in the upstream (southern) portion of the basin. The creek originates in a constructed wetland surrounded by commercial and industrial development, including the South Sound Center shopping complex. Stormwater from residential neighborhoods south of 18th Avenue would originally have drained toward Budd Inlet, but have been redirected into the basin, and major thoroughfares including I-5, Martin Way, and Pacific Avenue also disrupt the historic water flow patterns. The creek travels north along the Dickerson peninsula until it empties into Woodard Bay, an intact saltmarsh owned by the state Department of Natural Resources and protected as part of a Natural Area Preserve (the preserve itself is outside the study basin area).

The basin encompasses just over 5,000 acres, and is home to approximately 10,500 people. The population is anticipated to grow by around 42% by 2035, or to almost 15,000. Most of the growth will be accommodated in the urban growth area (UGA).

Jurisdiction

Woodard Creek basin is divided between Thurston County (52%), Olympia (33%), and the Olympia urban growth area (UGA), which is managed under Joint Planning agreements between the County and City (13%). A small portion of the basin is within the city of Lacey (2%) and the Lacey UGA (<1%) (Map 3). Under current plans, land within a UGA eventually will be annexed into their respective cities – in preparation for this, zoning and development regulations within the UGA match those of the city. Emergency services in the UGA are provided by the County.

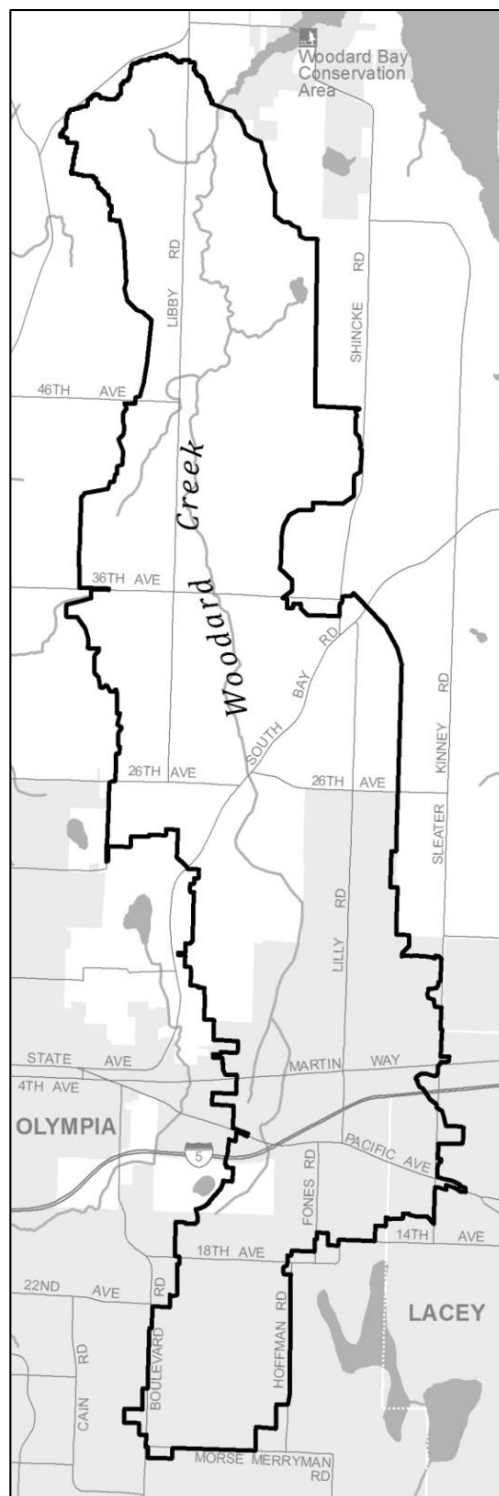


FIGURE 1: WOODARD CREEK BASIN.

Soils

Much of the basin is underlain by outwash soils, with significant areas of Kitsap, till, and saturated soils (NHC 2014)³. Outwash soils include glacial deposits of permeable sands and gravels; these are present in most of the southern half of the basin. Till soils include areas where glacial activity left a compacted and relatively impermeable layer of clay, silt, loam, and/or gravels; they generally allow limited drainage and have higher surface runoff. Within Woodard Creek basin, till soils are located along the northwestern and southeastern edges of the basin. Kitsap soils include those formed by lacustrine sediment, and generally have greater moisture storage and drainage than till soils, but less than outwash – much of the northern, rural half of the basin is underlain with Kitsap soils. Saturated soils are poorly drained – these occur along the creek and in several wetland areas.

Thurston County sets some standards for development and stormwater management according to hydrologic soil group classifications. Hydrologic soil groups are defined by the Natural Resources Conservation Service (NRCS) and are based on estimates of surface water runoff potential determined by how fast water can be expected to infiltrate – these groups are related but do not correspond exactly to the soil classes described above. Group A soils have the highest infiltration rates (low runoff potential) even when thoroughly wetted (greater than 0.30 in/hr); Group B soils have more moderate infiltration rates (0.15-0.3 in/hr); Group C soils have slow infiltration rates (0.05-0.15 in/hr) and include fine textured soils and those with a layer that impedes downward draining of water; Group D soils have very low infiltration rates (0-0.05 in/hr) and include clay soils as well as areas with high groundwater that nears the surface (Thurston County DDEM 209). In Woodard Creek basin, most of the soils have moderately high to high runoff potential (Groups C and D), particularly in the northern end of the basin, with some areas with more moderate infiltration within the city of Olympia and urban growth area (see Table 2; Map 4).

TABLE 2: SOIL TYPES IN WOODARD CREEK BASIN

USGS Soil Class	Outwash	Till	Kitsap	Saturated
	43%	20%	18%	19%
Hydrologic Soil Group (NRCS)	Group A	Group B	Group C	Group D
	12%	4%	52%	32%

Species and Habitat

Although portions of the area have been highly urbanized, Woodard Creek basin supports a variety of wildlife. Many species of fish utilize the creek, including coho, chum, steelhead, and cutthroat trout, and Olympic mudminnow have been noted in the creek near the I-5 interchange, though high winter flows

³ These four soil classifications were defined using NRCS soils inventory data by the US Geological Survey and were used in the HSPF modeling study for this project.

and low summer flows in the river have reduced the usability of this habitat. There are a number of bald eagle nesting sites within the basin, as well as a purple martin breeding area. There are several large wetland areas in the basin, including along Ensign and South Bay Roads.

Critical Areas

Thurston County's Critical Areas Ordinance (TCC 24) was updated in 2012; it includes protective policies for five types of critical areas: important fish and wildlife habitat areas (including riparian corridors), wetlands, critical aquifer recharge areas (including wellhead protection areas), frequently flooded areas, and geologically hazardous areas (including steep slopes and bluffs). Olympia's Critical Areas Ordinance was updated in 2006, and contains similar provisions. A variety of critical areas are located within Woodard Creek basin.

Habitat Areas

Woodard Creek, and some of its small tributaries, is listed as Type-F, or fish-bearing, stream under the Washington Department of Natural Resources (DNR) classification system. Thurston County's Critical Areas Ordinance assigns Type-F streams a riparian habitat area ranging from 150 to 250 feet, depending on the width of the stream.

Wetlands

There are many wetlands in the basin, including where the creek winds through property of Providence St. Peter Hospital and near the headwaters of several small tributaries. These areas qualify for protections under Critical Areas Ordinances, with wetland buffers ranging from 50 to 300 feet, depending on the condition of the habitat.

Critical Aquifer Recharge Areas

Critical Aquifer Recharge Areas (CARAs) are locations that overlie significant groundwater resources and, based on geology and soils, are particularly susceptible to groundwater contamination. Category I CARAs are considered extremely sensitive, and include Wellhead Protection Areas, or the distance around a well through which contaminants are likely to travel within one, five, or ten years. There are two wellhead protection areas within or overlapping the Woodard Creek basin, including those surrounding the water systems for Woodard Place and Red Cedar Estates. There are additional Category I CARAs within the basin, including near the Olympia city border. Activities that use hazardous materials or that could pose a risk to groundwater are restricted and regulated within these areas.

Frequently Flooded Areas

Flooding concerns are minimal within the basin, and the FEMA designated one-hundred-year floodplain along Woodard Creek is relatively narrow. There are a few identified high groundwater areas in the basin, including between South Bay and Lilly Road and near Lemon Road. Development must be set back and above the base flood elevation of these areas. New onsite septic systems must be located outside of the one-hundred-year floodplain, floodway, and high groundwater hazard areas.

Geologically Hazardous Areas

There are minimal areas within the basin where slopes are greater than 40%, mostly associated with ravines that include the stream channel in the northern, rural end of the basin. Removal of vegetation is restricted within these hazard areas, and tree harvesting is subject to review in addition to review required under Forest Practice Permits.

Land Use

The southern half of the basin is characterized by urban development, particularly along the Interstate-5 corridor and along Martin and Pacific Way. The northern half of the basin is largely low-density residential with some agricultural use. The Chehalis-Western Trail cuts through part of the basin.

Zoning

Most of the County portion of the basin is zoned Rural Residential Resource 1/5 (48% of basin), with some smaller areas in Limited Areas of More Intensive Rural Development (LAMIRD) 1/2 (3%), Rural Commercial, and Urban Reserve. Zoning within the city of Olympia is mostly Residential 4-8 units/acre (14% of basin), with a section of High Density Corridor (5% of basin) along Martin Way and a section zoned Medical Service (5%) surrounding Providence St. Peter Hospital. Smaller areas in the basin are zoned Residential Multifamily 18 (13%), General Commercial (2%), Light Industrial (2%), and Two Family Residential (2%) (Map 5).

Aquatic Habitat Condition

Woodard Creek basin is divided in its current level of modification – the southern headwaters of the basin have been heavily impacted and degraded, while the northern half of the basin is in relatively good condition. Overall, according to the Basin Evaluation Report (TRPC 2013) the basin has 14.5% total impervious surfaces and has retained just 35% of its tree canopy. The riparian area along the length of the creek has been impaired by removal of vegetation, direct animal access to stream, and a lack of large conifers remaining in riparian buffers – the downstream portions of the riparian corridor are in better condition than the upstream areas, which have been heavily impaired by clearing. There are a number of barriers to fish passage within the stream and an overall lack of large woody debris. Urban development in the basin has increased winter flood flows, causing erosion, sedimentation and scour, and decreased summer flows.

Overall water quality is ranked *Fair* by Thurston County Environmental Health, which has monitored the stream since 1983 (TCEH 2012). Woodard Creek is listed on Washington State's 303(d) list of impaired waterbodies for fecal coliform, dissolved oxygen, and pH violations. The stream has a history of failing the bacteria standard: in water year 2010/2011 it failed both parts of the fecal coliform standard. There have been occasional low dissolved oxygen measurements, though none in recent years. A TMDL study was completed for Henderson Inlet in 2006. It found that Woodard Creek contributed 11% of bacteria loads to Henderson Inlet during the wet season, and 18% during the dry season.

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Water quality in the stream has improved since the formation of the Henderson Shellfish Protection District in 2001, but stormwater runoff and agricultural practices in the basin continue to be a concern.

The Benthic Index of Biologic Integrity (B-IBI) is a method for evaluating and comparing the biological condition of streams by evaluating the presence and diversity of different macroinvertebrates. For Woodard Creek, the average B-IBI score for 2002-2011 ranks in good condition at 40.8.

TABLE 3: CURRENT AQUATIC HABITAT CONDITIONS FOR WOODARD CREEK BASIN

Level of Urbanization	Hydrology	Riparian Corridor	In-stream and Wetland Physical Conditions
<ul style="list-style-type: none">• Total Impervious Area Estimate 1991: 9.1% 2006: 14.2% 2011: 14.5%	<ul style="list-style-type: none">• Effective Impervious Area Estimate, 2006: 11.2%• Forest Cover, 2011: 35.2%• Unmodified Wetlands: 13.8%• Miles of Streams: 14.8• Areas of high groundwater flooding: 3.4% of basin	<ul style="list-style-type: none">• Coniferous forest cover in 250 foot stream riparian corridor, 2006: 10%• Forest, scrub/shrub vegetation and wetlands in stream riparian corridor: 150 ft: 73.3% 250 ft: 69.8% 1,000 ft: 55.7%• Number of road crossings per mile of creek: 2.8	<ul style="list-style-type: none">• Good amount of LWD, poor key piece LWD• Pools: fair for both surface area and frequency• Canopy closure not sufficient to maintain water temperatures• Fair amount of fine sediment• Estuary at mouth in good condition• Unmodified wetlands: 4.1%

SOURCE: TRPC 2013

Residential Development Potential

Most of the residential development potential in the basin lies within the city and UGA, including some master-planned community and other proposed subdivisions. The rural portion of the basin is largely developed at rural densities, though there are some areas that could see further development (Map 5Map 6).

Threats and Concerns

- The Basin Evaluation report (TRPC 2013) identified Woodard Creek basin as at moderate risk from development because of the projected increase in number of dwelling units and total impervious surfaces. Though the estimated increase in impervious surfaces was moderate (1.2%), the total amount of impervious cover in the basin would tip to over 15%.
- Water quality in the basin is impacted by urban stormwater runoff, particularly in the headwater wetlands complex, and nonpoint pollution from agricultural activities and septic systems in the more rural areas of the basin. Woodard Creek consistently fails part 2 of the fecal coliform standard and has repeatedly failed the turbidity standard. Nitrite is elevated in the creek and phosphorus levels are linked to low dissolved oxygen.

- Dissolved oxygen levels are low near the headwater, but improve downstream before discharging to Henderson Inlet.
- Woodard Creek has historically supported native runs of coho, chum, cutthroat, and winter steelhead. Limiting factors identified for the creek include alteration of the natural flow regime from increased impervious surfaces, lack of large woody debris (LWD), and barriers to fish passage.
- The riparian corridor has been impaired by the removal of vegetation in some areas, a lack of conifers in the remaining vegetation, and direct animal access to the stream. Fine sediment may also be a naturally occurring barrier.

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Woodard Creek basin (clockwise) originates in a wetland behind some large commercial districts of Olympia and Lacey (A). It travels under several large arterials, including Pacific Way, Interstate 5 and Martin Way (B). The wetland complex is well-marked and accessible from Ensign Road, near Providence St. Peter Hospital (C). Outside of the city, the character of the basin is rural and agricultural (D). The creek empties into Woodard Bay, an intact saltmarsh owned by the Department of Natural Resources and protected as part of a Natural Area Preserve (E).



FIGURE 2: WOODARD CREEK BASIN – OVERVIEW.

Threats and concerns in the Woodard Creek basin include (clockwise) pollution from urban stormwater runoff (oil sheen during storm event [A], and pollution and debris in culvert draining wetland [B]), agricultural activities (farm adjacent to a wetland) (C), and septic systems (rural residential development) (D).



FIGURE 3: WOODARD CREEK BASIN – THREATS AND CONCERNS.

Public Views

In response to a survey⁴ sent in August 2013, residents and property owners indicated that some of the things they value most about living in the Woodard Creek basin are its natural environment and scenery; access to parks, trails, and other recreational facilities; and opportunities for a rural lifestyle. Clean drinking water, Puget Sound water quality, and healthy salmon runs are all issues that are very important to the majority of respondents. More than half of those who responded (65%) indicated that they are somewhat or very concerned about water quality in the basin. The greatest risks to water quality they see are urban development, pollution from stormwater runoff and septic systems, and loss of forest cover. When it comes to planning for the future of the basin, residents felt that the most important issues to address were:

- Protecting water quality (55%),
- Protecting wildlife and fish habitat (54%),
- Preserving undeveloped land (37%)
- Preserving farmland and agriculture (29%), and
- Low-impact development (22%).

When asked how they would like to describe Woodard Creek basin in the future, many residents expressed hope that the area would remain much as it is today, with natural and rural areas maintained and protected, and with improved water quality. Development that does occur should be concentrated in the more urban areas, and designed to be low impact. Residents in this basin emphasized a desire to preserve natural areas while maintaining a high quality of life.

These views were underscored at a community workshop held on March 12, 2014 at the South Bay Elementary School gymnasium. Participants were knowledgeable about water quality issues in the basin, interested in watershed conservation and stormwater issues, and were curious about how development might affect the area in the future. Map 7 shows a summary of comments from that workshop on an aerial map of the basin. Participants were asked to identify areas they thought should be identified for protection, or that were of special concern to them. They noted a number of places where natural drainage has been modified in the basin, either through the digging of ditches to drain land (potentially for agricultural use) or through the installation of roads and culverts that may prevent fish passage. Many participants at the workshop noted a high level of interest in being involved with water quality improvements in the area.

Management Goals for Woodard Creek Basin

Woodard Creek basin was categorized as “impacted” in the Basin Evaluation report. The report identifies the following management goals for impacted basins:

- Maintain, and where possible restore, basin-wide conditions
- Protect, and where possible restore, critical habitats

⁴ The survey was sent to 3,374 homes and had a response rate of 12%.

Woodard Creek Basin Water Resource Protection Study

- Minimize downstream pollutants from new growth
- Improve water quality by lowering existing pollutant levels
- Minimize increase in peak flows
- Improve water flow conditions where degraded

The TMDL process for Henderson Inlet set a target dissolved oxygen level of 9.0 mg/L, to be met at river mile 2.9. Stormwater bacterial reduction targets included a 98% reduction in fecal coliform in discharge to the Taylor wetland, a 76% reduction at river mile 6.9, and a 90% reduction at the river mouth. It also recommended that sources of phosphorus be controlled.

The Salmon Habitat Preservation and Restoration Plan (2005) for WRIA 13 includes the following recommended actions for Woodard Creek:

- Restore riparian corridors, primarily in the lower basin, for increased shade and large woody debris (LWD) recruitment
- Increase LWD key piece abundance to encourage pool formation
- Provide adequate management to reduce/eliminate current stormwater impacts
- Identify and correct where livestock have direct access to Woodard Creek
- Educate landowners located in Woodard basin to increase compliance and voluntary implementation of BMPs
- Protect and restore stream associated and headwater wetlands

The Woodard Creek basin lies within the Henderson Inlet Shellfish Protection District, which was established in 2001 to reduce bacterial pollution in runoff that lead to the closure of shellfish beds in Henderson Inlet. The Henderson Inlet Shellfish Protection District Implementation work plan lists the following actions to improve water quality in the area:

- Encourage use of low impact development (LID)
- Protective rezoning where appropriate
- More protective development standards
- Purchase land and build stormwater facilities to new standards
- Use purchase of development rights, conservation easements to protect intact habitat

Watershed Characterizations

The project team considered two recently completed landscape-scale ecological analyses in the course of this study. Watershed characterizations integrate data sources to describe and relate ecological processes at a basin and watershed scale, rather than at a site scale. These analyses can provide an early filter to help identify priority areas for protection, restoration, and development.

The Washington Department of Ecology's Puget Sound Watershed Characterization Project (2010) includes assessments for water flow processes (delivery, surface storage, recharge, and discharge),

water quality (sediment, nutrients, pathogens, metals), and fish and wildlife habitat (terrestrial, freshwater, marine shorelines). In its regional analysis, the project assessed the Woodard Creek basin as part of the greater Deschutes watershed (WRIA 13), and identified it as a high priority area for restoration because of its high level of importance for recharge of water sources and surface storage and high level of degradation in the urban headwaters. In its assessment of freshwater habitats, the Woodard Creek basin is identified as relatively high value for a variety of freshwater species.

The project team worked with Ecology staff to further refine its water flow analysis within the Woodard Creek basin; that analysis identified the following priority areas:

- **North Basin:** The northern parts of the basin located approximately north of 36th Avenue were identified as the highest priority areas for protection. These areas have been the least degraded by past development and are important for surface storage and discharge of water.
- **Central Basin:** The central part of the basin, north of Interstate-5 is the highest priority area for restoration of surface storage, including wetland areas that have been modified or drained. One high priority area includes the sub-area along Ensign Road; a second key sub-area is the region around 26th Avenue NE north to 36th Avenue between Libby Road NE and Friendly Grove Road.
- **South Basin:** South of Interstate-5, the basin has been heavily degraded and was identified as best suited for redevelopment. The area around the wetlands at the headwaters of Woodard Creek – south of I-5 and north of 18th Avenue SE in the city of Olympia – is a higher priority area for restoration of recharge and surface storage.

Thurston County's Water Resources Division conducted a separate landscape analysis of the basin as part of the Henderson Watershed Characterization Report (2007). The primary purpose of this analysis was to support stormwater management planning, by assessing functional processes and identifying wetland, riparian, and floodplain areas that could provide ecological benefit if restored.

This assessment identified a number of priority riparian restoration areas along the main stream corridor, as well as potential larger wetland restoration areas at several locations within the basin. These areas were incorporated into the restoration alternative future scenario discussed below in Section 3.

3. Analysis of Basin Alternatives

How Scenarios Were Developed

Woodard Creek basin was classified as “impacted” in the Basin Evaluation report (TRPC 2013). While the headwaters are in an urbanized area, the downstream portions of the basin are fairly intact, and the stream still supports a diversity of species. For this reason it was felt that both protection and restoration management strategies would be effective in this basin.

Scenarios of historic, current, and future alternatives were developed to better understand stream water quantity and quality dynamics under a variety of conditions. All scenarios were developed for a hydrologic model⁵ that gave outputs on various stream flow and water quality factors.

What are Impervious Surfaces?

Impervious surfaces are materials that prevent the infiltration of water into the soil. The most common impervious surfaces in the built environment are roads, rooftops, sidewalks, and patios. While these structures are almost 100 percent impervious; other features such as gravel roads, compacted soils, and even lawns are impervious to varying degrees, as they allow for less infiltration than natural ground cover such as forests.

The premise behind considering alternative scenarios is that as land cover (forest, grass, impervious areas, etc.) and hydrology (stream network and infrastructure that modifies water flow such as ditches, pipes, and stormwater ponds) change it will have an impact on both the stream water quantity and quality. In general, as urbanization increases, so does the amount of impervious surfaces. This means less rainwater can infiltrate into the ground, and there is a greater amount of stormwater runoff (Figure 4). The runoff can scour stream beds and carry pollutants to the water. Stormwater infrastructure, such as ponds that capture runoff and release it slowly, can help mitigate some of the effects of runoff.

