



Thurston County

# **CURRENT AND FUTURE BASIN CONDITION ASSESSMENT**

July 2025

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# INTRODUCTION

In 2011, Thurston County received Environmental Protection Agency (EPA) funding to develop science-based guidance for watershed management. This project, the *Guiding Growth—Health Watersheds* planning project, was completed in collaboration with Thurston Regional Planning Council (TRPC). Working with project stakeholders, TRPC developed a methodology for assessing a basin’s overall health, taking into consideration land cover factors, water quality, and biological indicators. Basins were categorized into five groups:

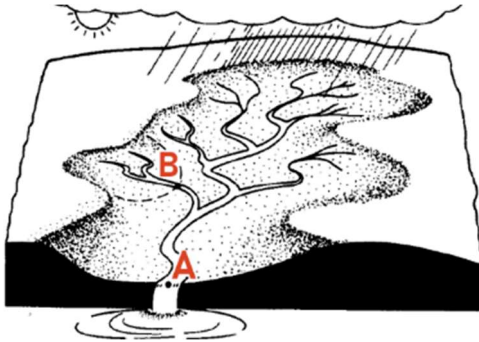
- **Intact** — Intact basins have little to no impervious surfaces, a nearly complete forest canopy, and vegetated riparian corridors. Water bodies are in excellent condition.
- **Sensitive** — Sensitive basins have minimal impervious area, considerable forest cover, and riparian corridors with few breaks in protective buffer. Water bodies are in good condition.
- **Impacted** — Impacted basins are moderately urbanized, with some remaining forest cover. Riparian corridors are cleared in many places and water quality is fair.
- **Degraded** — Degraded basins are urbanized with limited remaining forest canopy or vegetated riparian areas. Water quality is poor, with multiple impairments.
- **Very Degraded** — Highly degraded stream basins generally have poor water quality and support a low diversity of aquatic species.

In addition, TRPC refined its population and employment forecasting models to show which basins are most at risk of degradation due to future development. This included the development of a module to project future impervious surfaces and forest cover based on land use assumptions and development regulations.

The basin condition assessment is intended to be a resource for policymakers. It is a tool to inform appropriate zoning and development regulations in basins and identify areas most at risk of degradation due to development, the areas with the greatest potential for restoration, and areas best suited for conservation.

# THURSTON COUNTY WATERSHEDS AND BASINS

Thurston County's land area can be divided up into watersheds and basins based on how surface water collects and drains into streams and other water bodies. In general, a watershed can be described as the area draining to Point A in Figure 1. A basin is a smaller area and can generally be described as the area draining to Point B in Figure 1. Usually, many basins are located within a watershed.



**Figure 1: Delineation of a Watershed Boundary**

Source: Michigan State University Engineering Dept.

Thurston County contains parts of three major river systems or watersheds: the Deschutes, Nisqually, and Chehalis rivers. Both the Deschutes and Nisqually rivers flow into the Puget Sound, and therefore their watersheds are part of the larger Puget Sound drainage system. Along the shores of the Puget Sound are smaller drainage areas that are usually identified by their inlets. These include Totten, Eld, Budd, and Henderson inlets, and the Nisqually Reach. These areas include many smaller streams that discharge directly into the Puget Sound.

The other major river system — the Chehalis River — drains into the Pacific Ocean. This broader system encompasses the Black River, Skookumchuck, West Capitol Forest, and Chehalis watersheds. For basin boundaries and watershed terminology used in this report, please refer to Map 1.

## BASIN CONDITION METHODOLOGY

TRPC, working with local jurisdictions and other interested parties, developed a rating system for local river, stream, and lake basins in Thurston County. The rating system was developed as part of the *Guiding Growth–Healthy Watersheds* planning project, completed in 2015. The project was an EPA-funded collaboration between Thurston County and TRPC to develop strategies for managing growth in Thurston County while protecting water quality and preventing the degradation of water resources.

The basin condition rating system is shown in Table 1. It uses a variety of factors that affect stream health. This update excludes two factors used in the original basin current condition assessment: the Thurston County’s water quality ranking and the benthic index of biotic integrity (B-IBI). Both were omitted due to the lack of consistent, long-term data across Thurston County’s watersheds.

For more information on how the rating system was developed, see *Basin Evaluation and Management Strategies of Thurston County (April 2013)*<sup>1</sup>.

The following data sources were used in the analysis.

- Impervious Area (2001–2021): National Land Cover Dataset (NLCD).
- Impervious Area (2045, Buildout): Thurston Regional Planning Council
- Forest Land Cover (2001–2021): NOAA Coastal Change Analysis Program (C-CAP) land cover classes 9, 10, 11, 13, and 16.
- Forest Land Cover (2045, Buildout): Thurston Regional Planning Council
- Intact Riparian Land Cover: Percent of land cover within a 250-foot buffer (each side) of a stream. Streams include the Thurston County hydrology layer and the Wild Fish Conservancy stream inventory. Intact land covers include C-CAP land cover classes 9, 10, 11, 12, 13, 14, 15, 16, 17, and 18.


Waterbodies were excluded from the total area when calculating percents (C-CAP land cover classes 19, 21, 22, and 23).

Each category was assigned a score from one to five – with one scoring “intact” and five scoring “very degraded” (Table 1). Basins in Thurston County were assigned a “current conditions” ranking for 2001, 2006, 2011, 2016, and 2021 based on the average score across the three criteria, using the ranges shown in Table 2.

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<sup>1</sup> <https://www.trpc.org/DocumentCenter/View/86>

**Table 1: Basin Condition Criteria**

Basin Condition		Percent Impervious Land Cover	Percent Forest Land Cover	Percent Intact Riparian Land Cover	Criteria Score
Intact		< 2%	> 80%	> 90%	1
Sensitive		2%–10%	65%–80%	75%–90%	2
Impacted		10%–25%	45%–65%	60%–75%	3
Degraded		25%–40%	30%–45%	30%–60%	4
Highly Degraded		> 40%	< 30%	< 30%	5

**Table 2: Basin Current Condition Scoring**

Overall Basin Condition	Average Score of Three Criteria
Intact	1
Sensitive	Greater than 1 to 2.5
Impacted	2.5 to 3.5
Degraded	3.5 to 4.0
Very Degraded	Greater than 4.0

TRPC developed a future basin condition based on projections of impervious cover and forest cover. These projections use estimates of developable land and future residential densities from TRPC’s land capacity model. Projections were developed for two future scenarios: the year 2045 and “buildout,” a theoretical condition in which all land is fully developed to the extent allowed under current zoning. The future basin conditions assume no change in the basin’s riparian land cover.

The methodology used for projecting future impervious land cover and forest cover is described in Appendix I.

# CURRENT AND FUTURE BASIN CONDITIONS

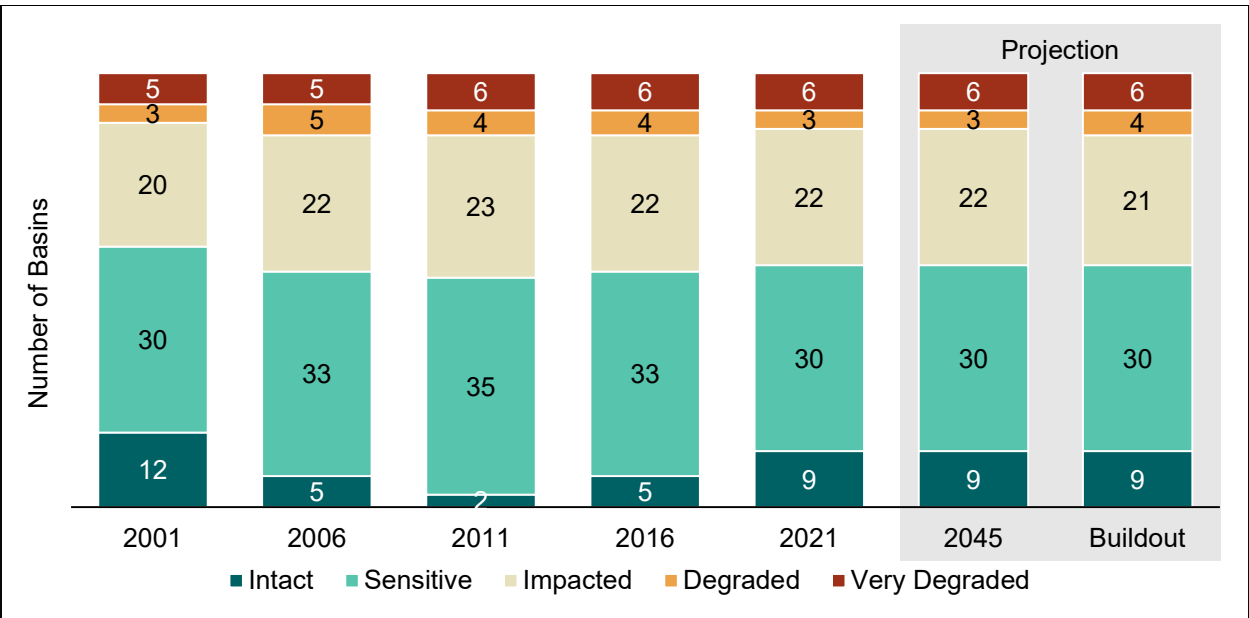
The current basin condition assessment shows an overall decrease in basin health between 2001 and 2021. The number of intact or sensitive basins decreased from 42 in 2001 to 39 in 2021, while the number of degraded or very degraded basins increased from eight to nine. While some basins' condition degraded due to forestry activities — which tend to be cyclical in nature — others degraded due to urbanization.

By 2045, countywide impervious area is expected to increase by 4,200 acres and forest cover is projected to decrease by 2,000 acres. Buildout conditions could see up to 7,800 acres of impervious surfaces and 3,900 fewer acres of forest cover countywide. However, only one basin — Thomson Creek (Nisqually) — is projected to have a change in basin condition (from impacted to degraded).

A basin's future condition is based solely on the projected impacts of future residential and commercial/industrial development. It does not consider the potential for future restoration and conservation efforts.

Maps 2 through 8 show 2001, 2006, 2011, 2016, and 2021 basin conditions as well as projections for 2045 and buildout conditions.

**Figure 2: Number of Basins by Basin Condition**



## High-Resolution Change Detection

The Washington Department of Fish and Wildlife (WDFW) maintains a GIS database of areas with land cover change. The database — part of the High-Resolution Change Detection (HRCD) project — uses 1 meter-resolution aerial imagery to identify change areas. For each area, a “change agent” is identified. Eight different change agents are identified, including natural and nonnatural causes.

Between 2011 and 2021, 8.6 percent of Thurston County experienced a land cover change. Forestry was the largest change agent (6.4 percent). Development and tree removal were the next largest (0.6 and 0.5 percent, respectively). Tree removal often precedes development. Other change agents accounted for 0.1 percent change. Appendix III includes a summary of the four most common change agents for each basin.

The causes of land cover change could be an indicator of future basin condition. Basins where the land cover change is due to forestry activities could improve as forests are replanted and regrow. This is most likely in basins where the condition changed from intact to sensitive. Tree removal and development, however, are likely to cause permanent land cover change. Improving conditions in these basins — notably basins that changed from impacted to degraded — will require restoration work.

**Table 3: Cause of Land Cover Change (2011-2021) by Water Resource Inventory Area (WRIA)**

WRIA	WRIA Name	Forestry	Develop- ment	Tree removal	Natural	No Change
11	Nisqually	3.5%	0.4%	1.4%	0.1%	94.6%
13	Deschutes	4.6%	1.3%	1.5%	0.1%	92.4%
14	Kennedy - Goldsborough	4.9%	0.2%	1.2%	0.1%	93.6%
22	Lower Chehalis	12.0%	0.0%	0.1%	0.0%	87.8%
23	Upper Chehalis	8.9%	0.2%	1.5%	0.2%	89.1%
—	<b>Thurston County</b>	<b>6.4%</b>	<b>0.6%</b>	<b>1.5%</b>	<b>0.1%</b>	<b>91.4%</b>

## Water Quality Index

The basin condition evaluation in this report uses land cover metrics as a surrogate for the health of waterbodies in Thurston County. This methodology is useful when water sampling data is limited or when projections of future basin conditions are needed.

The 2021 basin condition ratings evaluated in this report were compared to the Water Quality Index (WQI) score for 31 water sampling sites included in the Thurston County Water Resources Monitoring Report (2019–2021 Water Year)<sup>2</sup>. The Water Resources Monitoring Report is a joint report issued by Thurston County Environmental Health and Thurston County Stormwater Utility in cooperation with the cities of Olympia, Lacey, and Tumwater. The WQI combines seven measures of water quality into an index ranging from 1 to 100:

1. Dissolved Oxygen
2. pH
3. Temperature
4. Fecal Coliform Bacteria
5. Nitrogen
6. Phosphorus
7. Turbidity

The first four measures are tied to water quality standards for protecting aquatic life use and contact recreation. The other three measures do not have numeric standards, although they are related to general ecosystem function. A WQI of 39 or less indicates high concern for impairment, 40 to 79 indicates moderate concern for impairment, and 80 or above indicates low concern for impairment.

