Deschutes Watershed Land Use Analysis:

Scenario Development Report

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thurston regional planning council

THURSTON COUNTY
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1. Introduction

1.1 Purpose

Thurston County and the Thurston Regional Planning Council (TRPC) are working on ways to address existing water quality issues, as well as to protect areas that are properly functioning from effects of future growth. The aim of the Deschutes Watershed Analysis project is to take a proactive approach to land use planning in ways that keep our water clean, provide habitat for wildlife, protect important ecological functions, and maintain a robust and vibrant community with the character and quality of life that residents value. This report documents options for improving and protecting water quality that were considered as a part of this project, including evaluating different approaches to managing land use.

1.2 Background

The Deschutes River is one of the largest in Thurston County, flowing more than 57 miles from its forested headwaters to the Puget Sound. The watershed that drains into the river includes a variety of land uses, including timber and agriculture, as well as developed areas within the cities of Olympia and Tumwater. While the Deschutes River currently supports a variety of wildlife habitat and recreational uses, it also suffers from pollution and other concerns (see section 2). The river is listed under the federal Clean Water Act and is the subject of a state-coordinated water quality improvement project[1].

The Deschutes watershed is experiencing pressure from residential development and anticipated future development could exacerbate water quality issues. Projected development in the basin will result in increases in impervious area and more homes on septic systems, while reducing tree cover. These impacts could increase erosion, water pollution, stream temperatures, and demand for groundwater, which in turn could lead to a loss of fish and wildlife habitat, as well as recreational opportunities.

1.3 Scope of work

Recommendations developed by the staff project team and stakeholder workgroup will be considered as a part of the County's comprehensive plan update, as well as to inform other future work by the County.

[1] http://www.ecy.wa.gov/programs/wq/tmdl/deschutes/index.html

The first step of the project was to gather data on the current conditions of the watershed and perform an initial analysis, which narrowed the study area to focus on lands upstream of the confluence of the Deschutes River and Spurgeon Creek and north of the border of Thurston and Lewis counties. This area — which includes a mix of farms, forests, homes, lakes and small streams — was identified as ecologically important but at risk for further degradation of water quality due to anticipated growth. This information is collected in the *Deschutes Watershed Land Use Analysis: Current Conditions Report* (Thurston County, 2015)[2].

In the second phase, the project team formed a workgroup with diverse stakeholders in the watershed, including residents, representatives from state and local agencies, land trust, conservation district, and nonprofits. Project staff solicited membership in the workgroup using a variety of outreach methods, including mailings, e-mails, and individual calls to stakeholders, agencies, organizations, and residents. The workgroup met a total of five times between December 2015 and September 2016 to evaluate alternative land use management options for the Deschutes watershed.

Using the feedback and direction from the workgroup, the project team developed and modeled future land use scenarios to estimate the impact of different management approaches. The preliminary results were presented for consideration at the March 25, 2016, workgroup meeting, along with indicators evaluating the effectiveness of the scenarios (see section 4). The workgroup provided feedback and input on the preliminary results, which the staff team used to refine the scenarios further (see section 3).

[2] http://www.co.thurston.wa.us/planning/watershed/watershed-basin-deschutes-project-materials.html

2. Existing and Future Concerns

Research by the Washington Department of Ecology, the Thurston County Environmental Health Division of the Public Health and Social Services Department, and the Squaxin Island Tribe has identified several impairments to water quality for streams and lakes in the Deschutes Watershed. The Deschutes Watershed Land Use Analysis Workgroup developed scenarios targeting the following seven areas of concern in the watershed: groundwater quality; bacteria and pathogens in surface water; increased nutrients and algal blooms; water levels during drought periods; sediment and erosion; loss of farmland; and, stream temperature.

The *Deschutes Watershed Land Use Analysis: Current Conditions Report* (Thurston County, 2015) provides an overview of existing impairments identified in the Deschutes Watershed.

The Deschutes Watershed Analysis staff team determined future concerns for the watershed based on current conditions, baseline information, and the potential amount of development—also known as "buildout." Baseline is what we can expect if no changes are made to existing regulations, outreach, or restoration efforts. Buildout is the theoretical maximum number of dwelling units that could be built under existing zoning and critical area regulations.

2.1 Groundwater Quality

Septic systems that are not properly maintained may fail and possibly contaminate drinking water and groundwater. Septic systems on porous soils can leach contaminants such as nitrates and fecal coliform into groundwater and the drinking water supply. In 1999, Thurston County conducted a septic system evaluation and correction project in Henderson Inlet, and found a 14% failure rate among septic systems tested near water bodies. Even properly functioning septic systems, however, will leach nitrates. Single-family homes on septic systems – even if they are properly functioning – contribute eight to 20 times the amount of nitrate pollution as homes connected to sewer systems.

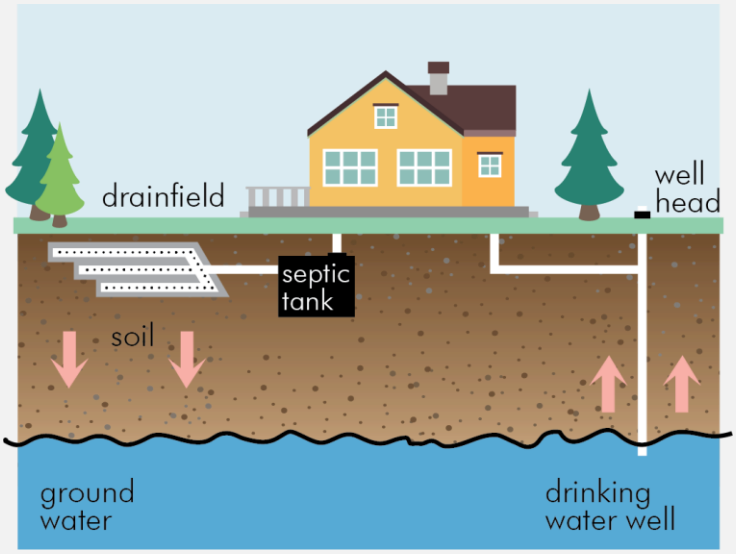


Figure 1: *Containments from septic systems leach into groundwater, where they can enter the water supply for homes on wells.*

Current Concerns

- No existing groundwater concerns have been identified in the Deschutes Watershed.

Future Concerns

- Under the current zoning scenario, projecting buildout would result in up to 59% increase in homes on septic systems on porous soils; 20% increase if Rainier is converted to sewer (see section 4.4).

2.2 Bacteria and Pathogens in Surface Water

The presence of fecal coliform bacteria in streams suggests that pathogenic microorganisms might also be present and that swimming and eating shellfish might be a health risk. Potential sources of fecal coliform bacteria include improperly maintained, poorly located, or failing septic systems, as well as farm animal waste, pet waste, misconnected sewers, and stormwater runoff.

Figure 2: *Agriculture, urbanized areas and pet waste are all sources of runoff that can contribute fecal coliform and other pathogenic microorganisms to streams and rivers.*

Current Concerns

- Spurgeon Creek failed fecal coliform standards in 2010/2011. Issues identified for Spurgeon Creek include non-point pollution from rural residential and agricultural activities, encroachment on wetlands and natural riparian areas by livestock grazing and other uses (Thurston County Water Resource Monitoring Report, 2012).
- Reichel Creek is on the 303(d) list of impaired waterbodies for fecal coliform. The state Department of Ecology places on the 303(d) list waters whose beneficial uses (e.g., drinking, recreation, aquatic habitat) are impaired by pollution (Current Conditions Report).

Future Concerns

- Under the current zoning scenario, projecting buildout would result in up to a 168% increase in failing septic systems on non-porous soils near waterbodies (see section 4.4) can be expected in the Deschutes Study Area.

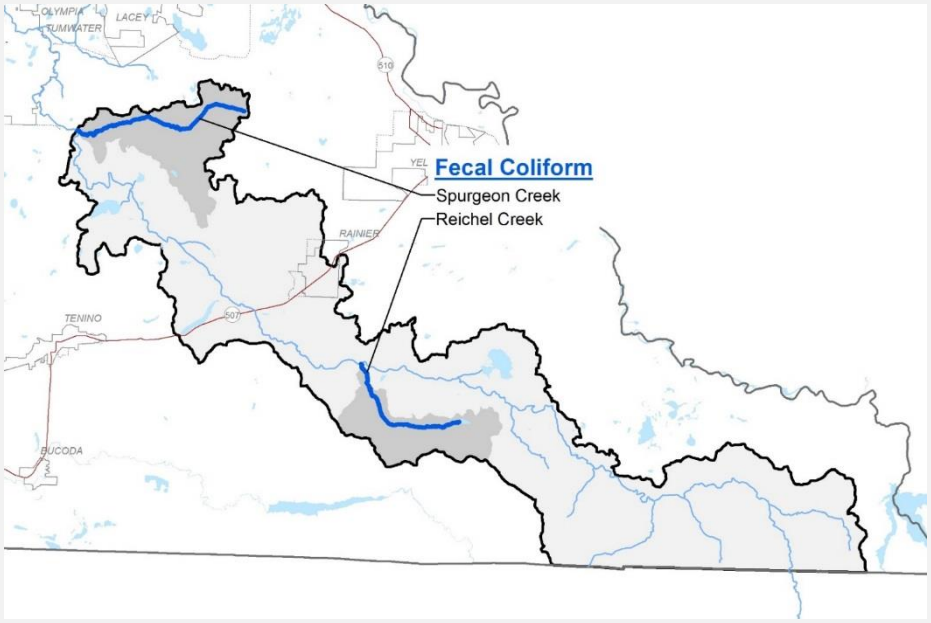


Figure 3: *Fecal Coliform issues have been identified in Spurgeon Creek and Reichel Creek by the Dept. of Ecology and Thurston County Environmental Health.*

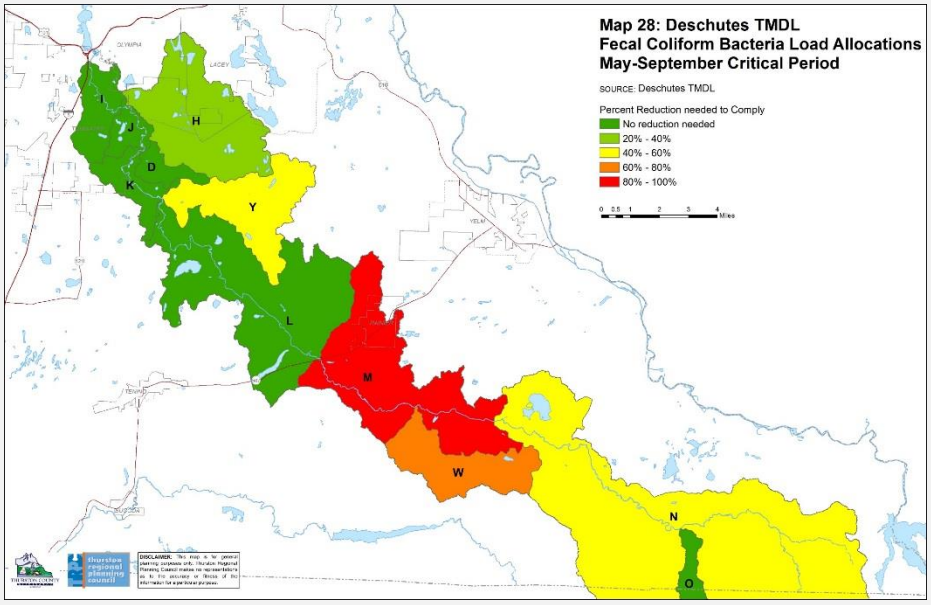


Figure 4: *The Deschutes TMDL identified basins where a reduction in fecal coliform is needed to meet water quality standards (Current Conditions Report: Map 28)*

2.3 Increased Nutrients and Algal Blooms

Nutrient-rich waters can fuel algal blooms in lakes, streams, and rivers, which can lead to low dissolved oxygen and high pH that stresses aquatic organisms. In freshwater lakes, the primary cause of algal blooms is phosphorous from septic systems and fertilized lawns, stormwater runoff, and erosion.