Using a hydrologic model, land cover and hydrologic conditions can be tied to stream flow and water quality where stream monitoring data are available. For this reason, the scenarios start with a Current Condition scenario to help ensure that the model is working (calibrated) correctly. The Historic Condition scenario gives an idea of how the stream flowed and functioned before the land cover and hydrology was altered. The three future scenarios were developed to evaluate potential management strategies. All future scenarios were designed to be realistic and achievable.

Scenarios were conceptualized and developed by a project team of land use, stormwater, and hydrology specialists with experience in Thurston County. The scenarios were designed to answer some specific questions such as:

- Will stream health degrade with additional development under current zoning regulations, and would changing the zoning density make a difference?
- Will it make a significant difference in stream health if some areas are removed from the urban growth areas, where growth was likely to occur on sewer systems, and rezoned to rural

⁵ For a detailed description of the hydrologic modeling study, see NHC 2014.

densities, where less growth is likely to occur, but the new development that does occur would be on septic systems?

- Will stream health degrade under current stormwater regulations, and will updating stormwater regulations to include low impact development techniques make a difference?
- Will stream corridor or wetland restoration lead to an improvement in stream health?
- Will retrofits of stormwater infrastructure in areas of existing development lead to an improvement in stream health?

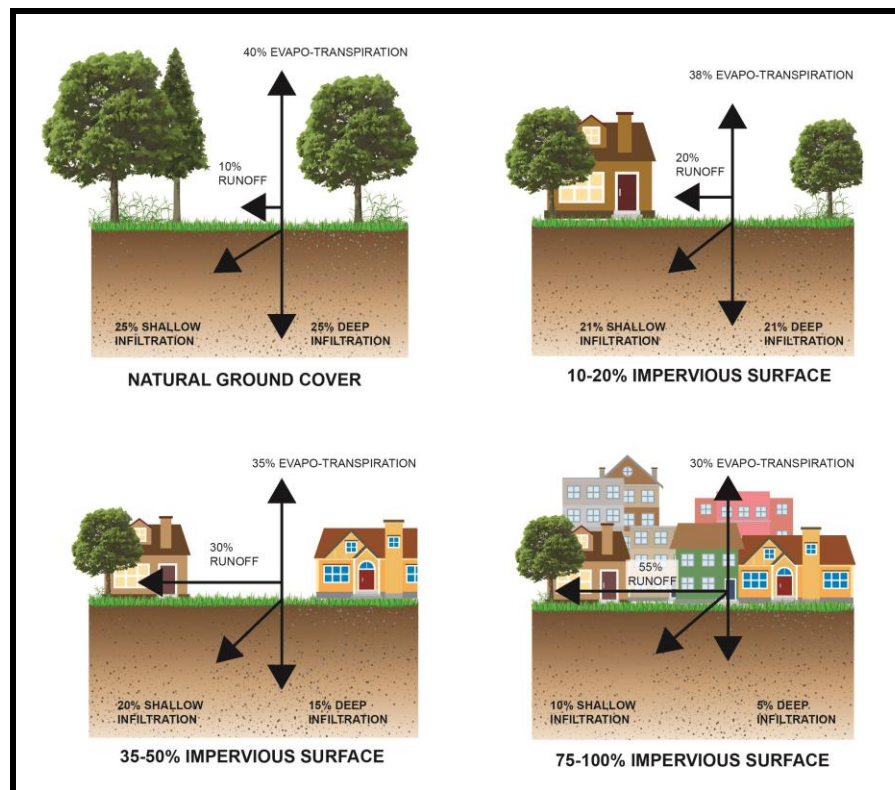


FIGURE 4: WATER CYCLE CHANGES ASSOCIATED WITH URBANIZATION.

SOURCE: GUIDANCE SPECIFYING MANAGEMENT MEASURES FOR SOURCES OF NONPOINT SOURCE POLLUTION IN COASTAL WATERS, 1993, AS SHOWN IN (ARNOLD, 1996).

Current Condition

The Current Condition scenario was developed to approximate 2010-12 conditions for land cover and land use, hydrology, and stormwater treatment facilities. Sources included existing land cover and land use data, basin reports, infrastructure mapping, and air photo mapping. Each land cover was assigned a value for water infiltration and runoff, as well as the amount of pollutants it was likely to generate.

The current condition data layers were used to calibrate the hydrologic model to stream flow and water quality data.

Historic Condition

The Historic Condition scenario was developed by assuming land cover was a combination of forest, wetlands and prairie throughout the basin, prior to Euro-American settlement. A variety of sources were used to develop the land cover data, including maps of historic wetlands and prairies.

Planned Trend

The Planned Trend scenario was developed to approximate future development under adopted zoning and development regulations. Planned Trend was consistent with the assumptions developed for the region's population and employment forecast and buildable lands analysis (www.trpc.org). Assumptions for future impervious area were made depending on the type or density of expected development (TRPC 2013A, TRPC 2015).

Specific assumptions for the Planned Trend scenario included:

- Current zoning and development regulations would remain in place
- Current stormwater regulations would remain in place
- Future development occurs in similar style / density as recent trends
- As development occurs, land cover would convert from existing cover to a mixture of impervious surfaces (homes, driveways, roads) and other urban land cover (lawns and cleared areas)

Alternative Future A

The Alternative Future A scenario (Map 9) examined changes to regulations as a way to protect stream health from the effects of development. The following changes were evaluated:

- Remove the portion of the urban growth area surrounding the stream corridor and rezone to rural densities. The portion of the urban growth area that is already serviced by water and sewer infrastructure would remain in the growth area (Map 8; Figure 5)
- Rezone the area around the stream corridor and mouth of the stream to lower density (20 acre lots) rural zoning.
- Set tree cover and impervious surface limits for new rural development
- Assume that new development in both the city and rural area would meet low impact development requirements for stormwater control, if feasible (Figure 6)

What are the New Low Impact Development (LID) Requirements for Stormwater Control?

The current stormwater flow control standard only requires controlled release for infrequent, large storms (50% of 2-year peak = 1.4" in 24-hrs at Olympia Airport) and is intended to only protect against stream bank erosion and control downstream flooding impacts. Smaller storm events are routed through stormwater facilities with little to no restrictions. This flow control standard can be met by detention ponds only, with little or no infiltration.

The new LID flow control standard (required by 2016 in parts of Thurston County) will provide control for much smaller storms (8% of 2-year peak = 0.22" in 24-hrs at Oly Airport). It is intended reduce the volume of stormwater runoff and limit low flows to pre-development (forested) conditions. Based on recent research, changes to these low flows can have impacts to stream quality and the increased volume of runoff increases pollutant loadings. In general to meet this standard requires extensive infiltration of stormwater into the ground through bioretention, porous pavement, infiltration ponds/trenches, etc. A detention pond in the majority of cases cannot be the only stormwater control method, mainly because they would be prohibitively large to meet the standard.

Future A includes an evaluation of whether or not removing a portion of Olympia's urban growth area (area in red on the right) and rezoning it to rural densities would protect water quality.

There are approximately 200 homes in that area today, all on septic systems.

A single family home with a properly functioning septic system generates eight to twenty times the nitrate pollution as a home on a sewer system (TRPC Sustainable Thurston Water Infrastructure Panel, 2013).

If the area (red) stays within the urban growth area (or the area the city has designated for future growth), as new development occurs sewer infrastructure will be extended. This ensures that new development will occur on sewer, and makes it more likely that the existing development will be able to hook into sewer if their septic systems fail. If the area were to remain in the growth area, the buildout capacity is around 580 homes total, or 380 new homes.

If the area were to be removed from the growth area and rezoned to rural densities, the buildout capacity would decrease to around 250 homes total, or 40 additional homes, however all new growth would occur on septic systems.

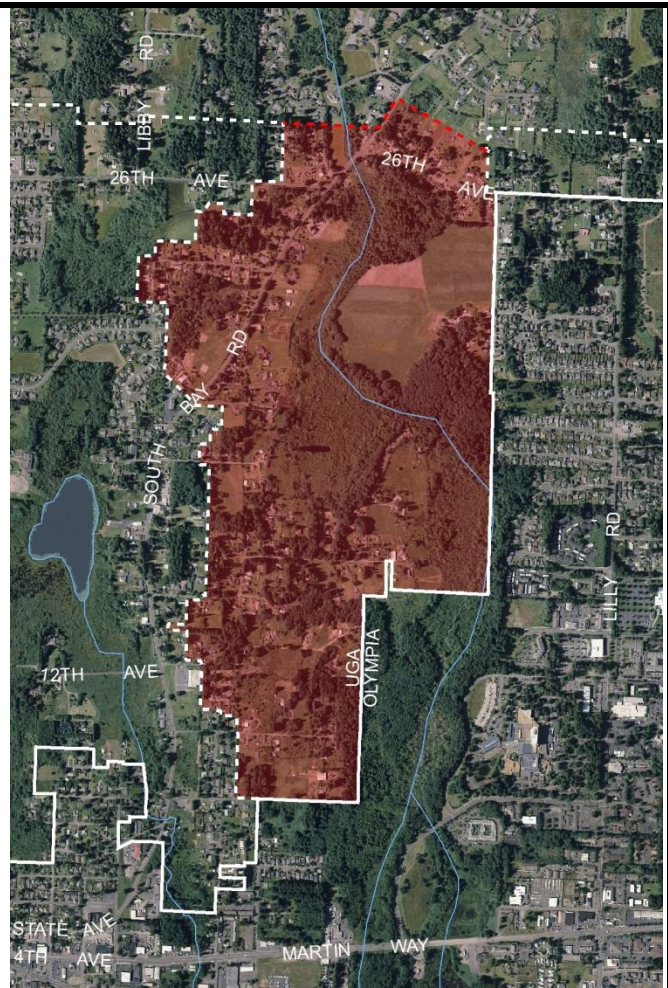


FIGURE 5: FUTURE A SCENARIO URBAN GROWTH AREA ADJUSTMENT.

What is Low Impact Development?

Low impact development (LID) is an approach to land development that works with nature to manage stormwater as close to its source as possible.

Some of the principles of low impact development are:

- Preserving and re-creating natural landscape features,
- Minimizing impervious areas and create functional and appealing site drainage that treat stormwater as a resource rather than a waste product.

By implementing low impact principles and practices, stormwater can be managed in a way that promotes the natural movement of water within an ecosystem.

At the site-level, low impact development techniques include:

- Reducing impervious area by requiring narrower streets than conventional development,
- Requiring smaller lots and clustering development to reduce miles of street,
- Using porous materials such as pervious sidewalks rather than impervious materials
- Maintaining native vegetation
- Using bioswales and bioretention areas to infiltrate runoff, rather than trying to capture the runoff and move it off of the site as quickly as possible



FIGURE 6: CONVENTIONAL DEVELOPMENT (LEFT) VERSUS LOW IMPACT DEVELOPMENT (RIGHT).

SOURCE: AHBL, 2012.

Compact Growth as a Form of Low Impact Development

Compact growth is also a form of low impact development. Given the same amount of homes, directing growth to city centers and urban residential neighborhoods instead of rural areas can significantly reduce the amount of impervious area within a basin. In the example below, at rural densities (A) 1,000 homes would cover the entire rural area – or 5,000 acres – resulting in 200 acres of impervious surfaces. At typical urban residential neighborhood densities, the same amount of homes would require around 125 acres (B) and result in around 55 acres of impervious surfaces. At city center densities, 1,000 apartments or condominiums would require around 10 acres (C) and result in around 6 acres of impervious surfaces. Of course actual growth will be accommodated in all three areas, but guiding growth to urban areas has less impact overall on a basin.

Type of Area	Density	Units of New Growth	Percent Impervious Area	Total Acres	Impervious Acres
City Center	100 dwellings per acre	1,000	55%	10	6
Urban Residential Neighborhood	8 dwellings per acre	1,000	44%	125	55
Rural 5 acre lots	1 dwelling per five acres	1,000	4%	5,000	200

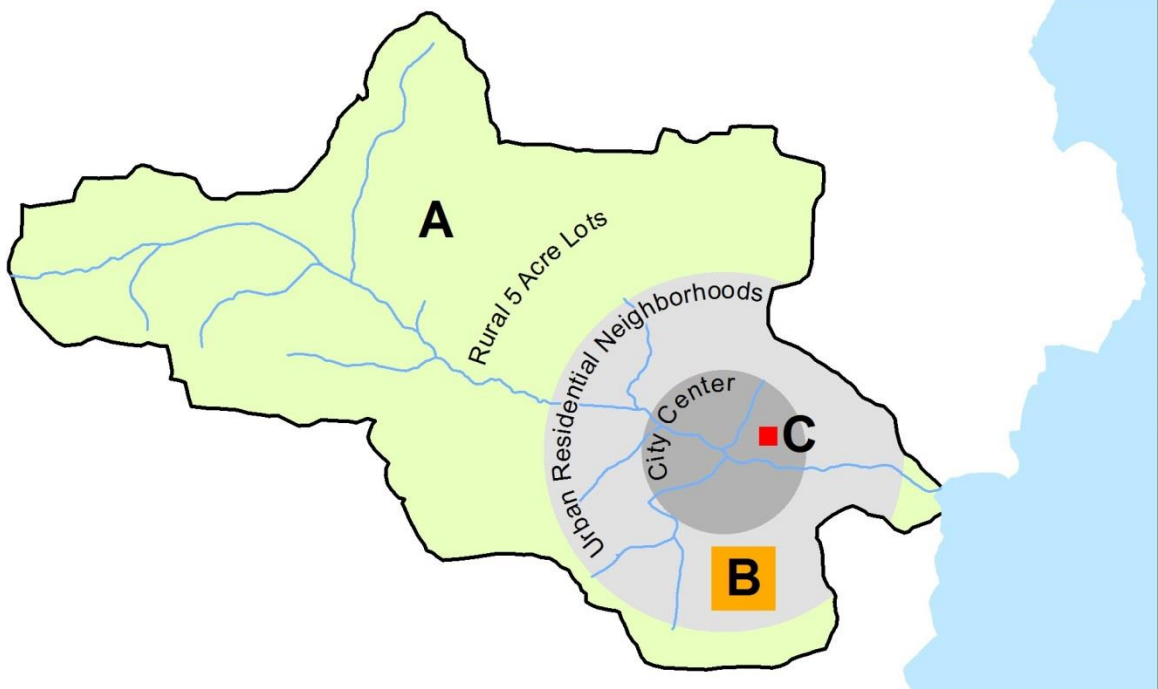


FIGURE 7: COMPACT GROWTH AS A FORM OF LOW IMPACT DEVELOPMENT.

Alternative Future B

The Alternative Future B (Map 10) scenario built on the Future A scenario and added the following:

- Restore wetland hydrology (where degraded)
- Restore forest cover along major stream corridors (where altered) (Figure 8)
- Implement stormwater retrofit projects for older residential subdivisions (Figure 9 and Figure 10)
- Encourage redevelopment and stormwater improvements along the Martin Way and Pacific corridors and Woodland District (Figure 9)

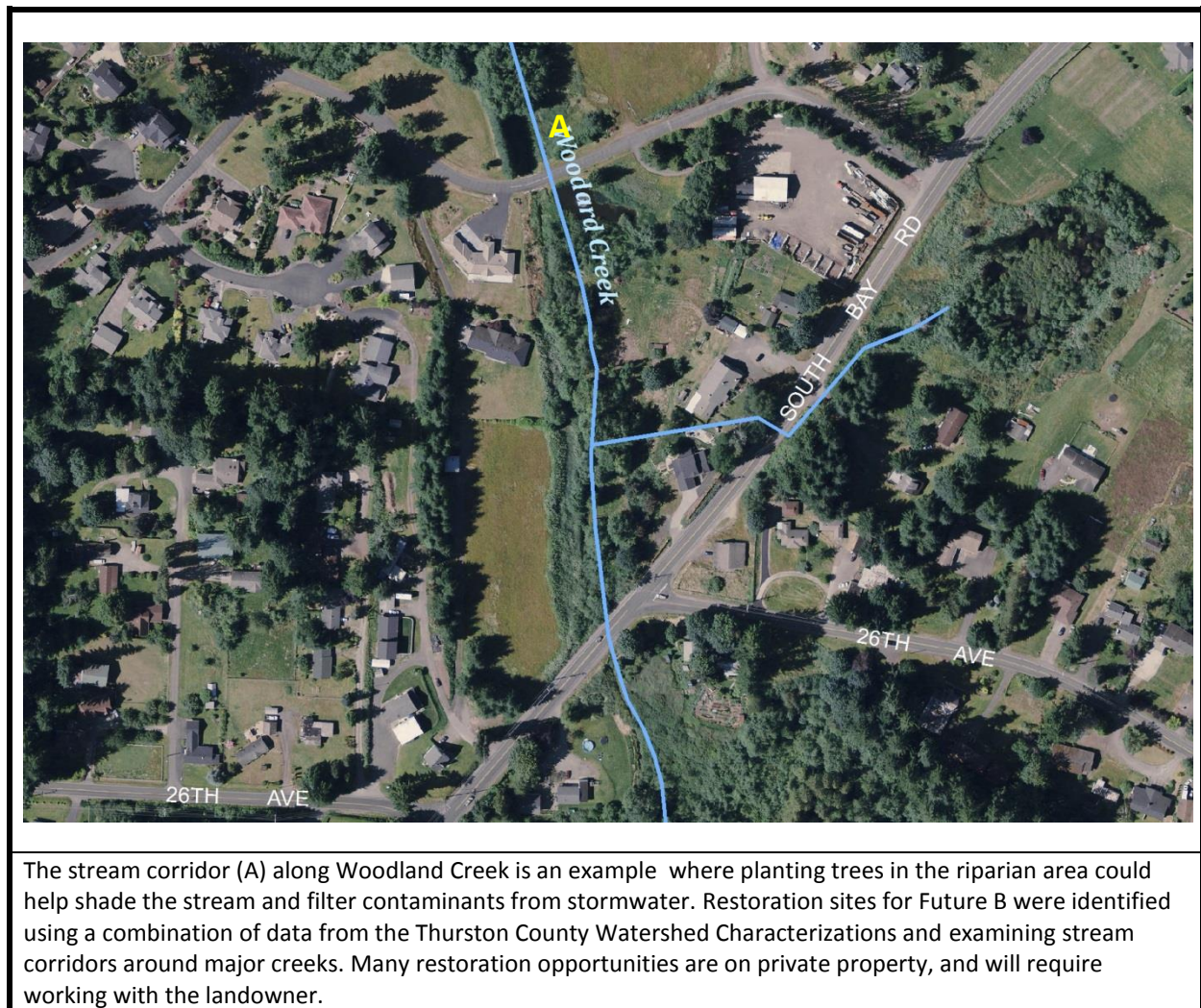


FIGURE 8: EXAMPLE OF A POTENTIAL RESTORATION SITE.



FIGURE 9: EXAMPLES OF POTENTIAL REDEVELOPMENT AND STORMWATER RETROFIT AREAS.



Stormwater retrofit is a term used when stormwater treatment is added to areas of existing development. Under current regulations, all new developments must be built with stormwater treatment facilities, but there are many existing development where stormwater can flow untreated into natural water bodies. These are areas where retrofits would be beneficial to water quality.

The project team asked public works and water resources professionals to identify areas where stormwater retrofits may be beneficial for the purposes of developing the Future B scenario.

FIGURE 10: EXAMPLE OF STORMWATER RETROFIT.

Comparison of Results

Land Use and Dwelling Units

Woodard Creek basin has around 4,880 homes in it today. Under the Planned Trend, at buildout it would have around 7,660 homes, or an increase of 57%. Under the Future A and B Alternatives, buildout within the city would remain the same, but the unincorporated areas (rural and urban growth area combined) would see a significant reduction in potential buildout. This would be a result of rezoning a portion of the unincorporated growth area to rural densities (and removing it from the growth area), and rezoning rural areas along the stream corridor to lower densities.

TABLE 4: NUMBER OF DWELLING UNITS FOR CURRENT AND FUTURE SCENARIOS.

Dwelling Units (homes)	Current Condition 2010	Planned Trend Buildout	Future A & B Buildout
City	3,890	6,160	6,160
Unincorporated	990	1,500	1,170
Total	4,880	7,660	7,330
% Increase from Current Condition			
City		58%	58%
Unincorporated		52%	18%
Total		57%	50%

What is Buildout?

Buildout is a theoretical maximum number of homes that can be built in a specific area based on current land use, ownership, and zoning. It is unlikely that all of the possible homes that could be built will be built, as many land owners will choose to keep their properties undeveloped. Properties that are designated for parks, open space, and long term forestry are not considered to be buildable.

SOURCE: THURSTON REGIONAL PLANNING COUNCIL

NOTE: DOES NOT INCLUDE REDEVELOPMENT, FAMILY MEMBER UNITS OR ACCESSORY DWELLING UNITS.

Land Cover

Development in the Woodard Creek basin has led to an estimated loss of 44% loss of forest cover when compared to conditions that likely existed in the region prior to the 1800s. Much of that area has been converted to grazing pastures⁶, roads, homes with yards, commercial spaces, parking lots or other uses. That development also contributed to some loss of historic wetland areas. The total amount of impervious surfaces in the basin has grown to around 18% – most of this is concentrated in the southern, urbanized area of the basin (see Table 5).

Under current regulations, in the Planned Trend scenario, impervious surfaces will increase to 22% in the future, with small additional loss of remaining forest cover. More open pasture areas will also likely be converted into residential development.

The zoning and land use changes proposed in the Future A scenario would result in slightly fewer new impervious surfaces when compared to the Planned Trend scenario, and retain slightly more forest

⁶ The model assumes that all pasture areas have some livestock or agricultural use.

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cover – but the difference would be very small. Adding the restoration activities in the Future B scenario would result in even less total impervious area and would restore some tree cover when compared with Planned Trend and even Current Conditions, but it does not restore to near historic conditions (Map 11; Map 12).

TABLE 5: COMPARISON OF HISTORIC, CURRENT, AND FUTURE LAND COVERS.