The basin boundaries used in this report (Map 1) do not always align with the areas upstream of the sampling sites in the Water Resources Monitoring Report. For the 17 sites where the basins used in this report are a close approximation of the area upstream of the sampling site, six sites had a similar condition, seven sites had a basin condition worse than the WQI, and four sites had a basin condition better than the WQI (Table 4).

A number of factors could explain these discrepancies:

- **Prairie land covers** — Prairie land cover is a common natural habitat in Thurston County. Because they have less forest cover, they are likely to rank lower in the basin condition rating than the seven WQI measure would indicate. Examples: Thompson Creek, Scatter Creek.
- **Agricultural activities** — Basins with significant agricultural activities tend to have low impervious surface coverages, similar to a healthy basin. While this

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<sup>2</sup> Thurston County Water Resources Monitoring Report 2019-2021 Water Years (<https://s3.us-west-2.amazonaws.com/thurstoncountywa.gov.if-us-west-2/s3fs-public/2023-02/2019-2021%20Stream%20Report.pdf>)

might lead to a higher basin condition rating, it does not capture degradation due to nutrient runoff (nitrogen and phosphorous) and fecal coliform bacteria.

Example: Reichel Lake.

- **Stormwater** — The basin condition rating does not account for efforts to manage and treat stormwater in urbanized basins. Examples: Indian Creek, Woodland Creek.

It is important to note that both the WQI and basin condition assessment use a few combined metrics — just three for the basin condition assessment and seven for the WQI — to assess the overall health of a basin. While this is helpful for broad planning purposes, local knowledge of basin conditions is important as other criteria could be influencing basin health.

**Table 4: Comparison of Basin Condition to 2020-2021 Water Quality Index (2019–2021 Thurston County Water Resources Monitoring Report)**

Waterbody	Sampling Location	WQI	Concern for Impairment	2021 Basin Condition	Fit
<b><u>Black River</u></b>					
Beaver Creek	Littlerock Road	85	Low	Impacted	Yes
Black River	128th Ave	46	Moderate	Impacted	No
Black River	Moon Road	79	Moderate	Impacted	No
Blooms Ditch	110th Ave	79	Moderate	Sensitive	Yes
Salmon Creek	Littlerock Road	42	Moderate	Impacted	Yes
<b><u>Budd Inlet</u></b>					
Black Lake Ditch	RW Johnson Road	43	Moderate	Impacted	No
Indian Creek	Quince Ave	74	Moderate	Very Degraded	Yes
Percival Creek	Percival Cove	66	Moderate	Very Degraded	No
<b><u>Chehalis River</u></b>					
Chehalis River	Independence Road	74	Moderate	Impacted	No
Prairie Creek	Old Highway 9	83	Low	Impacted	No
Scatter Creek	Gibson Road	81	Low	Impacted	No
Scatter Creek	James Road	90	Low	Impacted	Yes
Skookumchuck River	SR 507	73	Moderate	Impacted	Yes
<b><u>Deschutes River</u></b>					
Chambers	58th Ave	86	Low	Very Degraded	Yes
Deschutes River	Capitol Boulevard	94	Low	Impacted	No
Deschutes River	Vail Cutoff Road	84	Low	Sensitive	No
Deschutes River	Waldrick Road	78	Moderate	Sensitive	No
Reichel Creek	Vail Loop Road	37	High	Sensitive	Yes
Spurgeon Creek	Rich Road	66	Moderate	Sensitive	Yes

Waterbody	Sampling Location	WQI	Concern for Impairment	2021 Basin Condition	Fit
<b><u>Eld Inlet</u></b>					
Green Cove	Eld Inlet	89	Low	Impacted	Yes
McLane	Delphi Road	85	Low	Sensitive	Yes
Perry	Perry Creek Road	91	Low	Sensitive	Yes
<b><u>Henderson Inlet</u></b>					
Woodard Creek	Libby Road	75	Moderate	Impacted	No
Woodland Creek	Draham Road	64	Moderate	Degraded	No
Woodland Creek	Pleasant Glade	80	Low	Degraded	Yes
<b><u>Nisqually River</u></b>					
Eaton Creek	Yelm Highway	86	Low	Impacted	No
Thompson Creek	SR 510	87	Low	Impacted	Yes
Yelm Creek	Nisqually River	70	Moderate	Impacted	Yes
<b><u>Totten Inlet</u></b>					
Kennedy	Old Olympic Hwy	83	Low	Intact	Yes
Schneider Creek	US 101	49	Moderate	Sensitive	No
Schneider Creek	Totten Inlet	75	Moderate	Sensitive	Yes

Note: "Fit" indicates if the basins show in Map 1 is a good approximation of the area upstream of the sampling site. Caution should be used when comparing water quality to conditions where the upstream basin is not a good fit.

## SUSTAINABLE THURSTON

In 2014, Thurston Regional Planning Council completed *Sustainable Thurston*, a communitywide planning process to identify the region's vision for how Thurston County should "look, function, and feel in 2035." The process identified 12 "priority goals" for the region, one of which is

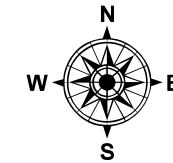
*"to preserve the stream basins that still have the opportunity to function properly, conduct watershed-based land-use planning (i.e., basin plans). Focus on those areas that may be at risk of degradation under current plans and development regulations."*

This goal included a target: Protect small stream basins that are currently ranked as "Intact" or "Sensitive" and improve and restore as many "Impacted" stream basins as possible. Based on the findings of this report, Thurston County is not on track to meet this Sustainable Thurston goal.

The Thurston Region is **not on track** to meet its goal of protecting intact and sensitive basins, and restoring impacted basins

TRPC plans to continue to update this basin current condition report as data are available, expected to be every five years. This will help us evaluate progress towards meeting the Sustainable Thurston goals.

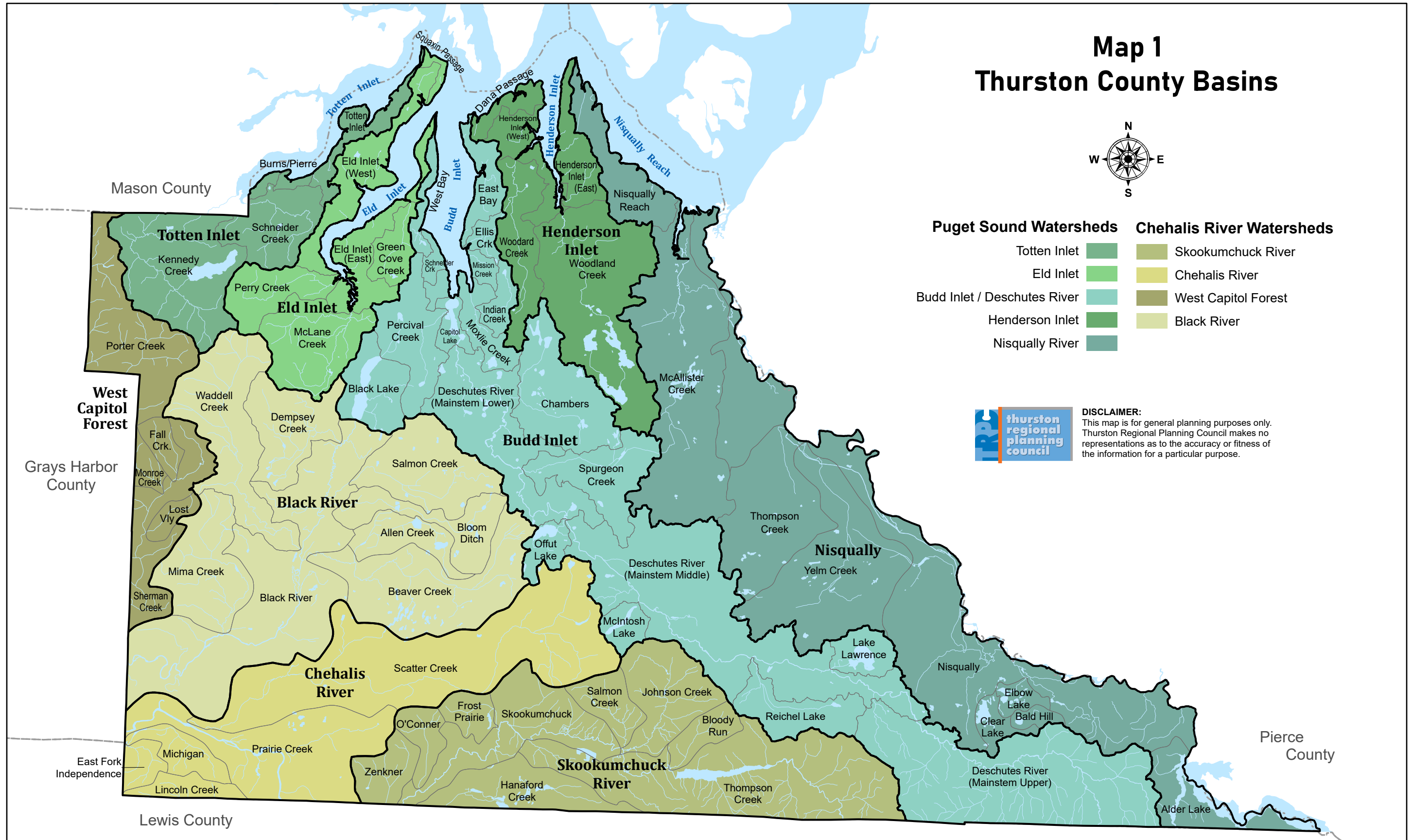
# Map 1 Thurston County Basins



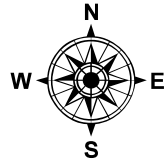
Puget Sound Watersheds		Chehalis River Watersheds	
Totten Inlet		Skookumchuck River	
Eld Inlet		Chehalis River	
Budd Inlet / Deschutes River		West Capitol Forest	
Henderson Inlet		Black River	
Nisqually River			



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# Map 2 2001 Basin Conditions

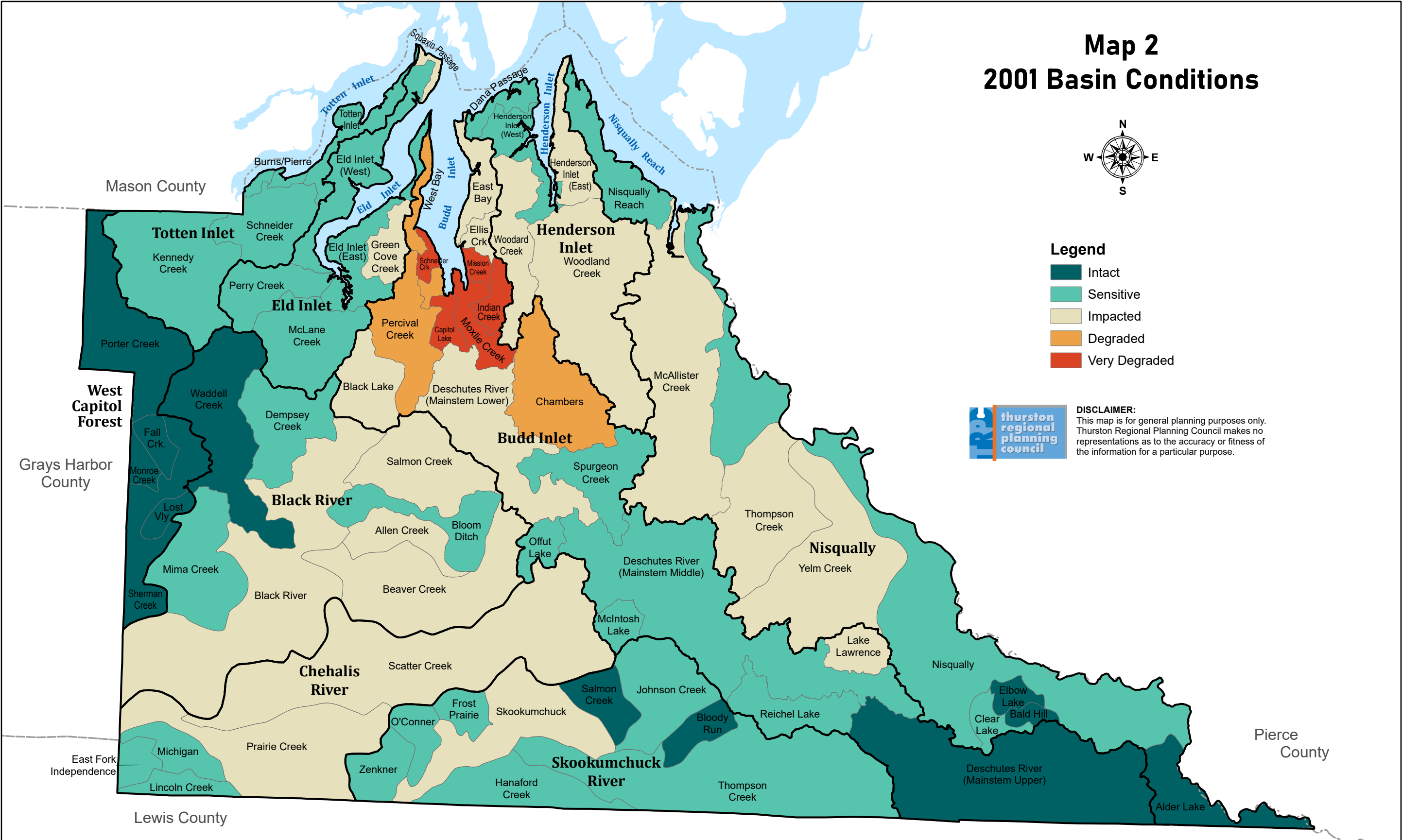


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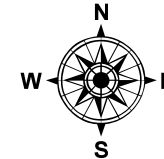
- Intact
- Sensitive
- Impacted
- Degraded
- Very Degraded