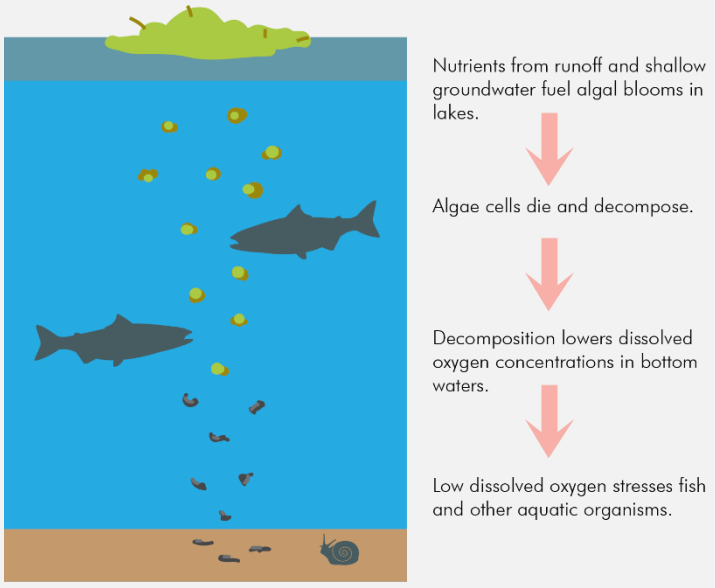


Figure 5: *Nutrients, including phosphorous and nitrogen, are responsible for algal blooms and low dissolved oxygen in rivers and lakes.*

Current Concerns

- Algal blooms and phosphorous concentrations are a concern in Lake Lawrence.
- Low dissolved oxygen is a concern in Reichel Creek, Lake Lawrence Creek, and an unnamed tributary draining into the Deschutes upstream of SR-507.

Future Concerns

- There could be up to a 168% increase in failing septic systems on non-porous soils near waterbodies (see section 4.4).
- Impervious area in the Offut Lake basin could increase from 3.4% to 6.8% at buildout — bringing it above the percentage currently in Lake Lawrence basin (see section 4.2).
- Forest cover in Offut Lake basin could decrease from 55% today to 47% at buildout, bringing the forest cover that has been lost to urbanization down to nearly the same level as currently in Lake Lawrence basin (see section 4.3).

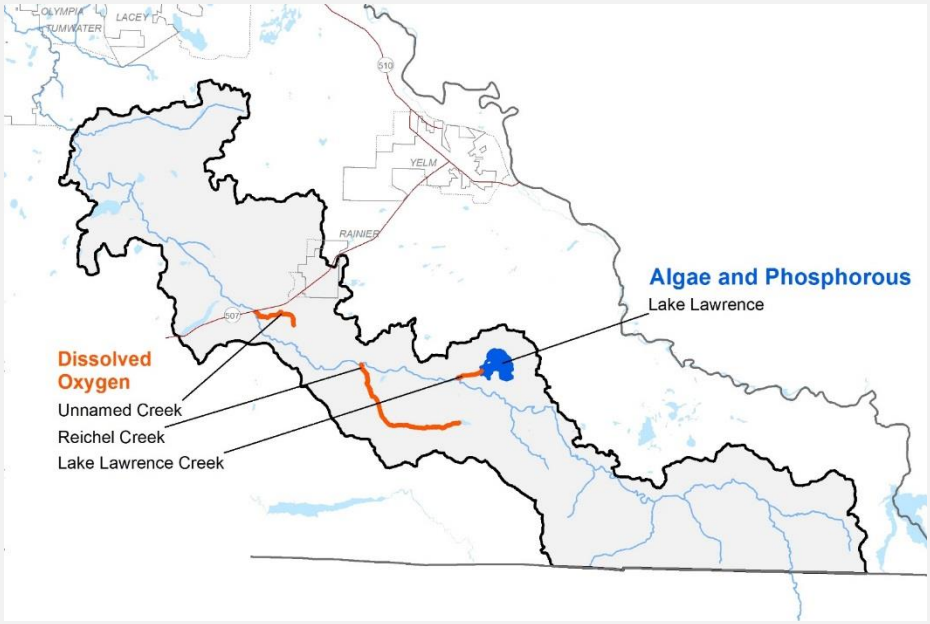


Figure 6: *Lake Lawrence, Lake Lawrence Creek and Reichel Creek are on the 303(d) list of impaired waterbodies (Current Conditions Report: Map 7).*

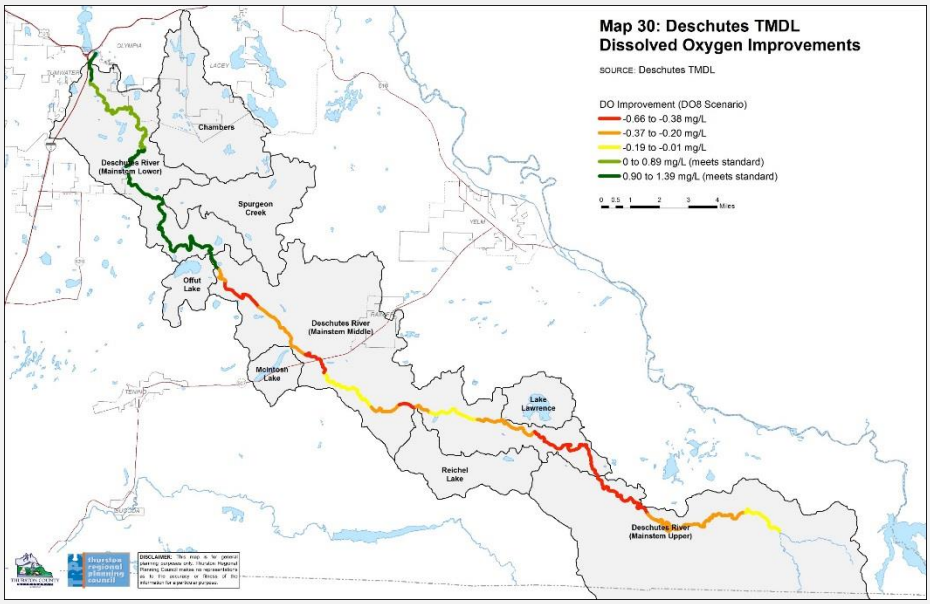


Figure 7: *The Deschutes River TMDL identifies several areas along the river where an improvement in dissolved oxygen is needed to meet water quality standards.*

2.4 Water Levels during Drought Periods

Washington State declared extreme drought conditions for the Deschutes Watershed in 2015. The following year started off with more rain and mountain snowpack, much of which melted in an early heat wave and a drier than normal spring. However, those conditions were alleviated with moderate weather in June and July of 2016 that helped to replenish the water supplies and reduce demand. Most households in the watershed rely on a water supply from the shallow aquifer, and if the water table drops, households may need to dig deeper (and more expensive) wells. Groundwater withdrawals and a changing water table can also affect water levels in streams. This is important because Coho salmon rely on adequate stream levels and cool temperatures for spawning and rearing habitat. As population in the watershed grows, ensuring that there is adequate water for households and stream flows will become increasingly difficult in drought years.

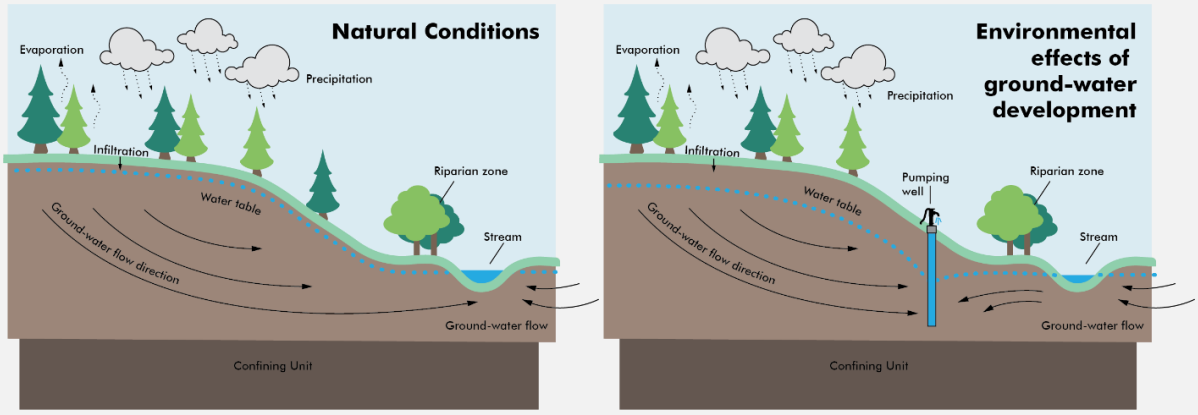


Figure 8: *Precipitation infiltrates the soil to recharge groundwater levels. Water moves through underground aquifers, where it may reemerge at a spring or stream. Water pumped from the groundwater system lowers the water table and may alter the direction of groundwater movement. Some water that flowed to the stream no longer does so and some water may be drawn in from the stream into the groundwater system, thereby reducing the amount of streamflow. Water-level declines may affect the environment for plants and animals. For example, plants in the riparian zone that grew because of the close proximity of the water table to the land surface may not survive as the depth to water increases. The environment for fish and other aquatic species also may be altered as the stream level drops.*

Current Concerns

- Low summer streamflows are a concern in the Deschutes River.

Future Concerns

- There could be up to 3,137 new homes in the Deschutes Study Area; there will be up to 3,644 if Rainier converts to sewer (see section 4.1).
- There could be up to a 96% increase in residential water consumption in the Deschutes Study Area (see section 4.5).

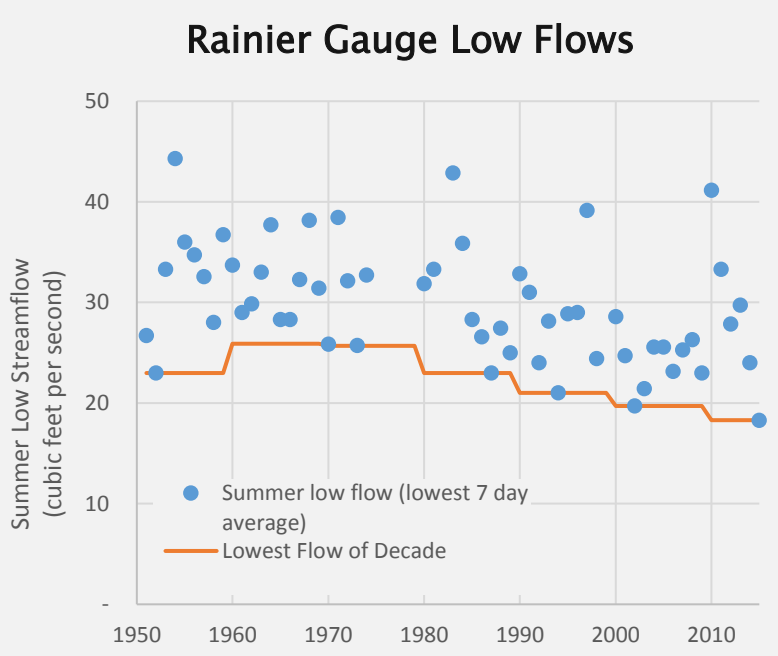


Figure 9: *Record low flows along the Deschutes for each decade have declined since the 1960s.*

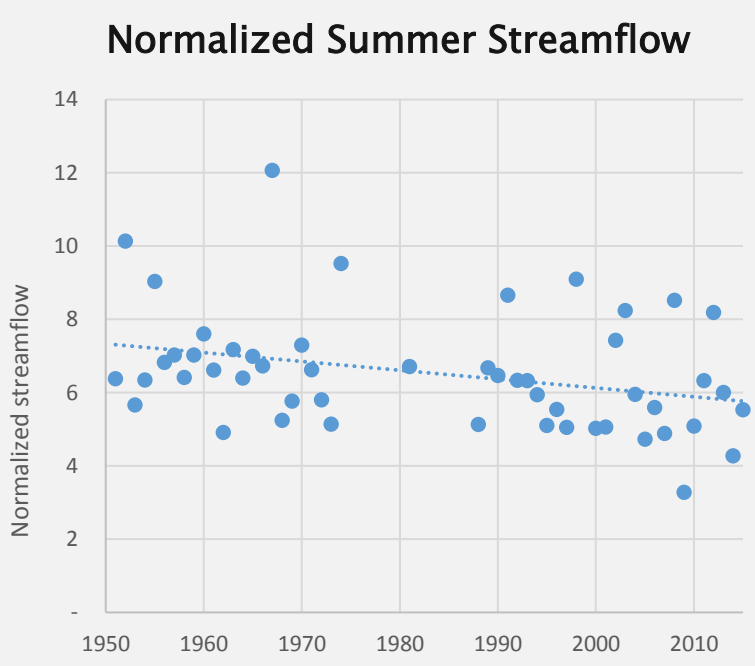
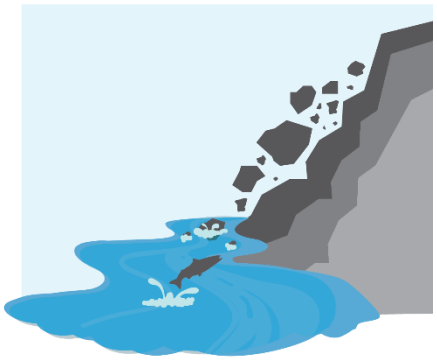


Figure 10: *Normalized summer streamflow (July to September streamflow divided by May to September precipitation) has declined since the 1950s.*

2.5 Sediment and Erosion

Major landslides near streams and the Deschutes River impact Coho salmon runs. While landslides are a natural part of the landscape in areas with steep slopes and abundant rainfall, the frequency and magnitude of landslides can increase with removal of natural vegetation and road building. This can lead to channel widening, bank erosion, and shallower water depths, and contribute increased levels of fine sediments into the river system. Landslides from the winter 1990 storm, exacerbated by logging activity, practically decimated the Coho salmon run from that year, and it hasn't recovered.