	Historic Condition	Current Condition 2010	Planned Trend Buildout	Future A	Future B
Forest	80%	36%	34%	35%	38%
Pasture/Prairie	1%	21%	19%	20%	17%
Grass	0%	14%	16%	15%	14%
Wetland	19%	17%	17%	17%	17%
High-polluting Total Impervious Area	0%	10%	11%	11%	10%
Low-polluting Total Impervious Area	0%	8%	11%	10%	10%

SOURCE: THURSTON REGIONAL PLANNING COUNCIL

Water Flow & Water Quality

The hydrologic model tested the effects of each of the five scenarios on water flow (hydrology) for both the basin as a whole and at the boundary between Olympia’s Urban Growth Area and the more rural parts of Thurston County. This allowed the study to isolate the impacts associated with the most developed and urbanized parts of the basin, from the rest of the watershed. Overall, when compared with historic conditions, minimum flows in the Woodard Creek have dropped by almost 10% and flows have become flashier, with sharply higher flows after storms and lower low flows in dry weather. These streams have a greater number of high pulse events when the amount of water in the stream doubles from its average flow. This has had an impact on the ecological communities of macroinvertebrates that are sentinels for stream health, and that are vulnerable to changes in flow brought by urbanization.

Looking ahead in the Planned Trend scenario, water flow is not projected to degrade substantially under existing plans and regulations and little difference was seen for flow projections between the Planned Trend and Alternative Future A scenarios, which considered the impact of lowering zoning and removing some area from the Olympia UGA. Alternative Future B, which involved extensive restoration of wetlands and shoreline vegetation as well as stormwater retrofits, would improve high pulse counts. This was most pronounced at the UGA boundary, where retrofits in the upper portion of the watershed provided about half the ecological lift to return the stream to its pre-development, historic condition.

The model also considered several water quality parameters, including temperature, bacteria (fecal coliform), and nitrates. Although the stream is slightly warmer than indicated in the Historic scenario, under current conditions, Woodard Creek as a whole does not experience temperature violations, in

which the water gets warmer than 16° Celsius, although there are occasional violations at the UGA boundary. This healthy condition is likely because the stream corridor remains vegetated along much of its length, particularly in the rural area, which keeps the stream shaded. In other factors, water quality has degraded, with substantial increases in nutrient and bacteria loads. Conditions do not significantly improve or worsen under the Planned Trend scenario, despite the assumption that all units on septic systems within the city and UGA boundaries will be converted to sewer.

The Alternative Future A and B scenarios do show some benefits to water quality, although they do not return to historic conditions. For the basin as a whole, there is a small reduction in fecal coliform concentrations between the Planned Trend and Alternative Future A (land use) scenarios with a larger reduction (10%) focusing just at the UGA boundary. Greater improvements to fecal coliform loads were seen in the Alternative Future B (restoration) scenario, as much as a 14% reduction in bacteria concentration for the basin as a whole, with as high as a 22% reduction at the UGA boundary.

All three future scenarios, including Planned Trend, showed a reduction in nitrate loads to Woodard Creek when compared to Current Conditions. The most pronounced reductions were noted at the UGA boundary, which reflects the replacement of septic systems by sewers in the urban areas. The reduction was roughly similar for both the Planned Trend and Future Alternative Future A, which indicates that the reductions associated with having more homes converted to sewer under the Planned Trend scenario was offset by the lower density of homes and low impact development standard in Alternative A (see next section below for more discussion). Even greater reductions in nitrates (24% reduction from Current Conditions) were seen in Alternative Future B due to increased stormwater treatment associated with redevelopment and retrofit projects, as well as the restoration of some pasture and grass areas to forest. The model also indicated that Alternative Future B would result in a reduction of phosphorus loads to the stream.

A summary that compares the results from the alternative futures modeling is shown in Table 6**Error! Reference source not found.** For a complete discussion of the model results, see NHC 2014.

TABLE 6: WOODARD CREEK BASIN MODELING RESULTS SUMMARY (SOURCE: NHC 2014)

	Planned Trend	Future Alternative A	Future Alternative B
Hydrology	No change	No change	Small improvement
Temperature	No change (few violations)	No change	Small improvement
Fecal Coliform (Bacteria)	Small local increase; small reduction basin-wide	Small reduction	Small to moderate reduction
Nitrate	Moderate local improvement; Small reduction basin-wide	Small reduction	Small to moderate reduction
Overall Benefit to Aquatic Health	Mixed	Moderate	Moderate

Septic Systems & Water Quality

One question raised at the start of the modeling was whether the Planned Trend scenario would result in less nutrient pollution than in the alternative future scenarios. Because traditional septic systems do not remove nutrients, a single home using a septic system can contribute between 8 to 20 times as much nitrate to groundwater and shallow sub-surface flows as one that is hooked up to a sewer system, which will treat waste at a central facility. When many homes are concentrated in a sensitive area, this can cause a substantial impact to water quality. Alternative Future A and B scenarios include an adjustment to the urban growth area boundary (Figure 4). This will affect how many homes are likely to have access to sewer infrastructure versus septic systems. Under the Growth Management Act, sewer infrastructure can only be extended to development within the urban growth area (UGA) and city limits, so homes that remain outside that boundary are likely to remain on septic systems.

One hypothesis was that the Planned Trend scenario would result in less nitrate and bacteria pollution than current conditions and Future A & B, because although the Planned Trend would result in more new homes overall, there would be fewer homes on septic systems. In practice, this assumption was complicated by the fact that some homes on septic systems pose a higher risk to water quality because of factors such as their proximity to water or the soil type used for drainage. The project team identified areas that would be considered higher risk for contributing pollution loads, and noted those septic systems as being higher contributors in the model (see Table 7). Many of these higher-risk areas are within the city of Olympia, and would be converted to sewer systems in any of the future scenarios – this was one assumption of the model. As discussed above, the two Alternative Future A and B scenarios show greater reductions in bacteria and nutrients when compared with the Planned Trend. The land use changes and low impact development of Alternative Future A seem to offset the benefit of sewerage additional homes in Planned Trend, while the restoration actions of Alternative Future B bring the greatest benefit of all the scenarios.

TABLE 7: ESTIMATES OF NITRATE POLLUTION UNDER CURRENT CONDITION, PLANNED TREND, AND FUTURE A & B.

	Current Condition 2010	Planned Trend Buildout	Future A & B Buildout
Number of homes in area that is designated in Future A & B Scenarios for removal from UGA	200	580	250
Type of wastewater treatment	septic	sewer	septic
Number of homes on septic systems in a high-risk zone for fecal coliform, total basin⁷	523	328	347
Number of homes on septic systems in a high-risk zone for nitrates, total basin⁷	1094	495	604

⁷ Source: NHC 2014.

Interpretation and Limits of Results

In summary, the model results indicate that:

- Existing land uses in the basin have impacted both water flow and water quality, when compared to conditions that would have prevailed prior to euro-American settlement in the 1850s. Woodard Creek is flashier with higher flows after storm events, due to the high percentage of impervious area around its headwaters, and lower summer flows. Bacteria and nutrient loads in the stream are much higher than they would have been prior to development.
- Although the analysis shows that there has been significant degradation of water quality when compared with historic conditions, this trajectory seems to have slowed, and conditions are not seen to get dramatically worse under the Planned Trend scenario. This result indicates that current regulations – including zoning and critical area protections – when properly implemented, can be effective at minimizing the impact of new development. Such an outcome is likely due in part to the fact that much of the basin is already built to the density of its underlying zoning, so downzoning the northern areas of the basin would not result in a substantial reduction in the number of units.
- Lowering the dwelling unit densities through downzoning, as presented in Alternative Future A, by itself is unlikely to have a substantial impact on water flow or water quality, although there may be localized improvements in some smaller areas.
- Removing the proposed area from the Olympia UGA is not likely to either improve or degrade water quality in Woodard Creek. The potential improvements that would come by converting homes in this area from on-site septic systems to sewer could be offset by other actions, such as having all new homes in the basin built to a low impact development standard.
- Stream temperatures remain below the threshold that is safe for aquatic resources, in part because the Woodard Creek riparian corridor is largely intact and provides shade to the stream. Targeted restoration of stream corridors in areas that have a lack of vegetation could further reduce temperatures, particularly for areas in the city and UGA. Stewardship of existing corridors will be important to maintaining this good condition.
- The policies identified for Future Alternative B, which pairs land use changes with a substantial restoration effort, will have the greatest benefit to water quality in Woodard Creek basin. In particular, revegetating shorelines where they have been cleared will help to shade and cool streams, making temperatures more hospitable to fish. Such restored riparian areas will also reduce the amount of fecal coliform bacteria and nitrogen loading into streams. Restoration of

degraded wetland areas would provide additional storage and treatment in some areas.

- Retrofitting older stormwater infrastructure can bring substantial improvements to stream conditions. Alternative Future B included the development of a regional stormwater facility to provide additional flow control and treatment for the heavily urbanized area around the headwaters of Woodard Creek. Redevelopment along Martin Way that meets higher stormwater standards also could benefit the watershed.
- No scenarios approach the simulated Historic condition. This is in part due to a lack of forest restoration in any scenarios – all non-pervious land covers will contribute nutrients and bacteria through runoff at more than twice the rate of a forested area. To restore water quality to be closer to historic, pre-development condition, existing pasture areas would need to be treated for nutrient removal, or returned to a non-agricultural, forested use.

A number of assumptions were made in the development and application of the model that should be considered when interpreting these results. The future scenarios assumed that new development would only clear and cover a minimal amount of each parcel with impervious surfaces, rather than the total amount allowed under current regulations (for example, up to 60% in areas zoned RRR 1/5). More extensive clearing and conversion could lead to additional impacts in the watershed. The model also assumed that all pasture areas have some livestock or agricultural use, and that this use would contribute a certain amount of bacteria and nutrient loads – these contributions could be lessened or mitigated through a variety of best practices. The model analysis assumed that existing regulations would effectively protect critical areas, and that stormwater facilities, including those required under the new low impact development standard, would be mostly effective at reducing and treating stormwater to mimic a pre-developed, forested condition. This assumption underlines the need for tools to ensure these facilities are properly built and maintained over time.

The model results provide a window into the potential effects of different policies, but they are limited to considering only impacts to water flow and water quality – they do not take into account many other important environmental factors that should be considered as part of the planning effort. For example, the model does not account for the many habitat benefits that would come from preserving tree cover in the basin. For this reason, the recommendations listed in Section 4 of this study are based on the full spectrum of information included in this report, rather than solely on the model results.

Public Views on Future Scenarios

On October 22, 2014, Thurston County and Thurston Regional Planning Council (TRPC) hosted a second community workshop for residents of Woodard Creek basin and other interested parties. Attendees had the opportunity to view maps that showed the different future scenarios and outlined different outcomes associated with each, including the results of the modeling work. They were provided with colored dots that they could place to indicate items they liked (green dot) or disliked (red dot) about a certain scenario, and could also write comments on notes attached to the maps.

Overall, participants showed support for policies that go beyond maintaining current conditions in the basin to actions that restore ecological functions and important wildlife habitat. Of the three future scenarios, participants generally disliked the Planned Trend scenario, which had the greatest increase in projected number of new dwelling units – they noted a concern for the quality of drinking water and were concerned that it underestimated the full impact of development, such as traffic impacts. For the Alternative Future A scenario, participants recognized that it did not lead to a great difference in water flow or quality, but some indicated that they thought it would have greater value for wildlife habitat and quality of life and would help preserve rural areas. Participants liked and were highly engaged by the restoration actions of Future Alternative B – a number of landowners indicated their interest and willingness to undertake restoration activities on their own land. Multiple participants suggested that their preference was for a combination of actions in Alternative Future scenarios A and B – actions that would simultaneously limit growth in the rural area, preserve undeveloped land, and restore degraded areas.

4. Management Goals and Recommendations

This watershed study provided an opportunity to consider current conditions in the Woodard Creek basin, how future growth and development may impact those conditions, and how alternative management approaches might affect that future. The following recommendations for management actions in the Woodard Creek basin are based on the basin alternatives analysis outlined above in Section 3, as well as public input and other information described in this report. This section outlines four overarching **goals** for the basin – these are high-level statements that outline the desired aim of any actions taken. The basin goals are grounded in the watershed-scale assessments completed in the Baseline Conditions report and Puget Sound Watershed Characterization project, which both emphasized the need for protection and restoration of ecological functions in this basin, as well as in the feedback received during public outreach. Associated with each goal are a mix of **strategies** intended to set the guiding direction for achieving that goal, as well as specific **actions** that address each strategy. Some actions have priority areas for implementation, as identified in the analyses or other planning efforts. These actions can be taken on by Thurston County, as well as other local jurisdictions, state and federal agencies, or community organizations.

GOAL W.1 Maintain and restore basin-wide ecological functions, including surface storage and recharge to groundwater

Woodard Creek basin was identified as a priority area for protection and restoration of water flow processes, especially surface storage and recharge of water sources. Extensive development in the upper watershed has resulted in a loss of forest cover and nearly a fifth of the basin is covered in impervious surfaces that cut off the infiltration of water into the ground. Historically, the area had a number of depressional wetlands that would have provided significant storage capacity – while some of these wetlands remain, many others have been modified, filled, or redirected. As a result, overall stream flow is flashier with increased peak flows and reduced base flows, and, particularly in the lower watershed, the stream is more channelized. Although the basin is not anticipated to see extensive additional growth under the future scenarios, to maintain current conditions it will be important to ensure that new development is built in a way that minimizes discharge and retains existing tree cover and wetlands. The riparian corridor is currently in relatively good condition along the lower watershed, and should be protected.

Strategies

- ◆ Minimize the installation of new impervious surfaces
 - Thurston County*
 - Encourage clustering of new development (see Memo, Appendix A)
 - Consider ways to minimize new impervious surfaces from detached family member units (see Memo, Appendix B)
 - Establish impervious surface limits through zoning in this basin (see Memo, Appendix C)

- Consider implementing an impervious surface trading program that would shift the placement of new surfaces out of sensitive areas
- ◆ Maintain existing tree cover and riparian vegetation
 - Thurston County*
 - Establish tree retention standards for the rural portions of the basin to ensure canopy cover remains at current levels or better
 - Review open space standards, and consider increasing incentives to landowners who set aside and maintain open space
- ◆ Implement low impact development approaches for areas that develop
 - *County and Olympia*: Update stormwater regulations to encourage low impact development, where feasible, in accordance with state guidelines
- ◆ Encourage redevelopment of older infrastructure in ways that can improve stormwater flow control
 - *County, Olympia, Lacey*: Collaborate to consider the feasibility of a regional stormwater facility to provide additional treatment and control for runoff from the urbanized area
 - ❖ *Priority Area*: The area identified in Alternative Scenarios B was bounded by 14th Avenue on the north, the Chehalis-Western Trail on the east and Lilly Road on the west.
 - *County, Olympia*: Fund and implement stormwater retrofit projects identified in the Woodard Creek Stormwater Retrofit study
 - ❖ *Priority Areas*: The top five sites identified by AHBL in memo from August 2014
- ◆ Encourage and support the restoration and enhancement of degraded wetland areas
 - *County*: Identify opportunities for use in the pilot in lieu fee mitigation program
 - ❖ *Priority areas*: Along Ensign Rd, along South Bay Rd, area west of Libby Rd between 36th and 46th
 - *County*: Develop guidance and improved outreach for landowners interested in conducting restoration on their own properties
- ◆ Encourage and support restoration of vegetation within riparian corridors, where degraded
 - Continue restoration work through Stream Team, Shellfish Protection District projects
 - *County*: Consider how to conduct restoration within County-owned areas of riparian corridor
 - *County*: Develop guidance and improved outreach for landowners interested in conducting restoration on their own properties
- ◆ Monitor key indicators – such as impervious surfaces, water quality, and acres of forested land – to assess long-term condition of basin
 - Continue annual monitoring through TRPC’s benchmark program
- ◆ Consider how climate change may affect ecological functions
 - Develop a watershed-based climate resilience plan

GOAL W.2 Protect and improve water quality

Past development and current activities have substantially degraded water quality in Woodard Creek, resulting in higher levels of bacteria and nutrients when compared with historic conditions. Considering the level of development in the basin, however, water quality in Woodard Creek is better than might be expected. This is likely due to the focused work over the past decade related to the Henderson Inlet Shellfish Protection District, which has led to more oversight and public engagement about how activities in the upland can impact water quality downstream. The modeling study found that actions that address existing impairments could improve water quality.

Strategies

- ◆ Continue focused work of Henderson Inlet Watershed protection area to address water quality
- ◆ Minimize and reduce pollution from septic systems
 - *County*: Continue focused operation and maintenance program for Henderson Inlet
 - *County*: Expand septic risk assessment to identify high risk areas for septic systems in the rural areas of the County
 - *County and Olympia*: Implement a focused program to convert septic systems of the southern, urban portion of basin to sewer systems
 - ❖ *Priority Areas*: Neighborhoods identified in 2015 Urban Septic Risk Assessment
- ◆ Encourage redevelopment and retrofit of older infrastructure to improve stormwater treatment
 - *County, Olympia, Lacey*: Collaborate to consider the feasibility of a regional stormwater facility to provide additional treatment and control for runoff from the urbanized area
 - ❖ *Priority Area*: The area identified in Alternative Scenarios B was bounded by 14th Avenue on the north, the Chehalis-Western Trail on the east and Lilly Road on the west.
 - *County, Olympia*: Fund and implement stormwater retrofit projects identified in the Woodard Creek Stormwater Retrofit study
 - ❖ *Priority Areas*: The top five sites identified by AHBL in memo from August 26, 2014
 - *Olympia*: Fund and implement stormwater retrofit projects along Martin Way, included in Capital Facilities Plan
 - ❖ *Priority Areas*: 2020 Martin Way water quality retrofit planned at Indian Creek (\$750,000 and a grant); 2028 Martin Way water quality retrofit planned at Ensign and Mary Elder (\$750,000 and a grant)

GOAL W.3 Protect open space and critical habitat for wildlife and fish

With Woodard Bay Natural Resources Conservation Area at its mouth, Woodard Creek basin provides an important corridor for wildlife traveling along Southern Puget Sound, and the basin contains important habitat for a number of species. Residents value opportunities they have to view wildlife in the area, and the more open feel of the northern reaches of the basin. The County should work to ensure that current regulations continue to protect critical habitat, and look for innovative ways to encourage preservation of open space areas.

Strategies

- ◆ Provide options for preserving habitat through land use regulations
 - Ensure development occurs in compliance with the Critical Areas Ordinance (TCC 24)
 - Encourage clustered development that preserves more open space and habitat (See Memo, Appendix A)
 - Develop a regional approach to track and plan for open space
- ◆ Consider long-term protection options for remaining large parcels in private ownership
 - Provide priority ranking for projects in Woodard Creek basin through the county's Conservation Futures program, including purchase of development rights or fee simple land acquisition
 - Consider expanding the county's Transfer of Development Rights Program to include priority open space within Woodard Creek basin as applicable sending areas, and urban areas within the city of Olympia as applicable receiving areas (See Memo, Appendix D)
- ◆ *County*: Investigate and devise management plan for county-owned right-of-way along stream

GOAL W.4 Encourage sustainable development and redevelopment within urban corridors

An infrastructure assessment for the Martin Way District considered the development of a mixed-use district with improved pedestrian and transportation options along a corridor that connects downtown Olympia to Lacey and crosses through the Woodard Creek basin at an area that contains extensive wetlands. Such redevelopment would also result in enhanced stormwater control and treatment, and these were incorporated into Future Alternative B, which showed improved water quality benefits and was preferred by attendees who viewed it at a public workshop. A market study revealed a number of economic barriers to redevelopment in this area, but if incentives could be provided to encourage it, it would benefit the greater watershed. In addition, the Woodland District Plan, which was adopted by the Lacey City Council in 2013, recommends a regional stormwater management plan for the District. If the District redevelops over time as planned, it would support the case for stormwater upgrades identified by Olympia staff in the neighborhood to the west of the Chehalis-Western Trail and south of I-5.

Strategies

- ◆ *Olympia, Lacey*: Create incentives for redevelopment along central urban corridor areas
 - Utilize incentives to improve financial viability for infill and redevelopment projects. This includes: Special Valuation multifamily tax program, reducing or eliminating impact fees, waiving stormwater fees for a number of years, providing frontage and utility improvements, eliminating connection charges
 - ❖ Priority areas: Martin Way corridor, Pacific Avenue/Fones Road, Woodland District
 - Explore ways to meet regional stormwater goals yet allow infill and redevelopment flexibility amid urban corridor and center areas.

5. Implementation and Next Steps

This study identified a number of recommended strategies and actions to protect and improve water quality and aquatic resources in the Woodard Creek basin. Accomplishing the goals set out in the previous section will require leadership and continued support from project partners as well as funding for many of the individual actions. Because this study was directed by Thurston County, most of the actions noted are ones that should be led by one or another county department, except where noted otherwise. Additional actions could be taken up by other organizations interested in supporting these strategies.

The actions identified in this study can be grouped into a number of different categories; some may potentially be addressed by work that is currently underway.

Land Use. These actions concern changes to zoning, development regulations, or plans that guide land use in the County, such as the Shoreline Master Program (SMP) or Comprehensive Plan (CP). Actions in this category would likely be led by Thurston County's Long-Range Planning Division.

- *Code review:* The County is currently reviewing many of its development codes for as required under its NPDES stormwater permit to make low impact development the preferred option for development. This code review is being led by an interdepartmental LID Work Group and is covering topics like tree and vegetation retention, cluster and open space standards, and impervious surface limits.

Programs. These actions would involve the modification of current programs run by the county, or the development of entirely new programs.

- *Outreach and education:* This study identified a need for additional outreach to landowners in a number of categories, and a way to provide centralized information and support for those who may be interested in either preserving large open areas or doing restoration in degraded areas.

The following table includes an implementation plan that identifies the potential lead and timeline for each action.

TABLE 8: IMPLEMENTATION OF BASIN-SPECIFIC ACTIONS.