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# Map 3 2006 Basin Conditions

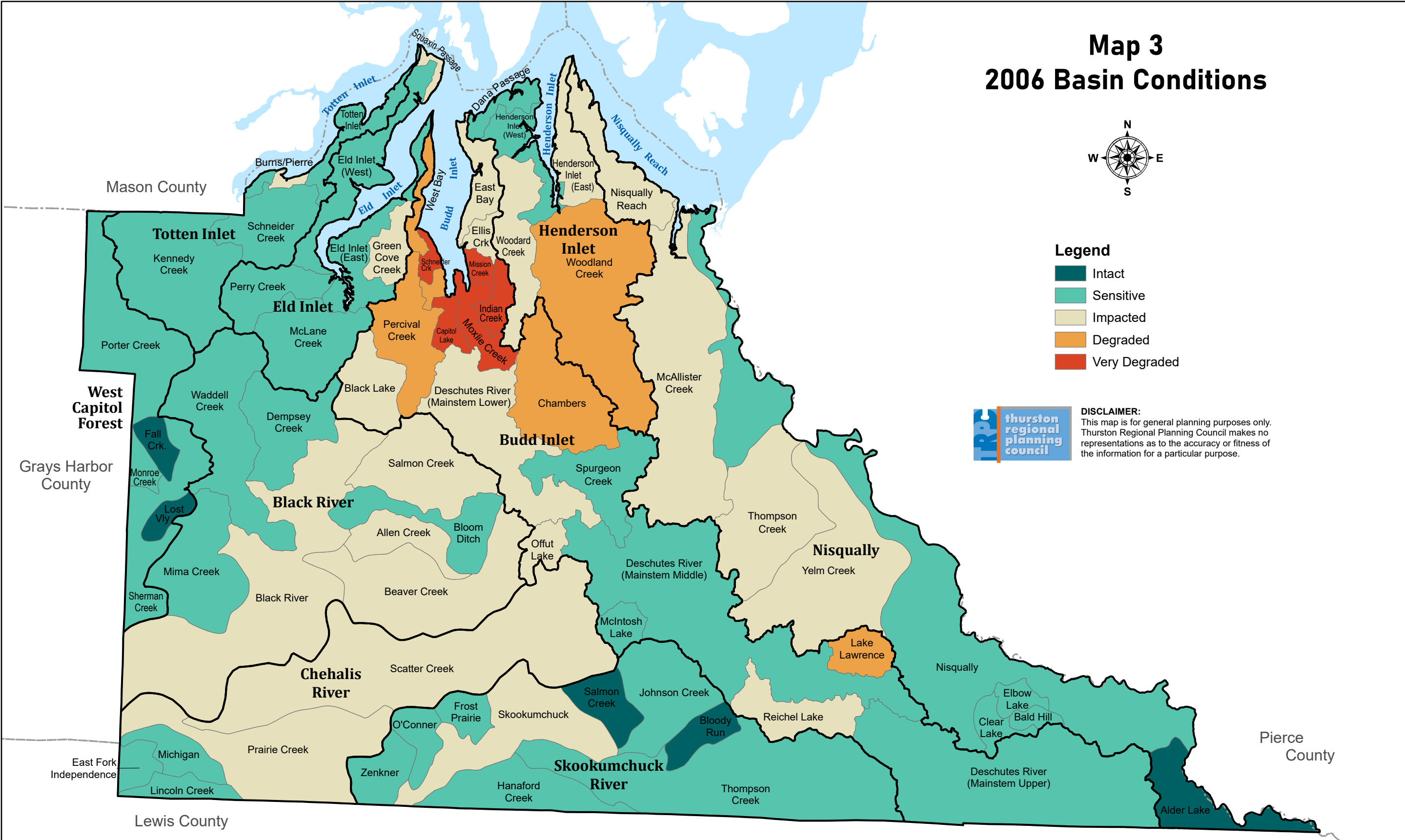


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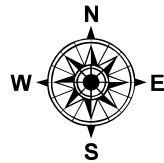
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# Map 4 2011 Basin Conditions

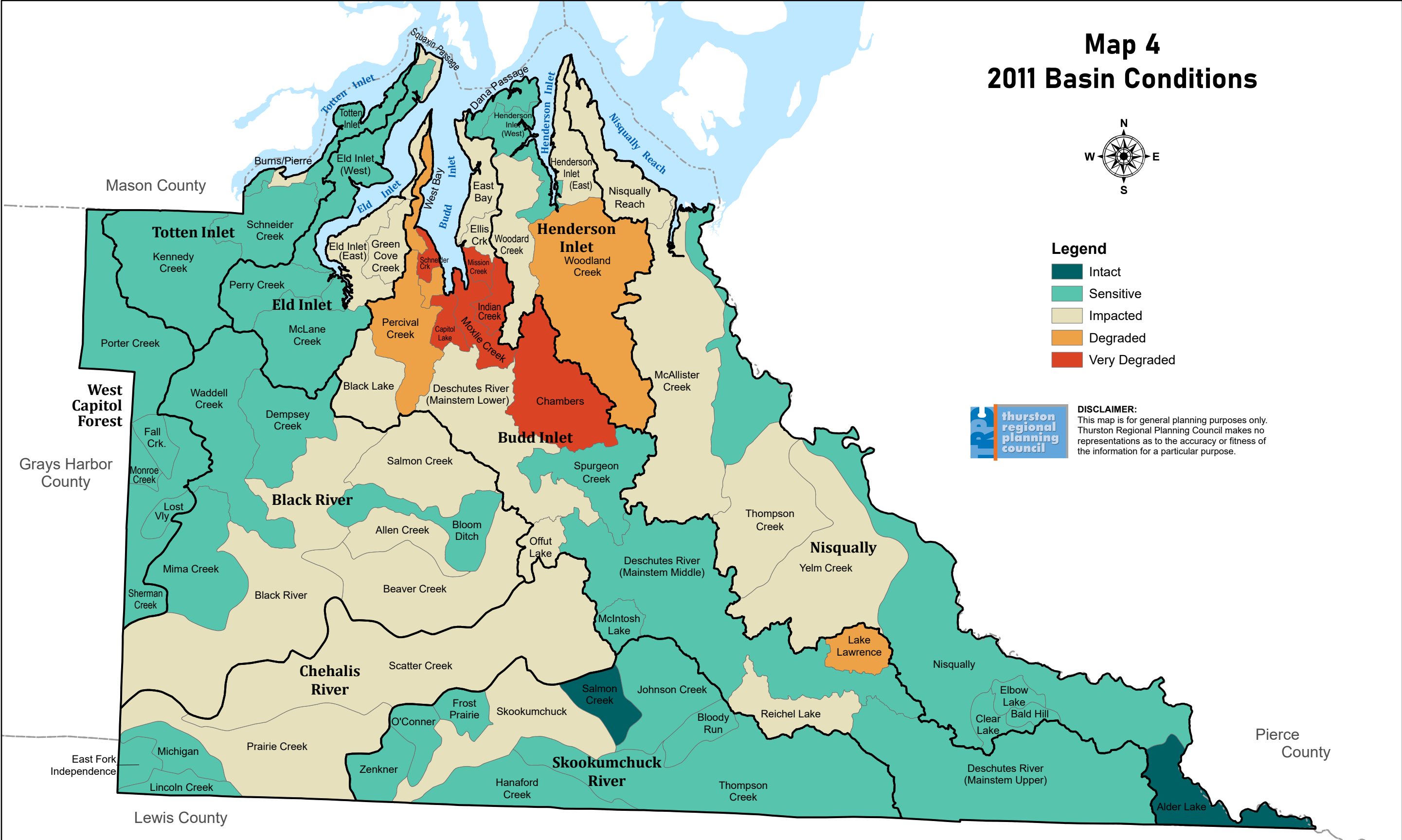


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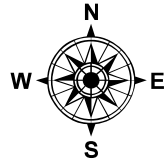
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# Map 5 2016 Basin Conditions

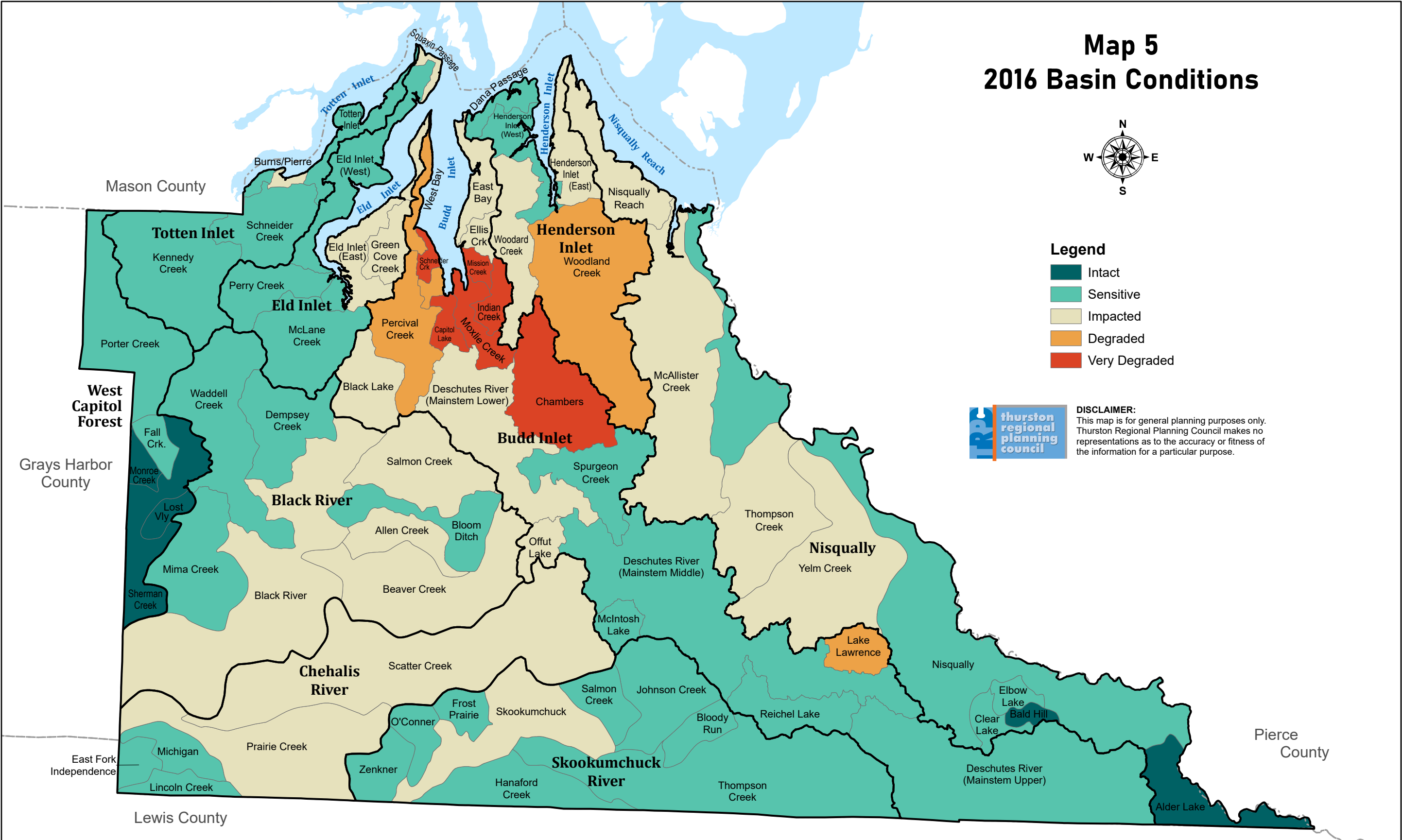


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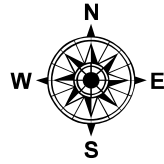
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# Map 6 2021 Basin Conditions