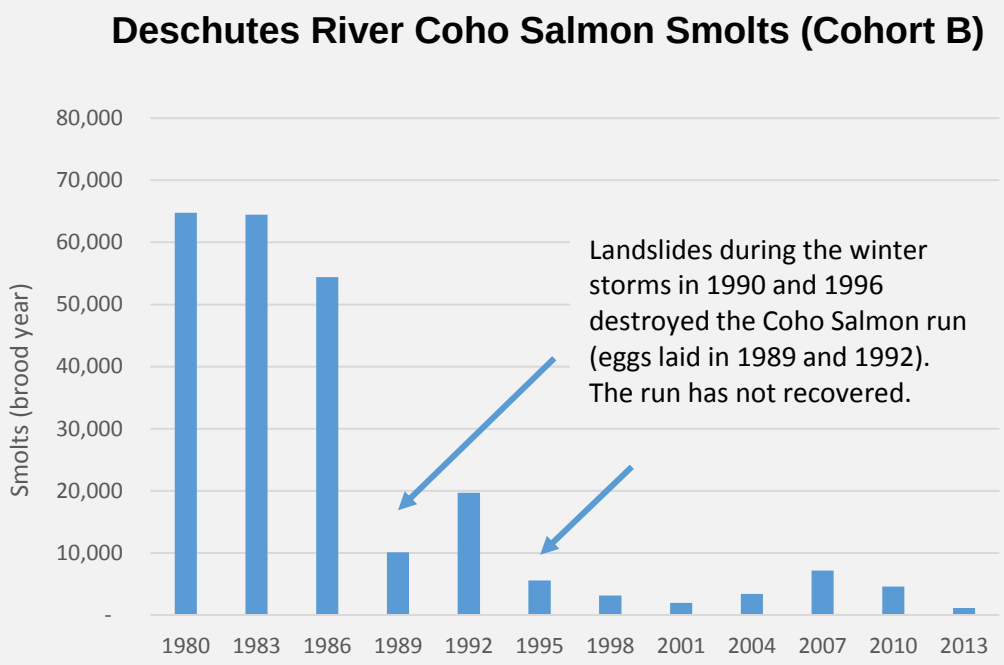


Figure 11: *Coho salmon return to spawn three years after emerging. Cohort B, which includes eggs which were laid in 1980 and their descendants, has not recovered from landslides that decimated habitat in the Deschutes during the winters of 1990 and 1996.*

Current Concerns

- Fine sediment is an identified pollutant in the Deschutes River (Current Conditions Report: Map 32).
- Erosion and channel migration threatens waterfront property along the Deschutes.

Future Concerns

- There could be up to a 6% loss of forestlands on steep slopes (see section 4.6).

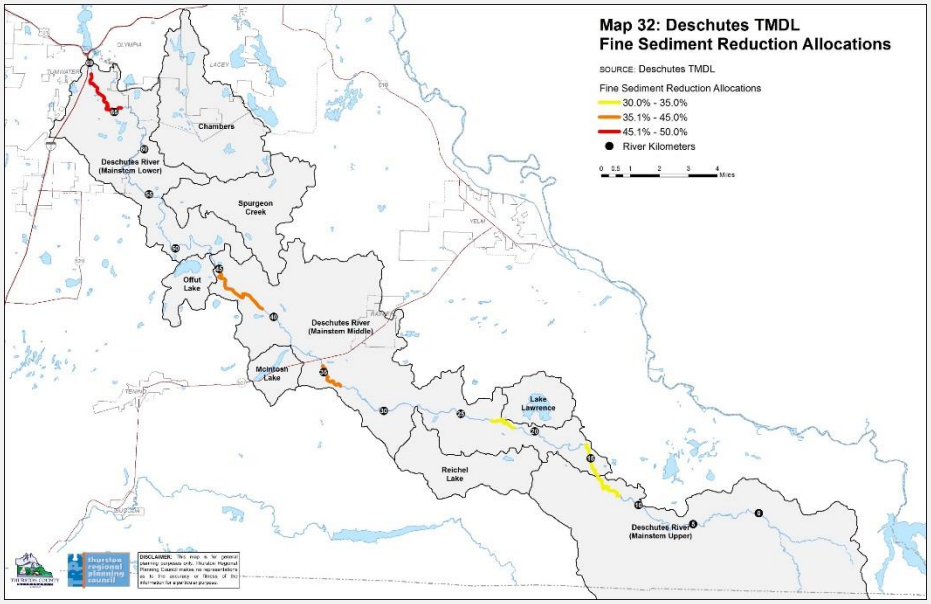


Figure 12: *The Deschutes River TMDL identifies several areas along the river where an improvement in fine sediment is needed (Current Conditions Report: Map 32).*

2.6 Loss of Farmland

Farms are an important part of Thurston County's economy and rural landscape. Farms that have implemented best management practices for protecting water quality provide ecosystem benefits such as soil retention and water purification. The development of farmland is usually associated with increased impervious surfaces and runoff, more nutrients and pathogens from septic systems, and a loss of habitat.

Current Concerns

- More than 700 acres of farmland were developed between 2000 and 2011.

Future Concerns

- More than 3,000 acres of farmland in the Deschutes Study Area are vulnerable to development (see section 4.7).

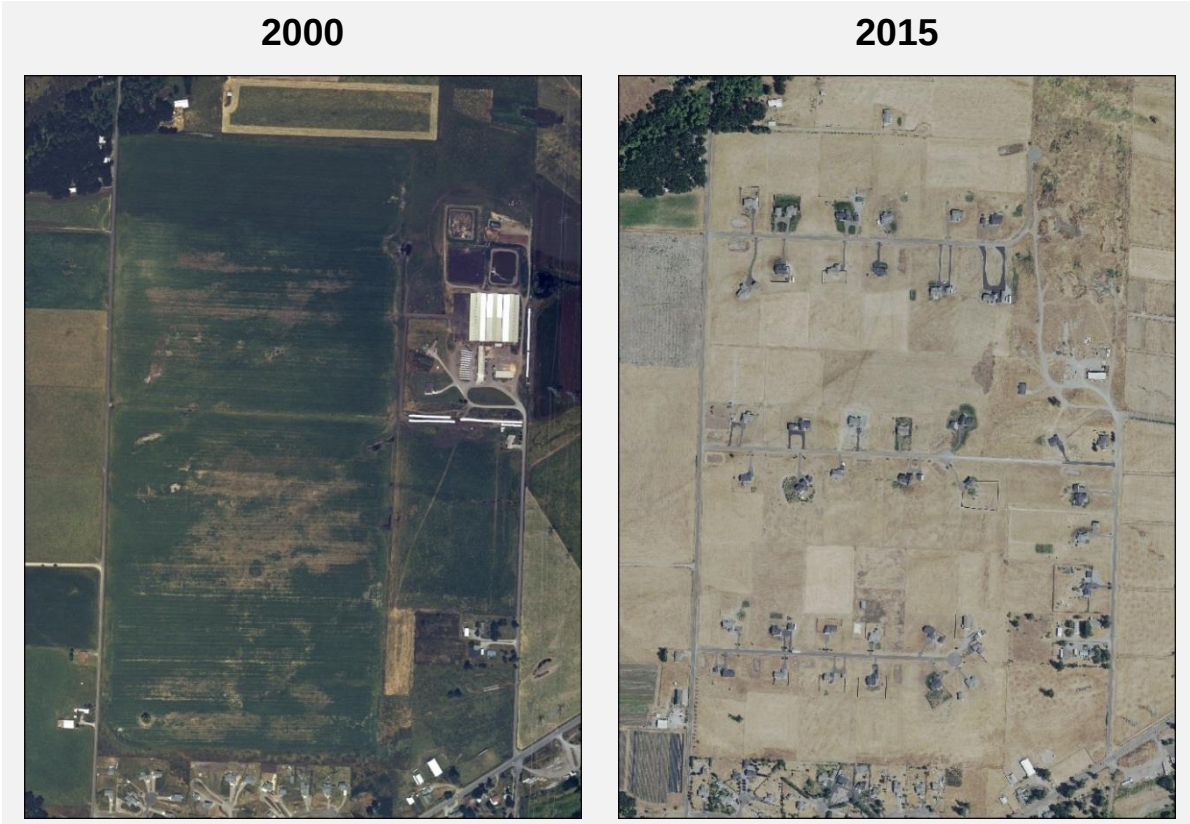


Figure 13: *This 230-acre farm near Scatter Creek was subdivided in 2007. It is one of many examples of farmland being developed in Thurston County.*

2.7 Stream Temperature

Coho salmon require cold water to survive. State standards require temperatures less than 16 degrees Celsius (60.8°F) for summer holding and 17.5 degrees Celsius (63.5°F) for spawning, rearing and migrating. Cold-water refugia — locations in streams that are persistently colder than adjacent areas — are particularly crucial for salmon survival during periods of high temperatures or drought. The loss of shady habitat along the Deschutes and its tributaries, as well as low summer water flows, causes stream temperatures to increase to levels unsuitable for Coho salmon.