Goals, Strategies, Actions		Category	Lead	Partners	Timeline
W.1 Maintain and restore basin-wide ecological functions, including surface storage and recharge to groundwater					
	<i>Minimize the installation of new impervious surfaces</i>				
	Encourage clustering of new development	Land use; code review	County	LID Work group	Underway
	Consider ways to minimize new impervious surfaces from detached family member units	Land use; code review	County		Short

Woodard Creek Basin Water Resource Protection Study

Goals, Strategies, Actions		Category	Lead	Partners	Timeline
	Establish impervious surface limits through zoning in this basin	Land use; code review	County	LID Work group	Medium
	Consider implementing an impervious surface trading program that would shift the placement of new surfaces out of sensitive areas	Programs	County		Long
<i>Maintain existing tree cover and riparian vegetation</i>					
	Establish tree retention standards for the rural portions of the basin to ensure canopy cover remains at current levels or better	Land use; code review	County	LID Work group	Underway
	Review open space standards, and consider increasing incentives to landowners	Land use; code review	County	LID Work group	Underway
<i>Implement low impact development approaches for areas that develop</i>					
	Update stormwater regulations to encourage low impact development	Land use; code review	County, Olympia	LID Work group	Underway
<i>Encourage redevelopment of older infrastructure in ways that can improve stormwater flow control</i>					
	Collaborate to consider the feasibility of a regional stormwater facility to provide additional treatment and control for runoff from the urbanized area	Programs		Olympia, Lacey, County,	Long
	Fund and implement stormwater retrofit projects identified in the Woodard Creek Stormwater Retrofit study	Programs	County		Medium
<i>Encourage and support the restoration and enhancement of degraded wetland areas</i>					
	Identify opportunities for use in the pilot in lieu fee mitigation program	Programs	County		Medium
	Develop guidance and improved outreach for landowners interested in conducting restoration on their own properties	Programs	County		Medium
<i>Encourage and support restoration of vegetation within riparian corridors, where degraded</i>					
	Continue restoration work through Stream Team, Shellfish Protection District projects	Programs; ongoing	County		Ongoing
	Consider how to conduct restoration within County-owned areas of riparian corridor	Programs; research	County		Long
	Develop guidance and improved outreach for landowners interested in conducting restoration on their own properties	Programs; outreach	County		Medium
<i>Monitor key indicators to assess long-term condition of basin</i>					
	Continue annual monitoring through TRPC's benchmark program	Programs	TRPC	County	Ongoing
<i>Consider how climate change may affect ecological functions</i>					

Woodard Creek Basin Water Resource Protection Study

Goals, Strategies, Actions		Category	Lead	Partners	Timeline
	Develop a watershed-based climate resilience plan	Land use	TRPC	County	
W.2 Protect and improve water quality					
	<i>Continue focused work of Henderson Inlet Watershed protection area to address water quality</i>	Programs; ongoing	County	Olympia, Lacey, SPD Citizens Advisory Group	Ongoing
	<i>Minimize and reduce pollution from septic systems</i>				
	Continue focused operation and maintenance program for Henderson Inlet	Programs; ongoing	County		Ongoing
	Expand septic risk assessment to identify high risk areas for septic systems in the rural areas of the County	Programs; research	County		Medium
	Implement a focused program to convert septic systems of the southern, urban portion of basin to sewer systems	Programs	County		Long
	<i>Encourage redevelopment and retrofit of older infrastructure to improve stormwater treatment</i>				
	Collaborate to consider the feasibility of a regional stormwater facility to provide additional treatment and control for runoff from the urbanized area	Programs	Olympia, Lacey, County		Long
	Fund and implement stormwater retrofit projects identified in the Woodard Creek Stormwater Retrofit study	Programs	County		Medium
	Fund and implement stormwater retrofit projects along Martin Way, included in Capital Facilities Plan	Programs	Olympia		Medium
W.3 Protect open space and critical habitat for wildlife and fish					
	<i>Provide options for preserving habitat through land use regulations</i>				
	Ensure development occurs in compliance with the CAO	Programs; ongoing	County, Olympia		Ongoing
	Encourage clustered development that preserves more open space and habitat	Land use; code review	County		Medium
	Develop a regional open space plan	Land use	TRPC	County	Medium to long
	<i>Consider long-term protection options for remaining large parcels in private ownership</i>				
	Provide priority ranking for projects in Woodard Creek basin through the county's Conservation Futures program	Programs	County		Short

Woodard Creek Basin Water Resource Protection Study

Goals, Strategies, Actions			Category	Lead	Partners	Timeline
		Consider expanding the county's Transfer of Development Rights Program	Programs	County		Medium
		Investigate County ownership of area along stream corridor	Programs; research	County		Medium
W.4 Encourage sustainable development and redevelopment within urban corridors						
		<i>Create incentives for redevelopment along central urban areas</i>	Programs; research	Olympia		Medium

This study did not include an analysis of the costs associated with the different scenarios, but an initial next step could include a prioritization of actions that includes such an analysis. Collaboration among the different groups and partners with interest in the watershed will be essential to carrying out these recommendations, as will continued monitoring to track the condition of the basin over the long term.

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Maps

MAP 1: PROJECT AREA

MAP 2: 2012 AERIAL OVERVIEW

MAP 3: BASIN OVERVIEW

MAP 4: SOILS

MAP 5: CURRENT ZONING (2014)

MAP 6: RESIDENTIAL DEVELOPMENT POTENTIAL

MAP 7: PUBLIC COMMENTS FROM APRIL 2014 WORKSHOP

MAP 8: WATER, SEWER, AND STORMWATER INFRASTRUCTURE

MAP 9: FUTURE A ZONING CHANGES

MAP 10: FUTURE B SCENARIO

MAP 11: IMPERVIOUS AREA IN CURRENT AND FUTURE SCENARIOS

MAP 12: FOREST COVER IN CURRENT AND FUTURE SCENARIOS

Appendices

Appendix A. Thurston County Cluster Developments

Appendix B. Family Member Units in Rural Thurston County

Appendix C. Impervious Surface Limits

Appendix D. Transfer of Development Rights and Purchase of Development Rights

Appendix A.

Thurston County Cluster Developments

Issue:

Cluster development is considered a low-impact development technique because it reduces the amount of impervious surface in a subdivision. Thurston County's zoning code allows for cluster developments in certain zoning districts; however, more code work could be done to encourage rural cluster type development over conventional developments and incorporate additional low-impact development techniques.

Recommendations:

1. Amend Thurston County's Development code to removed inconsistencies and clarify open space requirements:
 - Establish an open space requirement for PRRD's in zoning districts where resource parcels are not required - R 1/20; R 1/10; UR 1/5; LAMIRD 1/2
 - Determine whether or not PRRDs are possible in the LAMIRD 1/2 zone (it appears as if no developable parcels are over 20 acres in size in this zoning district).
 - Reconcile inconsistencies in density bonus language in zoning and PRRD code for the Nisqually sub-area
 - Remove reference to cluster lots sizes in LAMIRD zones that are not eligible for PRDs and PRRDs.
2. Consider the recommendation from Thurston County's 2011 *Low-Impact Development Barriers Analysis* that additional considerations related to stormwater and water quality be incorporated into cluster development code, including:
 - Encourage cluster subdivisions where sensitive areas exist such as streams, wetlands, shorelines, etc.
 - Require or provide incentives to locate the open space areas and/or resource parcel downslope from the developed portions of a site to create water quality benefits.
 - Require or provide incentives to locate the open space area and/or resource parcel contiguous to parks, critical areas/buffers, or open space on adjacent lands to increase connectivity of habitat areas.
 - Require or provide incentives for the retention (or restoration) of native vegetation and tree canopy on the proposed resource parcel/open space area.

Background:

Thurston County allows for cluster development in all of the rural residential zoning districts with the exception of two LAMIRD zones: RL 2/1 and RL 1/1. In the Grand Mound urban growth area cluster development and cottage housing (a form of clustering) is also allowed.

In the Lacey, Olympia, and Tumwater UGAs, cluster developments are permitted through the Planned Residential Development (Lacey and Olympia) or Planned Unit Development (Tumwater) planning processes, and all three jurisdictions allow for cottage housing.

Clustering is considered a best management practice for low-impact development as it allows for a large resource or environmentally sensitive parcel to be set aside, and the residential units to be clustered in a smaller part of the property, resulting in fewer miles of roads.

The benefits of clustering in subdivision design include¹:

- Reduced impervious surface and land disturbance per dwelling unit
- Protection of resource lands provides habitat, particularly if resource land is located contiguous to other resource lands, parks, or open space.
- Area of resource land and/or open space may be suitable for low-impact development best management practices such as dispersion
- If the resource land/open space is located between development and critical areas, or at least “down slope” from the developed area it can provide additional water quality benefits and mitigation.



Conventional Development versus Low Impact Development Cluster Design

Source: Integrating LID into Local Codes: A Guidebook for Local Governments. July 2012.

Since the Growth Management Act Comprehensive Plan and Zoning was adopted in Thurston County in the mid-1990s, Thurston County has approved 47 rural cluster subdivision developments, resulting in 990 residential lots and more than 2,600 acres of open space or resource lands placed into protection. The amount of open space and resource land protection varied by zoning district, and averaged 77 percent of the total area.

¹ Low Impact Development Barriers Analysis – Thurston County, Washington. March, 2011.

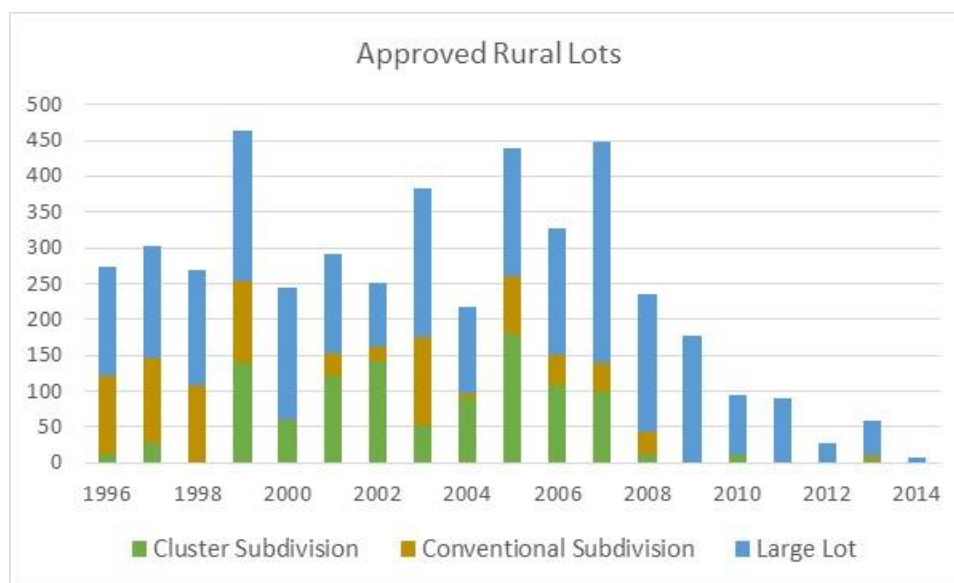
Guiding Growth – Healthy Watersheds: Science to Local Policy

Zoning District	Number of Residential Lots	Residential (acres)	Resource or Open Space (acres)	Rights-of-Way (acres)	Total (acres)	Percent Open Space	Units per Acre	Acres per Unit
LTA	7	14	147	1	162	90%	0.04	23.21
MGSA	129	63	528	12	602	88%	0.21	4.67
RR1/2	211	94	234	22	350	67%	0.60	1.66
RRR1/5	644	491	1,703	64	2,258	75%	0.29	3.51
Total	991	662	2,612	99	3,372	77%	0.29	3.40

Thurston County placed a moratorium on cluster developments in the late 2000's. The moratorium was lifted in June 2011 when new regulations were adopted. One of the main differences between the earlier regulations and current regulations was the removal of most of the density bonuses given for clustering.

The main issue with the density bonuses was that they allowed for an increase in rural densities of between 35 and 65 percent based on how much open space/resource lands were put aside. Overall, the regulations resulted in about a 50 percent increase in density in clustered subdivisions in the RRR1/5 zone compared to conventional development.

The number of new rural lots being approved slowed considerably starting in the late 2000s. There were many factors at play: the recession and drop in the housing market; changing demographic preferences of a walkable urban lifestyle; and a rural rezone in 2007.



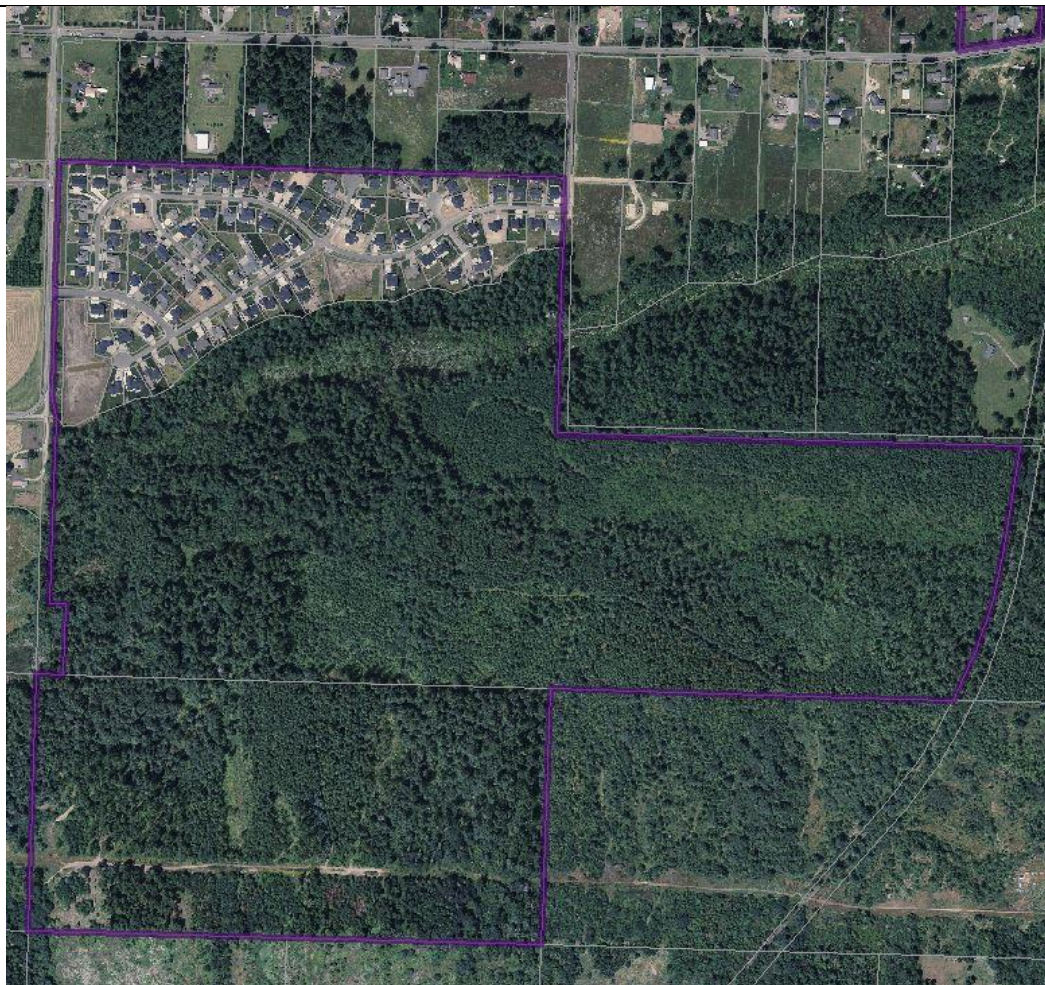
Today density bonuses are allowed in the Grand Mound UGA², and density increases are allowed amid the Nisqually Agriculture zoning district and the RRR 1/5 and RR1/5 if there are certain critical areas present.

² Although density bonuses are listed in the zoning code for the Nisqually sub-area (in RR1/5) they are not allowed in Chapter 20.30.050 (PRD section of code.)

Since Thurston County lifted the moratorium on clusters put into place new regulations, the County has approved just two small subdivisions — one a cluster subdivision and the other a conventional one.

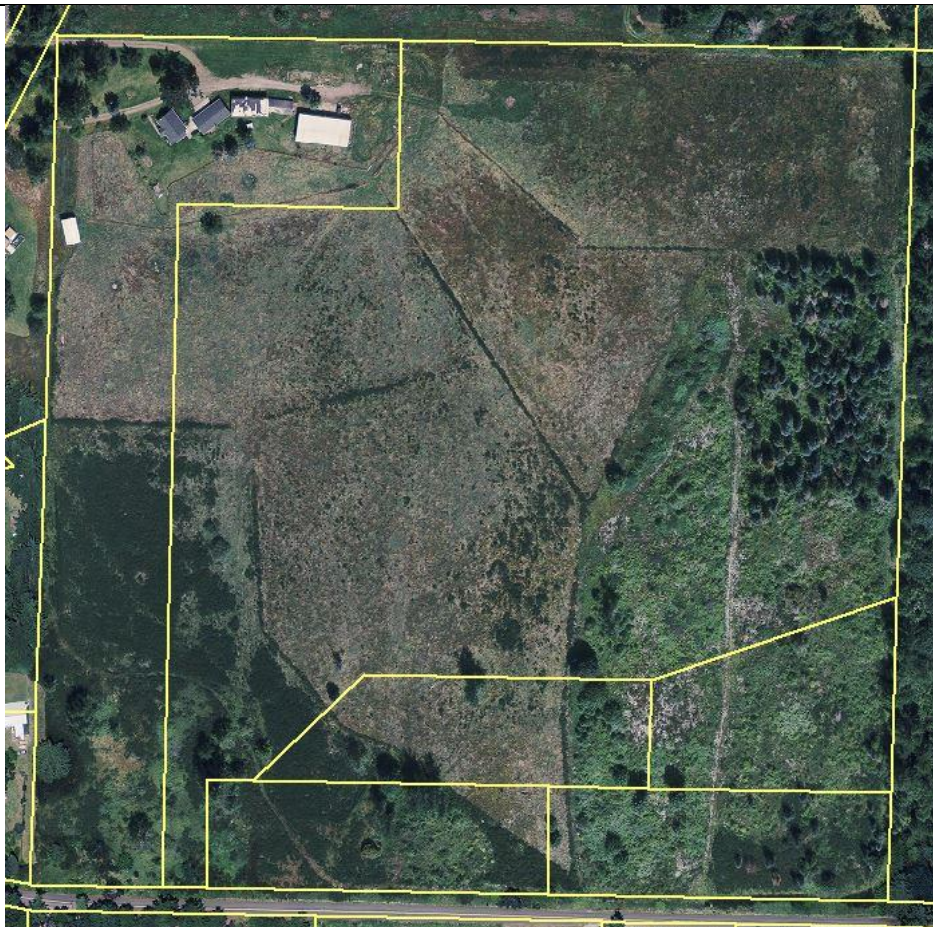
There are more than 1,300 rural properties over 20 acres in size — almost 64,000 undeveloped acres — that could either develop in a conventional or cluster form at an average density of around one unit per five acres.

Cluster Subdivision Approved under pre-2011 Regulations



The Riverwood subdivision was approved in 2007. The open space parcel contains Spurgeon Creek. Ninety homes were permitted on a 305-acre property. The average residential lot size is 0.37 acres in size, for an average density of 0.3 units per acre, or 3.3 acres per unit. Compare that to the lots just north of the subdivision that represent the typical 5 acres per unit lot size in this zoning district (RRR1/5). Eighty-six percent of the land was preserved in open space. Without the density bonus, around 61 lots would have been allowed (without removing critical areas from the density calculation per rules in 2007).

Cluster Subdivision Approved under updated Regulations



Merryman Estates is the only subdivision to be approved under the updated PRRD regulations. This 39-acre parcel has been subdivided into five residential lots and a 23-acre resource parcel (60 percent of the total plat area). The original farm home is now on a 7.7-acre lot, and the new residential lots are around 2 acres in size. The overall density is around 7.7 units per acre.