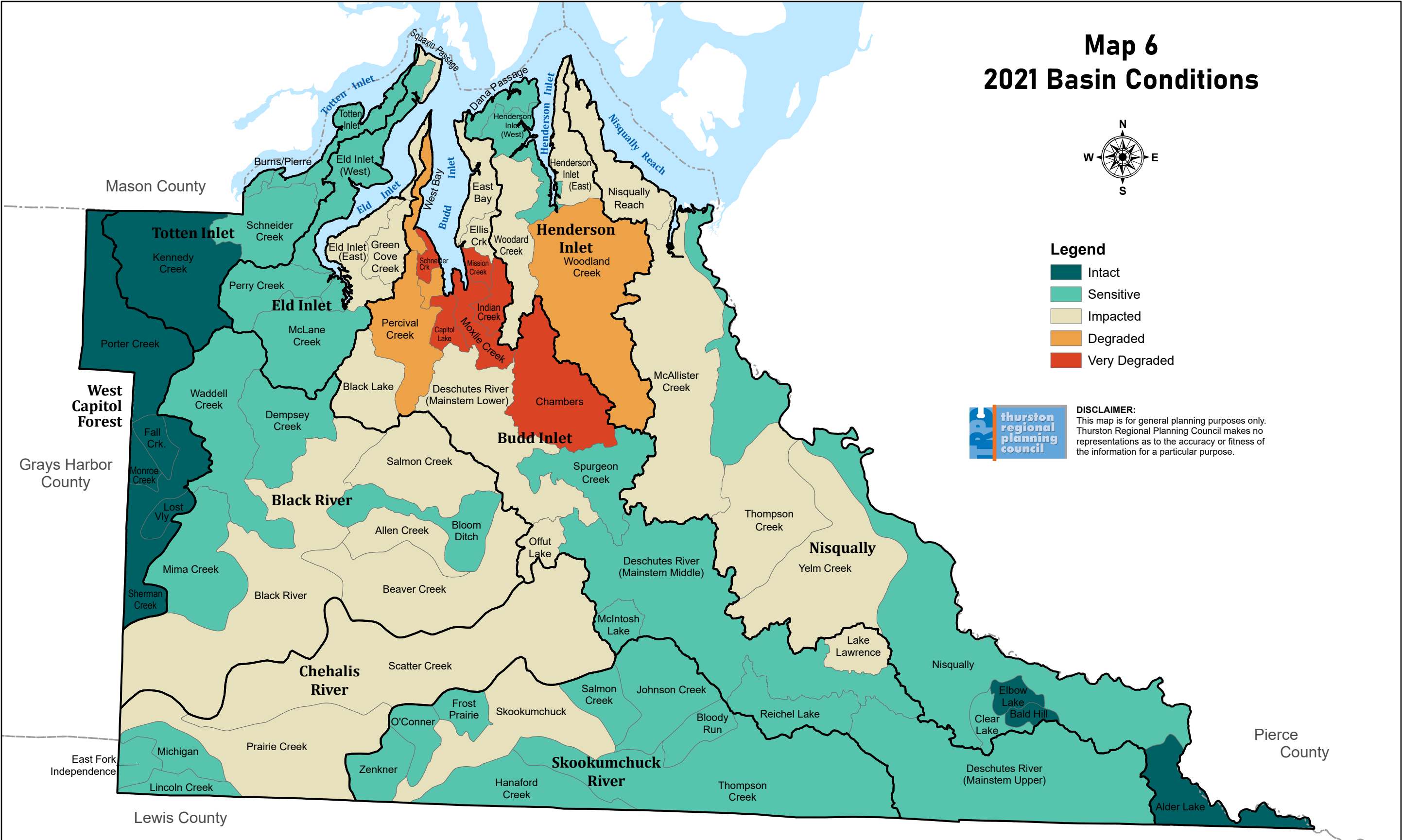


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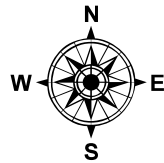
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# Map 7 2045 Projected Basin Conditions

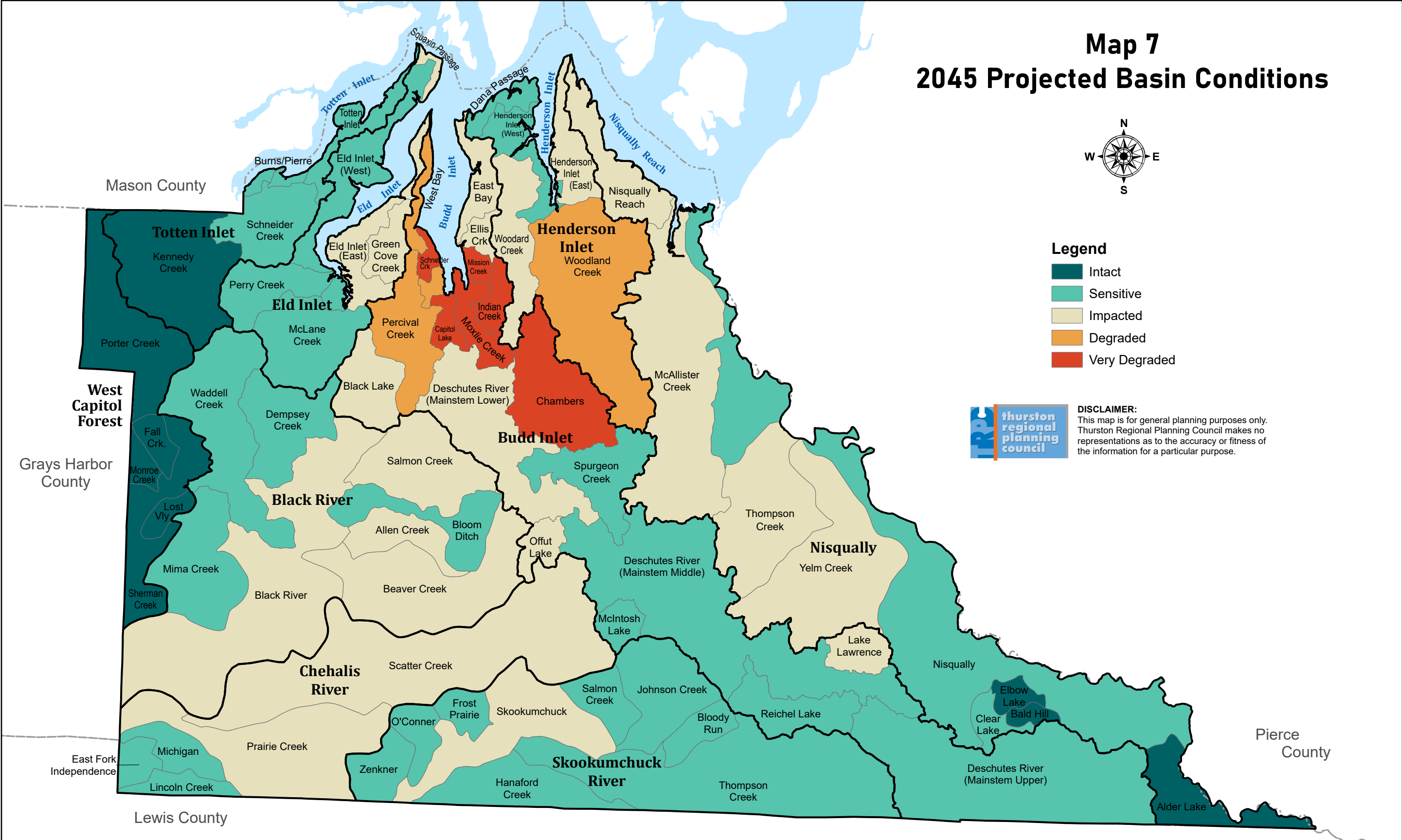


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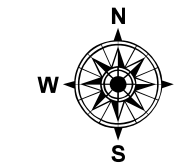
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# Map 8 Buildout Projected Basin Conditions

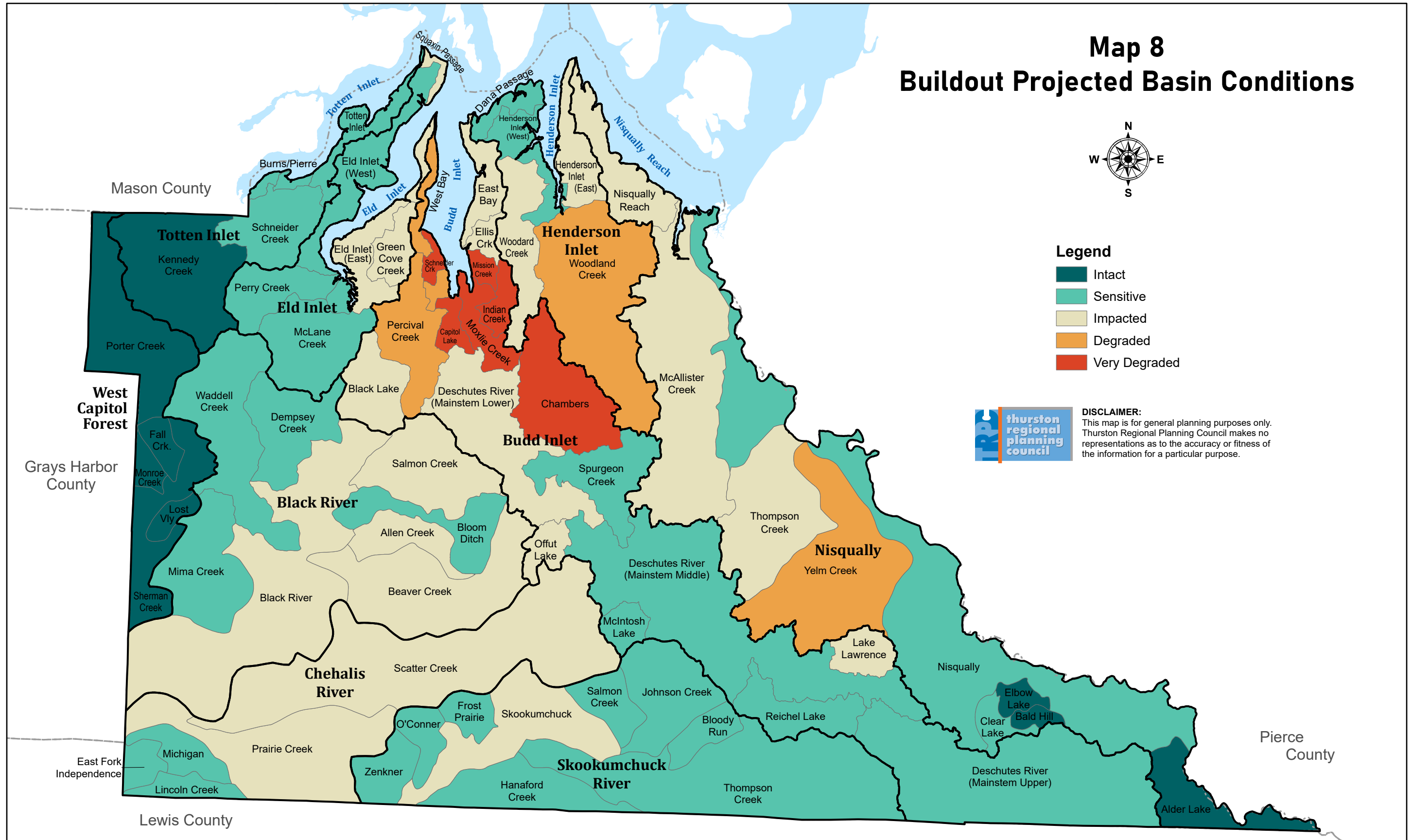


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# APPENDIX I: METHODOLOGY FOR FUTURE IMPERVIOUS AND CANOPY COVER ESTIMATES

## Introduction

A growing population and its accompanying development are associated with the conversion of natural land covers — such as forests, wetlands, and prairies — to impervious surfaces, like rooftops, parking lots, roads, and even compacted lawns. These hard surfaces stop rainwater and stormwater runoff from slowly infiltrating into the soil. Numerous studies — including those reviewed in *Basin Evaluation and Management Strategies of Thurston County (April 2013)*<sup>3</sup> — have identified impervious surfaces as detrimental to the health of streams and rivers.