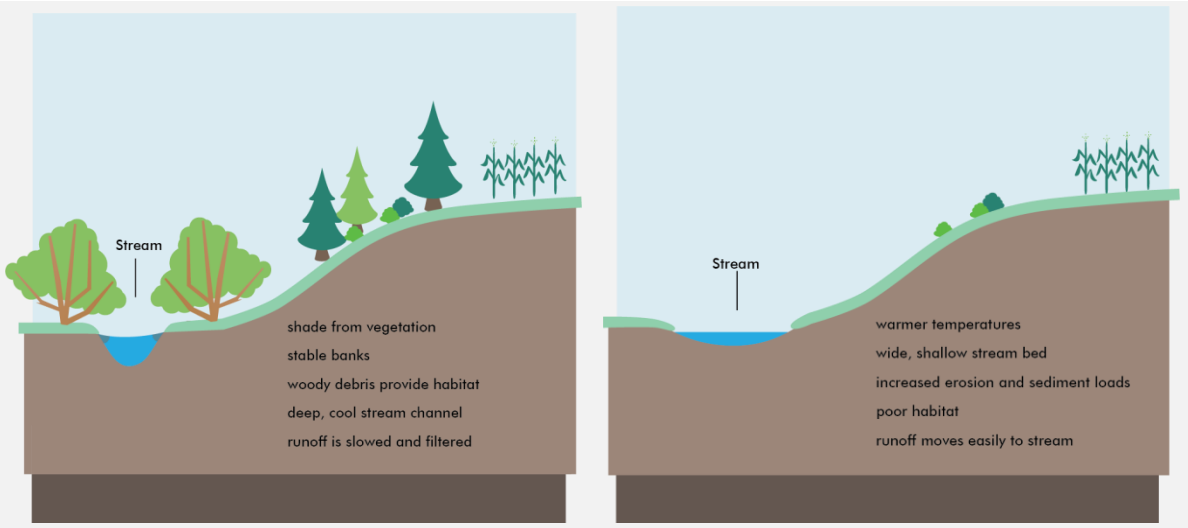


Figure 14: *Clearing riparian areas increases stream temperature, runoff, and erosion, and degrades overall habitat for fish.*

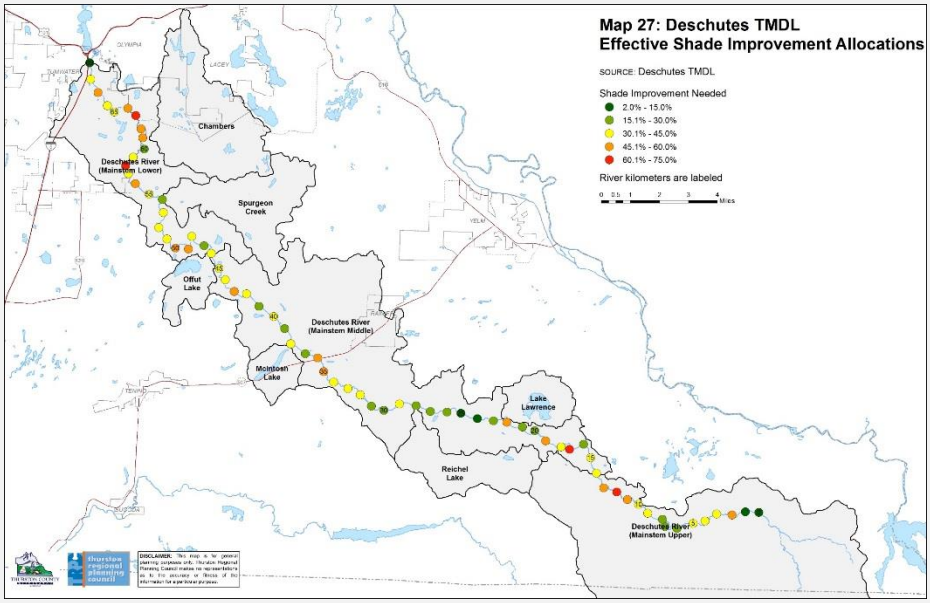


Figure 15: *The Deschutes River TMDL identifies several areas along the river where increased shade cover is needed to keep water temperatures low (Current Conditions Report: Map 27).*

Current Concerns

- The Deschutes Total Maximum Daily Load (TMDL) study identified 50 river miles needing shade cover to increase by 20% or more; of this, 9 miles of river need an improvement greater than 50%.

Future Concerns

- There could be up to a 96% increase in residential water consumption in the Deschutes Study Area (see section 4.5).
- There needs to be enforcement of current critical areas regulations and implementation of voluntary restoration efforts to protect and restore riparian vegetation cover.

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3. Scenarios

At the March 25, 2016, workgroup meeting, staff presented four scenarios for the workgroup's consideration, along with indicators evaluating the effectiveness of the scenarios (see section 4). Staff subsequently incorporated the workgroup's feedback into the scenarios. The scenarios are: education and outreach; restoration and conservation; zoning regulations; and development regulations and monitoring. In addition, staff included the Rainier Wastewater Treatment Plant scenario at the request of the city's planner, as well as other management options not modeled in the indicators, but considered by the workgroup.

3.1 Education and Outreach Scenario

This scenario assumes an increased investment in time and effort for outreach and education efforts by Thurston County staff and other partners, all of which would require additional funding. Funding sources have not been identified. The goals are increased watershed stewardship, water conservation, and septic system maintenance.

Without action and increased funding, Thurston County, its partners, and other organizations would continue education and outreach efforts at current levels.

Watershed Stewardship

Action 1	Increased investment in time and funding for education and outreach on watershed issues. This includes increasing opportunities for voluntary restoration and encouraging residents to be good stewards of the watershed and use best management practices for protecting water quality.
Result	Reduction in nutrients in the Deschutes River, tributaries and lakes and increased stewardship activities on private properties.

Farm Plans

Action 2	Work with the Conservation District to increase number of conservation plans.
Result	Reduced impacts of farming and agricultural activities on water quality.

Septic Inspections

Action 3	Thurston County and its partners expand outreach and education efforts on proper septic system operation and maintenance.
Result	Identify and repair more failing septic systems. The estimated number of failing septic systems would decrease from 480 to 370, a 23% decrease (see section 4.4).

Water Conservation

Action 4 Thurston County and its partners increase water conservation outreach and education during drought years. Efforts could include incentives and rebates.

Result Reduced residential water consumption. Aggressive water-reduction efforts in the City of Olympia – including outreach material, rebates for water-efficient appliances, free household water-savings kits and a tiered pricing structure – reduced water consumption by 7% per household between 2010 and 2015.

Action 5 Encourage short-term leasing and donations of water rights.

Result Greater availability of surface water during drought periods. Greater summer stream flows and lower temperatures in streams.

3.2 Restoration and Conservation Scenario

This scenario assumes a major increase in funding for restoration and conservation. The goals are restoring habitat near wetlands, streams, and the Deschutes River, and conserving habitat throughout the basin.

Without action and increased funding, the restoration and conservation efforts of Thurston County, its partners, and other organizations would continue at existing levels. Over each of the past 10 years, conservation groups in Thurston County have restored about 1,600 feet of fish and wildlife habitat and riparian area along the streams and river.

Restoration

Action 6 Increase funding and incentives for habitat and riparian restoration. Could include funding restoration projects or providing financial incentives, such as rebates, to landowners who restore riparian areas.

Result Increased habitat and shade cover to reduce water temperatures along streams and rivers.

Action 7 Assess stormwater retrofit opportunities and implement several projects.

Result Decrease in stormwater runoff from pockets of high-density development in the Deschutes Basin. Decrease in nutrients and sediment entering the Deschutes River.

Conservation

Action 8 Thurston County increases the efficacy of the Purchase of Development Rights (PDR) and Transfer of Development Rights (TDR) programs and opens it up to include areas other than agricultural lands. Additional funding for acquisition of lands through the PDR/TDR and other programs.

Result Increased protection of ecologically sensitive areas and rural character. Financial benefit to property owners whose land provides conservation value and ecosystem services.

Action 9 Identify and prioritize the preservation of areas contiguous with existing conservation areas to maximize the benefit to habitat.

Result Increase in protected habitat. Financial benefit to property owners whose land provides valuable wildlife habitat.

3.3 Zoning Regulations Scenario

Thurston County changes zoning regulations to reduce the number of new homes in sensitive areas. New development is associated with increased pollution from runoff, tree clearing, and water withdrawals. Under existing zoning, the Deschutes Study Area could see up to 3,600 new homes — an 84% increase from 2015. The goal of this scenario is to reduce the impacts of new homes.

Bacteria and Pathogens in Surface Water

Action 10 Rezone parcels currently zoned Rural Residential Resource (RRR) one dwelling unit per 5 acres (1/5) to Rural (R) one dwelling unit per 20 acres (1/20) in areas with nonporous soils near waterbodies.

Result Less pollution entering waterbodies from new septic systems.

Sediment and Erosion

Action 11 Rezone parcels currently zoned RRR 1/5 to R 1/20 in areas with steep slopes near waterbodies.

Result Less erosion and less sediment entering the Deschutes River from new development.

Nutrients and Algae Blooms

Action 12 Rezone parcels currently zoned RRR 1/5 to R 1/20 in Lake Lawrence, McIntosh and Offut Lake basins.

Result Decreased impacts of new growth on nutrient and algae issues in lakes.

Salmonid Habitat

Action 13 Downzone areas near cold-water thermal refugia.

Result Protect habitat important for salmonid survival.

Project staff initially considered two additional zoning options, which did not go forward:

- Project staff modeled downzoning areas with farmland and forestland due to strong community interest in preserving these areas. However, project staff dropped this option due to its indirect connection to water quality and because of other ongoing efforts by Thurston County to preserve farmland.
- Project staff modeled downzoning all areas in the Deschutes watershed currently zoned Rural Residential Resource (RRR) one dwelling unit per 5 acres (1/5) to show the maximum impact of downzoning on residential capacity.

Results of both of these scenarios are presented in section 4.1.

3.4 Development Regulations and Monitoring Scenario

Thurston County changes development regulations and implements mandatory monitoring programs so as to reduce the impacts of future development on water quality.

Under current regulations, the Deschutes Study Area could see an additional 1,400 acres of impervious surfaces, 3% loss in forest cover, and 3,100 new homes on septic systems.

Impervious Surface Limits

Current impervious surface limits allow up to 60% of a parcel's area to be impervious surface, depending on zoning and soils.

Action 14 For parcels in Lake Lawrence, McIntosh Lake, and Offut Lake basins currently zoned RRR 1/5, reduce impervious surface limits to:

- 5% for lots larger than 5 acres,
- 60% or 10,000 square feet (whichever is less) for parcels smaller than 5 acres.

Result More compact development and less impervious surface in sensitive basins. Regulations would be similar to those in other sensitive areas, such as the McAllister Geological Sensitive Area (MGSA).

Action 15 For remaining parcels, reduce impervious surface limits to a level more in line with typical new developments.

- Impervious surface limits would be reduced to 10% for lots 2.5 acres or larger,
- Impervious surface limits would be reduced to 60% or 10,000 square feet (whichever is less) for parcels smaller than 2.5 acres.

Result Limit development with excessive impervious surfaces. Would have a limited impact as most new development occurs below proposed thresholds.

Septic Inspection

Action 16 Implement a mandatory septic system operation and maintenance program.

Result Identify and repair more failing septic systems. The estimated number of failing septic systems would decrease from 480 to 140, a 70% decrease (see section 4.4).

Water Use Monitoring

Action 17 Require water meters be installed for all new surface and groundwater uses, including permit-exempt wells.

Result Better understanding of the effects of groundwater withdrawals on water levels. Small reduction in residential water consumption as users are better able to monitor water use and potential leaks. County will not require reporting of water use or tie to utility rates.

Water Quality Monitoring

Action 18 Increased water quality monitoring in Offut and McIntosh lakes.

Result More information about potential water quality violations in sensitive basins.

3.5 Other Management Options

Rainier Wastewater Treatment Plant

The City of Rainier includes more than 700 homes, all of which are connected to septic systems. If Rainier were to construct a wastewater treatment plant, it would significantly reduce the risk of groundwater contamination by nitrates and fecal coliform bacteria. While the workgroup opted against making a recommendation regarding a wastewater treatment plant, Rainier's city planner requested that this scenario be modeled for informational purposes.

Action 19 The City of Rainier installs a wastewater treatment plant.

Result Reduced number of homes on septic systems. Fewer nitrates, nutrients and pathogens in groundwater and surface water

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4. Indicators

Indicators are a useful tool for evaluating how effective a management strategy or scenario is at achieving the desired outcome. Staff presented the following indicators to the workgroup at the March 25, 2016, meeting. They compare the baseline and alternative scenarios under buildout conditions. Baseline is what we can expect if no changes are made to existing regulations, outreach, or restoration efforts. Buildout is the theoretical maximum number of dwelling units that could be built under existing zoning and critical area regulations.

Not all actions were included in the indicator modeling, either because there is insufficient data to project the effects of the action, or because the action was added after the March 25, 2016 workgroup meeting. The following actions were included in the indicator modeling:

- Education and Outreach Scenario: Actions 1, 3 and 4
- Restoration and Conservation Scenario: Action 5
- Zoning Regulations Scenario: Actions 10, 11 and 12
- Development Regulations and Monitoring Scenario: 14, 15, 16 and 17
- Other Management Options: Action 19

4.1 Total Number of Homes

The total number of dwelling units is associated with increased impervious surfaces, decreased canopy cover, and an overall degradation in stream health.