Guiding Growth – Healthy Watersheds: Science to Local Policy

Zoning Code	Underlying Zoning District Density	Cluster Development Allowed	Density Bonus or Incentive to Cluster	Resource Parcel / Open Space
Chapter 20.08A Long-Term Agriculture District (LTA)	One unit per 20 acres	Yes – PRRD (consistent with 20.30A – when in conflict more restrictive standards apply)	No	85 percent of proposed subdivision – resource parcel Chapter 20.32 for open space – no specific set-aside
Chapter 20.08C Nisqually Agricultural District (NA)	One unit per 40 acres	Yes - PRRD	Yes – density calculated at one unit per five acres for cluster development	90 percent of proposed subdivision – resource parcel Chapter 20.32 for open space – no specific set-aside
Chapter 20.08D Long-Term Forestry District (LTF)	One unit per 80 acres unless lots are smaller than 640 acres then 1 unit per 20 acres	Yes – PRRD	Required for subdivisions in this zoning district (on lots smaller than 640 acres) Density is one unit per 20 acres	75 percent of proposed subdivision – resource parcel Chapter 20.32 for open space – no specific set-aside
Chapter 20.09 Rural Residential—One Dwelling Unit per Five Acres (RR 1/5)	One unit per 5 acres ¹	Yes - PRD	Yes if wetlands are present - wetlands not subtracted if it is a cluster development	30 percent or more – greenbelt, active recreation, environmentally sensitive lands
Nisqually Sub-area	Same as above	Yes – PRD	Required for lots 20 acres or larger Density bonus of 20 percent listed in 20.09.045 but conflicts with other section 20.30.050 Number 4 that says “no density bonus shall be awarded for PRDs in the RR 1/5 and MGSA area.	Title 20.09.045 75 percent of parcel shall be open space Does this conflict with 20.30.060: 30 percent or more – greenbelt, active recreation, environmentally sensitive lands
Chapter 20.09A Rural Residential/Resource—One Dwelling Unit per Five Acres (RRR 1/5)	One unit per 5 acres ¹	Yes – PRRD Wetlands not subtracted if it is a cluster development	Yes if wetlands are present - wetlands not subtracted if it is a cluster development Resource parcel may be converted after annexation to city	60 percent of proposed subdivision – resource parcel If annexed into adjacent city, limitations on the use of the resource parcel will be removed Chapter 20.32 for open space – no specific set-aside
Chapter 20.09B Rural—One Dwelling Unit per Twenty Acres (R 1/20)	One unit per 20 acres	Yes – PRRD	No	No resource parcel required; Chapter 20.32 for open space – no specific set-aside
Chapter 20.09C Rural—One Dwelling Unit per Ten Acres (R 1/10)	One unit per 10 acres	Yes – PRRD	No	No resource parcel required Chapter 20.32 for open space – no specific set-aside

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Zoning Code	Underlying Zoning District Density	Cluster Development Allowed	Density Bonus or Incentive to Cluster	Resource Parcel / Open Space
Chapter 20.09D Urban Reserve—One Dwelling Unit per Five Acres (UR 1/5)	One unit per 5 acres	Yes – PRRD	Resource parcel may be converted after annexation to city	No resource parcel required Chapter 20.32 for open space – no specific set-aside
Chapter 20.10A Residential LAMIRD—One Dwelling Unit per Two Acres (RL 1/2)	One unit per 2 acres	Yes – PRRD Minimum lot size: Cluster subdivision lot—one acre for single-family, two acres for duplexes	No	No resource parcel required Chapter 20.32 for open space – no specific set-aside
Chapter 20.11A Residential LAMIRD—One Dwelling Unit per Acre (RL 1/1)	One unit per acre	No (but cluster lot size mentioned in zoning) Minimum lot size: Cluster subdivision lot—one-half acre for single-family, one acre for duplexes	N/A	
Chapter 20.13A Residential LAMIRD — Two Dwelling Units per Acre (RL 2/1)	Two dwelling units per acre	No (but cluster lot size mentioned in zoning) Minimum lot size: Cluster subdivision lot—seven thousand two hundred square feet for single-family, fifteen thousand square feet for duplexes	N/A	
Chapter 20.15 Residential—Three To Six Dwelling Units per Acre (R 3—6/1) ²	Three to six units per acre	Yes – PRD Minimum lot size: Cluster subdivision lot—four thousand square feet	Yes – up to 20 percent if open space requirements are met	30 percent or more – greenbelt, active recreation, environmentally sensitive lands
Chapter 20.21A Residential—Four To Sixteen Dwelling Units per Acre (R 4—16/1) ²	Four to sixteen units per acre	Yes – PRD No minimum lot size for cluster	Yes – up to 20 percent if open space requirements are met	30 percent or more – greenbelt, active recreation, environmentally sensitive lands
Chapter 20.23 McAllister Geologically Sensitive Area District (MGSA)	One unit per 5 acres	Yes – PRD Minimum lot size: Cluster subdivision lot: twelve thousand five hundred square feet	No	30 percent or more – greenbelt, active recreation, environmentally sensitive lands

Notes:

Project size for PRD in the RR1/5 and MGSA zones and PRRDs in all zones is 20 to 100 acres

¹ Subtract critical areas (but not critical area buffers) for traditional development. No deductions for cluster development.

² Grand Mound Urban Growth Area

Appendix B.

Family Member Units in Rural Thurston County

Issue:

Several chapters of Title 20 of Thurston County’s code (Zoning) permit the following: In addition to the maximum number of dwelling units permitted on a lot, “one temporary mobile/manufactured home or modular home may be located upon a lot for the purposes of housing a person or persons who are family members to a person residing in a structure existing on the lot when application for family unit approval is requested.” Such Family Member Units (FMUs) must be removed: 1) when a family member no longer occupies the units; 2) or prior to sale of the property – unless the purchaser provides the County a letter stating that a family member will occupy the FMU.

Approximately 190 FMUs were built in the rural county between 2000 and 2011, according to a Thurston Regional Planning Council analysis.

Thurston County and Lewis County are the only two counties in Washington that allow FMUs; however, Lewis County will terminate its FMU code provisions as of July 1, 2015. Other counties allow Accessory Dwelling Units (ADUs) instead. The difference is that FMUs are detached structures, usually mobile homes, while ADUs are attached to the main residence or garage. This is important, as the Western Washington Growth Management Hearings Board (No. 03-2-0003c) held that detached units must be counted as dwelling units for the purpose of determining residential density.

Current rules in Thurston County allow FMUs to be permanently placed modular homes, thus making removal difficult when the family member moves out, according to Thurston County staff. The result is a permanent increase in rural density — density inconsistent with the Comprehensive Plan and Growth Management Act.

A secondary, but related issue, is that family member units are often placed on the property in a way that greatly increases the amount of impervious surfaces via driveways and the new residence — infrastructure that increases stormwater runoff. Even if the FMU were to be removed, the driveway would remain (See aerial photo examples of added FMUs and related impervious surface area, beginning on pg. 13). This is an important point, as the state Department of Ecology’s revised municipal stormwater permit directs Thurston County and other jurisdictions to integrate low-impact development (LID) practices into their codes and standards so as to reduce stormwater runoff into waterbodies.

Recommendation:

Eliminate all references to Family Member Units throughout the Thurston County Code and amend Chapter 20.34 (Accessory Uses and Structures) to allow accessory dwelling units in all rural residential areas, as well as the unincorporated urban growth areas. This measure (Option 1, below) would not only eliminate arcane FMU references from the code but mitigate the issue of de facto urban sprawl as a result of detached accessory housing and associated impervious surfaces. Option 2 (also below), would leave Thurston County as the only municipality in the state with “Family Member Unit” provisions still in

its code. Further, Option 2 would not mitigate the issue of impervious surfaces, which also has a major impact on basin water quality.


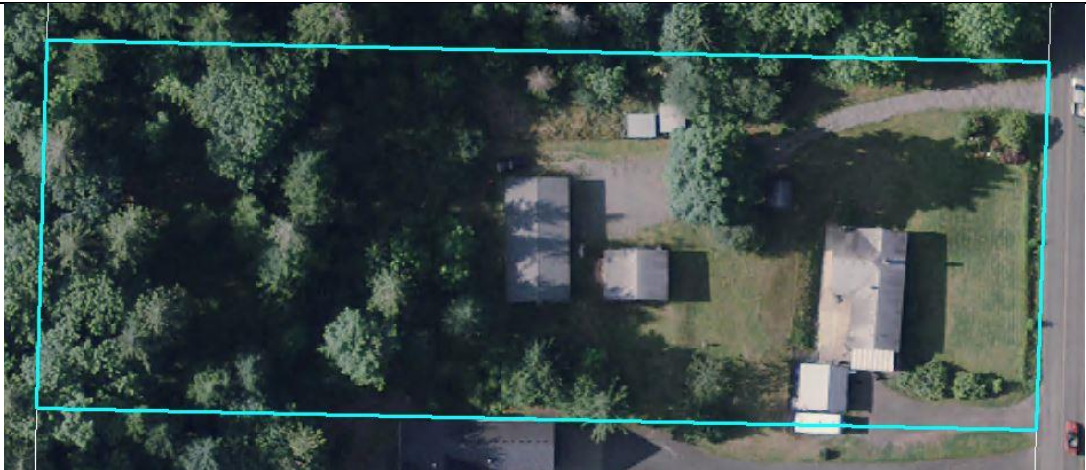
Analysis:

Family Member Units and Accessory Dwelling Units are allowed in various chapters of Title 20, Thurston County's zoning code.

Zoning District	Additional Units
Chapter 20.08A Long-Term Agriculture District (LTA)	FMUs and Farm Housing
Chapter 20.08C Nisqually Agricultural District (NA)	No
Chapter 20.08D Long-Term Forestry District (LTF)	FMUs
Chapter 20.08E Public Parks, Trails, And Preserves District (PP)	N/A
Chapter 20.08F Military Reservation District (MR)	N/A
Chapter 20.08G Agritourism Overlay District (AOD)	N/A
Chapter 20.09 Rural Residential—One Dwelling Unit per Five Acres (RR 1/5)	FMUs
Nisqually Sub-area	As above
Chapter 20.09A Rural Residential/Resource—One Dwelling Unit per Five Acres (RRR 1/5)	FMUs and Farm Housing
Chapter 20.09B Rural—One Dwelling Unit per Twenty Acres (R 1/20)	FMUs and Farm Housing
Chapter 20.09C Rural—One Dwelling Unit per Ten Acres (R 1/10)	FMUs and Farm Housing
Chapter 20.09D Urban Reserve—One Dwelling Unit per Five Acres (UR 1/5)	FMUs
Chapter 20.10A Residential LAMIRD—One Dwelling Unit per Two Acres (RL 1/2)	FMUs
Chapter 20.11A Residential LAMIRD—One Dwelling Unit per Acre (RL 1/1)	FMUs
Chapter 20.13A Residential LAMIRD —Two Dwelling Units per Acre (RL 2/1)	No
Chapter 20.15 Residential—Three To Six Dwelling Units per Acre (R 3—6/1)	ADUs
Chapter 20.21A Residential—Four To Sixteen Dwelling Units per Acre (R 4—16/1)	ADUs
Chapter 20.22 Neighborhood Convenience District (NC)	N/A
Chapter 20.23 McAllister Geologically Sensitive Area District (MGSA)	FMUs
Chapter 20.24 Rural Commercial Center District (RCC)	No
Chapter 20.25 Arterial Commercial District (AC)	No
Chapter 20.26 Highway Commercial District (HC)	N/A
Chapter 20.27 Planned Industrial Park District (PI)	N/A
Chapter 20.28 Light Industrial District (LI)	N/A
Chapter 20.29 Rural Resource Industrial District (RRI)	Caretaker unit



Examples of Additional Family Member Units and Impervious Surfaces

2000 Aerial Photograph	2012 Aerial Photograph
	
<p>Location: Black Lake Basin</p> <p>Change: The family member unit was added in 2002. Impervious area increased from 10% to 14.5% on this 3 acre property.</p>	

2000 Aerial Photograph	
2012 Aerial Photograph	
<p>Location: Black Lake Basin</p> <p>Change: The family member unit on this property was permitted in 2008. Impervious area increased from 7% to 13% on this 2 acre property.</p>	

2000 Aerial Photograph	2012 Aerial Photograph
	
<p data-bbox="203 1308 487 1339">Location: McLane Basin</p> <p data-bbox="203 1371 1446 1486">Change: The manufactured home on this property (partially covered by trees) was converted to a family member unit when the single family home was constructed in 2008. Impervious area increased from 3 percent to 17 percent on this 5 acre property.</p>	

2000 Aerial Photograph	
2012 Aerial Photograph	
<p>Location: Woodard Basin</p> <p>Change: The family member unit on this property was permitted in 2005. Impervious area increased from 9% to 14% on this 3 acre property.</p>	

2000 Aerial Photograph	
2012 Aerial Photograph	
<p>Location: Woodard Basin</p> <p>Change: The family member unit on this property was permitted in 2008. Impervious area increased from 3% to 20% on this 2.5 acre property.</p>	

Option 1: Eliminate all references to Family Member Units throughout the Thurston County Code and amend Chapter 20.34 (Accessory Uses and Structures) with language modeled after that in Chapter 17.102 of the Lewis County Code. In other TCC Title 20 chapters that currently allow FMUs, replace the FMU language with ADU language and cross-reference Chapter 20.34.

In Washington, only Thurston and Lewis counties use the term “Family Member Unit” in their code in this context. Currently, Thurston County allows FMUs only in residential zones within rural unincorporated areas (See Option 2 below); Accessory Dwelling Units (ADUs), rather, are allowed only within the Grand Mound (Chapter 20.15 and 20.21A), Lacey, Tumwater and Olympia unincorporated urban growth areas (Titles 21-23). Instead, Thurston County could allow attached ADUs in all rural residential areas, as well as the unincorporated urban growth areas (See suggested edits below).

For the time being, Lewis County Code allows ADUs as well as “Separate Residential Units” (also known as Family Member Units) in rural residential areas outside of Local Areas of More Intense Rural Development (LAMIRD). Separate Residential Units are allowed in RRD 1-10 and 1-20 (areas eligible for a

density bonus) and must be occupied by “family members.” ADUs, rather, are allowed where no subdivision of the land may occur; such units must be attached to or within the land’s primary dwelling unit [See Lewis County Code Chapters 17.102.040 and .050 (implementation) and 17.102.060 (enforcement)]. Lewis County will terminate the FMU provisions of the code as of July 1, 2015 (the FMU language was put in as a stopgap in 2002 to allow people caught in the middle of zoning to break up land, if needed, to continue farming practices), according to Lewis County Senior Planner Karen Witherspoon. The ADU provisions will remain in place.

Benton County has similar code language (below):

Benton County Code 11.52.082 *(Does not allow detached ADUs and sets size limit)*

ACCESSORY DWELLING UNITS--PURPOSE AND AUTHORIZATION. An accessory dwelling unit shall be allowed on any real property located within unincorporated Benton County that is zoned for single family residences, except for those properties with an Industrial or Commercial zoning designation, thereby meeting the requirements of the Washington State Housing Policy Act of 1993 to incorporate provisions for accessory apartments in the County's zoning ordinance (Title 11 BCC).

11.52.084 ACCESSORY DWELLING UNITS--CRITERIA.

Accessory Dwelling Units authorized herein shall meet the following minimum criteria:

- (a) Existing residence. The single family dwelling in which the accessory dwelling unit is to be located must meet Benton-Franklin District Health Department requirements for the additional unit.
- (b) The accessory dwelling unit must be located within or attached to the single family dwelling unit with a common wall. In no case shall an accessory dwelling be permitted in a detached structure such as a guest house or garage.
- (c) The appearance and character of the single family residence shall be maintained when viewed from the surrounding neighborhood. Whenever possible, any new entrance shall be placed at the side or rear of the building.
- (d) Only one accessory dwelling unit shall be approved for each primary single family dwelling. If the parcel has an approved Temporary Dwelling Permit as allowed in BCC 11.52.091, no accessory dwelling unit shall be allowed.
- (e) The occupant of the accessory dwelling unit must be related to the occupant or be providing or receiving continuous care and assistance necessitated by advanced age, illness, or other infirmity.
- (f) Rent or other remuneration will not be required as a condition for occupancy of the accessory dwelling unit.
- (g) The accessory dwelling unit shall not exceed a maximum of 800 square feet.

TCC Chapters 20.15 and 20.21A, which pertain to residential development amid the Grand Mound Urban Growth Area, currently permit ADUs and contain the following language:

Accessory uses. 

Accessory dwelling unit, in accordance with the provisions of Chapter 20.34.

In Title 20 chapters that currently allow FMUs (20.08A and 20.08D; 20.09; 20.09A-D; 20.10A; 20.11A; and, 20.23), the FMU language could be replaced with the ADU language above. An example of how such chapters could be amended is below:

20.09.010 Purpose.

The intent of this district is to assist in maintaining the commercial timber industry and to protect the public health in areas with severe soil limitation for septic system, severely limited water supply, aquifer recharge and floodplains, and the Nisqually subarea.

(Ord. 11398 § 3 (part), 1997; Ord. 11025 § 5, 1995; Ord. 6708 § 3 (part), 1980)

20.09.020 Primary uses.

Subject to the provisions of this title, the following uses are permitted in this district;

1. Agriculture, including forest practices;
2. Single-family and two-family residential (within urban growth management areas, limited to four residential dwelling units per lot; otherwise, limited to one primary residential structure per lot);

(Ord. 11804 § 47, 1998; Ord. 11398 § 3 (part), 1997; Ord. 11025 § 4, 1995; Ord. 10398 § 6, 1993; Ord. 8216 § 14, 1985; Ord. 6708 § 3 (part), 1980)

(Ord. No. 14773, § 7(Att. F), 7-24-2012)

20.09.025 Special uses.

See [Chapter 20.54](#) for special uses permitted in this district.

(Ord. 11398 § 3 (part), 1997; Ord. 8216 § 15, 1985)

20.09.030 Family member unit.

~~1. In addition to the maximum number of dwelling units permitted on a lot, one temporary mobile/manufactured home or modular home may be located upon a lot for the purposes of housing a person or persons who are family members to a person residing in a structure existing on the lot when application for family unit approval is requested. A person is a family member when related by blood, marriage or adoption.~~

~~2. Persons wishing to establish a family member unit shall furnish proof of family member status and shall receive written approval to establish such unit from the department before locating or constructing the unit.~~

~~3. Dwelling units which are located or constructed pursuant to this section shall be removed when the family member no longer occupies the family member unit.~~

~~4. Dwelling units which are pursuant to this section shall be removed prior to sale of the property, unless the purchaser provides a letter to the county stating the family member unit will be occupied by a family member.~~

~~5. A family member unit must have an approved sewage disposal system, adequate water source, and all other applicable permits.~~

~~(Ord. 11804 § 48, 1998; Ord. 11398 § 3 (part), 1997; Ord. 10595 § 12, 1994; Ord. 6708 § 3 (part), 1980)
(Ord. No. 14773, § 10(Att. I), 7-24-2012)~~

20.09.030 Accessory uses.

Accessory dwelling unit, in accordance with the provisions of Chapter 20.34.

20.09.040 Design standards.

The following standards are established as the minimum necessary to insure that the purpose of this rural residential, one unit per five acre district is achieved and maintained as new lots are created and new buildings are constructed:

1. Minimum Lot Size:
 - a. Conventional subdivision lot (net)—four acres for single-family, eight acres for duplexes;
 - b. Nonresidential use—five acres;
2. Maximum Building Height—thirty-five feet;
3. Minimum Yard Requirements:
 - a. Single-family and two-family residential:
 - i. Front yard—twenty feet from right-of-way easement or property line and thirty feet from right-of-way easement or property line on arterials, except ten feet from right-of-way of a flanking street;
 - ii. Side yard—six feet;
 - iii. Rear yard—ten feet;
 - b. All other structures: See [Section 20.07.030](#) (required minimum yards);
4. Maximum Coverage by Structures—sixty percent.

~~(Ord. 12761 § 10, 2002; Ord. 11398 § 3 (part), 1997; Ord. 10595 § 14, 1994; Ord. 6708 § 3 (part), 1980)~~

20.09.045 Subdivisions within the Nisqually subarea.

The subdivision of parcels twenty acres and larger which are located within the Nisqually subarea shall meet the following standards:

1. At least seventy-five percent of the parcel shall be open space;
2. The open space portion of the lot shall only be used for agriculture, forestry, or passive recreation with no more than twenty-five percent of this area used for stormwater facilities or sewage system drainfields;

3. Subdivisions created under these standards shall have a twenty percent density bonus but no fractional units may be created;
4. Lots may be as small as one-half acre provided that the sewage disposal and water supply systems are approved by the environmental health department;
5. Lots shall also have a minimum width to length ratio of not less than one unit per four units of length (1 to 4);
6. The minimum setback from the exterior boundary of the site shall be the same as the underlying zone; however, other setback requirements may be waived to provide design flexibility, provided individual buildings shall maintain a ten-foot separation; and
7. The design of the subdivision shall minimize its impacts upon critical areas and resource lands.

(Ord. 11398 § 3 (part), 1997: Ord. 10595 § 15, 1994: Ord. 10199 § 6, 1992)

20.09.050 Density.

1. The base density for this district is a maximum of one unit per five acres, or one unit per one-one hundred twenty-eighth of a section of land; and
2. The maximum number of dwelling units allowed shall be determined by:
 - a. Subtracting from the parcel area: documented high groundwater hazard areas, wetlands twenty-two thousand square feet or more and two thousand five hundred square feet or more if adjacent to a stream or within its one-hundred-year floodplain, marine bluff hazard areas to the top of the bluff and landslide hazard areas; one-hundred-year floodplains; and submerged lands as defined in the Shoreline Master Program for the Thurston Region, as amended;
 - b. Critical area buffers shall not be subtracted from the parcel for purposes of making the density calculation; and
 - c. The zoning density shall be applied to the remainder of the parcel.
 - d. For the purposes of calculating density, the documented area of a wetland shall not be subtracted from the parcel area if a property owner opts to develop a planned residential development as specified in [Chapter 20.30](#) TCC.

(Ord. No. 14773, § 7(Att. F), 7-24-2012)

20.09.070 Additional regulations.

Refer to the following chapters for provisions which may qualify or supplement the regulations presented above:

1. [Chapter 20.32](#), Open Space;
2. [Chapter 20.34](#), Accessory Uses and Structures;
3. [Chapter 20.40](#), Signs and Lighting;
4. [Chapter 20.44](#), Parking and Loading;
5. [Chapter 20.45](#), Landscaping and Screening.

(Ord. 11398 § 3 (part), 1997: Ord. 11025 § 6, 1995: Ord. 8216 § 18, 1985; Ord. 6708 § 3 (part), 1980)

Suggested edits to Chapter 20.34 of the Thurston County Code are below:

20.34.010 Authorization.

Accessory uses are permitted in any zoning district, ~~accept~~ **except** as prohibited or limited in this chapter.