In recognition of the importance of impervious surfaces to the overall health of stream and river systems, Thurston Regional Planning Council (TRPC) developed an impervious surface module as part of its land capacity model. The module was added after the 2007 population and employment forecast update and refined during the *Guiding Growth—Healthy Watersheds* planning project. It uses TRPC’s estimates of developable land and projected population and employment growth to project future increases in impervious surfaces at the parcel level.

The impervious area model allows TRPC to project future impervious area in a basin based on zoning and development regulations.

## Impervious Surface Ratios for Residential Development

The amount of impervious surface associated with each new dwelling unit varies with residential density (the number of units per acre). In general, the impervious area per unit decreases as density increases. This means that high-density, urban development will have a higher impervious surface coverage, but the per-unit impervious area will be less than a suburban or rural development with the same number of units.

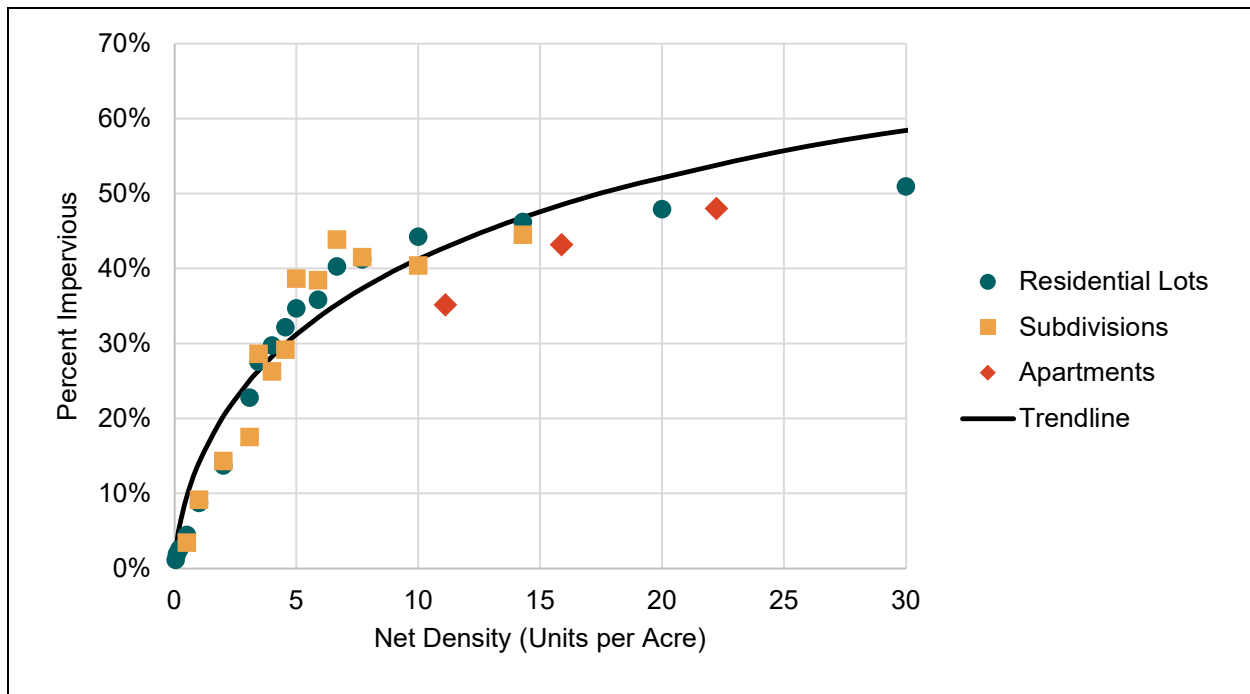
TRPC compared fully built lots in Thurston County against the 2006 impervious surface GIS data layer to identify a relationship between residential units and total impervious area (Figure 1). Three types of lots were analyzed:

- **Residential lots** — These are residential units (single-family and duplexes on individual platted lots). This is reflective of net density.

<sup>3</sup> <https://www.trpc.org/DocumentCenter/View/86>

- **Apartments/condominiums** — These are residential units in multifamily buildings, on lots that may include parking lots, stormwater facilities, and communal landscaping. Density was adjusted to reflect net density to be comparable with other data sets.
- **Subdivision** — Subdivision boundaries reflect a gross density, and include open space tracts, storm water facilities, and local roads. Densities were adjusted to net density to be comparable to other data sets.

Figure 1: Relationship Between Net Density and Impervious Area in Thurston County



This information was used to build an equation estimating percent impervious area for a given residential density (shown in the trendline in Figure 1):

$$\text{Logit}(I) = 0.6310 \times \text{Ln}(D) - 1.8055$$

Where  $\text{Logit}(I)$  is the natural logarithm of ratio of impervious to non-impervious surfaces, and  $\text{Ln}(D)$  is the natural logarithm of the residential density, in units per acre. Table 1 shows impervious estimates for eight different residential densities.

**Table 1: Impervious Area Assumptions for Future Residential Development**

Density (units / acre)	Lot Size (per Unit)	Impervious Area (Percent)	Impervious Area (per Unit)
50.0	900 feet <sup>2</sup>	66%	600 feet <sup>2</sup>
20.0	2,200 feet <sup>2</sup>	52%	1,100 feet <sup>2</sup>
10.0	4,400 feet <sup>2</sup>	41%	1,800 feet <sup>2</sup>
5.0	0.2 acres	31%	2,700 feet <sup>2</sup>
2.0	0.5 acres	20%	4,400 feet <sup>2</sup>
1.0	1 acre	14%	6,100 feet <sup>2</sup>
0.5	2 acres	10%	8,400 feet <sup>2</sup>
0.2	5 acres	6%	12,200 feet <sup>2</sup>

To project future impervious area on a parcel, the residential density was first calculated using the total number of units at buildout (current dwellings plus capacity) divided by the estimated developed area plus buildable area on the parcel. This was done to exclude any critical areas on the parcel from the calculation. For projects in the development pipeline, density was averaged across all parcels in the project area.

Estimates of current dwellings units, future capacity, and developable area were developed in TRPC’s land capacity model, as part of the Thurston County Buildable Lands program. Documentation is available in *Population and Employment Land Supply Assumptions (April 2019)*<sup>4</sup>. For the year 2045, impervious area is estimated as impervious acres at buildout times the projected number of dwelling units divided by total dwelling units in the buildout scenario. Housing estimates for 2045 come from TRPC’s population and employment forecast (See *Population Forecast Allocations (June 2019)*<sup>4</sup>).

$$\text{Impervious Area (2045)} = \text{Impervious Area (Buildout)} \times \frac{\text{Dwellings Units (2045)}}{\text{Dwellings Units (Buildout)}}$$

<sup>4</sup> <https://www.trpc.org/236/Population-Employment-Forecasting>

## Impervious Surface Ratios Nonresidential Development

Estimates for commercial, industrial, and institutional lots were derived in a similar fashion, by measuring actual impervious area for fully built lots (Table 2). Due to the differences between urban and rural lots, ratios were broken into three categories:

- Cities, reflecting urban to suburban conditions,
- Unincorporated growth area, which reflect suburban conditions, and
- Rural unincorporated areas

**Table 2: Estimates of Percent Impervious Area for Nonresidential Lands at Buildout**

Land Use	Cities	Unincorporated Growth Areas	Rural
Agriculture	10%	13%	2%
Forestry	2%	1%	0%
Mining	31%	33%	4%
Commercial	44%	39%	10%
Church	32%	25%	6%
School	37%	30%	20%
Industrial	65%	54%	5%
Parks, Open Space	11%	11%	1%
Rights-of-Way	39%	29%	12%

It is assumed that 50 percent of non-residential impervious areas will be developed by 2045.

## Comparison with Previous Studies

A wide range of impervious surface coefficients have been reported in other studies across the United States. The values generated for this study fall within the range of other studies (Table 3).

**Table 3: Impervious Surface Percentages from Various Studies**

Land Use Category	Brascher 2002 (Local)	Pierce County	USDA 1986	Bannerman 2001	ESA Adolfson 2007 (Birch Bay)	Capiella and Brown, 2001 (Maryland)	Yancey 2008 (California)
Residential							
>8 units/acre	60	50	65	64	—	41 to 44	63
4 to < 8 units/acre	50	>35	—	49	40	33	51
3 to <4 units/acre	40	25 to 35	38	41	42	28	—
3 units/acre	—	—	30	—	38	—	45
1 to <3 units/acre	20	16 to 25	25	—	—	21	—
1 unit/acre	—	—	20	—	—	14	—
< 1 unit/acre	10	<12	12	—	19 to 22	11	—
Commercial	90	85	85	83 to 96	41 to 49	72	69 to 86
Industrial	60	84	72	69	27 to 66	53	81 to 91
Schools	40 to 90 <sup>1</sup>	30	—	39	—	34	—
Churches	40 to 90 <sup>1</sup>	50	—	—	—	—	—
Open Urban Lands	—	5	—	—	13	9	2

Notes: 1. Values lowered to account for partially-developed parcels.

## Forest Cover Projections

Future forest cover was estimated at the parcel level using the impervious area projections. The change in canopy cover between 2016 and 2045 was estimated as percentage point change in impervious land cover times the 2016 forest cover for each parcel

$$F_{2045} = F_{2016} - F_{2016} \times (I_{2045} - I_{2016})$$

Where  $F$  is the percent of the basin with a forest land cover and  $I$  is the percent impervious surface. The same methodology was used for buildout conditions.

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# APPENDIX II: ESTIMATES OF IMPERVIOUS AREA, FOREST LAND COVER, AND INTACT RIPARIAN LAND COVER

Table 2-1: Percent Impervious Surfaces

	0-2%: Intact	2-10%: Sensitive	10-25%: Impacted	25-40% Degraded	40-100%: Very Degraded		
Basin	2001	2006	2011	2016	2021	2045	Buildout
<b>Black River</b>							
Allen Creek	5.1%	5.2%	5.4%	5.4%	5.4%	5.9%	6.8%
Beaver Creek	2.4%	2.5%	2.6%	2.7%	2.7%	3.5%	5.0%
Black River	3.3%	3.4%	3.5%	3.6%	3.7%	4.2%	4.8%
Bloom Ditch	2.4%	2.5%	2.6%	2.6%	2.6%	3.1%	4.1%
Dempsey Creek	1.9%	2.0%	2.0%	2.0%	2.0%	2.8%	3.5%
Mima Creek	0.4%	0.4%	0.4%	0.4%	0.4%	0.6%	0.7%
Salmon Creek	10.8%	11.7%	12.3%	12.5%	13.2%	16.3%	19.3%
Waddell Creek	0.6%	0.6%	0.6%	0.6%	0.6%	0.7%	0.7%
<b>Chehalis River</b>							
East Fork Independence	0.3%	0.4%	0.4%	0.4%	0.4%	1.4%	4.2%
Lincoln Creek	0.3%	0.3%	0.4%	0.4%	0.4%	1.2%	3.7%
Michigan	0.6%	0.6%	0.6%	0.6%	0.7%	1.5%	3.9%
Prairie Creek	5.6%	5.8%	6.2%	6.5%	6.6%	7.3%	8.6%
Scatter Creek	4.4%	4.6%	4.7%	5.0%	5.0%	5.6%	7.0%
<b>Skookumchuck River</b>							
Bloody Run	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Frost Prairie	0.2%	0.2%	0.2%	0.2%	0.2%	0.9%	2.8%
Hanaford Creek	0.3%	0.3%	0.3%	0.3%	0.3%	0.4%	0.7%
Johnson Creek	0.2%	0.2%	0.2%	0.2%	0.2%	0.3%	0.4%
O'Conner	0.6%	0.6%	0.6%	0.7%	0.7%	1.0%	2.1%
Salmon Creek	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Skookumchuck	2.3%	2.4%	2.4%	2.5%	2.5%	3.0%	4.4%
Thompson Creek	0.2%	0.2%	0.2%	0.2%	0.2%	0.2%	0.3%
Zenkner	0.3%	0.3%	0.3%	0.3%	0.3%	0.8%	2.3%
<b>West Capitol Forest</b>							
Fall Creek	0.1%	0.1%	0.1%	0.1%	0.1%	0.1%	0.1%
Lost Valley	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Monroe Creek	0.1%	0.1%	0.1%	0.1%	0.1%	0.1%	0.1%
Porter Creek	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%
Sherman Creek	0.1%	0.1%	0.1%	0.1%	0.1%	0.1%	0.1%