		Buildout							
	2015	Baseline	Education & Outreach	Restoration, & Conservation	Zoning	Regulations & Monitoring	Rainier Treatment Plant	Zoning* (Farmlands)	Zoning* (All RRR1/5)
Total number of dwelling units:									
Deschutes River (Lower)	265	500	500	500	496	500	500	394	394
Deschutes River (Middle)	2,072	3,809	3,809	3,809	3,649	3,809	4,316	3,133	3,129
Deschutes River (Upper)	77	417	417	417	404	417	417	387	387
Lake Lawrence	771	954	954	954	927	954	954	928	927
McIntosh Lake	147	209	209	209	200	209	209	200	200
Offut Lake	320	512	512	512	424	512	512	424	424
Reichel Lake	21	130	130	130	121	130	130	103	103
Spurgeon Creek	648	927	927	927	924	927	927	881	875
Deschutes Study Area	**4,321**	**7,458**	**7,458**	**7,458**	**7,145**	**7,458**	**7,965**	**6,450**	**6,439**
— change from 2015	*-*	*3,137*	*3,137*	*3,137*	*2,824*	*3,137*	*3,644*	*2,129*	*2,118*
— percent increase	*-*	*73%*	*73%*	*73%*	*65%*	*73%*	*84%*	*49%*	*49%*

Note: **Farmland and RRR 1/5 zoning scenarios are included for informational purposes. They were not considered by the workgroup.*

Source: *Thurston Regional Planning Council: Population and Employment Forecast (2015 Update)*

4.2 Impervious Area

Stream health degrades as impervious surfaces, such as rooftops and driveways, increase. Impervious surfaces are associated with increased runoff of harmful pollutants, nutrients and sediments into streams and lakes. General thresholds for stream health (see Figure 16) are:

<2%	Intact stream basin
2-10%	Sensitive stream basin
10-25%	Impacted stream basin
>25%	Degraded stream basin

		Buildout					
	2014	Baseline	Education & Outreach	Restoration & Conservation	Zoning	Regulations & Monitoring*	Rainier Treatment Plant
Percent impervious surface:							
Deschutes River (Lower)	1.7%	4.9%	4.9%	4.9%	4.9%	4.9%	4.9%
Deschutes River (Middle)	1.9%	4.3%	4.3%	4.3%	4.1%	4.3%	4.4%
Deschutes River (Upper)	0.9%	2.9%	2.9%	2.9%	2.9%	2.9%	2.9%
Lake Lawrence	5.7%	7.8%	7.8%	7.8%	7.5%	7.8%	7.8%
McIntosh Lake	2.3%	4.6%	4.6%	4.6%	4.5%	4.6%	4.6%
Offut Lake	3.4%	6.8%	6.8%	6.8%	5.3%	6.8%	6.8%
Reichel Lake	1.5%	3.6%	3.6%	3.6%	3.6%	3.6%	3.6%
Spurgeon Creek	1.9%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%
Deschutes Study Area	**1.7%**	**3.8%**	**3.8%**	**3.8%**	**3.7%**	**3.8%**	**3.9%**
— change from 2014	-	*2.1%*	*2.1%*	*2.1%*	*2.0%*	*2.1%*	*2.2%*

Note: **Because most developments' new impervious surfaces fall below the limits included in the Regulations and Monitoring scenario, there would be no change to basin-wide impervious area, compared to baseline.*

Source: *Historical impervious estimates: NOAA C-CAP; Department of Ecology; National Land Cover Dataset (NLCD). Impervious Projections: Thurston Regional Planning Council.*

4.3 Forest Cover

Forest cover reduces runoff, cools streams and rivers, and provides habitat for wildlife. General thresholds for stream health (see Figure 16) are:

>80%	Intact stream basins
65-80%	Sensitive stream basins
45-65%	Impacted stream basins
<45%	Degraded stream basins

		Buildout					
	2011	Baseline	Education, Outreach	Restoration, Conservation*	Zoning	Regulations, Monitoring	Rainier Treatment Plant
Percent forest cover:							
Deschutes River (Lower)	57%	50%	50%	51%	54%	50%	50%
Deschutes River (Middle)	48%	44%	44%	45%	47%	44%	44%
Deschutes River (Upper)	51%	51%	51%	52%	51%	51%	51%
Lake Lawrence	45%	42%	42%	44%	45%	42%	42%
McIntosh Lake	80%	78%	78%	79%	80%	78%	78%
Offut Lake	55%	47%	47%	48%	55%	47%	47%
Reichel Lake	59%	58%	58%	59%	58%	58%	58%
Spurgeon Creek	63%	62%	62%	62%	62%	62%	62%
Deschutes Study Area	**53%**	**50%**	**50%**	**51%**	**52%**	**50%**	**50%**
— change from 2011	-	*-2.3%*	*-2.3%*	*-1.5%*	*-0.7%*	*-2.3%*	*-2.3%*

Notes: **The Restoration and Conservation scenario assumes half the area within 100 feet of a waterbody (excluding wetlands) would be restored. While restoration would significantly improve canopy in riparian areas, it would have a limited effect on basin-wide canopy cover.*

Forest cover includes the following NOAA C-CAP land cover classes: Deciduous Forest, Evergreen Forest, Mixed Forest, and Forested Wetland classes. Forest loss for developable parcels was calculated based on recent trends: 87.8% for lots under 0.17 acres and planned communities; 49.5% for lots 0.17 to half an acre; 43.3% for lots half an acre to an acre; 23.3% for lots one to two acres; 21.2% for lots 2 acres or larger; 70.5% for commercial and industrial lots.

Source: *Historical Forest Cover: NOAA C-CAP; WA Dept. of Ecology. Forest Cover Projections: Thurston Regional Planning Council.*

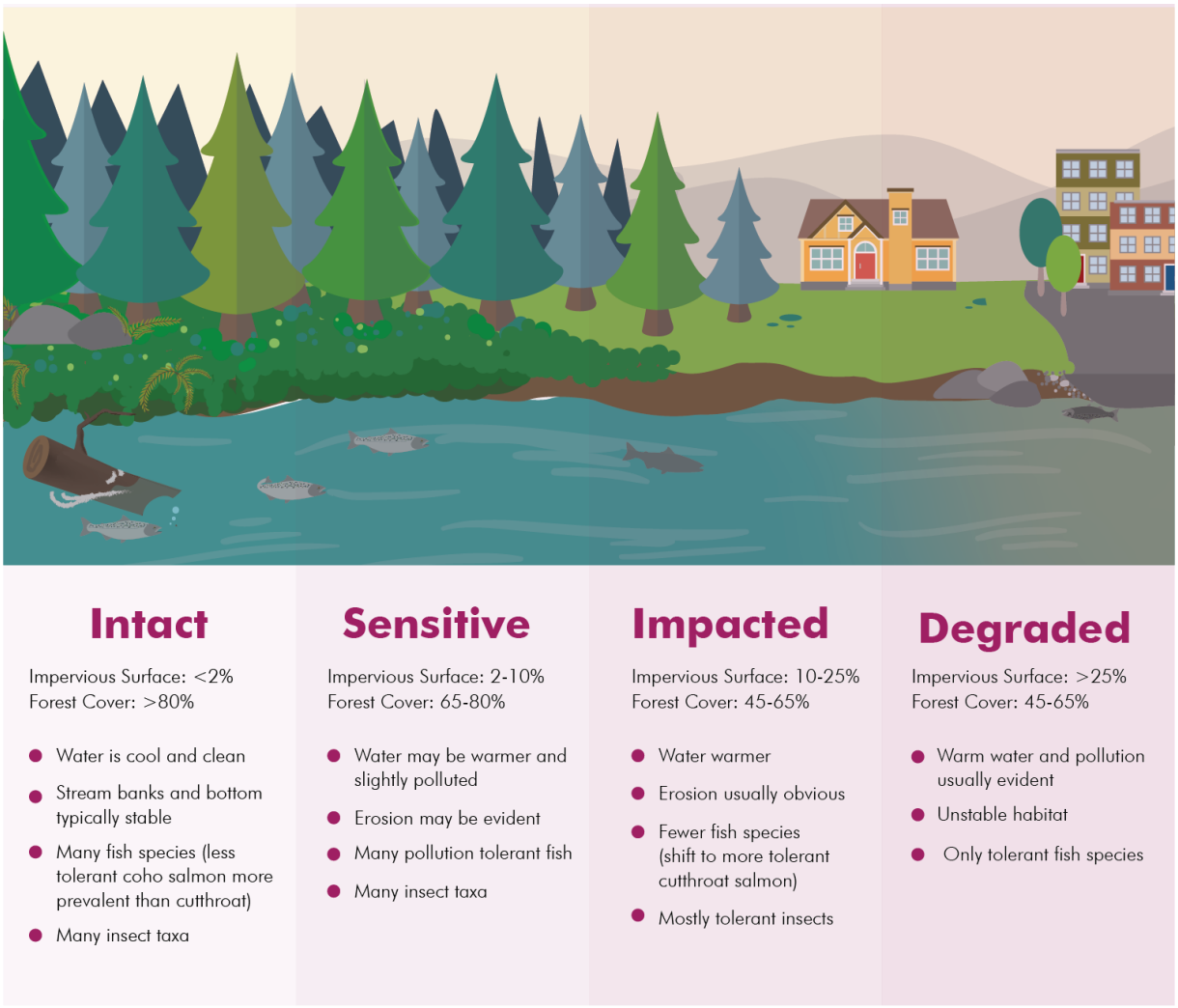

Figure 16: *On a basin-wide level, impervious area and forest cover provide a general indicator of stream health. Although some areas of the Deschutes basin are historically prairie with naturally less forest cover, in the Deschutes Study Area, Lake Lawrence and Reichel Lake basins are currently considered "Impacted;" the remainder is "Sensitive."*

4.4 Septic Systems

Improperly maintained, poorly located, and failing septic systems are potential sources of fecal coliform bacteria and other pathogenic microorganisms. Even properly functioning septic systems can leach nutrients, including phosphorous and nitrogen. From 1996 to 1999, Thurston County conducted a sanitary survey of septic systems in the Henderson Inlet watershed. The project found a 14% failure rate among septic systems near shorelines, based on the results of dye testing those properties. Dye testing was not conducted for upland sites, where a failing drainfield is less likely to make a visible connection to a nearby waterbody. Regular inspections can identify additional types of failures. An analysis of the first six years (2007-2012) of the Henderson Inlet septic system operation and maintenance program, which included mandatory inspections, found a 3.3% failure rate on properties across the watershed.

		Buildout					
	2015	Baseline	Education & Outreach	Restoration & Conservation	Zoning	Regulations & Monitoring	Rainier Treatment Plant
Total number of estimated failing septic systems:							
Deschutes River (Lower)	16	35	27	35	34	10	35
Deschutes River (Middle)	108	215	166	215	192	63	181
Deschutes River (Upper)	8	51	40	51	50	15	51
Lake Lawrence	43	55	42	55	54	16	55
McIntosh Lake	12	15	12	15	15	4	15
Offut Lake	22	44	35	44	33	13	44
Reichel Lake	2	10	8	10	9	3	10
Spurgeon Creek	31	55	43	55	55	16	55
Deschutes Study Area	**242**	**480**	**372**	**480**	**441**	**140**	**446**
— *change from 2015*	-	238	130	238	199	-102	204
— *percent change*	-	98%	54%	98%	82%	-42%	84%
Septic failure rate:							
Shoreline	14%	14%	11%	14%	14%	4%	14%
Upland	3.3%	3.3%	2.5%	3.3%	3.3%	1.0%	3.3%
Total	5.6%	6.4%	5.1%	6.4%	6.2%	2.0%	6.9%

Source: *Septic Systems: Estimates based on number of dwelling units and location. Failure Rates: Thurston County Environmental Health, personal communication.*

Two areas of concern for septic systems are porous soils, and non-porous soils if near a waterbody. Septic systems on porous soils are at a high risk of contaminating groundwater — the source of water for homes on wells — with nitrates and fecal coliform. Exposure to nitrate can have personal health consequences. Single-family homes on septic systems – even if they are properly functioning – contribute eight to 20 times the amount of nitrate pollution as homes connected to sewer systems.