20.34.020 Limitations on accessory uses.

1. Location of accessory uses. Accessory uses shall be on the same lot of record as the principal use or building, unless a provision of this title allows otherwise.
2. Antenna structures and satellite dishes shall not be located within twenty feet of any property line. This requirement does not apply to satellite dishes eighteen inches or less in diameter.
3. Buildings shall not be located in required front or side yards.
4. Corner lot structures and planting shall comply with Section 20.07.070 (Use limitations on corner lots).
5. Barbed wire fences are prohibited in the RL 2/1, R 3-6/1, and R 4-16/1 districts, except as accessory uses to agricultural operations of one acre or more. On industrial and commercial uses, the strands shall be restricted to the uppermost portion of the fence and shall not extend lower than a height of six feet from the nearest ground level.
6. **Accessory dwelling units may be permitted in the following zoning districts:**

Chapter 20.08A Long-Term Agriculture District (LTA)
Chapter 20.08D Long-Term Forestry District (LTF)
Chapter 20.09 Rural Residential—One Dwelling Unit per Five Acres (RR 1/5)
Chapter 20.09A Rural Residential/Resource—One Dwelling Unit per Five Acres (RRR 1/5)
Chapter 20.09B Rural—One Dwelling Unit per Twenty Acres (R 1/20)
Chapter 20.09C Rural—One Dwelling Unit per Ten Acres (R 1/10)
Chapter 20.09D Urban Reserve—One Dwelling Unit per Five Acres (UR 1/5)
Chapter 20.10A Residential LAMIRD—One Dwelling Unit per Two Acres (RL 1/2)
Chapter 20.11A Residential LAMIRD—One Dwelling Unit per Acre (RL 1/1)
Chapter 20.13A Residential LAMIRD —Two Dwelling Units per Acre (RL 2/1)
Chapter 20.15 Residential—Three To Six Dwelling Units per Acre (R 3—6/1)
Chapter 20.21A Residential—Four To Sixteen Dwelling Units per Acre (R 4—16/1)
Chapter 20.23 McAllister Geologically Sensitive Area District (MGSA)
Chapter 20.24 Rural Commercial Center District (RCC)
Chapter 20.25 Arterial Commercial District (AC)

~~Within the residential three—six units per acre and residential four—sixteen units per acre districts located within the Grand Mound urban growth area~~ accessory dwelling units are permitted as follows:

- a. There shall be no more than one accessory dwelling unit per lot in conjunction with a single-family structure.
- ~~b. An accessory dwelling unit may be attached to, created within, or detached from a new or existing primary single-family dwelling unit.~~
- b. An accessory dwelling unit must be attached to or created within a new or existing primary single-family structure or associated accessory building, and may not be a separate, stand-alone unit.¹**

¹ Lewis County amended its code with this language to clarify that ADUs cannot be detached, standalone units and thus not increase the density of structures on a parcel or property (See Western Washington Growth Management

- c. The accessory dwelling unit will require one parking space, which is in addition to any off-street spaces required for the primary single-family dwelling unit.
- d. The primary entrance to an accessory dwelling unit shall not be visible from the yard on the same side of the lot on which the primary entrance to the primary single-family dwelling unit is located.
- e. To ensure that the accessory dwelling unit is clearly secondary to the primary dwelling unit, the floor area for the accessory dwelling unit shall in no case exceed eight hundred square feet, nor be less than three hundred square feet, and the accessory dwelling unit shall contain no more than two bedrooms.
- f. No more than one family, as defined in Chapter 20.03, shall be allowed to occupy an accessory dwelling unit.
- g. An accessory dwelling unit, together with the primary single-family dwelling unit with which it is associated, shall conform to all other provisions of this chapter.
- h. All accessory dwelling units shall conform to the Uniform Building Code and all other applicable codes and ordinances.
- i. Prior to final approval of any structure for an accessory dwelling unit, the property owner shall file a covenant to run with the land that stipulates the accessory dwelling unit shall not be cause for subdivision unless such subdivision is in compliance with all subdivision, zoning and other development regulations in effect at the date of application for subdivision approval.²
- j. The restriction referenced above shall be recorded on the face of the plat of any lot created by the density bonus granted herein, including the date of the implementation and termination of the restriction.
- k. Property may be transferred to other qualifying family members without invoking the covenant.
- l. Any property transferred in violation of the covenant shall be liable for an assessment of a fee equal to 10 percent of the sale price or assessed value of the property, whichever is higher. The fee shall be assessed to the seller of the property.

Hearings Board, Yanich v. Lewis County, Case No. 02-2-007c. ... In a separate case, No. 03-2-0003c, the Board held that detached ADUs must be counted as dwelling units for the purpose of determining residential density.)

² This implementation and enforcement language below was adapted from the Lewis County Code (17.102)

Option 2: Amend Title 20 of the Thurston County Code by limiting the size and type of FMU allowed. This could be achieved by removing the reference to a modular home as an allowable FMU type. A modular home is not a mobile/manufactured home; it is simply a home that is built in pieces off site and then assembled on site. According to HUD:

“Manufactured (also known as mobile) homes are constructed according to a code administered by the U.S. Department of Housing and Urban Development (HUD Code). The HUD Code, unlike conventional building codes, requires manufactured homes to be constructed on a permanent chassis. Modular homes are constructed to the same state, local or regional building codes as site-built homes. Other types of systems-built homes include panelized wall systems, log homes, structural insulated panels, and insulating concrete forms.”

Family Member Units are permitted in the following sections of Title 20: 20.08A and 20.08D; 20.09; 20.09A-D; 20.10A; 20.11A; and, 20.23.

The suggested edits to 20.09 (below) could be made to all applicable sections of Title 20 so as to ensure consistency.

20.09.010 Purpose.

The intent of this district is to assist in maintaining the commercial timber industry and to protect the public health in areas with severe soil limitation for septic system, severely limited water supply, aquifer recharge and floodplains, and the Nisqually subarea.

(Ord. 11398 § 3 (part), 1997: Ord. 11025 § 5, 1995: Ord. 6708 § 3 (part), 1980)

20.09.020 Primary uses.

Subject to the provisions of this title, the following uses are permitted in this district;

1. Agriculture, including forest practices;
2. Single-family and two-family residential (within urban growth management areas, limited to four residential dwelling units per lot; otherwise, limited to one primary residential structure per lot);

(Ord. 11804 § 47, 1998: Ord. 11398 § 3 (part), 1997: Ord. 11025 § 4, 1995: Ord. 10398 § 6, 1993: Ord. 8216 § 14, 1985; Ord. 6708 § 3 (part), 1980)

(Ord. No. 14773, § 7(Att. F), 7-24-2012)

20.09.025 Special uses.

See [Chapter 20.54](#) for special uses permitted in this district.

(Ord. 11398 § 3 (part), 1997: Ord. 8216 § 15, 1985)

20.09.030 Family member unit.

1. In addition to the maximum number of dwelling units permitted on a lot, one temporary mobile/manufactured home ~~or modular home~~ may be located upon a lot for the purposes of housing a person or persons who are family members to a person residing in a structure existing on the lot when

application for family unit approval is requested. A person is a family member when related by blood, marriage or adoption.

2. Persons wishing to establish a family member unit shall furnish proof of family member status and shall receive written approval to establish such unit from the department before locating or constructing the unit.

3. Dwelling units which are located or constructed pursuant to this section shall be removed when the family member no longer occupies the family member unit.

4. Dwelling units which are pursuant to this section shall be removed prior to sale of the property, unless the purchaser provides a letter to the county stating the family member unit will be occupied by a family member.

5. A family member unit must have an approved sewage disposal system, adequate water source, and all other applicable permits.

6. To ensure that the family member unit is clearly secondary to the property's primary dwelling unit, the habitable floor area of the family member unit shall in no case exceed 800 square feet, nor be less than 300 square feet. Further, the family member unit shall contain no more than two bedrooms.

(Ord. 11804 § 48, 1998; Ord. 11398 § 3 (part), 1997; Ord. 10595 § 12, 1994; Ord. 6708 § 3 (part), 1980)

(Ord. No. 14773, § 10(Att. I), 7-24-2012)

20.09.040 Design standards.

The following standards are established as the minimum necessary to ~~insure~~ensure that the purpose of this rural residential, one unit per five acre district is achieved and maintained as new lots are created and new buildings are constructed:

1. Minimum Lot Size:

- a. Conventional subdivision lot (net)—four acres for single-family, eight acres for duplexes;
- b. Nonresidential use—five acres;

2. Maximum Building Height—thirty-five feet;

3. Minimum Yard Requirements:

a.

Single-family and two-family residential:

- i. Front yard—twenty feet from right-of-way easement or property line and thirty feet from right-of-way easement or property line on arterials, except ten feet from right-of-way of a flanking street;
- ii. Side yard—six feet;
- iii. Rear yard—ten feet;

b. All other structures: See [Section 20.07.030](#) (required minimum yards);

4. Maximum Coverage by Structures—sixty percent.

(Ord. 12761 § 10, 2002; Ord. 11398 § 3 (part), 1997; Ord. 10595 § 14, 1994; Ord. 6708 § 3 (part), 1980)

20.09.045 Subdivisions within the Nisqually subarea.

The subdivision of parcels twenty acres and larger which are located within the Nisqually subarea shall meet the following standards:

1. At least seventy-five percent of the parcel shall be open space;
2. The open space portion of the lot shall only be used for agriculture, forestry, or passive recreation with no more than twenty-five percent of this area used for stormwater facilities or sewage system drainfields;
3. Subdivisions created under these standards shall have a twenty percent density bonus but no fractional units may be created;
4. Lots may be as small as one-half acre provided that the sewage disposal and water supply systems are approved by the environmental health department;
5. Lots shall also have a minimum width to length ratio of not less than one unit per four units of length (1 to 4);
6. The minimum setback from the exterior boundary of the site shall be the same as the underlying zone; however, other setback requirements may be waived to provide design flexibility, provided individual buildings shall maintain a ten-foot separation; and
7. The design of the subdivision shall minimize its impacts upon critical areas and resource lands.

(Ord. 11398 § 3 (part), 1997: Ord. 10595 § 15, 1994: Ord. 10199 § 6, 1992)

20.09.050 Density.

1. The base density for this district is a maximum of one unit per five acres, or one unit per one-one hundred twenty-eighth of a section of land; and
2. The maximum number of dwelling units allowed shall be determined by:
 - a. Subtracting from the parcel area: documented high groundwater hazard areas, wetlands twenty-two thousand square feet or more and two thousand five hundred square feet or more if adjacent to a stream or within its one-hundred-year floodplain, marine bluff hazard areas to the top of the bluff and landslide hazard areas; one-hundred-year floodplains; and submerged lands as defined in the Shoreline Master Program for the Thurston Region, as amended;
 - b. Critical area buffers shall not be subtracted from the parcel for purposes of making the density calculation; and
 - c. The zoning density shall be applied to the remainder of the parcel.
 - d. For the purposes of calculating density, the documented area of a wetland shall not be subtracted from the parcel area if a property owner opts to develop a planned residential development as specified in [Chapter 20.30](#) TCC.

(Ord. No. 14773, § 7(Att. F), 7-24-2012)

20.09.070 Additional regulations.

Refer to the following chapters for provisions which may qualify or supplement the regulations presented above:

1. [Chapter 20.32](#), Open Space;

2. [Chapter 20.34](#), Accessory Uses and Structures;
3. [Chapter 20.40](#), Signs and Lighting;
4. [Chapter 20.44](#), Parking and Loading;
5. [Chapter 20.45](#), Landscaping and Screening.

Carol Tobin, a planning analyst with MRSC, said it shouldn't be problematic for Thurston County to remove the explicit reference to "modular home." Such an approach would be consistent with several other counties' codes, which omit references to modular homes. Instead, the codes allow structures generally referred to as "temporary dwellings." Examples below:

Clark County Code 40.260.210 Temporary Dwellings (*allows standalone temporary dwelling units, so long as they're small enough to be deemed "accessory"*)

B1c. The temporary dwelling shall be a temporary structure such as a mobile home designed, constructed and maintained in a manner which will facilitate its removal at such time as the justifying hardship or need no longer exists; provided, that the additional dwelling authorized by Section [40.260.210](#)(A)(4)(b) need not be a temporary structure if the declaration required by Section [40.260.210](#)(C)(1)(e) includes a covenant obligating the purchaser or successors to remove the existing dwelling upon the death or permanent change in residency of the seller retaining a life estate.

Grays Harbor County Code 17.24.030(F) (*allows standalone temporary dwelling units, so long as they're small enough to be deemed "accessory"*)

On any legal parcel which is less than ten acres, a second temporary dwelling unit may be authorized provided that the following conditions are met:

- (1) The accessory unit is for use by a member of the family of the occupants of the principal residence on the property. For the purposes of this section, "member of the family" means related by blood, marriage or law;
- (2) No division of the property is authorized;
- (3) The unit shall be removed or converted to a conforming use when the use authorized by the permit is discontinued;
- (4) The parcel shall comply with the minimum lot requirements of the health department for each unit;
- (5) The board of adjustment shall establish either a final expiration date or annual renewal by the administrator upon showing by the applicant that the approved use is continuing;

###

Appendix C.

Transfer of Development Rights and Purchase of Development Rights Programs

Issue:

Thurston County’s Transfer of Development Rights and Purchase of Development Rights programs are programmatic tools that may be used to protect environmentally sensitive, open space, forest, and farm lands. The two programs, however, are open only to owners of specific agricultural lands. Modifications to these programs’ *sending areas* will increase their usefulness to protect forest and farm lands and preserve open space in rural watersheds.

Recommendation:

1. Amend existing Transfer of Development Rights and Purchase of Development programs in Thurston County so a greater range of environmentally sensitive, open space, forest, and farm lands are eligible as sending areas.
2. Prioritize potential sending areas.
3. Consider new sending areas.

Background:

Transfer of Development Rights

Thurston County established a Transfer of Development Rights (TDR) program in 1995 so as to preserve farmland while allowing owners to realize the economic value of their property’s development potential. The program allows owners of property in a designated ***sending area*** to gain credit for unused development rights that can be sold and transferred to another property in designated ***receiving area***.

Sending Area

The current area for the TDR program is composed of parcels within the Long-Term Agriculture (LTA) Zoning District. Thurston County credits one transferable development right per five acres in the LTA zoning district — subtracting one development right for each residence or commercial structure on the parcel, unless the structure qualifies as farm housing or a Family Member Unit (FMU). Zoning density for the LTA zoning district is one unit per 40 acres (unless, of course, the residential units are farm housing or FMUs.)

Receiving Area

The cities of Olympia, Lacey, Tumwater, and Thurston County have identified areas within their zoning codes where TDRs may be used to achieve specific urban densities. These receiving areas exist both within city boundaries and unincorporated urban growth areas (UGAs).

Location	Receiving Area Zoning	What may a TDR be used for?	Code Reference
Grand Mound UGA	Residential 3-6	One additional unit of density above 5 dwelling units/acre	TCC 20.15
	Residential 4-16	One additional unit of density above 15 dwelling units/acre	TCC 20.21A
Olympia City & UGA	Residential 4-8	One additional unit of density above 7 dwelling units/acre; OR one less unit of density below 5 dwelling units/acre	OMC 18.04.080 TCC 23.04.080
Lacey City & UGA	Mixed Use Moderate Density Corridor (MMDC)	Density bonus above 12 residential units/acre (standard density is 8-12 du/acre)	LMC 16.22 TCC 21.22
	Mixed Use High Density Corridor (MHDC)	Density bonus above 20 residential units/acre (standard density is 12-20 du/acre)	LMC 16.22 TCC 21.23
	Moderate Density Residential Zone (MD)	Density bonus above 12 dwelling units/acre (standard density is 6-12 du/acre)	LMC 16.15 TCC 21.15
	High Density Residential Zone (HD)	Density bonus above 20 dwelling units/acre (standard density is 6-20 du/acre)	LMC 16.18 TCC 21.18
Tumwater City & UGA	Single Family Low Density 4-7	One additional unit of density above 6 dwelling units/acre	TMC 18.10.050 TCC 22.10.050
	Single Family Medium Density 6-9	One additional unit of density above 8 dwelling units/acre	TMC 18.12.050 TCC 22.12.050
	Multifamily Medium Density 9-15	One additional unit of density above 14 dwelling units/acre	TMC 18.14.050 TCC 22.14.050
	Multifamily High Density 14-29	Up to 4 additional units of density above 25 dwelling units/acre	TMC 18.16.050 TCC 22.14.050

Purchase of Development Rights Program

Thurston County established a Purchase of Development Rights (PDR) program to buy and retire development rights amid the Nisqually Agriculture District. Through this program in the 1990s, private land owners sold 168 development rights for \$2,241,122. In 2011, Thurston County amended the program to align it better with land-preservation funding sources, as well as to authorize Thurston County and qualified conservation organizations to purchase development rights to preserve farmland throughout the county. The program works in the following ways:

- The County or qualified conservation organizations will compensate agricultural land owners for agreeing to conserve their land.
- Generally, the property owner would retain ownership of the land and continue to reside on and farm the property.
- County Conservation Futures funds may be used as matching funds in partnership with non-profit land trusts so as to maximize and leverage public funds.

In essence, instead of transferring the development right to a receiving area (such as in a TDR program), the PDR program retires the development right after purchasing it through grant or conservation futures funds.

Sending Area:

The sending area for the PDR program is open to all lands that meet the definition of agricultural lands, as defined in the Open Space Tax Program — RCW 84.34.020.

Options for Modifying Receiving Areas for TDR Program:

Current Program

In the zoning districts where the TDR program is currently applied, only two transfers have occurred.

One was a Habitat for Humanity project off of Henderson Boulevard, just south of Yelm Highway. The TDR program enabled the project to provide one additional dwelling unit and exceed the 6 du/acre maximum for a project in the SFL 4-7 zone district.

In 2014, two development rights were transferred from farmland in the rural County to allow for additional density at the Woodard Lane Cohousing development in west Olympia, a 2.34 acre parcel zoned Residential 4-8.

Infill and Redevelopment

The TDR program has been successful in larger cities where there is a strong infill and redevelopment market, and the development community is willing to “pay extra” for increased density. This is unlikely to be the case in Thurston County’s urban areas. Recent market studies have shown that at current land values and rents, higher-density developments in our city centers and corridors are on the edge of financial feasibility. Cities are implementing such tools as multifamily tax exemptions, lowering parking standards, or funding infrastructure to tip the balance. This means that adding additional financial burdens to achieving higher densities, such as buying development rights from a TDR bank, will likely result in financially infeasible projects.

Options for Receiving Areas for TDR Program

Option A - Keep the receiving areas as they are today

Option B - Increase receiving eligibility to add Accessory Dwelling Units (ADUs) in the rural County

Option C - Increase receiving eligibility to add density bonuses for cluster development in the rural County

Option D - Increase receiving eligibility to allow for impervious surfaces transfer

Option A – Keep the receiving areas as they are today

There have been two development rights purchased for transfer to urban projects. This lack of participation in the program could be due to the lack of market in receiving areas, or lack of outreach about the program. The existing receiving areas of the program could be a barrier to successful program implementation.

Option B - Increase receiving eligibility to add Accessory Dwelling Units (ADUs) in the rural county

Thurston County currently allows for Family Member Units in the rural county. Essentially, one additional residential unit may be built on a rural lot for the purpose of housing people related to those residing in the structure existing on the lot when the additional unit is requested. Between 2000 and 2011, about 190 Family Member Units were built in rural Thurston County (TRPC data program).

Family Member Units are meant to be temporary. They are often permanently placed modular homes, however, making removal difficult when the family member moves out. One option is to eliminate FMUs and allow for Accessory Dwelling Units (ADUs) in the rural county instead. ADUs are attached to the main structure and are typically restricted in size. While permanent, an ADU has less of an environmental footprint than an additional detached dwelling unit.

If the County were to proceed with that change, it could require that a development right be purchased as a requirement of building an Accessory Dwelling Unit in the rural county. ADUs are not considered to add density (per the Western Washington Growth Management Hearings Board); therefore, transferring development rights from one traditional housing unit to an ADU would result in a decrease in rural density.

Option C - Increase receiving eligibility to add density bonuses for cluster development in the rural county

Cluster developments are allowed in several zoning districts in the rural county as Planned Residential Developments (PRDs) and Planned Rural Residential Developments (PRRDs). There are currently only two types of density bonuses allowed:

- Nisqually Sub-Area – 20 percent density bonus

- RR1/5 and RRR1/5 – density is calculated on total acreage for cluster developments, rather than total acreage minus critical areas (not including critical area buffers). This allows for a density bonus on property with critical areas.

This option would allow for a third type of density bonus for cluster developments through the use of the PDR program.

Option D - Increase receiving eligibility to allow for impervious surfaces transfer

This option allows for increases in impervious surfaces in rural zoning districts (where limits have been set) through the use of a development right transfer. It would require a conversion of one development right to a set square footage of impervious area.

Options for Sending Areas for Both Programs:

Option A - Keep the sending areas of the programs as they are today

Option B - Expand the eligible sending areas for both programs to a broader range of criteria

Option C - Expand the eligibility of the sending areas of the TDR program to the entire Rural County

Option A - Keep the sending areas of the programs as they are today

There is one land owner who has gone through the program to certify her development rights with Thurston County for the TDR program. This lack of participation in the program could be due to the limited area of eligible sending areas, lack of market in receiving areas, or lack of outreach about the program itself to eligible land owners. Keeping only the existing sending areas of the programs (especially the TDR) could be a barrier to successful program implementation.

Option B - Expand the eligible sending areas for both programs to a broader range of criteria

For the goal of watershed protection, expand the criteria to include:

- Land defined as “Open Space land” pursuant to RCW 84.34.020 and is used for agricultural or forestry operations;
- Lands defined as “Farm and agricultural land” pursuant to RCW 84.34.020;
- Lands defined as “Timber land” pursuant to RCW 84.34.020.
- Areas rezoned to 1/10 or 1/20 or lower densities as part of basin planning efforts (development credits could be calculated at 1/5 units per acre as per the Nisqually Agriculture zoning district.
- Other areas identified as priority preservation areas identified in basin planning efforts.

Additional Criteria

Thurston County may consider adding other environmentally sensitive lands to the PDR/TDR sending area criteria. For instance, Pierce County includes a variety of other lands, such as:

- A site containing habitat for a federally listed endangered or threatened species;
- A site identified in the Pierce County Comprehensive Plan, including community plans or the Pierce County Park, Recreation, and Open Space Plan, as a regional trail or associated public purpose.

A prioritization of lands eligible for the program will likely have to occur, as changing the criteria will open up a large amount of area for program eligibility. In the prioritization process, the goals of watershed protection would need to be balanced with habitat preservation and other goals.

Why include lands from the Open Space Tax Program in the TDR/PDR Program if they are already eligible for tax breaks?

The Open Space Tax Program works to protect forest and farm lands by allowing those lands to be taxed at their current use rather than their “highest and best use,” as would be required otherwise under state law. The program provides a voluntary incentive for property owners to “. . . *maintain, preserve, conserve, and otherwise continue in existence adequate open space lands for the production of food, fiber, and forest crops, and to assure the use and enjoyment of natural resources and scenic beauty for the economic and social well-being of the state and its citizens.*” Market value for land used for timber, agriculture, or open space is often lower than the “higher” use of residences or businesses.

The Open Space Tax Program does not provide permanent protection from open space lands converting to other uses. Land can be withdrawn from the program at any time. However, the property owner must pay back taxes — and in some cases, penalties — unless he or she had the land in the program for eight years and gives two years notice of intent to withdraw from the program.