Basin	2001	2006	2011	2016	2021	2045	Buildout
<b><u>Budd Inlet/Deschutes</u></b>							
Black Lake	11.6%	11.9%	12.1%	12.2%	12.5%	16.4%	17.1%
Capitol Lake	41.6%	42.1%	42.6%	42.6%	42.7%	43.5%	43.8%
Chambers	21.0%	24.4%	25.3%	25.6%	25.9%	27.5%	28.0%
Deschutes (Lower)	17.9%	18.8%	19.8%	20.3%	20.8%	22.7%	23.8%
Deschutes (Middle)	2.2%	2.3%	2.4%	2.6%	2.6%	3.3%	4.4%
Deschutes (Upper)	0.1%	0.1%	0.1%	0.1%	0.1%	0.2%	0.2%
East Bay	8.1%	8.2%	8.3%	8.5%	8.5%	9.2%	9.7%
Ellis Creek	9.3%	9.5%	9.6%	9.8%	10.0%	10.7%	11.1%
Indian Creek	33.9%	34.1%	34.7%	34.9%	35.0%	37.8%	39.0%
Moxlie Creek	46.6%	47.4%	47.9%	48.0%	48.2%	49.7%	50.6%
Lake Lawrence	6.7%	7.1%	7.2%	7.3%	7.4%	7.9%	8.8%
McIntosh Lake	2.3%	2.4%	2.4%	2.5%	2.6%	2.9%	3.6%
Mission Creek	29.1%	29.8%	30.1%	30.2%	30.3%	33.1%	33.9%
Offut Lake	4.2%	4.3%	4.3%	4.3%	4.3%	5.5%	7.1%
Percival Creek	29.1%	30.7%	32.3%	33.0%	33.6%	36.9%	38.1%
Reichel Lake	0.6%	0.6%	0.6%	0.6%	0.6%	0.8%	1.0%
Schneider Creek	25.9%	26.0%	26.6%	26.9%	26.9%	32.4%	34.0%
Spurgeon Creek	2.1%	2.4%	2.7%	2.9%	2.9%	3.3%	3.5%
West Bay	22.8%	23.1%	23.4%	23.6%	23.7%	26.0%	26.9%
<b><u>Eld Inlet</u></b>							
Eld Inlet (East)	8.9%	9.6%	10.7%	11.1%	11.2%	12.7%	13.3%
Eld Inlet (West)	5.3%	5.5%	5.6%	5.7%	5.7%	6.6%	7.6%
Green Cove Creek	11.9%	13.7%	14.5%	14.7%	14.8%	15.5%	15.7%
McLane Creek	1.1%	1.2%	1.2%	1.2%	1.2%	1.8%	2.4%
Perry Creek	1.7%	1.7%	1.7%	1.8%	1.8%	1.9%	2.1%
Squaxin Passage	13.1%	13.4%	13.6%	13.9%	14.0%	14.6%	15.3%
<b><u>Henderson Inlet</u></b>							
Dana Passage	5.2%	5.4%	5.5%	5.6%	5.6%	6.8%	7.9%
Henderson Inlet (East)	4.8%	5.1%	5.3%	5.5%	5.6%	6.5%	7.2%
Henderson Inlet (West)	3.5%	3.6%	3.7%	3.8%	3.8%	4.6%	5.3%
Woodard Creek	17.3%	17.9%	18.4%	18.7%	19.0%	21.0%	21.6%
Woodland Creek	24.1%	26.6%	28.2%	29.0%	30.9%	34.0%	35.0%
<b><u>Nisqually River</u></b>							
Alder Lake	0.1%	0.1%	0.1%	0.1%	0.1%	0.1%	0.1%
Bald Hill Lake	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Clear Lake	2.6%	3.2%	3.3%	3.5%	3.5%	3.7%	4.5%
Elbow Lake	0.7%	0.7%	0.8%	0.7%	0.7%	1.3%	2.0%
McAllister Creek	8.4%	9.1%	9.5%	10.1%	10.7%	11.8%	12.2%
Nisqually	2.1%	2.2%	2.3%	2.4%	2.5%	3.0%	3.6%
Nisqually Reach	7.9%	12.0%	13.3%	15.0%	16.2%	16.9%	17.1%
Thompson Creek	3.8%	4.6%	5.0%	5.1%	5.3%	9.6%	10.9%
Yelm Creek	6.2%	6.7%	7.0%	7.3%	7.4%	8.8%	10.5%

Basin	2001	2006	2011	2016	2021	2045	Buildout
<b>Totten Inlet</b>							
Burns/Pierre	3.3%	3.4%	3.4%	3.5%	3.6%	4.5%	5.8%
Kennedy Creek	1.4%	1.4%	1.4%	1.4%	1.4%	1.6%	1.7%
Schneider Creek	2.1%	2.1%	2.1%	2.1%	2.2%	2.7%	3.3%
Totten Inlet (East)	3.7%	3.9%	4.0%	4.1%	4.1%	5.0%	6.0%

**Table 2-2: Percent Forest Land Cover**

	80-100%: Intact	65-80%: Sensitive	45-65%: Impacted	30-45% Degraded	0-30%: Very Degraded		
<b>Basin</b>	<b>2001</b>	<b>2006</b>	<b>2011</b>	<b>2016</b>	<b>2021</b>	<b>2045</b>	<b>Buildout</b>
<b>Black River</b>							
Allen Creek	36.2%	36.0%	34.0%	34.9%	40.7%	40.4%	39.9%
Beaver Creek	51.1%	50.2%	50.0%	49.6%	56.5%	56.0%	55.0%
Black River	37.6%	36.4%	35.4%	38.5%	43.2%	42.9%	42.6%
Bloom Ditch	48.5%	47.3%	46.2%	46.1%	52.0%	51.7%	51.2%
Dempsey Creek	67.0%	66.9%	66.2%	65.9%	71.8%	71.2%	70.6%
Mima Creek	79.7%	74.9%	69.3%	73.5%	76.6%	76.6%	76.5%
Salmon Creek	35.2%	33.7%	32.9%	33.0%	36.8%	35.7%	34.6%
Waddell Creek	84.3%	76.6%	74.7%	73.8%	79.9%	79.9%	79.9%
<b>Chehalis River</b>							
East Fork Independence	68.6%	64.4%	58.8%	70.2%	79.2%	78.4%	76.1%
Lincoln Creek	66.1%	60.4%	56.3%	49.9%	63.6%	63.1%	61.4%
Michigan	63.2%	66.5%	65.1%	64.7%	72.1%	71.5%	69.5%
Prairie Creek	38.1%	37.4%	34.5%	33.9%	37.7%	37.5%	36.8%
Scatter Creek	39.1%	38.1%	37.6%	37.9%	41.1%	40.8%	40.0%
<b>Skookumchuck River</b>							
Bloody Run	81.2%	81.6%	77.2%	75.2%	71.7%	71.7%	71.7%
Frost Prairie	74.5%	70.0%	69.2%	69.3%	74.2%	73.7%	72.4%
Hanaford Creek	45.1%	44.8%	48.1%	51.3%	57.9%	57.8%	57.5%
Johnson Creek	76.2%	75.0%	68.9%	68.1%	72.0%	72.0%	71.9%
O'Conner	61.8%	61.1%	61.5%	58.0%	51.0%	50.8%	50.2%
Salmon Creek	91.5%	92.4%	84.9%	75.7%	79.2%	79.2%	79.2%
Skookumchuck	45.6%	46.4%	45.8%	46.1%	53.3%	53.0%	52.2%
Thompson Creek	65.5%	59.5%	55.7%	66.7%	77.0%	77.0%	76.9%
Zenkner	52.6%	50.5%	52.2%	53.0%	73.5%	73.1%	72.0%
<b>West Capitol Forest</b>							
Fall Creek	93.3%	89.7%	72.4%	77.7%	85.6%	85.6%	85.6%
Lost Valley	86.9%	85.0%	76.8%	82.2%	82.0%	82.0%	82.0%
Monroe Creek	82.0%	77.0%	66.8%	80.3%	86.2%	86.2%	86.2%
Porter Creek	83.3%	78.3%	78.1%	78.7%	81.5%	81.5%	81.5%

<b>Basin</b>	<b>2001</b>	<b>2006</b>	<b>2011</b>	<b>2016</b>	<b>2021</b>	<b>2045</b>	<b>Buildout</b>
Sherman Creek	84.2%	79.8%	76.2%	82.1%	88.7%	88.7%	88.7%
<b><u>Budd Inlet/Deschutes</u></b>							
Black Lake	35.9%	35.5%	35.4%	35.2%	39.0%	38.0%	37.7%
Capitol Lake	18.8%	18.2%	17.8%	17.8%	17.8%	17.5%	17.4%
Chambers	26.3%	23.0%	22.0%	22.0%	22.2%	21.7%	21.5%
Deschutes (Lower)	34.4%	33.4%	32.3%	32.4%	33.3%	32.5%	32.1%
Deschutes (Middle)	53.6%	51.6%	49.7%	50.6%	54.8%	54.4%	53.8%
Deschutes (Upper)	80.7%	70.3%	56.8%	64.9%	72.3%	72.2%	72.2%
East Bay	54.4%	54.4%	54.1%	54.1%	54.3%	53.9%	53.5%
Ellis Creek	52.6%	52.1%	52.6%	52.4%	52.6%	52.2%	52.0%
Indian Creek	19.1%	19.2%	18.8%	18.8%	18.8%	18.1%	17.8%
Moxlie Creek	15.4%	15.2%	15.1%	15.1%	15.0%	14.7%	14.6%
Lake Lawrence	47.8%	44.1%	44.1%	43.5%	47.0%	46.6%	46.1%
McIntosh Lake	78.8%	78.9%	79.0%	70.4%	66.6%	66.4%	65.9%
Mission Creek	26.3%	25.6%	25.6%	25.6%	25.8%	24.7%	24.5%
Offut Lake	67.1%	61.8%	55.2%	54.3%	56.3%	55.6%	54.5%
Percival Creek	33.2%	31.5%	29.8%	29.8%	30.5%	28.8%	28.3%
Reichel Lake	69.1%	62.3%	63.6%	65.7%	64.4%	64.3%	64.1%
Schneider Creek	28.7%	28.7%	27.3%	27.3%	27.3%	25.2%	24.7%
Spurgeon Creek	67.8%	65.2%	64.4%	64.2%	66.4%	66.1%	66.0%
West Bay	39.3%	39.1%	38.9%	38.6%	39.0%	37.8%	37.4%
<b><u>Eld Inlet</u></b>							
Eld Inlet (East)	62.3%	61.2%	60.7%	60.5%	60.4%	59.7%	59.4%
Eld Inlet (West)	64.1%	61.3%	60.4%	60.4%	61.9%	61.3%	60.6%
Green Cove Creek	52.5%	48.6%	48.2%	48.0%	47.9%	47.4%	47.3%
McLane Creek	68.4%	67.5%	64.6%	66.6%	77.4%	76.9%	76.5%
Perry Creek	76.5%	77.3%	70.6%	72.5%	75.1%	74.9%	74.8%
Squaxin Passage	50.9%	50.9%	50.9%	50.9%	51.1%	50.6%	50.1%
<b><u>Henderson Inlet</u></b>							
Dana Passage	67.2%	66.8%	67.1%	66.2%	67.2%	66.3%	65.5%
Henderson Inlet (East)	61.9%	61.0%	60.6%	60.3%	61.9%	61.3%	60.8%
Henderson Inlet (West)	61.9%	62.3%	61.5%	60.6%	61.6%	61.2%	60.7%
Woodard Creek	36.7%	36.1%	35.5%	35.4%	35.4%	34.8%	34.5%
Woodland Creek	32.2%	29.9%	28.7%	27.6%	25.9%	24.8%	24.3%
<b><u>Nisqually River</u></b>							
Alder Lake	89.0%	89.1%	87.9%	85.9%	83.5%	83.5%	83.5%
Bald Hill Lake	80.2%	79.7%	79.2%	82.5%	90.6%	90.6%	90.6%
Clear Lake	75.3%	63.0%	53.5%	56.3%	72.4%	72.3%	71.7%
Elbow Lake	81.8%	72.4%	67.1%	71.4%	85.6%	85.1%	84.7%
McAllister Creek	52.8%	49.2%	48.7%	47.5%	48.4%	48.1%	47.9%
Nisqually	63.4%	59.6%	58.6%	57.6%	64.1%	63.8%	63.5%
Nisqually Reach	60.0%	54.1%	51.7%	51.0%	50.9%	50.4%	50.1%
Thompson Creek	54.5%	53.6%	52.6%	51.8%	56.2%	53.3%	52.7%