		Buildout					
	2015	Baseline	Education & Outreach	Restoration & Conservation	Zoning	Regulations & Monitoring	Rainier Treatment Plant
Total number of septic systems on porous soils							
Deschutes River (Lower)	142	290	290	290	286	290	290
Deschutes River (Middle)	1,383	2,351	2,351	2,351	2,344	2,351	1,402
Deschutes River (Upper)	9	17	17	17	17	17	17
Lake Lawrence	382	451	451	451	433	451	451
McIntosh Lake	0	7	7	7	7	7	7
Offut Lake	280	337	337	337	331	337	337
Reichel Lake	1	3	3	3	3	3	3
Spurgeon Creek	233	404	404	404	404	404	404
Deschutes Study Area	**2,430**	**3,860**	**3,860**	**3,860**	**3,825**	**3,860**	**2,911**
— change from 2015	-	*1,430*	*1,430*	*1,430*	*1,395*	*1,430*	*481*
— percent change	-	*59%*	*59%*	*59%*	*57%*	*59%*	*20%*

Source: *Septic Systems: Estimates based on number of dwelling units and location. Soil Type: USDA Natural Resources Conservation Service, Thurston GeoData Center.*

When located near waterbodies, septic systems can exacerbate toxic algae blooms, low dissolved oxygen, and high fecal coliform counts that make swimming in those lakes and rivers a health risk. Non-porous soils (those with lots of clay), are of particular concern because nutrients and pathogenic organisms can move laterally into waterbodies more easily compared to porous soils (those with lots of sand), where they are more likely to seep deeper into the ground.

		Buildout					
	2015	Baseline	Education & Outreach	Restoration & Conservation	Zoning	Regulations & Monitoring	Rainier Treatment Plant
Total number of failing septic systems on non-porous soils near waterbodies							
Deschutes River (Lower)	6	11	9	11	11	3	11
Deschutes River (Middle)	26	67	55	67	46	21	67
Deschutes River (Upper)	7	48	39	48	46	15	48
Lake Lawrence	14	22	18	22	22	7	22
McIntosh Lake	9	10	8	10	10	3	10
Offut Lake	3	20	16	20	9	6	20
Reichel Lake	1	7	6	7	6	2	7
Spurgeon Creek	7	11	9	11	11	4	11
Deschutes Study Area	**73**	**196**	**160**	**196**	**161**	**61**	**196**
— change from 2015	-	*+123*	*+87*	*+123*	*+88*	*-12*	*+123*
— percent change	-	*+168%*	*+119%*	*+168%*	*+121%*	*-16%*	*+168%*
Septic failure rate	14%	14%	11%	14%	14%	4%	14%

Source: *Septic Systems: Estimates based on number of dwelling units and location. Soil Type: USDA Natural Resources Conservation Service, Thurston GeoData Center.*

4.5 Residential Water Consumption

Washington State declared extreme drought conditions for the Deschutes Watershed in 2015, and in August, 2016 the drought monitor registered abnormally dry to moderate drought conditions. Ensuring clean water supplies are adequate to support household and commercial needs while sustaining ecological systems and water flows in streams is a challenge currently — more so in the future.

		Buildout					
	2015	Baseline	Education, Outreach	Restoration, Conservation	Zoning	Regulations, Monitoring	Rainier Treatment Plant
Water used for residential purposes per day (thousands of gallons per day):							
Deschutes River (Lower)	92	220	130	220	218	220	220
Deschutes River (Middle)	933	1,848	1,029	1,848	1,747	1,848	1,950
Deschutes River (Upper)	49	263	131	263	255	263	263
Lake Lawrence	259	348	228	348	332	348	348
McIntosh Lake	71	108	59	108	102	108	108
Offut Lake	134	249	140	249	194	249	249
Reichel Lake	13	82	41	82	76	82	82
Spurgeon Creek	363	538	279	538	537	538	538
Deschutes Study Area	**1,915**	**3,656**	**2,037**	**3,656**	**3,460**	**3,656**	**3,758**
— change from 2015	-	1,741	122	1,741	1,545	1,741	1,843
— percent change	-	*91%*	*6%*	*91%*	*81%*	*91%*	*96%*

Note: *Water consumption is estimated at 630 gallons per day for exempt wells and Class B systems (systems that generally serve 2 to 14 units); 230 gallons per day for Class A rural systems, 260 gallons per day for Class A other systems, and 210 gallons per day for single family homes / 150 gallons per day for multifamily units for Class A systems in cities. Modest conservation estimates assume 315 gallons per day for exempt wells and Class B systems; 200 gallons per day for Class A rural systems, 230 gallons per day for Class A other systems, and 185 gallons per day for single family homes / 130 gallons per day for multifamily units for Class A systems in cities.*

Source: *Water Consumption Rates: Thurston Regional Planning Council, Sustainable Thurston Water Panel. Water System Boundaries: WA Dept. of Health.*

4.6 Landslide Hazards

Landslides are a natural part of the landscape in areas with steep slopes and abundant rainfall, but the frequency and magnitude of landslides can increase with removal of natural vegetation and road building. This can lead to channel widening, bank erosion, and shallower water depths, and contribute increased levels of fine sediments in the river system.

		Acres Vulnerable to Development					
	Total Acres 2011	Baseline	Education & Outreach	Restoration & Conservation	Zoning	Regulations & Monitoring	Rainier Treatment Plant
Forestlands with steep slopes near waterbodies:							
Deschutes River (Lower)	369	238	238	238	85	238	238
Deschutes River (Middle)	4,249	1,136	1,136	1,136	217	1,136	1,136
Deschutes River (Upper)	21,760	118	118	118	32	118	118
Lake Lawrence	1,055	14	14	14	0	14	14
McIntosh Lake	365	246	246	246	0	246	246
Offut Lake	3,810	50	50	50	27	50	50
Reichel Lake	69	63	63	63	28	63	63
Spurgeon Creek	369	238	238	238	85	238	238
Deschutes Study Area	**31,678**	**1,866**	**1,866**	**1,866**	**388**	**1,866**	**1,866**
— percent of total	-	*5.9%*	*5.9%*	*5.9%*	*1.2%*	*5.9%*	*5.9%*

Note: *The forest land inventory includes public and private timber lands, and other forest lands. "Public Timber Lands" are state timber lands (excluding forested lands on Joint Base Lewis McChord or in public parks). "Private Timber Lands" are lands that have been enrolled in the open space tax program as timber lands, or designated as forest lands by the Thurston County Assessor any time between 2000 and 2014, and have not been subsequently developed. "Other Forest Lands" are lands that are more than 40% forested and have 5 or more acres of forested land cover any time between 1991 and 2014 (thereby capturing lands that are in the forest harvest cycle), and are considered undeveloped or partially developed. "Vulnerable lands" are those that those lands that are not protected from residential development either through ownership (such as public forest lands) or zoning (such as resource zoning or low-density rural zoning (lot sizes 10 acres or greater). Vulnerable acres exclude critical areas and critical area buffers. Properties were included if greater than 10 percent of the tax parcel was steep (>40% slope).*

Source: *Steep Slopes: Thurston GeoData Center. Forest Lands: Thurston Regional Planning Council Farm and Forest Land Inventory.*

4.7 Farmlands Vulnerable to Development

Agricultural activities provide many ecosystem services and benefits beyond food, fiber, and fuel production. The preservation of open space and aesthetic landscapes, wildlife corridors and habitat for important species such as pollinators, protection of soils, climate change mitigation, and flood water storage are other ecosystem services that can be provided on actively farmed land.

		Acres of Farmland Vulnerable to Development					
	Acres of Farmland 2011	Baseline	Education & Outreach	Restoration & Conservation	Zoning	Regulations & Monitoring	Rainier Treatment Plant
Deschutes River (Lower)	399	88	88	88	20	88	88
Deschutes River (Middle)	4,715	2,501	2,501	2,501	989	2,501	2,501
Deschutes River (Upper)	21	0	0	0	0	0	0
Lake Lawrence	497	108	108	108	6	108	108
McIntosh Lake	126	20	20	20	0	20	20
Offut Lake	441	4	4	4	4	4	4
Reichel Lake	575	327	327	327	315	327	327
Spurgeon Creek	399	88	88	88	20	88	88
Deschutes Study Area	**6,774**	**3,048**	**3,048**	**3,048**	**1,333**	**3,048**	**3,048**
— percent of total	-	*45%*	*45%*	*45%*	*20%*	*45%*	*45%*

Note: *"Farmlands" include those lands classified as agriculture by the Thurston County Assessor, enrolled in the open space tax program (any time from 2000 forward) and meeting the definition of farm or agricultural lands, and not subsequently developed or changed to enrollment in the tax program as timber lands, or lands that have more than 15% and three acres of agricultural land cover (any time from 2000 forward) and are undeveloped or partially developed. "Vulnerable Lands" are those that those lands that are not protected from residential development either through ownership (such as land trusts) or zoning (such as resource zoning or low-density rural zoning (lot sizes 10 acres or greater). Vulnerable acres exclude critical areas and critical area buffers.*

Source: *Thurston Regional Planning Council Farm and Forest Land Inventory.*

4.8 Restoration

Restoring riparian (stream) shade is one of a number of actions to address water quality issues in the Deschutes River, where high temperatures in the summer are a concern for aquatic life.

		Buildout					
	2015	Baseline	Education, Outreach	Restoration, Conservation	Zoning	Regulations, Monitoring	Rainier Treatment Plant
Feet restored per year	1,564	1,500	2,000	3,000	1,500	1,500	1,500
Years to meet TMDL restoration goals	51	56	42	28	56	56	56

Note: *Estimates of feet restored by year based on restoration projects by the South Sound Salmon Enhancement Group, Thurston Conservation District, StreamTeam and the Capitol Land Trust between 2005 and 2015.*

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5. Scenario Comparison

The project team estimated the relative effectiveness of the scenarios using available data and indicators. Each scenario is ranked low (L), medium (M), or high (H) for the expected effectiveness of addressing the future concern. If the scenario is not expected to address the concern it was marked as not applicable (n/a).

Water Quality Concern	Education & Outreach	Restoration & Conservation	Zoning	Regulations & Monitoring
1. Groundwater Quality	M	L	L	H
2. Bacteria and Pathogens *from Septic Systems:*	M	n/a	L	H
from Agriculture:	M	M	n/a	n/a
3. Increased Nutrients and Algal Blooms	M	H	M	M
4. Water Levels During Drought Periods	M	n/a	L	L
5. Sediment and Erosion	L	H	L	n/a
6. Loss of Farmland	n/a	L	n/a	n/a
7. Stream Temperature	L	H	n/a	n/a

While there are no known groundwater problems currently within the Deschutes study area, future concerns about nitrates, fecal coliform, and other pathogenic organisms in the groundwater would be best addressed by mandatory septic system monitoring programs included in the Regulations and Monitoring scenario. Voluntary programs (Education and Outreach scenario) would have a slightly lower benefit. Lower housing densities (Zoning scenario) would reduce the number of new homes with septic systems on porous soils which would also have a small effect. Restoration throughout the watershed may treat more pollution sources before they reach groundwater.

The Regulations and Monitoring scenario would be most effective at addressing current and future concerns about fecal coliform and other pathogens from septic systems. The mandatory monitoring requirements in that scenario would result in about 500 fewer failed septic systems than under the voluntary programs included in the Education and Outreach scenario. The Zoning scenario would have only a small impact by reducing the number of new septic systems (Failing Septic Systems indicator).

Voluntary programs included in the Education and Outreach scenario are expected to have a moderate impact at addressing pathogens from agriculture. Likewise, riparian restoration (Restoration and Conservation scenario) would reduce the amount of pathogens entering surface water from runoff.

Concerns about nutrients, algal blooms and dissolved oxygen would be addressed best by riparian restoration and stormwater retrofits (Restoration and Conservation scenario). The remaining scenarios would have a moderate improvement: mandatory septic system monitoring combined with impervious surface limits (Regulation and Monitoring scenario), voluntary riparian restoration efforts and education on reducing household phosphate use (Education and Outreach scenario), and reduced impervious surfaces from new development (Zoning scenario). The Zoning scenario would address only the impacts of new development (Failing Septic Systems and Impervious Area indicators).

While the groundwater and surface hydrology in Thurston County is very complicated, educating homeowners about reducing water use in homes, on lawns and on gardens (Education and Outreach scenario) is expected to have a moderate impact on water levels in streams and rivers. Reducing housing densities (Zoning scenario) would have small benefits by reducing future water withdrawals (Water Consumption indicator). Requiring the installation of water meters (Regulation and Monitoring scenario) could make residents more aware of their water use, and may reduce water consumption slightly.

By reducing runoff and stabilizing stream banks, the riparian restoration and stormwater retrofit programs included in the Restoration and Conservation scenario are expected to have the greatest impact on reducing sediment and erosion along the Deschutes River. Education and Outreach efforts and Zoning Regulation changes are expected to have only a small effect: The former would encourage homeowners to voluntarily restore riparian habitat; the latter would reduce runoff from new impervious surface and reduce forest loss due to new development (Landslide Hazards, Impervious Area, Canopy Cover and Restoration indicators).