In 2000, there were about 177,400 acres of land enrolled in the various open space tax programs. By 2015, 8.5 percent — or more than 15,100 acres — was taken out of the program; 11,800 acres of land was added to the program, resulting in a net loss of 1.9 percent. Not all of the land removed from the program was converted to residential or commercial uses.

Type of Open Space Tax Program	2000	2000-2015					
	Acres	Acres removed	% removed	Acres added	% added	Net Rem./Added	Net % Rem./Added
Current Use Open Space	3,922	-179	-4.6%	1,891	48.2%	1,712	43.6%
Current Use Agriculture	38,274	-6,144	-16.1%	2,686	7.0%	-3,458	-9.0%
Current Use Timber or Designated Forest	135,207	-8,816	-6.5%	7,217	5.3%	-1,600	-1.2%
Overall	177,403	-15,139	-8.5%	11,794	6.6%	-3,346	-1.9%

Source: Thurston County Assessor’s database; Thurston Regional Planning Council analysis.

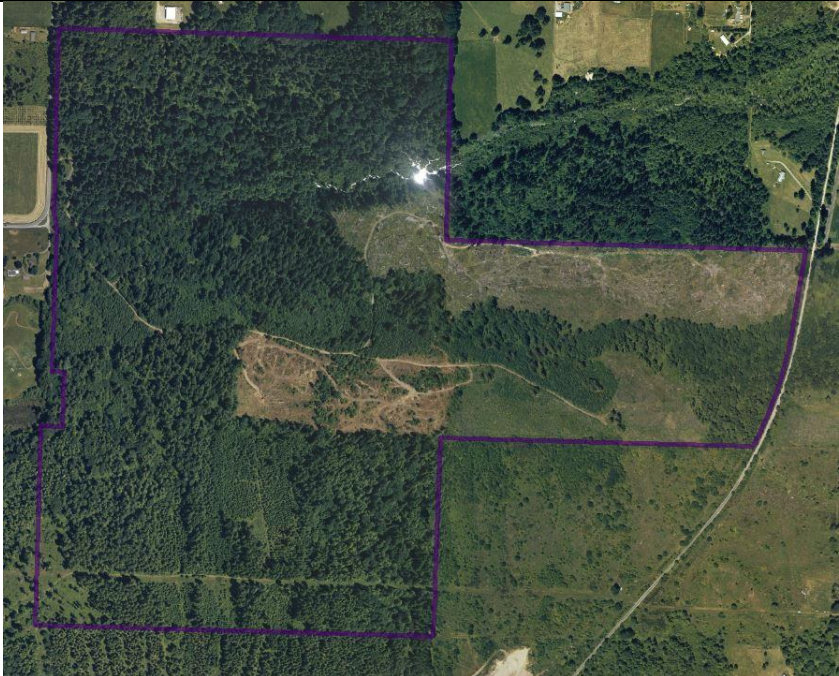
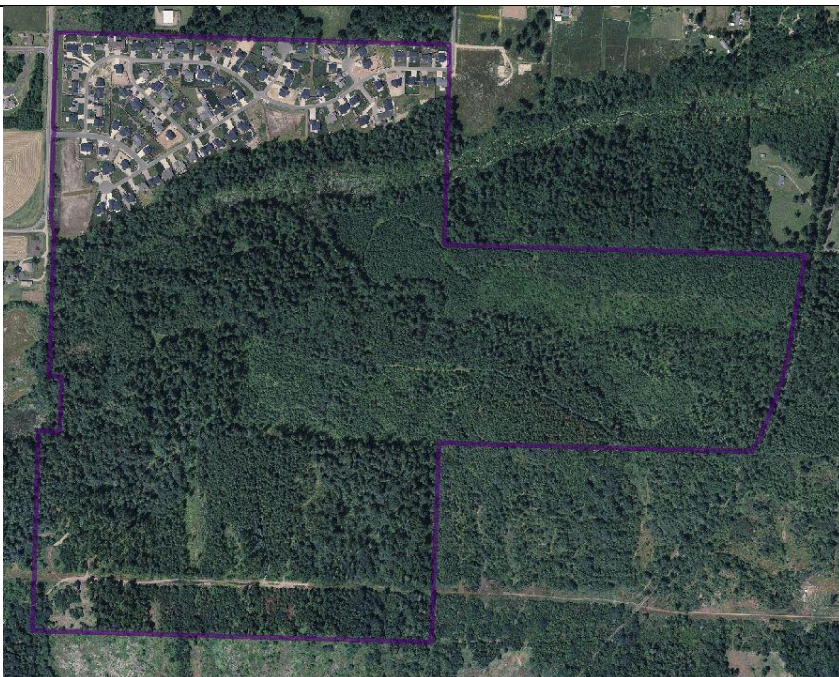
While the Open Space Tax Program does provide an incentive to keep lands in agriculture or forestry uses, it does not provide permanent protection in the way a Transfer of Development Rights or Purchase of Development Rights program would.

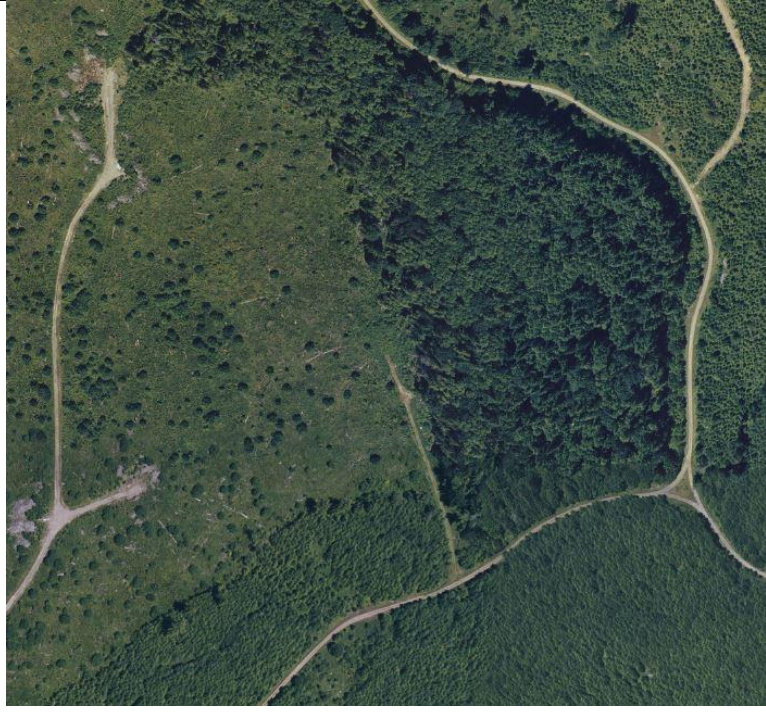

Examples of properties removed from the Open Space Tax Program

2000 Aerial Photos	 An aerial photograph from 2000 showing a large, rectangular, light-brown agricultural field in the upper left. To its right is a dense, dark green forest. Further right, a road and a small cluster of buildings are visible. The bottom right corner shows a lighter, grassy area.
2012 Aerial Photos	 An aerial photograph from 2012 of the same area. The large agricultural field from 2000 is now mostly covered by a dense forest. The buildings and road are still present, but the surrounding landscape has changed significantly, with more forest and less open land.
<p>Location: McLane Basin</p> <p>Change: The 22-acre farm at the top and left was enrolled in the open space agriculture program in 2000 but not enrolled by 2015. It did not convert to residential uses. The zoning is RRR 1/5.</p>	

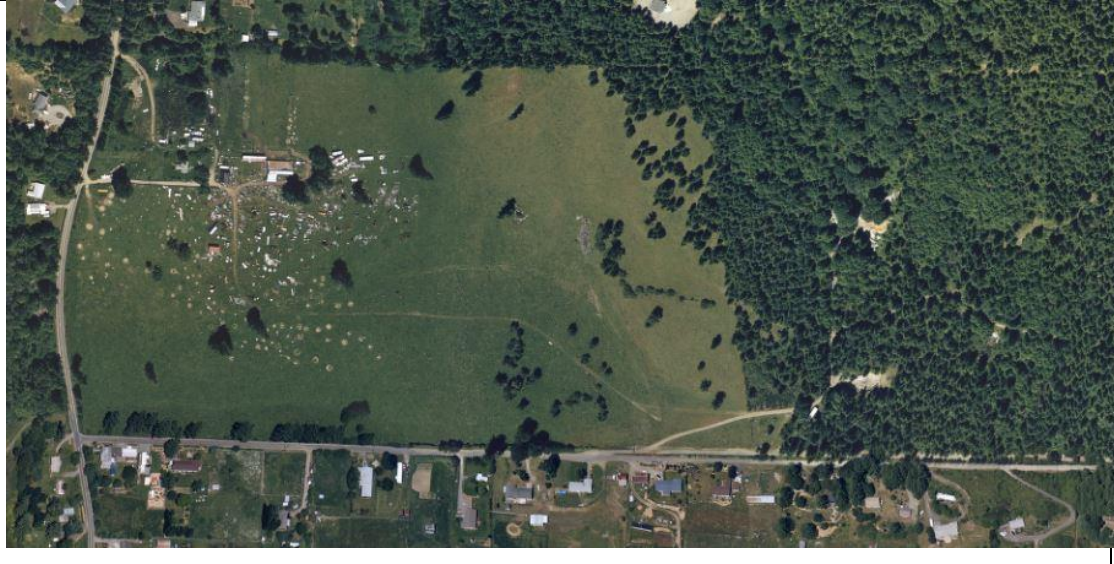

2000 Aerial Photos	2012 Aerial Photos
 An aerial photograph from 2000 showing a rural landscape. A large, dark, irregularly shaped pond is in the upper left. To its right is a cluster of farm buildings, including a large white barn and several smaller houses. The surrounding area is mostly green fields with some dirt roads and patches of trees.	 An aerial photograph from 2012 of the same area. The pond remains in the upper left. The farm buildings are still present but the land around them has been subdivided into smaller, more rectangular lots. There is more developed land, including what appears to be a parking lot or paved area near the buildings, and more trees planted in rows, suggesting landscaping or reforestation efforts.
<p>Location: Woodard Basin</p> <p>Change: The farm (top right) was enrolled in the Open Space Tax Program in 2000. By 2012, about half of the farm had been divided into five-acre lots that were developed subsequently. The zoning is RRR 1/5.</p>	

2000 Aerial Photos	 An aerial photograph from 2000 showing a large, irregularly shaped area outlined in purple. The area is predominantly forested with dense green trees. There are some cleared patches and a few small buildings visible along the edges of the purple boundary.
2012 Aerial Photos	 An aerial photograph from 2012 showing the same area outlined in purple. The forest cover has been significantly reduced, particularly in the central and lower-left portions, where a large residential subdivision with many houses and roads has been developed. The purple boundary still encompasses the original area.
<p>Location: Spurgeon Creek Basin</p> <p>Change: The property outlined in purple was enrolled in the Open Space Tax Program in 2000. In 2006, the property was platted into the Fox Hill cluster subdivision. The resource parcels of the cluster subdivision left a large tract of forest cover that remained in the Open Space Tax Program. The zoning is MGSA.</p>	

<p>2000 Aerial Photos</p>	 An aerial photograph from 2000 showing a large, irregularly shaped parcel of land outlined in purple. The parcel is predominantly covered in dense, dark green forest. To the left of the parcel, there is a baseball field and some residential areas. To the right, there are more open fields and some buildings. The parcel is situated in a valley with a creek or stream visible on the right side.
<p>2012 Aerial Photos</p>	 An aerial photograph from 2012 showing the same parcel outlined in purple. The forest cover remains dense, but there is a significant change in the surrounding landscape. A large residential subdivision with many houses and roads is now visible to the left of the parcel. The parcel itself appears to be more isolated from the surrounding development.
<p>Location: Spurgeon Creek Basin</p> <p>Change: The property outlined in purple was enrolled in the Open Space Tax Program as Forest in 2000. In 2007, the property was platted into the Riverwood cluster subdivision. The resource parcel of the cluster subdivision left a large tract of forest cover that remained in the Open Space Tax Program. The zoning is RRR1/5.</p>	

2000 Aerial Photos	 An aerial photograph showing a dense forest of green trees. A light-colored dirt road or path winds through the forest, starting from the bottom left and curving towards the top right. The terrain appears slightly hilly.	
2012 Aerial Photos	 An aerial photograph of the same area as the 2000 photo, but now heavily developed. The forest has been cleared in several places, and a network of paved roads is visible. Numerous houses with light-colored roofs and some swimming pools are scattered throughout the cleared areas. The remaining forest is in smaller, irregular patches.	
<p>Location: Deschutes Mainstem (middle basin)</p> <p>Change: The property in the middle of the photos was enrolled in the Open Space Tax Program as Forest in 2000. By 2012, the property had been removed and split into five-acre residential lots, most of which have been developed. The zoning is RRR1/5.</p>		

2000 Aerial Photos		
2012 Aerial Photos		
<p>Location: Deschutes Mainstem (middle basin)</p> <p>Change: The property in the middle of the photos was enrolled in the Open Space Tax Program as Forest in 2000. By 2012, the property had been removed and split into five-acre residential lots, most of which have been developed. The zoning is RRR1/5.</p>		

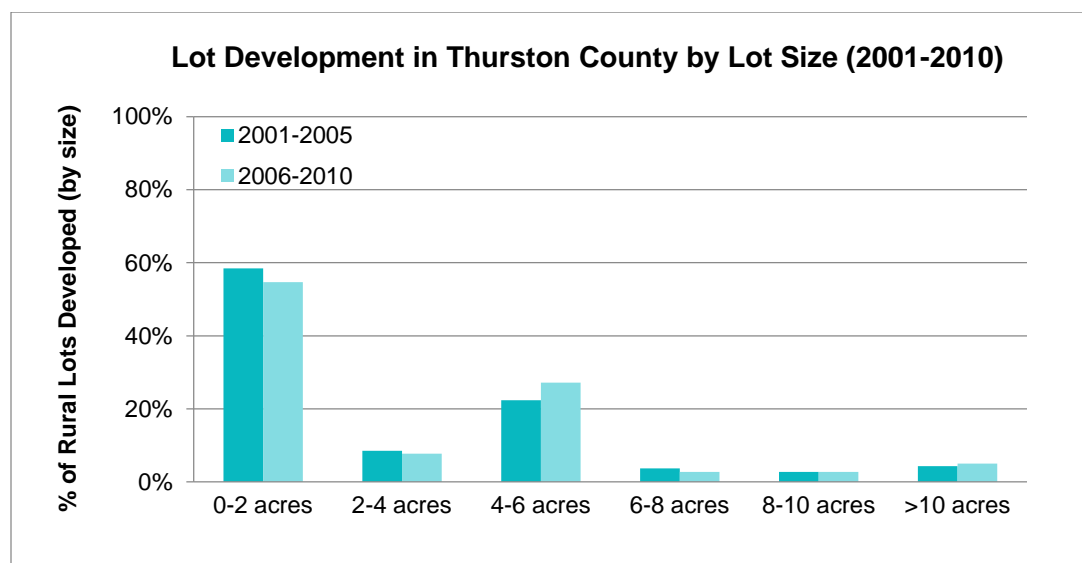
2000 Aerial Photos	
2012 Aerial Photos	
<p>Location: Spurgeon Basin</p> <p>Change: The property in the middle of the photos was enrolled in the Open Space Tax Program as Agriculture in 2000. By 2012, the property had been removed and split into five-acre residential lots, most of which have been developed. The zoning is MGSA.</p>	

Option C - Expand the eligibility of the sending areas of the TDR program to the entire Rural County

This option suggests expanding the sending area eligibility of the TDR program to all areas in the rural county. This would help with the issue of the large inventory of undeveloped lots in the County that are much smaller than would currently be allowed under current zoning. These lots are still developable under the reasonable use exemption as long as development can meet department of health requirement for sewer and well placement. Over 3,800 lots smaller than 4 acres were developed in rural Thurston County between 2001 and 2010. The average lot size was 1.26 acres. There are a further 2,600 developable lots, a seven year inventory if past development trends hold.

This is not an option for the PDR program, as the funding for the PDR program comes from Thurston County's conservation futures program and as such is targeted towards working farm lands and environmentally sensitive lands.

A prioritization of lands eligible for the program will likely have to occur, as changing the criteria will open up a large amount of area for program eligibility. In the prioritization process, the goals of watershed protection would need to be balanced with habitat preservation and other goals.



SINGLE-FAMILY RESIDENTIAL LOT DEVELOPMENT AND FUTURE SUPPLY IN THURSTON COUNTY BY LOT SIZE

Lot Size	Lots Developed (2001-2010)	Inventory of Vacant Lots ¹	Estimated Supply
0-4 acres	3,865	2,652	7 years
4-8 acres	1,624	1,898	12 years

Note:¹ Inventory of lots for single units.

Source: Thurston Regional Planning Council Buildable Lands Program.

Appendix D.

Impervious Surface Limits

Issue:

Thurston County's zoning code has an inconsistent approach to addressing impervious surfaces. Where limits have been set they are typically located within sensitive zoning districts, such as the R 1/10, R 1/20, sensitive basins such as McAllister Geologically Sensitive Area, and Green Cove Creek Basin, or on soil types with low infiltration rates. In other rural zoning districts there are sometimes building coverage limits and/or impervious surface limits that range as high as 60 percent in rural areas, or no mention of limits at all. Sixty percent is much higher than the actual impervious area on an average developed rural residential lot. Indeed, if all new residential development occurred with such a large amount of impervious area, it would likely lead to degradation of stream health and water quality.

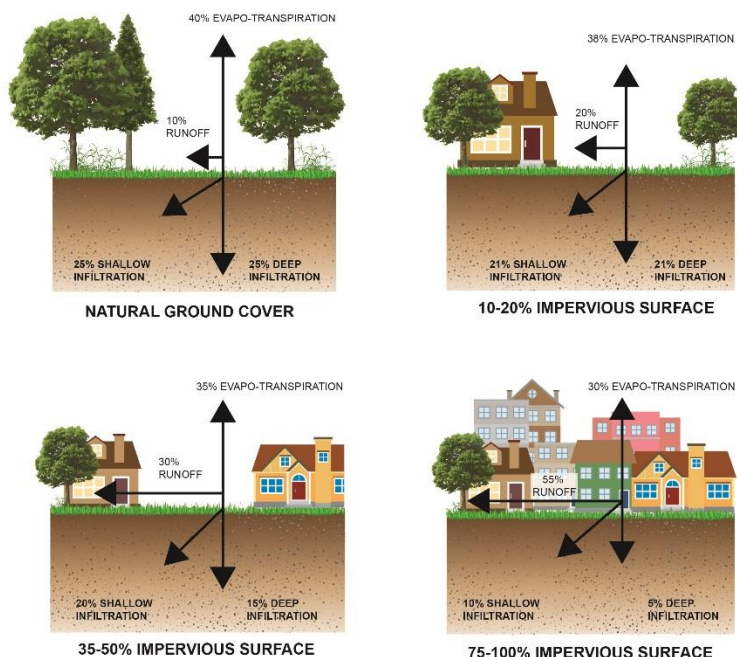
Recommendation:

1. Amend zoning code to place appropriate and consistently worded impervious surface coverage limits in a new chapter of zoning code, and reference the new chapter in each zoning district. The limits should be varied based on factors such as: 1) environmental sensitivity (by basin or soil group); and, 2) zoning density and lot size, including cluster versus traditional development, while allowing for a full range of rural development without adversely impacting water quality.
2. Use the low-impact development code-review process to recommend specific impervious surface thresholds.

Background:

Impervious surfaces, by definition, are materials that prevent the infiltration of water into the soil. The most common impervious surfaces in the built environment are roads, rooftops, sidewalks, and patios. While these structures are almost 100 percent impervious, other features such as gravel roads, compacted soils, and even lawns are impervious to varying degrees, as they allow for less infiltration than forests and other natural ground. As development increases, so does the amount of impervious surface, which leads to changes in the way water is transported and the hydrology of a drainage basin.



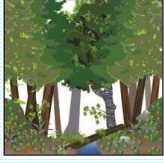
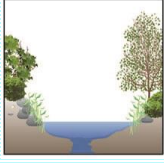
Stormwater runoff resulting from increased impervious surfaces affects both the quality and quantity of water entering natural water bodies in many ways. Stormwater runoff can lead to severe environmental impacts such as flooding, habitat loss, erosion, channel widening, and streambed alteration. Along with increased runoff comes decreased infiltration, which reduces groundwater supplies and may lead to a lowering of the water table. Ground water provides a consistent water supply to streams, wetlands, and lakes, and decreases in ground water supply may cause a stream or wetland to dry out during months when precipitation is low.



WATER CYCLE CHANGES ASSOCIATED WITH URBANIZATION.

As a general rule of thumb, when impervious surfaces exceed 10 percent of a basin (the entire area that drains into a stream) adverse environmental impacts can be measured in the stream — although impacts can occur in rural basins at impervious surface thresholds as low as 2 percent. Stream basins with above 25 percent impervious area generally have degraded water quality.

Basin Conditions

Intact 	<i>Intact basins have little to no impervious surfaces (<2% basin-wide), a nearly complete forest canopy (>80% basin-wide), and vegetated riparian corridors (>90%). Water bodies are in excellent condition, with no water quality violations and a high B-IBI score (>41).</i>	Impacted 	<i>Impacted basins are moderately urbanized (10-25% total impervious area), with some remaining forest cover (45-65%). Riparian corridors are cleared in many places (only 60-75% vegetated) and water quality is fair, with some impairments and lower B-IBI scores (28-35).</i>
Sensitive 	<i>Sensitive basins have minimal impervious area (2-10% basin-wide), considerable forest cover (65-80% basin-wide), and riparian corridors with few breaks in protective buffers (75-90% vegetated). Water bodies are in good condition, meeting most water quality standards, and have a high B-IBI score (36-41).</i>	Degraded 	<i>Degraded basins are urbanized (25-40% total impervious area) with limited remaining forest canopy (30-45%) or vegetated riparian areas (30-60%). Water quality is poor, with multiple impairments and very low B-IBI scores (28-35).</i>

Thurston County Zoning Code and Existing Impervious Limits

Impervious surface and lot coverage limits exist in various chapters of Thurston County's zoning code, as shown in the table below. Where limits have been set, they are typically located within sensitive zoning districts such as the R 1/10, R 1/20, McAllister Geologically Sensitive Area, Green Cove Creek Basin, or on soil types with low infiltration rates. In other rural zoning districts there are sometimes building coverage limits and/or impervious surface limits that range as high as 60 percent in rural areas, or no mention of limits at all. The table below shows the range of impervious surface limits currently in Thurston County's zoning (Chapter 20) code.