Basin	2001	2006	2011	2016	2021	2045	Buildout
Yelm Creek	35.7%	34.2%	33.0%	31.0%	32.6%	32.3%	31.9%
<b>Totten Inlet</b>							
Burns/Pierre	71.4%	64.7%	64.2%	64.3%	70.7%	70.0%	69.0%
Kennedy Creek	77.3%	68.4%	64.5%	70.8%	80.8%	80.7%	80.6%
Schneider Creek	72.3%	68.8%	68.5%	71.4%	75.1%	74.7%	74.2%
Totten Inlet (East)	71.8%	70.6%	71.0%	68.8%	70.8%	70.1%	69.3%

**Table 2-3: Percent Intact Riparian Land Cover**

	90-100%: Intact	75-90%: Sensitive	60-75%: Impacted	30-60%: Degraded	0-30%: Very Degraded		
<b>Basin</b>	<b>2001</b>	<b>2006</b>	<b>2011</b>	<b>2016</b>	<b>2021</b>	<b>2045</b>	<b>Buildout</b>
<b>Black River</b>							
Allen Creek	62.5%	63.0%	62.7%	62.5%	62.7%	62.7%	62.7%
Beaver Creek	67.8%	69.8%	69.7%	69.3%	69.7%	69.7%	69.7%
Black River	74.9%	75.9%	75.2%	75.2%	75.0%	75.0%	75.0%
Bloom Ditch	82.7%	82.1%	81.9%	81.9%	82.3%	82.3%	82.3%
Dempsey Creek	86.8%	88.8%	88.9%	88.2%	89.0%	89.0%	89.0%
Mima Creek	87.9%	88.7%	88.4%	88.9%	89.0%	89.0%	89.0%
Salmon Creek	78.3%	78.3%	78.1%	78.3%	78.3%	78.3%	78.3%
Waddell Creek	93.6%	93.4%	93.5%	92.6%	93.3%	93.3%	93.3%
<b>Chehalis River</b>							
East Fork Independence	84.6%	84.5%	81.0%	84.1%	84.9%	84.9%	84.9%
Lincoln Creek	96.1%	94.3%	93.6%	90.9%	94.5%	94.5%	94.5%
Michigan	88.4%	88.5%	88.0%	88.2%	88.5%	88.5%	88.5%
Prairie Creek	66.4%	67.1%	66.2%	66.0%	66.3%	66.3%	66.3%
Scatter Creek	66.3%	66.9%	66.4%	66.7%	66.6%	66.6%	66.6%
<b>Skookumchuck River</b>							
Bloody Run	95.8%	95.8%	97.8%	96.3%	94.9%	94.9%	94.9%
Frost Prairie	87.4%	85.5%	85.8%	86.0%	85.8%	85.8%	85.8%
Hanaford Creek	75.4%	87.5%	87.8%	88.2%	88.4%	88.4%	88.4%
Johnson Creek	92.5%	91.5%	86.1%	87.0%	89.3%	89.3%	89.3%
O'Conner	91.1%	91.8%	91.4%	90.8%	79.8%	79.8%	79.8%
Salmon Creek	99.0%	100.0%	99.1%	96.7%	99.1%	99.1%	99.1%
Skookumchuck	64.8%	67.3%	65.9%	64.7%	66.3%	66.3%	66.3%
Thompson Creek	91.2%	89.8%	86.5%	90.8%	94.5%	94.5%	94.5%
Zenkner	86.2%	95.1%	94.6%	94.6%	94.6%	94.6%	94.6%
<b>West Capitol Forest</b>							
Fall Creek	99.7%	99.3%	94.5%	98.5%	99.2%	99.2%	99.2%
Lost Valley	97.6%	100.0%	99.6%	98.2%	99.3%	99.3%	99.3%
Monroe Creek	97.9%	99.3%	98.9%	99.1%	99.1%	99.1%	99.1%

<b>Basin</b>	<b>2001</b>	<b>2006</b>	<b>2011</b>	<b>2016</b>	<b>2021</b>	<b>2045</b>	<b>Buildout</b>
Porter Creek	96.9%	93.9%	94.8%	96.5%	95.5%	95.5%	95.5%
Sherman Creek	96.9%	97.6%	97.2%	97.7%	97.3%	97.3%	97.3%
<b><u>Budd Inlet/Deschutes</u></b>							
Black Lake	82.4%	82.1%	82.4%	82.4%	82.4%	82.4%	82.4%
Capitol Lake	65.2%	65.2%	65.2%	65.2%	65.2%	65.2%	65.2%
Chambers	56.9%	56.1%	55.3%	55.6%	55.6%	55.6%	55.6%
Deschutes (Lower)	67.2%	67.6%	67.5%	67.7%	67.6%	67.6%	67.6%
Deschutes (Middle)	81.4%	81.5%	80.9%	81.1%	81.8%	81.8%	81.8%
Deschutes (Upper)	95.1%	91.7%	84.2%	88.9%	94.1%	94.1%	94.1%
East Bay	70.6%	70.6%	70.6%	70.6%	70.6%	70.6%	70.6%
Ellis Creek	69.1%	68.8%	69.1%	69.1%	69.1%	69.1%	69.1%
Indian Creek	49.2%	49.1%	48.9%	48.9%	48.9%	48.9%	48.9%
Moxlie Creek	48.6%	48.6%	48.4%	48.4%	48.4%	48.4%	48.4%
Lake Lawrence	19.5%	19.5%	19.5%	19.5%	19.5%	19.5%	19.5%
McIntosh Lake	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Mission Creek	54.3%	53.4%	53.6%	53.6%	53.6%	53.6%	53.6%
Offut Lake	74.2%	74.3%	70.1%	70.1%	71.0%	71.0%	71.0%
Percival Creek	65.9%	64.6%	63.5%	63.5%	63.3%	63.3%	63.3%
Reichel Lake	59.9%	59.5%	59.8%	57.6%	60.7%	60.7%	60.7%
Schneider Creek	43.8%	43.8%	43.8%	43.8%	43.8%	43.8%	43.8%
Spurgeon Creek	82.7%	82.9%	81.7%	81.5%	81.6%	81.6%	81.6%
West Bay	53.2%	53.2%	52.9%	52.9%	52.9%	52.9%	52.9%
<b><u>Eld Inlet</u></b>							
Eld Inlet (East)	82.5%	82.5%	82.2%	82.2%	82.2%	82.2%	82.2%
Eld Inlet (West)	82.0%	81.7%	83.0%	83.3%	83.6%	83.6%	83.6%
Green Cove Creek	84.2%	83.6%	83.7%	83.7%	83.5%	83.5%	83.5%
McLane Creek	85.5%	86.3%	86.3%	85.9%	86.4%	86.4%	86.4%
Perry Creek	89.7%	89.9%	86.2%	86.9%	88.0%	88.0%	88.0%
Squaxin Passage	45.8%	45.8%	45.8%	45.8%	45.8%	45.8%	45.8%
<b><u>Henderson Inlet</u></b>							
Dana Passage	84.4%	84.2%	84.0%	84.0%	84.0%	84.0%	84.0%
Henderson Inlet (East)	74.1%	73.9%	73.7%	73.6%	73.4%	73.4%	73.4%
Henderson Inlet (West)	75.9%	75.4%	75.4%	75.4%	75.4%	75.4%	75.4%
Woodard Creek	72.1%	72.1%	71.8%	71.9%	71.7%	71.7%	71.7%
Woodland Creek	74.4%	74.4%	73.4%	73.3%	73.1%	73.1%	73.1%
<b><u>Nisqually River</u></b>							
Alder Lake	98.5%	98.5%	95.5%	95.2%	91.4%	91.4%	91.4%
Bald Hill Lake	95.9%	95.9%	95.9%	95.9%	95.9%	95.9%	95.9%
Clear Lake	81.1%	81.1%	81.1%	81.1%	81.1%	81.1%	81.1%
Elbow Lake	94.3%	77.7%	85.2%	89.4%	97.7%	97.7%	97.7%
McAllister Creek	50.0%	51.9%	51.3%	51.3%	51.3%	51.3%	51.3%
Nisqually	85.3%	84.8%	84.7%	84.5%	85.8%	85.8%	85.8%
Nisqually Reach	86.4%	85.9%	85.4%	85.3%	85.3%	85.3%	85.3%

Basin	2001	2006	2011	2016	2021	2045	Buildout
Thompson Creek	46.3%	46.3%	45.8%	45.8%	45.9%	45.9%	45.9%
Yelm Creek	40.2%	40.6%	40.1%	40.2%	40.1%	40.1%	40.1%
<b>Totten Inlet</b>							
Burns/Pierre	66.9%	66.9%	66.9%	66.9%	67.9%	67.9%	67.9%
Kennedy Creek	92.5%	90.8%	91.6%	91.0%	94.1%	94.1%	94.1%
Schneider Creek	85.5%	84.5%	84.8%	85.0%	85.0%	85.0%	85.0%
Totten Inlet (East)	90.0%	89.7%	90.0%	89.7%	90.0%	90.0%	90.0%

**Table 2-4: Current and Projected Basin Condition**

Basin	2001	2006	2011	2016	2021	2045	Buildout
<b>Black River</b>							
Allen Creek	Impacted	Impacted	Impacted	Impacted	Impacted	Impacted	Impacted
Beaver Creek	Impacted	Impacted	Impacted	Impacted	Impacted	Impacted	Impacted
Black River	Impacted	Impacted	Impacted	Impacted	Impacted	Impacted	Impacted
Bloom Ditch	Sensitive	Sensitive	Sensitive	Sensitive	Sensitive	Sensitive	Sensitive
Dempsey Creek	Sensitive	Sensitive	Sensitive	Sensitive	Sensitive	Sensitive	Sensitive
Mima Creek	Sensitive	Sensitive	Sensitive	Sensitive	Sensitive	Sensitive	Sensitive
Salmon Creek	Impacted	Impacted	Impacted	Impacted	Impacted	Impacted	Impacted
Waddell Creek	Intact	Sensitive	Sensitive	Sensitive	Sensitive	Sensitive	Sensitive
<b>Chehalis River</b>							
East Fork Independence	Sensitive	Sensitive	Sensitive	Sensitive	Sensitive	Sensitive	Sensitive
Lincoln Creek	Sensitive	Sensitive	Sensitive	Sensitive	Sensitive	Sensitive	Sensitive
Michigan	Sensitive	Sensitive	Sensitive	Sensitive	Sensitive	Sensitive	Sensitive
Prairie Creek	Impacted	Impacted	Impacted	Impacted	Impacted	Impacted	Impacted
Scatter Creek	Impacted	Impacted	Impacted	Impacted	Impacted	Impacted	Impacted
<b>Skookumchuck River</b>							
Bloody Run	Intact	Intact	Sensitive	Sensitive	Sensitive	Sensitive	Sensitive
Frost Prairie	Sensitive	Sensitive	Sensitive	Sensitive	Sensitive	Sensitive	Sensitive
Hanaford Creek	Sensitive	Sensitive	Sensitive	Sensitive	Sensitive	Sensitive	Sensitive
Johnson Creek	Sensitive	Sensitive	Sensitive	Sensitive	Sensitive	Sensitive	Sensitive
O'Conner	Sensitive	Sensitive	Sensitive	Sensitive	Sensitive	Sensitive	Sensitive
Salmon Creek	Intact	Intact	Intact	Sensitive	Sensitive	Sensitive	Sensitive
Skookumchuck	Impacted	Impacted	Impacted	Impacted	Impacted	Impacted	Impacted
Thompson Creek	Sensitive	Sensitive	Sensitive	Sensitive	Sensitive	Sensitive	Sensitive
Zenkner	Sensitive	Sensitive	Sensitive	Sensitive	Sensitive	Sensitive	Sensitive
<b>West Capitol Forest</b>							
Fall Creek	Intact	Intact	Sensitive	Sensitive	Intact	Intact	Intact
Lost Valley	Intact	Intact	Sensitive	Intact	Intact	Intact	Intact
Monroe Creek	Intact	Sensitive	Sensitive	Intact	Intact	Intact	Intact
Porter Creek	Intact	Sensitive	Sensitive	Sensitive	Intact	Intact	Intact
Sherman Creek	Intact	Sensitive	Sensitive	Intact	Intact	Intact	Intact