Many farmlands also have riparian habitat that is important for maintaining healthy streams. Conservation efforts (Restoration and Conservation scenario) could also result in the preservation of farmland through easements or fee simple purchases by conservation organizations (Farmland Vulnerable to Development indicator).

Restoring riparian habitat and increasing shade along stream and riverbanks (Restoration and Conservation scenario) are expected to be most effective in reducing stream temperature. Voluntary riparian restoration efforts — and to a lesser extent, outreach on water conservation — may have a small impact on increasing stream flows and reducing water temperatures (Restoration indicator).

While Thurston County and its partners have a wide range of management options available for improving water quality concerns in the Deschutes Watershed, the strategies that the County chooses to pursue will depend both on their effectiveness and the resources needed to implement them. This comparison is intended as a guide to inform that process.

6. Workgroup Analysis

At the Deschutes Watershed Land Use Analysis Workgroup's second meeting, on Jan. 29, 2016, members evaluated different management tools to address water quality; workgroup members provided feedback via small-group discussions, used sticky dots to indicate individual preferred approaches, and filled out an online survey to evaluate the management tools from different perspectives.

Project staff members used the feedback to draft initial land-use management scenarios for analysis. At the workgroup's third meeting, on March 25, 2016, project staff members presented four scenarios for the workgroup's consideration, along with indicators evaluating the effectiveness of the scenarios. The initial feedback showed that there was not universal support for a single management option. Rather, a combination of approaches would likely be necessary to improve water quality.

On June 30, 2016, project staff presented the revised scenarios and workgroup's recommended actions during a commmunity workshop. The goal of the workshop was to to gather further input from a larger audience of watershed residents and property owners.

Results, comments, suggestions and overall feedback from the workgroup meetings and the community workshop are summarized below:

6.1 Education & Outreach Scenario

This scenario assumes an increased investment in time and effort for outreach and education efforts by Thurston County staff members and other partners, all of which would require additional funding. Funding sources have not been identified. The goals are increased watershed stewardship, water conservation, and septic system maintenance.

Without action and increased funding, Thurston County, its partners, and other organizations would continue education and outreach efforts at current levels.

Watershed Stewardship

ACTION 1: Increase investment in time and funding for education and outreach on watershed issues. Encourage residents to be good stewards of the watershed and use best management practices for protecting water quality.

Ideas and suggestions:

- *Education and outreach applies to other programs and should be a component of any county action to improve water quality*
- *Target outreach and education efforts to specific groups. Use messages and technologies for the audience*
- *Collaborate with community organizations, schools, and nonprofits to lead planting sessions and habitat restoration activity tours or work parties, and to reach a wider audience*
- *Find creative ways to engage the community in improving water quality, such as a watershed education art contest, a fun watershed quiz, social media, citizen science, or a watershed recreation map.*
- *Create a map of voluntary actions to track and give credit for watershed stewardship efforts and create more incentive for others to be watershed stewards*
- *Use the state Department of Ecology's Environmental Incident Report (ERTS) online system for reporting watershed issues or create a community reporting hotline to report issues*

Conservation Plans

ACTION 2: Work with the Conservation District to increase the number of conservation plans.

Ideas and suggestions:

- *Quantify the benefits farms provide to the community, including local food sales, jobs, farmland preservation, and open space*
- *Use online tools, rather than print, to reduce costs*

Septic Inspections

ACTION 3: Expand septic system operation and maintenance education and outreach program.

Ideas and suggestions:

- *Use the recommendations from Thurston County's proposed On-Site Sewage System Management Plan for increased education and outreach to septic owners*

Water Conservation

ACTION 4: Increase water conservation outreach and education, as well as incentives during drought years.

ACTION 5: Encourage short-term leasing and donations of water rights.

Ideas and suggestions:

- *Determine the region's resource-based "carrying capacity" for maximum population given various per capita water consumption rates*
- *Landowners need incentives and options to be able to stop use of their water rights without losing them. Would benefit the landowners as well as in-stream flows for wildlife and water quantity during periods of drought if landowners donated their water rights temporarily at that time.*

6.2 Restoration & Conservation Scenario

This scenario assumes a major increase in funding for restoration and conservation. The goals are restoring habitat near wetlands, streams, and the Deschutes River, and conserving habitat throughout the basin.

Without action and increased funding, the restoration and conservation efforts of Thurston County, its partners, and other organizations would continue at existing levels. Over each of the past 10 years, conservation groups in Thurston County have restored about 1,600 feet of fish and wildlife habitat and riparian area along the streams and river.

Restoration

ACTION 6: Increase funding and incentives for habitat and riparian restoration.

Ideas and suggestions:

- *Create a list and map of restoration areas based on identified priorities. Include the cost of restoration for prioritization. Invest in restoration projects that are well-engineered*
- *Funds should leverage and implement existing agreed-upon priorities. This would build upon and fund past stakeholder involvement and efforts that identified priority areas.*
- *Provide tax incentives or other financial incentives for landowners to restore habitat and riparian areas on private property*
- *Communicate economic benefits of ecotourism and agritourism to leverage investments in restoration and conservation. Inventory and map Eco/Agritourism and/or business development on tourism and outdoor recreation to show extent*

ACTION 7: Assess opportunities for and implement stormwater retrofit projects.

Ideas and suggestions:

- *Focus on County roads and projects*
- *Develop better standards for roads; retrofit existing roads and properties*
- *Reevaluate how stormwater is dealt with*
- *Find ways to address sediment issues from logging roads*

Conservation

ACTION 8: Thurston County increases the efficacy of the Purchase of Development Rights (PDR) and Transfer of Development Rights (TDR) programs and opens them up to include more than agricultural lands. Additional funding for acquisition of lands through PDR/TDR and other programs.

Ideas and suggestions:

- *Find ways to increase the functionality of the PDR/TDR program*
- *Current demand for Conservation Futures funding is higher than available funds. Increase Conservation Futures funding to better meet the need*
- *Survey local market and interest for PDR/TDR*

ACTION 9: Identify and prioritize the preservation of areas contiguous with existing conservation areas to maximize the benefit to habitat.

Ideas and suggestions:

- *Work with land trusts to identify wildlife corridor funding and build upon existing conservation areas, connect wildlife corridors and open spaces near the river, and invest in areas that provide multiple benefits for recreation, wildlife habitat, and water quality*
- *Improve wildlife crossing signs and increase ed. & outreach for allowing wildlife movement*
- *Conservation of properties with high ecological and social value need to be a high priority*
- *Support the Conservation Futures program to maintain funding for conservation projects*

6.3 Zoning Regulations Scenario

In this scenario, Thurston County changes zoning regulations to reduce the number of new homes in sensitive areas. New development is associated with increased pollution from runoff, tree clearing, and water withdrawals. Under existing zoning, the Deschutes Study area could see up to 3,600 new homes — an 84% increase from 2015. The goal of this scenario is to reduce the impacts of new homes.

Bacteria and Pathogens in Surface Water

ACTION 10: Rezone parcels currently zoned Rural Residential Resource (RRR) one dwelling unit per five acres (1/5) to Rural (R) one unit per 20 acres (1/20) in areas with nonporous soils near waterbodies.

Sediment and Erosion

ACTION 11: Rezone parcels currently zoned RRR 1/5 to R 1/20 in areas with steep slopes near waterbodies.

Nutrients and Algae Blooms

ACTION 12: Rezone parcels currently zoned RRR 1/5 to R 1/20 in Lake Lawrence, McIntosh and Offut Lake basins.

Salmon Habitat

ACTION 13: Downzone areas near cold-water thermal refugia.

Ideas and suggestions:

- *Consider the equity issues of downzoning some properties but not others. Balance downzoning of sensitive areas with upzoning in other areas of the watershed*
- *Exemptions to zoning regulations are also an issue. Limit and enforce exemptions to zoning densities and create a map to show the rate and prevalence of exemptions and non-compliance*
- *Rezone to 1/10 units in more areas and 1/5 should be a minimum density*

- *Need a "strategic deployment" of zoning that is property-specific. Use zoning as a last resort. There will likely be opposition by property owners to down-zoning*
- *Preserves rural character and benefits water quality, wildlife, and the environment. May also result in less incentive to develop farmland*
- *Not an effective means of solving water quality issues. The Critical Areas Ordinance already protects many sensitive areas and changes to zoning won't provide additional benefits*
- *Use zoning to protect cold-water refugia and other important habitat areas for fish. Consider rezoning thermal refugia along Silver Spring and other priority areas*
- *The workgroup disagreed on whether lowering zoning densities affects property values*

6.4 Development Regulations and Monitoring Scenario

In this scenario, Thurston County changes development regulations and implements mandatory monitoring programs so as to reduce the impacts of future development on water quality.

Under current regulations, the Deschutes Study Area could see an additional 1,400 acres of impervious surfaces, 3% loss in forest cover, and 3,100 new homes on septic systems.

Impervious Surface Limits

ACTION 14: Reduce limits for parcels in Lake Lawrence, McIntosh Lake and Offut Lake basins currently zoned RRR 1/5, reduce impervious surface limits to:

- 5% for lots larger than 5 acres,
- 60% or 10,000 square feet (whichever is less) for parcels smaller than 5 acres

ACTION 15: For remaining parcels reduce limits to that typical of new developments (10% for lots 2.5+ acres and 60% for lots less than 2.5 acres).

Ideas and suggestions:

- *60% impervious surface limit is too high*
- *It's more important for the property owners to mitigate the stormwater impacts*
- *Would have water quality benefits and improve wildlife habitat, as well as better aesthetics*
- *Changing impervious surface limits would be more politically feasible than lowering zoning densities*

Septic Inspection

ACTION 16: Implement a mandatory septic system operation and maintenance program.

Ideas and suggestions:

- *Cost is a barrier to maintaining and repairing septic systems. There should be grants or rebates for low-income households. More loans, incentives, and funding for inspections and enforcement are needed. Explore new public-private partnerships to deal with costs*

- *The workgroup disagreed on whether voluntary septic inspection programs alone are sufficient to improve and protect water quality*
- *Be strategic about where to implement the program. Focus on sensitive basins and priority areas*
- *This program is a good solution—it's reasonable and would have a minimal impact on property owners while improving water quality*
- *Use the recommendations from Thurston County's proposed On-Site Sewage System Management Plan for a mandatory septic inspection program. The proposed program recommends a single flat fee to all OSS owners for the funding necessary to implement a septic system operations and maintenance program (similar to the program in the Henderson Watershed Protection Area)*

Water Use Monitoring

ACTION 17: Require water meters be installed for all new surface and groundwater uses in the Deschutes watershed, including permit exempt wells.

Ideas and suggestions:

- *Usage would need to be reported if it is to help fill data gaps on water usage and the effects of groundwater withdrawals in the watershed*
- *The workgroup disagreed on whether monitoring well water usage would affect water quantity and quality*

Water Quality Monitoring

ACTION 18: Increased water quality monitoring in Offut and McIntosh Lakes.

6.5 Other Management Options

Workgroup members also evaluated the management options below, which did not fit with any particular scenario.

Rainier Wastewater Treatment Plant

The City of Rainier includes more than 700 homes, all of which are connected to septic systems. If Rainier were to construct a wastewater treatment plant, it would significantly reduce the risk of groundwater contamination by nitrates and fecal coliform bacteria. While the workgroup opted against making a recommendation regarding a wastewater treatment plant, Rainier's city planner requested that this scenario be modeled for informational purposes.

ACTION 19: The City of Rainier installs a wastewater treatment plant

Ideas and suggestions:

- *Could be very costly and have a negative impact on water quality and other environmental impacts from increased development (impacts rural character)*
- *Negative impacts of growth could be offset by the overall high benefits of a wastewater treatment plant for water quality*
- *This is a Rainier-specific issue, not an issue for this workgroup*

Other Actions

The workgroup also considered other actions, which did not receive enough support to go forward in the process, including:

- Write a letter to State agencies and decision-makers regarding forest practices. The result of which could be reduced landslides and sedimentation originating from forestland and logging activities in the upper Deschutes watershed.
    - The workgroup’s consensus was that it didn't have adequate information about forest impacts on water quality to write a letter to the State, per one workgroup member's suggestion.