Zoning Code	Density	Impervious Surface Limit
Chapter 20.08A Long-Term Agriculture District (LTA)	One unit per 20 acres	None
Chapter 20.08C Nisqually Agricultural District (NA)	One unit per 40 acres	Maximum lot coverage: five percent Cluster: ten percent
Chapter 20.08D Long-Term Forestry District (LTF)	One unit per 80 acres unless lots are smaller than 640 acres then 1 unit per 20 acres	None
Chapter 20.08E Public Parks, Trails, And Preserves District (PP)	N/A	None
Chapter 20.08F Military Reservation District (MR)	N/A	None
Chapter 20.08G Agritourism Overlay District (AOD)	N/A	Same as underlying zoning district New buildings can be up to 20,000 sq ft
Chapter 20.09 Rural Residential—One Dwelling Unit per Five Acres (RR 1/5)	One unit per 5 acres ¹	Maximum Coverage by Structures—sixty percent.
Nisqually Sub-area	Same as above but with 20% density bonus for cluster development	As above
Chapter 20.09A Rural Residential/Resource—One Dwelling Unit per Five Acres (RRR 1/5)	One unit per 5 acres ¹	Maximum Building Coverage for non-special uses: 6,000 sf for parcels 5-10 acres in size; 20,000 sf for parcels over 10 acres Maximum impervious surface coverage for subdivisions, large lot subdivisions, short plats and new construction on lots: 5 acres or more on soils C & D: 10 percent less than 5 acres on soils C & D: 45 percent All other 60 percent Green Cove Creek Drainage Basin Lots up to but not including .23 acres (ten thousand nineteen square feet)—forty five percent Lots .23 acres to one acre—twenty-five percent Lots 1.01 acres or more—six percent

Guiding Growth – Healthy Watersheds: Science to Local Policy

Zoning Code	Density	Impervious Surface Limit
Chapter 20.09B Rural—One Dwelling Unit per Twenty Acres (R 1/20)	One unit per 20 acres	Maximum Building Coverage for non-special uses: 6,000 sf for parcels 5-10 acres in size; 20,000 sf for parcels over 10 acres Maximum impervious surface coverage for subdivisions, large lot subdivisions, short plats and new construction on lots: 5 acres or more predominately on soils C & D: 10 percent less than 5 acres predominately on soils C & D: 45 percent All other 60 percent
Chapter 20.09C Rural—One Dwelling Unit per Ten Acres (R 1/10)	One unit per 10 acres	Same as above
Chapter 20.09D Urban Reserve—One Dwelling Unit per Five Acres (UR 1/5)	One unit per 5 acres	Same as above
Chapter 20.10A Residential LAMIRD—One Dwelling Unit per Two Acres (RL 1/2)	One unit per 2 acres	Maximum impervious surface coverage 60 percent Green Cove Creek Drainage Basin Lots up to ten thousand square feet—forty-five percent Lots ten thousand one square feet to one acre—twenty-five percent Lots 1.01 acres or more—six percent
Chapter 20.11A Residential LAMIRD—One Dwelling Unit per Acre (RL 1/1)	One unit per acre	Same as above
Chapter 20.13A Residential LAMIRD —Two Dwelling Units per Acre (RL 2/1)	Two dwelling units per acre	Maximum coverage by structures—sixty percent
Chapter 20.15 Residential—Three To Six Dwelling Units per Acre (R 3—6/1) ²	Three to six units per acre	Maximum coverage by structures—sixty percent
Chapter 20.21A Residential—Four To Sixteen Dwelling Units per Acre (R 4—16/1) ²	Four to sixteen units per acre	Maximum coverage by structures—sixty percent
Chapter 20.22 Neighborhood Convenience District (NC)	N/A	Maximum coverage by impervious surfaces—eighty-five percent
Chapter 20.23 McAllister Geologically Sensitive Area District (MGSA)	One unit per 5 acres	Maximum Lot Coverage by Impervious Surfaces Five acres or larger: five percent For those uses allowed with a special use permit, the approval authority may grant additional lot coverage by impervious surfaces, of up to a maximum of ten percent Less than 5 acres: 60 percent or 10,000 sf – whichever is less
Chapter 20.24 Rural Commercial Center District (RCC)	Residential density must comply with RL 1/1 zone	Maximum coverage by impervious surfaces: seventy-five percent
Chapter 20.25 Arterial Commercial District (AC) ²	Residential density must comply with RL 4-16/1 zone	Maximum coverage by structures—sixty percent
Chapter 20.26 Highway Commercial District (HC)	N/A	Maximum coverage by structures—sixty percent
Chapter 20.27 Planned Industrial Park District (PI) ²	N/A	The total lot coverage of all structures and buildings shall not exceed sixty percent of such lot.
Chapter 20.28 Light Industrial District (LI) ²	N/A	The total lot coverage of all structures and buildings shall not exceed sixty percent of such lot.
Chapter 20.29 Rural Resource Industrial District (RRI)	N/A	Maximum lot coverage by impervious surfaces: sixty percent

¹ Subtract critical areas (but not critical area buffers) for traditional development. No deductions for cluster development.

² Grand Mound Urban Growth Area

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SUMMARY OF IMPERVIOUS SURFACE THRESHOLDS BY VARIOUS ZONING DISTRICTS

Lot Size		5%	6%	10%	25%	45%	60%	75%	85%	Other
Acres	Sq. Ft.	Sq. Ft.	Sq. Ft.	Sq. Ft.	Sq. Ft.	Sq. Ft.	Sq. Ft.	Sq. Ft.	Sq. Ft.	Sq. Ft.
0.14	6,000	300	360	600	1,500	2,700	3,600	4,500	5,100	
0.23	10,000	500	600	1,000	2,500	4,500	6,000	7,500	8,500	
0.23	10,001	500	600	1,000	2,500	4,500	6,001	7,501	8,501	
0.38	16,667	833	1,000	1,667	4,167	7,500	10,000	12,500	14,167	
0.38	16,668	833	1,000	1,667	4,167	7,501	10,001	12,501	14,168	10,000
1.00	43,560	2,178	2,614	4,356	10,890	19,602	26,136	32,670	37,026	10,000
1.01	43,996	2,200	2,640	4,400	10,999	19,798	26,397	32,997	37,396	10,000
1.50	65,340	3,267	3,920	6,534	16,335	29,403	39,204	49,005	55,539	10,000
2.00	87,120	4,356	5,227	8,712	21,780	39,204	52,272	65,340	74,052	10,000
2.50	108,900	5,445	6,534	10,890	27,225	49,005	65,340	81,675	92,565	10,000
3.00	130,680	6,534	7,841	13,068	32,670	58,806	78,408	98,010	111,078	10,000
3.50	152,460	7,623	9,148	15,246	38,115	68,607	91,476	114,345	129,591	10,000
4.00	174,240	8,712	10,454	17,424	43,560	78,408	104,544	130,680	148,104	10,000
4.50	196,020	9,801	11,761	19,602	49,005	88,209	117,612	147,015	166,617	10,000
4.99	217,364	10,868	13,042	21,736	54,341	97,814	130,419	163,023	184,760	10,000
5.00	217,800	10,890	13,068	21,780	54,450	98,010	130,680	163,350	185,130	
5.50	239,580	11,979	14,375	23,958	59,895	107,811	143,748	179,685	203,643	
6.00	261,360	13,068	15,682	26,136	65,340	117,612	156,816	196,020	222,156	
6.50	283,140	14,157	16,988	28,314	70,785	127,413	169,884	212,355	240,669	
7.00	304,920	15,246	18,295	30,492	76,230	137,214	182,952	228,690	259,182	
7.50	326,700	16,335	19,602	32,670	81,675	147,015	196,020	245,025	277,695	
8.00	348,480	17,424	20,909	34,848	87,120	156,816	209,088	261,360	296,208	
8.50	370,260	18,513	22,216	37,026	92,565	166,617	222,156	277,695	314,721	
9.00	392,040	19,602	23,522	39,204	98,010	176,418	235,224	294,030	333,234	
9.50	413,820	20,691	24,829	41,382	103,455	186,219	248,292	310,365	351,747	
10.00	435,600	21,780	26,136	43,560	108,900	196,020	261,360	326,700	370,260	
Large Parcels		traditional		cluster						

	Green Cove Creek
	MGSA
	RRR1/5; R1/10; R 1/20 & UR 1/5 Soil types C & D
	RRR1/5; R1/10; R 1/20 & UR 1/5 Soil types A & B
	RR1/5*; RL 1/1; RL 2/1*; RL3-6/1*; RL 4-16/1*; AC*; HC*; PI*; LI*; RRI
	RCC
	NC
	NA
None	LTA; LTF; PP; MR

* lot coverage of structures

Actual Impervious Surface Coverage

Thurston Regional Planning Council staff digitized the impervious area for 92 properties that contained a single residential dwelling unit built after 1995 and was considered fully developed based on zoning density. Using this sample data set, the following relationship of rural lot sizes to impervious area were developed:

<u>Lot Size</u>		Typical Zoning Density	Average Percent Impervious	Average Square Feet Impervious	Number of Parcels in sample
Acres	Square Feet				
0.07 to 0.2	3,000-8,700	4 - 16 units per acre	52%	3,000	9
0.2 to 0.9	8,700-39,200	3 - 6 units per acre 2 units per acre	27%	3,900	10
0.9 to 1.8	39,200-78,400	One unit per acre	15%	8,600	16
1.8 to 4.6	78,400-200,400	One unit per 2 acres	9%	8,500	11
4.6 to 9.5	200,400-413,820	One unit per 5 acres	5%	13,000	24
9.5 to 19.5	413,820-849,400	One unit per 10 acres	3%	18,300	7
19.5 to 40	849,400-1,742,400	One unit per 20 acres	3%	37,200	6
40+ ac	1,742,400 plus	One unit per 40 acres	1%	36,100	9

The table above shows average percent impervious area. The range is quite high depending on how long driveways are and whether the garage is attached or detached. Below are some examples of specific properties from the sample set.

Examples were divided into three groups:

- Smaller rural lots – around one to one and a half acres in size
- Small to medium-sized rural lots – around two to less than five acres
- Medium-sized rural lots – around 5 acres in size
- Large resource and residential lots

Smaller Rural Lots – 0.9 to 1.8 acres

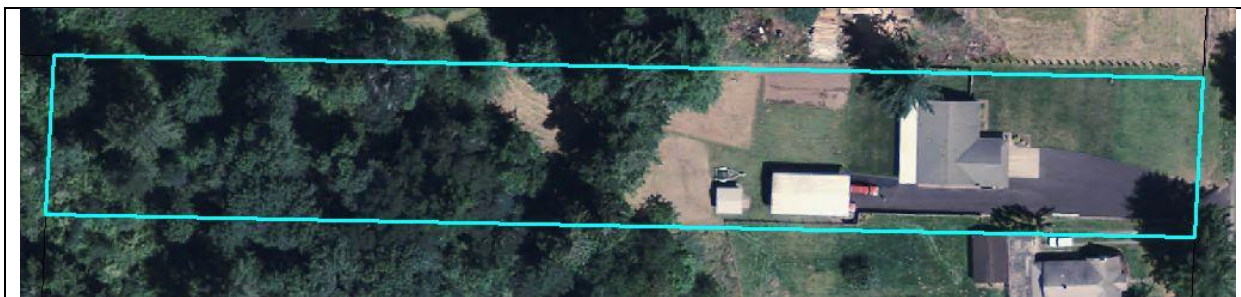
The average impervious area coverage on lots this size was 15 percent. The range was 7 percent to 28 percent. Photos are from 2012 unless otherwise indicated.



This 1 acre property contains a large home, detached garage, and driveway. The impervious area is 19 percent or 8,200 square feet.



This 1.2 acre property contains a large home, attached garage, and driveway. The impervious area is 16 percent or 8,700 square feet.



This 1.5 acre property contains a large home, detached garage, and driveway. The impervious area is 14.5 percent or 9,500 square feet.



This 1.7 acre property contains a large home, attached garage, and long driveway. The impervious area is 12 percent or 8,800 square feet.

Small to Medium Sized Rural Lots – 1.8 to 4.6 acres

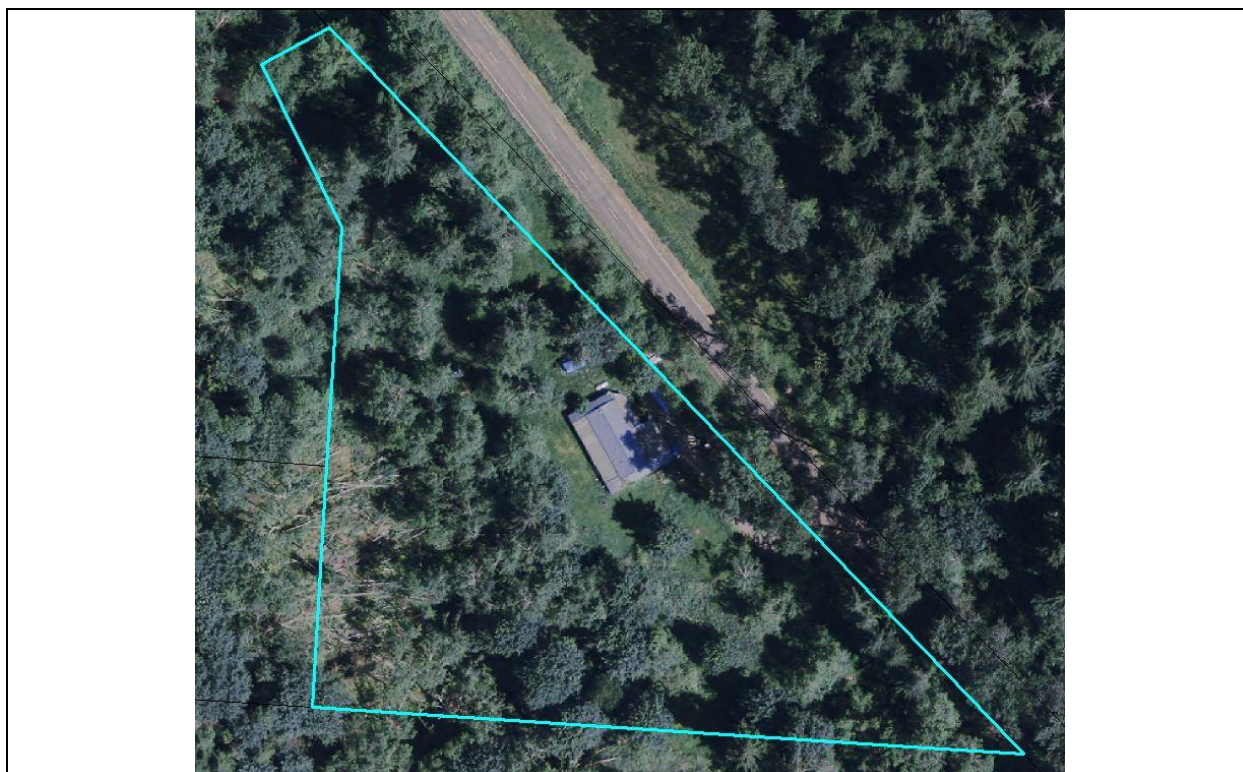
The average impervious area coverage on lots this size was 8 percent. The range was 3 percent to 14 percent. Photos are from 2012 unless otherwise indicated.



This 2.2 acre property contains a large home, detached garage, and driveway. The impervious area is 10 percent or 9,900 square feet.



This 1.9 acre property contains a large home with attached garage and large parking area. The impervious area is 10 percent or 8,200 square feet.



This 3.6 acre property contains a small home and driveway. The impervious area is 3 percent or 4,000 square feet.



This 2.4 acre property contains several buildings and a large driveway. The impervious area is 13 percent or 13,600 square feet.

Medium Sized Rural Lots – 4.6 to 9.5 acres

The average impervious area coverage on lots this size was 5 percent. The range was 2 percent to 12 percent. Photos are from 2012 unless otherwise indicated.

2000	
2012	
This 5-acre property contains a primary residence, garage, and driveway. The impervious area is 12 percent or 26,000 square feet.	



This 5 acre property contains a primary residence, garage, and driveway. The impervious area is 8.5 percent or 19,000 square feet.



This 5-acre property contains a primary residence, garage, and driveway. The impervious area is 8 percent or 19,000 square feet (excluding the road at the edge of the property).



This 5.5-acre property contains a primary residence, attached garage, and driveway. The impervious area is 4.5 percent or 10,000 square feet.



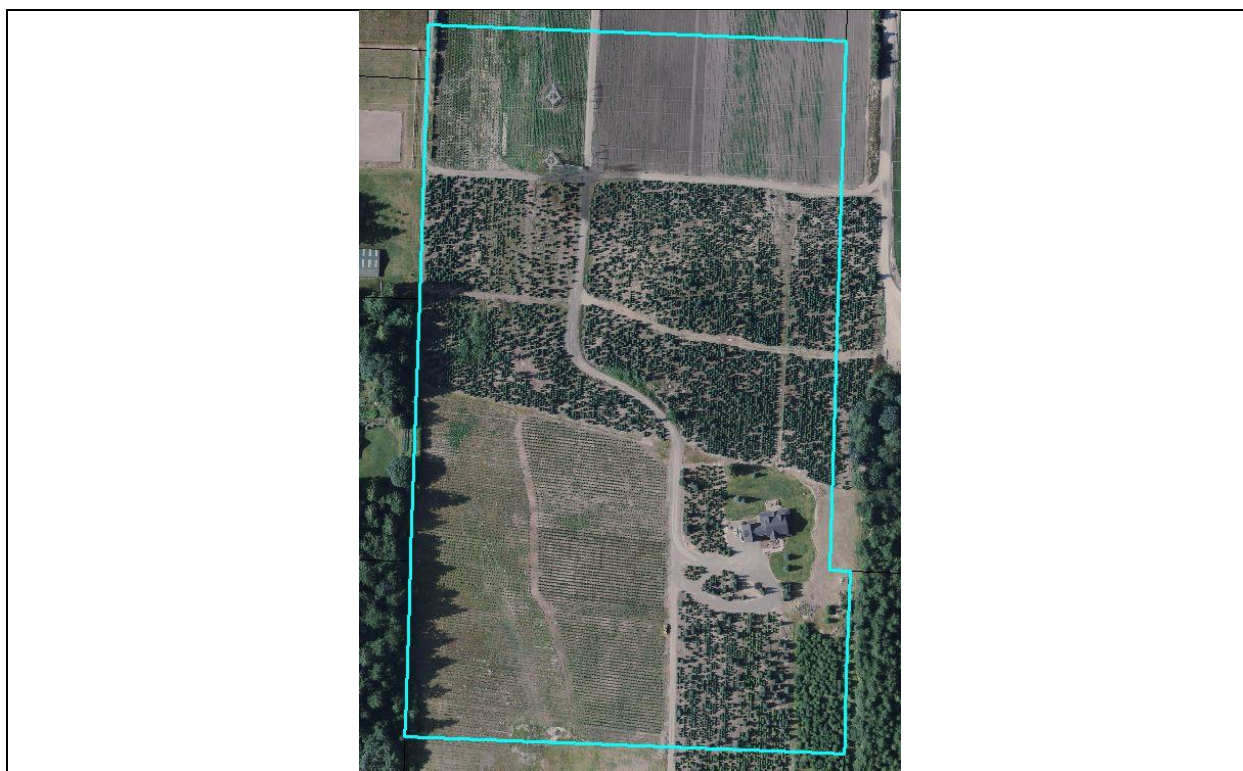
This 7-acre property contains a primary residence, garage, and driveway. The impervious area is 6.6 percent or 21,000 square feet.

Large Resource and Residential Lots – 9.5 to 40 acres

The average impervious area coverage on lots this size was 5 percent. The range was 2 percent to 12 percent. Photos are from 2012 unless otherwise indicated.



This 15-acre property contains a primary residence, driveway, and access road. The impervious area is 3.9 percent or 25,000 square feet.



This 25-acre farm contains a primary residence and numerous access roads. The impervious area is 5.8 percent or 66,000 square feet. It is enrolled in the current use agriculture tax program.



This 40 acre farm contains a primary residence, other buildings, and an access road. The impervious area is 2.4 percent or 43,000 square feet. It is enrolled in the current use agriculture tax program.



Closeup.



This 66 acre farm contains numerous farm buildings as well as a long access road. The impervious area is 4.1 percent or 118,000 square feet. It is enrolled in the current use agriculture tax program.



Closeup



This 98 acre farm contains several buildings and roads. The impervious area is 1.3 percent or 57,300 square feet. It is enrolled in the current use agriculture tax program. Impervious estimates do not include gravel roads.



Closeup.



Relationship to Stormwater Flow Control

Based on Department of Ecology guidance, any development in unincorporated Thurston County that fits the criteria below requires a review by Thurston County Water Resources staff to ensure it meets runoff flow-control standards:

- More than 5,000 square feet new impervious surfaces
- Converting more than three quarters of an acre from native vegetation to lawn or landscaping

- Clearing of more than two-and-a-half acres of native vegetation to pasture

Depending on soils and property-specific characteristics, flow-control mechanisms may be put into place to manage stormwater.

Options:

Option A - Leave impervious area thresholds in zoning code as they are currently.

Option B - Place modest impervious area thresholds in zoning districts where none exist to better align with how development is actually occurring. For example, place limits of 10 percent impervious area for all lots larger than 4.6 acres.

Option C - Place low impervious area thresholds in watersheds and basins that still have a Sensitive or Intact current condition. In Green Cove Creek basin, for example, lots greater than one acre have an impervious surface limit of five percent. Allow a mechanism for the limits to be increased, by using pervious pavements or purchasing development rights.