Basin	2001	2006	2011	2016	2021	2045	Buildout
<b><u>Budd Inlet/Deschutes</u></b>							
Black Lake	Impacted	Impacted	Impacted	Impacted	Impacted	Impacted	Impacted
Capitol Lake	Very Deg.	Very Deg.	Very Deg.	Very Deg.	Very Deg.	Very Deg.	Very Deg.
Chambers	Degraded	Degraded	Very Deg.	Very Deg.	Very Deg.	Very Deg.	Very Deg.
Deschutes (Lower)	Impacted	Impacted	Impacted	Impacted	Impacted	Impacted	Impacted
Deschutes (Middle)	Sensitive	Sensitive	Sensitive	Sensitive	Sensitive	Sensitive	Sensitive
Deschutes (Upper)	Intact	Sensitive	Sensitive	Sensitive	Sensitive	Sensitive	Sensitive
East Bay	Impacted	Impacted	Impacted	Impacted	Impacted	Impacted	Impacted
Ellis Creek	Impacted	Impacted	Impacted	Impacted	Impacted	Impacted	Impacted
Indian Creek	Very Deg.	Very Deg.	Very Deg.	Very Deg.	Very Deg.	Very Deg.	Very Deg.
Moxlie Creek	Very Deg.	Very Deg.	Very Deg.	Very Deg.	Very Deg.	Very Deg.	Very Deg.
Lake Lawrence	Impacted	Degraded	Degraded	Degraded	Impacted	Impacted	Impacted
McIntosh Lake	Sensitive	Sensitive	Sensitive	Sensitive	Sensitive	Sensitive	Sensitive
Mission Creek	Very Deg.	Very Deg.	Very Deg.	Very Deg.	Very Deg.	Very Deg.	Very Deg.
Offut Lake	Sensitive	Impacted	Impacted	Impacted	Impacted	Impacted	Impacted
Percival Creek	Degraded	Degraded	Degraded	Degraded	Degraded	Degraded	Degraded
Reichel Lake	Sensitive	Impacted	Impacted	Sensitive	Sensitive	Sensitive	Sensitive
Schneider Creek	Very Deg.	Very Deg.	Very Deg.	Very Deg.	Very Deg.	Very Deg.	Very Deg.
Spurgeon Creek	Sensitive	Sensitive	Sensitive	Sensitive	Sensitive	Sensitive	Sensitive
West Bay	Degraded	Degraded	Degraded	Degraded	Degraded	Degraded	Degraded
<b><u>Eld Inlet</u></b>							
Eld Inlet (East)	Sensitive	Sensitive	Impacted	Impacted	Impacted	Impacted	Impacted
Eld Inlet (West)	Sensitive	Sensitive	Sensitive	Sensitive	Sensitive	Sensitive	Sensitive
Green Cove Creek	Impacted	Impacted	Impacted	Impacted	Impacted	Impacted	Impacted
McLane Creek	Sensitive	Sensitive	Sensitive	Sensitive	Sensitive	Sensitive	Sensitive
Perry Creek	Sensitive	Sensitive	Sensitive	Sensitive	Sensitive	Sensitive	Sensitive
Squaxin Passage	Impacted	Impacted	Impacted	Impacted	Impacted	Impacted	Impacted
<b><u>Henderson Inlet</u></b>							
Dana Passage	Sensitive	Sensitive	Sensitive	Sensitive	Sensitive	Sensitive	Sensitive
Henderson Inlet (East)	Impacted	Impacted	Impacted	Impacted	Impacted	Impacted	Impacted
Henderson Inlet (West)	Sensitive	Sensitive	Sensitive	Sensitive	Sensitive	Sensitive	Sensitive
Woodard Creek	Impacted	Impacted	Impacted	Impacted	Impacted	Impacted	Impacted
Woodland Creek	Impacted	Degraded	Degraded	Degraded	Degraded	Degraded	Degraded
<b><u>Nisqually River</u></b>							
Alder Lake	Intact	Intact	Intact	Intact	Intact	Intact	Intact
Bald Hill Lake	Intact	Sensitive	Sensitive	Intact	Intact	Intact	Intact
Clear Lake	Sensitive	Sensitive	Sensitive	Sensitive	Sensitive	Sensitive	Sensitive
Elbow Lake	Intact	Sensitive	Sensitive	Sensitive	Intact	Intact	Intact
McAllister Creek	Impacted	Impacted	Impacted	Impacted	Impacted	Impacted	Impacted
Nisqually	Sensitive	Sensitive	Sensitive	Sensitive	Sensitive	Sensitive	Sensitive
Nisqually Reach	Sensitive	Impacted	Impacted	Impacted	Impacted	Impacted	Impacted
Thompson Creek	Impacted	Impacted	Impacted	Impacted	Impacted	Impacted	Impacted
Yelm Creek	Impacted	Impacted	Impacted	Impacted	Impacted	Impacted	Degraded

Basin	2001	2006	2011	2016	2021	2045	Buildout
<b>Totten Inlet</b>							
Burns/Pierre	Sensitive	Impacted	Impacted	Impacted	Sensitive	Sensitive	Sensitive
Kennedy Creek	Sensitive	Sensitive	Sensitive	Sensitive	Intact	Intact	Intact
Schneider Creek	Sensitive	Sensitive	Sensitive	Sensitive	Sensitive	Sensitive	Sensitive
Totten Inlet (East)	Sensitive	Sensitive	Sensitive	Sensitive	Sensitive	Sensitive	Sensitive

## APPENDIX III: CAUSES OF LAND COVER CHANGE

Table 3-1: Washington Dept. of Fish and Wildlife High-Resolution Change Detection Change Agents, 2011-2021

Basin	Forestry	Development	Tree Removal	Other	No Change	Basin Condition Change (2011-2021)
<b><u>Black River</u></b>						
Allen Creek	1.1%	0.1%	1.1%	0.3%	97.5%	Impacted
Beaver Creek	4.4%	0.3%	2.8%	0.1%	92.4%	Impacted
Black River	2.6%	0.3%	1.7%	0.1%	95.4%	Impacted
Bloom Ditch	1.9%	0.4%	2.0%	0.2%	95.5%	Sensitive
Dempsey Creek	5.1%	0.2%	2.7%	0.1%	91.9%	Sensitive
Mima Creek	10.7%	0.0%	0.6%	1.0%	87.7%	Sensitive
Salmon Creek	0.0%	1.4%	2.0%	0.6%	96.0%	Impacted
Waddell Creek	12.3%	0.0%	1.3%	0.0%	86.3%	Sensitive
<b><u>Chehalis River</u></b>						
East Fork Independence	1.4%	0.0%	2.3%	0.0%	96.3%	Sensitive
Lincoln Creek	24.3%	0.2%	3.3%	0.1%	72.1%	Sensitive
Michigan	4.7%	0.1%	3.8%	0.1%	91.3%	Sensitive
Prairie Creek	7.0%	0.4%	2.6%	0.4%	89.7%	Impacted
Scatter Creek	8.1%	0.3%	1.9%	0.1%	89.6%	Impacted
<b><u>Skookumchuck River</u></b>						
Bloody Run	30.6%	0.0%	1.9%	0.0%	67.5%	Sensitive
Frost Prairie	15.6%	0.0%	1.6%	0.3%	82.4%	Sensitive
Hanaford Creek	7.0%	0.0%	0.2%	0.2%	92.6%	Sensitive
Johnson Creek	23.2%	0.0%	0.5%	0.0%	76.3%	Sensitive
O'Conner	31.7%	0.0%	0.7%	0.1%	67.5%	Sensitive
Salmon Creek	23.5%	0.0%	0.7%	0.1%	75.7%	Intact to Sensitive
Skookumchuck	11.5%	0.1%	1.2%	0.1%	87.1%	Impacted
Thompson Creek	13.1%	0.0%	0.8%	0.2%	85.9%	Sensitive
Zenkner	7.0%	0.0%	1.1%	0.0%	91.8%	Sensitive
<b><u>West Capitol Forest</u></b>						
Fall Creek	7.9%	0.0%	0.0%	0.0%	92.1%	Sensitive to Intact
Lost Valley	12.8%	0.0%	0.4%	0.0%	86.8%	Sensitive to Intact
Monroe Creek	0.0%	0.0%	0.0%	0.0%	100.0%	Sensitive to Intact
Porter Creek	15.2%	0.0%	0.7%	0.1%	83.9%	Sensitive to Intact
Sherman Creek	8.7%	0.0%	0.4%	0.1%	90.8%	Sensitive to Intact
<b><u>Budd Inlet/Deschutes</u></b>						
Black Lake	3.1%	0.4%	1.5%	0.1%	94.9%	Impacted
Capitol Lake	0.0%	0.4%	0.4%	0.0%	99.1%	Very Degraded
Chambers	0.1%	1.2%	1.0%	0.0%	97.6%	Very Degraded
Deschutes (Lower)	0.2%	1.9%	1.7%	0.6%	95.7%	Impacted
Deschutes (Middle)	5.9%	0.2%	1.5%	0.1%	92.2%	Sensitive

Basin	Forestry	Develop- ment	Tree Removal	Other	No Change	Basin Condition Change (2011-2021)
Deschutes (Upper)	16.6%	0.0%	0.8%	0.0%	82.5%	Sensitive
East Bay	0.3%	0.4%	0.7%	0.0%	98.5%	Impacted
Ellis Creek	0.0%	0.6%	0.7%	0.0%	98.7%	Impacted
Indian Creek	0.0%	1.3%	1.0%	0.0%	97.7%	Very Degraded
Moxlie Creek	0.0%	1.6%	1.0%	0.2%	97.3%	Very Degraded
Lake Lawrence	2.0%	0.4%	1.4%	0.0%	96.2%	Degraded to Impacted
McIntosh Lake	22.7%	0.2%	1.4%	0.0%	75.7%	Sensitive
Mission Creek	0.0%	0.6%	0.6%	0.0%	98.7%	Very Degraded
Offut Lake	9.0%	0.1%	2.1%	0.1%	88.7%	Impacted
Percival Creek	0.0%	2.4%	1.1%	0.1%	96.3%	Degraded
Reichel Lake	17.8%	0.0%	2.5%	0.1%	79.5%	Impacted to Sensitive
Schneider Creek	0.0%	0.4%	0.4%	0.0%	99.2%	Very Degraded
Spurgeon Creek	0.5%	0.5%	1.4%	0.0%	97.6%	Sensitive
West Bay	0.0%	1.1%	0.7%	0.0%	98.2%	Degraded
<b><u>Eld Inlet</u></b>						
Eld Inlet (East)	0.0%	1.3%	0.8%	0.1%	97.9%	Impacted
Eld Inlet (West)	1.5%	0.6%	2.2%	0.2%	95.5%	Sensitive
Green Cove Creek	0.0%	0.7%	1.0%	0.0%	98.3%	Impacted
McLane Creek	3.1%	0.1%	0.5%	0.0%	96.3%	Sensitive
Perry Creek	4.4%	0.0%	0.8%	0.0%	94.8%	Sensitive
Squaxin Passage	0.0%	0.3%	0.9%	0.1%	98.8%	Impacted
<b><u>Henderson Inlet</u></b>						
Dana Passage	0.0%	0.8%	2.7%	0.1%	96.4%	Sensitive
Henderson Inlet (East)	1.2%	0.5%	3.6%	0.0%	94.7%	Impacted
Henderson Inlet (West)	0.6%	0.2%	0.7%	0.1%	98.5%	Sensitive
Woodard Creek	0.0%	1.0%	0.8%	0.4%	97.8%	Impacted
Woodland Creek	0.1%	4.0%	3.0%	0.1%	92.8%	Degraded
<b><u>Nisqually River</u></b>						
Alder Lake	8.1%	0.0%	0.1%	0.2%	91.6%	Intact
Bald Hill Lake	3.4%	0.0%	0.2%	0.1%	96.3%	Sensitive to Intact
Clear Lake	10.2%	0.1%	0.4%	0.0%	89.3%	Sensitive
Elbow Lake	0.0%	0.0%	0.3%	0.1%	99.6%	Sensitive to Intact
McAllister Creek	1.1%	1.3%	1.9%	0.1%	95.7%	Impacted
Nisqually	5.0%	0.3%	1.2%	0.1%	93.5%	Sensitive
Nisqually Reach	0.5%	7.0%	2.9%	0.1%	89.6%	Impacted
Thompson Creek	1.7%	0.5%	1.5%	0.1%	96.3%	Impacted
Yelm Creek	3.2%	0.5%	2.1%	0.0%	94.1%	Impacted
<b><u>Totten Inlet</u></b>						
Burns/Pierre	0.0%	0.6%	0.5%	0.0%	98.9%	Impacted to Sensitive
Kennedy Creek	7.7%	0.0%	0.5%	0.0%	91.8%	Sensitive to Intact
Schneider Creek	6.0%	0.3%	0.9%	0.1%	92.8%	Sensitive
Totten Inlet (East)	0.8%	0.5%	3.3%	0.1%	95.3%	Sensitive