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7. Workgroup Recommendations

At the workgroup's fourth meeting, on June 2, 2016, project staff asked the workgroup to indicate its collective level of support for each action. The workgroup's support was recorded as either "All," "Split," or "None". The recommended actions for each scenario were revised based on input from the workgroup, feedback from the public at the community workshop on June 30, 2016, and staff team research on the feasibility of each action (see Action Feasibility Table on pages 46-47).

Action Feasibility

Action 1. Staff from Thurston County's Water Resources Program estimated that increasing investment in time and funding for education and outreach on watershed issues would require a relatively high level of ongoing effort to implement and would include workshops, classroom presentations, class field trips, Stream Team projects, and development of specific topic-focused outreach materials. To implement this action, an additional full-time employee would be needed. The total cost estimate for increasing investment in time and funding for education and outreach on watershed issues would be approximately $100,500 per year.

Action 2. The estimate for increasing the number of conservation plans was determined by data from the Thurston Conservation District on funding, effort and time of current projects. The Conservation District has developed 16 conservation plans in eight years (2007-2015) in the Deschutes watershed – approximately two plans per year. The total cost of accelerating this level, on average, is approximately $80,000 per year, with the addition of a full-time Conservation District employee. It is estimated that increasing the number of conservation plans developed would require a relatively high level of ongoing education and outreach effort from the Conservation District and other partners.

Action 3. The estimate for expanding a voluntary septic system operation and maintenance program was derived from information on the Henderson watershed protection area septic operation and maintenance program's 5-year review. The total average yearly cost was estimated by combining the voluntary aspects of the Henderson program, including the owner training program, landowner rebates, small grants and financial assistance for landowners to maintain or repair their systems. This estimate for the Henderson watershed was adjusted for the number of septic systems for the Deschutes watershed. The total annual cost for creating a voluntary septic system operation and maintenance program in the Deschutes watershed was estimated to be approximately $43,000 per year with a relatively high level of ongoing education and outreach effort from Thurston County and other partners.

Action 4. Increasing water conservation education and outreach was estimated to require a relatively high level of ongoing effort by Thurston County and other partners. The design, promotion, and implementation of workshops and classroom presentations, and the development of specific topic-focused outreach materials was estimated to cost approximately $10,500.

Action 5. Education and outreach efforts specifically for encouraging water rights donations and short-term leases to conserve water during drought periods could be included in the water conservation education and outreach program, and would cost approximately $3,000 for workshops and outreach materials.

Action 6. The estimate for increasing funding and incentives for restoration was based on data from restoration efforts that have occurred in the past 10 years (2005-2015) by the South Sound Salmon Enhancement Group, Thurston Conservation District, the Thurston County Stream Team, and Capitol Land Trust. This is a low estimate of the cost, effort, and time for this action because many other restoration projects may not be well documented or reported, and it is based primarily on volunteer riparian revegetation projects, which does not include the much higher cost of engineered restoration projects, such as large woody debris placement and bank stabilization. The estimated cost to increase riparian restoration efforts is $123,000 per year, which includes a relatively high level of long-term effort by Thurston County, the Conservation District and other partners, including one full-time employee, printed materials, website, mailers, neighborhood outreach, planting materials, and other costs. The goal

for this level of effort would be to double the rate of riparian restoration to 3,000 feet per year; at this rate, it would take approximately 28 years to reach the shade targets set in the Department of Ecology's Water Quality Improvement Report and Implementation Plan for the Deschutes watershed.

Action 7. Staff from the Thurston County Water Resources Program estimated the cost of assessing opportunities for and implementing stormwater retrofit projects to be approximately $250,000 per year for the studies and retrofits. The amount of effort, primarily by Thurston County staff, for this action is estimated to be relatively high and ongoing for approximately 20 years.

Action 8. To include more lands and more funding in the Transfer of Development Rights and Purchase of Development Rights programs Thurston County staff estimated that approximately $13,000 would be needed with a relatively low level of short-term effort for one Thurston County employee to work approximately 280 hours on updating the development rules and regulations for the programs. The funding for the subsequent development rights transactions would primarily come from developers and the "buyers" of the credits. Additional funding would need to be identified to purchase development rights.

Action 9. To prioritize the preservation of areas contiguous with existing conservation areas. Thurston County staff estimated that approximately $12,000 would be needed to fund one Thurston County employee to work approximately 260 hours to gather data on current conservation areas and develop a report for potential conservation projects near those areas. This would constitute a relatively low level of short-term effort.

Actions 10, 11, 12, and 13. Thurston County staff estimated zoning changes would require approximately $18,800 and a medium level of short-term effort for one Thurston County employee to work approximately 400 hours. All of the zoning regulations scenario actions received a split level of support from the workgroup, however action 12 to rezone parcels currently zoned Rural Residential Resource (RRR) one dwelling unit per five acres (1/5) to Rural (R) one unit per 20 acres (1/20) received support from all but one member of the workgroup.

Actions 14 and 15. To reduce impervious surface limits Thurston County staff estimated that approximately $13,000 would be needed with a low level of short-term effort for one employee to work approximately 280 hours on changing the development codes and regulations. Thurston County is currently (2016) in the process of updating the Low-Impact Development (LID) codes, which includes similar impervious surface limits to that proposed in action 15.

Action 16. The estimated feasibility of implementing a mandatory septic system operation and maintenance program was derived from the Henderson watershed protection area septic operation and maintenance program's 5-year review. The total average yearly cost for the Henderson watershed program was adjusted for the number of septic systems in the Deschutes watershed. The total annual cost for a septic system operation and maintenance program in the Deschutes watershed was estimated to be approximately $234,000 with a relatively high-level of ongoing effort. The Henderson watershed program was found to require one half-time staff person dedicated to compliance activities and additional employee time for a staff-intensive owner/inspector training and certification program, as well as funding for rebates, financial assistance, and small grants to help low-income owners with the cost of inspections, maintenance, and repairs. Although the workgroup did not unanimously support this action, there was strong support from a majority of members.

Action 17. Thurston County staff estimated that requiring water meters to be installed for all new surface and groundwater uses would require a relatively low level of short-term effort. The total cost to purchase basic meters would be approximately $10,000 per year (at approximately $40 per meter), based on the average of 246 new homes per year built in the county between 2008 and 2015.

Action 18. Thurston County staff estimated that water quality monitoring for Offut and McIntosh lakes would cost approximately $4,500 per lake per year for monthly sampling from May through October, similar to Thurston County's other ambient lake sampling programs. The level of effort for water quality monitoring in these two lakes was estimated to be relatively low and the time frame would be short to implement an ongoing program.

Final Recommendations

At the stakeholder workgroup's fifth and final meeting on September 2, 2016, the group reviewed the alternative land use management options that were developed throughout this process, as well as the estimates on cost, time, effort, and feasibility of each action. The workgroup came to final management action recommendations and prioritizations for the actions that had received support from all members of the group at the previous meeting. Each group member was able to identify up to four preferred actions as their highest priority out of all the recommended actions that received unanimous support from the workgroup. These results were aggregated into three priority tiers.

High Priority: Actions 2, 3, 4, and 6.

Middle Priority: Actions 1, 7, and 8.

Lower Priority: Actions 5, 9, 14, 15, and 18

High Priority Actions

Action 3 to expand the county septic system operation and maintenance program under the Education and Outreach Scenario received the highest level of support and prioritization from the workgroup.

Action 6 to increase funding and incentives for restoration received the second highest level of support for prioritization from the workgroup.

Action 4 to increase water conservation-specific education and outreach efforts received the third highest level of support for prioritization from the workgroup.

Action 2 to increase the number of Conservation Plans with the Conservation District received the fourth highest level of support for prioritization from the workgroup.

Action Feasibility Table

SCENARIO & CATEGORY		WORKGROUP PRIORITY	WORKGROUP SUPPORT	COST ESTIMATE	FUNDING	EFFORT	LEAD	TIME
EDUCATION & OUTREACH	**Watershed Stewardship**							
	ACTION 1: Increase investment in time and funding	Mid	ALL	$100,500	Grants, Partnerships	H	TC, TCD, other partners	Short / Ongoing
	Conservation Plans							
	ACTION 2: Work with Thurston Conservation District to increase the number of conservation plans	High	ALL	$80,000	Grants, Partnerships	H	TC, TCD, other partners	Short / Ongoing
	Septic Inspections							
	ACTION 3: Expand septic system operation & maintenance program	High	ALL	$43,000	TC, Grants, Partnerships	H	TC, other partners	Short / Ongoing
	Water Conservation							
	ACTION 4: Increase water conservation education & outreach and incentives	High	ALL	$10,500	TC, Grants, Partnerships	H	TC, other partners	Short / Ongoing
	ACTION 5: Encourage temporary water rights donations or short-term leases to conserve water during drought periods	Low	ALL	$3,000	TC, Grants, Partnerships	M	TC, other partners	Short / Ongoing
RESTORATION & CONSERVATION	**Restoration**							
	ACTION 6: Increase funding and incentives for restoration	High	ALL	$123,000	CF, Grants, Partnerships	H	TC, TCD, other partners	Long / Ongoing
	ACTION 7: Assess opportunities for and implement stormwater retrofit projects	Mid	ALL	$250,000	TC, Grants, Partnerships	H	TC, other partners	Med-Long
	Conservation							
	ACTION 8: Include more lands in the Purchase of Development Rights and Transfer of Development Rights programs	Mid	ALL	$13,000	PDR/TDR, CF, Grants, Partnerships	L	TC, TCD, other partners	Short
	ACTION 9: Prioritize the preservation of areas contiguous with existing conservation areas to maximize the benefit to habitat	Low	ALL	$12,500	CF, Grants, Partnerships	L	TC, TCD, other partners	Short

LEGEND: CF = Conservation Futures
TC = Thurston County
TRPC = Thurston Regional Planning Council
PDR/TDR = Purchase of Development Rights/Transfer of Development Rights
TCD = Thurston Conservation District

	SCENARIO & CATEGORY	WORKGROUP PRIORITY	WORKGROUP SUPPORT	COST ESTIMATE	FUNDING	EFFORT	LEAD	TIME
ZONING REGULATIONS	**Bacteria & Pathogens in Surface Water**							
	ACTION 10: Rezone parcels currently zoned RRR 1/5 to R 1/20 in areas with nonporous soils near waterbodies	N/A	SPLIT	$18,800	TC	L	TC	Short
	Sediment & Erosion							
	ACTION 11: Rezone parcels currently zoned RRR 1/5 to R 1/20 in areas with steep slopes near waterbodies	N/A	SPLIT	$18,800	TC	L	TC	Short
	Nutrients & Algae Blooms							
	ACTION 12: Rezone parcels currently zoned RRR 1/5 to R 1/20 in Lake Lawrence, McIntosh and Offut Lake basins	N/A	SPLIT	$18,800	TC	L	TC	Short
	Salmon Habitat							
	ACTION 13: Downzone areas near cold-water thermal refugia	N/A	SPLIT	$18,800	TC	L	TC, other partners to ID areas	Short
DEVELOPMENT REGULATIONS AND MONITORING	***Impervious Surface Limits***							
	ACTION 14: Reduce limits for parcels in Lake Lawrence, McIntosh Lake and Offut Lake basins currently zoned RRR 1/5	Low	ALL	$13,000	TC, TRPC, Other Partners	L	TC	Short
	ACTION 15: For remaining parcels, reduce limits to that typical of new developments (10% for lots 2.5+ acres and 60% for lots less than 2.5 acres	Low	ALL	$13,000	TC, TRPC, Other Partners	L	TC	Short
	Septic Inspection							
	ACTION 16: Implement a mandatory septic system operation and maintenance program	N/A	SPLIT	$234,000	TC, Grants, Other Partners	H	TC	Medium / Ongoing
	Water Use Monitoring							
	ACTION 17: Require water meters be installed for all new surface and groundwater uses, including permit exempt wells	N/A	SPLIT	$10,000	TC, Other Partners	L	TC	Short / Ongoing
	Water Quality Monitoring							
	ACTION 18: Increased water quality monitoring in Offut and McIntosh lakes	Low	ALL	$9,000	TC, Other Partners	L	TC, Lake Districts	Short / Ongoing

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