

Habitat Conditions in the Lower Snoqualmie, Tolt, and Raging Rivers



King County

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Special Thanks



King County

- Snoqualmie Watershed Forum
- King County Flood Control District Cooperative Watershed Management Grant

King County Staff

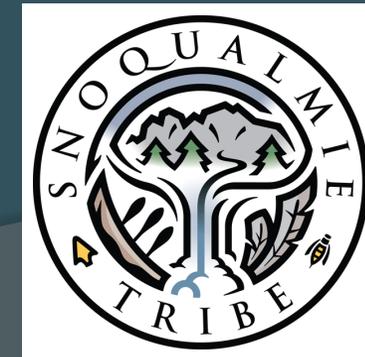
- Josh Baldi
- Chris Gregersen
- Kollin Higgins
- Dan Lantz
- Beth leDoux
- Kate O’Laughlin
- Elissa Ostergaard
- Ken Rauscher
- Dave White
- Jo Wilhelm

Snoqualmie Tribe Staff

- Matt Baerwalde
- Angela Dillon
- Heather Minnella

Snohomish River Basin Partners

- Brian Footen
- Gretchen Glaub
- Frank Leonetti
- Morgan Ruff
- Mike Rustay
- Colin Wahl



Special Thanks



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Matt Baerwalde on the Raging River

Snoqualmie River & Salmon Conservation



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Snohomish River Basin Salmon Conservation Plan



JUNE 2005

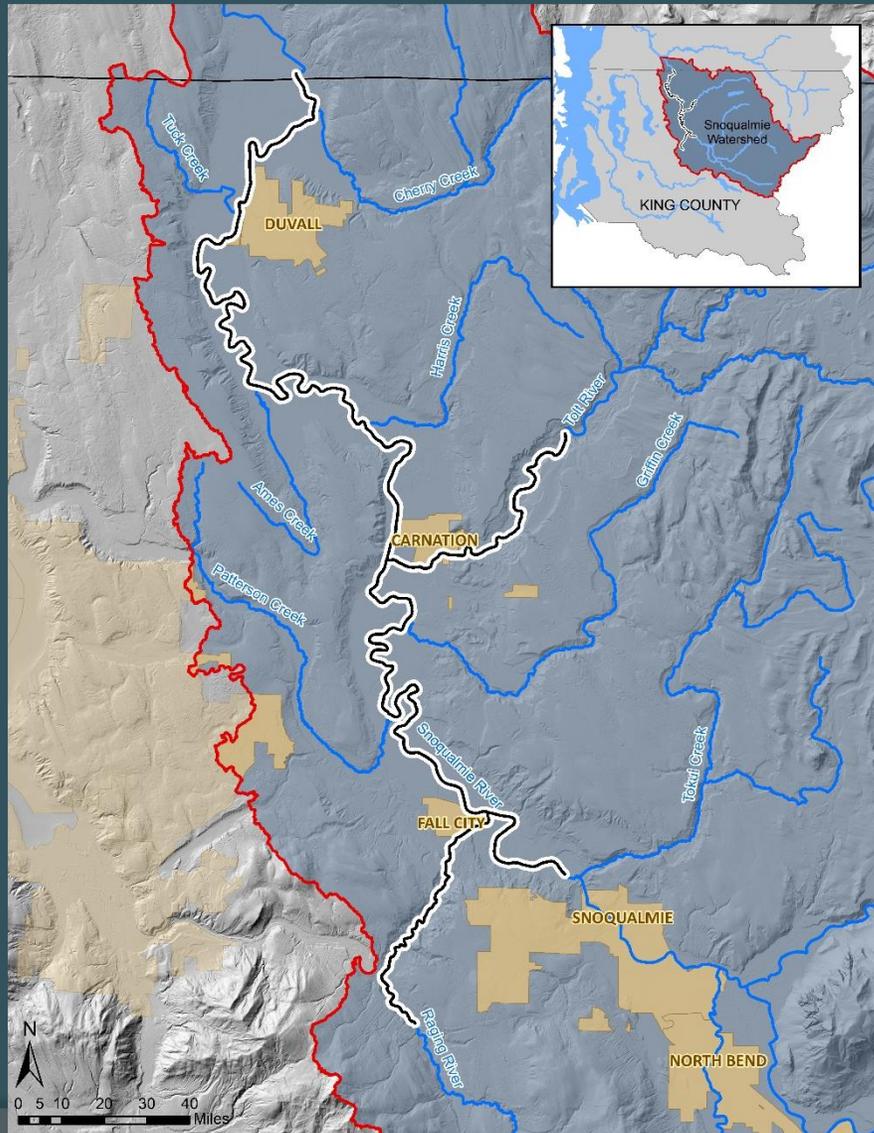
During preparation of this plan, Mark Soltro, City of North Bend, and Terry Williams, The Tulalip Tribes, served as Chair and Vice-Chair of the Snohomish Basin Salmon Recovery Forum, respectively. Martha Neuman, Snohomish County Department of Public Works, Surface Water Management Division, served as project manager, editor, and lead staff to the Forum.

Special thanks are given to members and alternates of the Snohomish Basin Salmon Recovery Forum, staff from Snohomish County Department of Public Works, Surface Water Management Division, and King County Department of Natural Resources and Parks, the Snoqualmie Watershed Forum and the Snohomish Basin Salmon Recovery Technical Committee. Environmentalists assisted with plan preparation and public involvement. EcoPlan International provided support for developing alternatives and decision-making.

2017 Habitat Surveys



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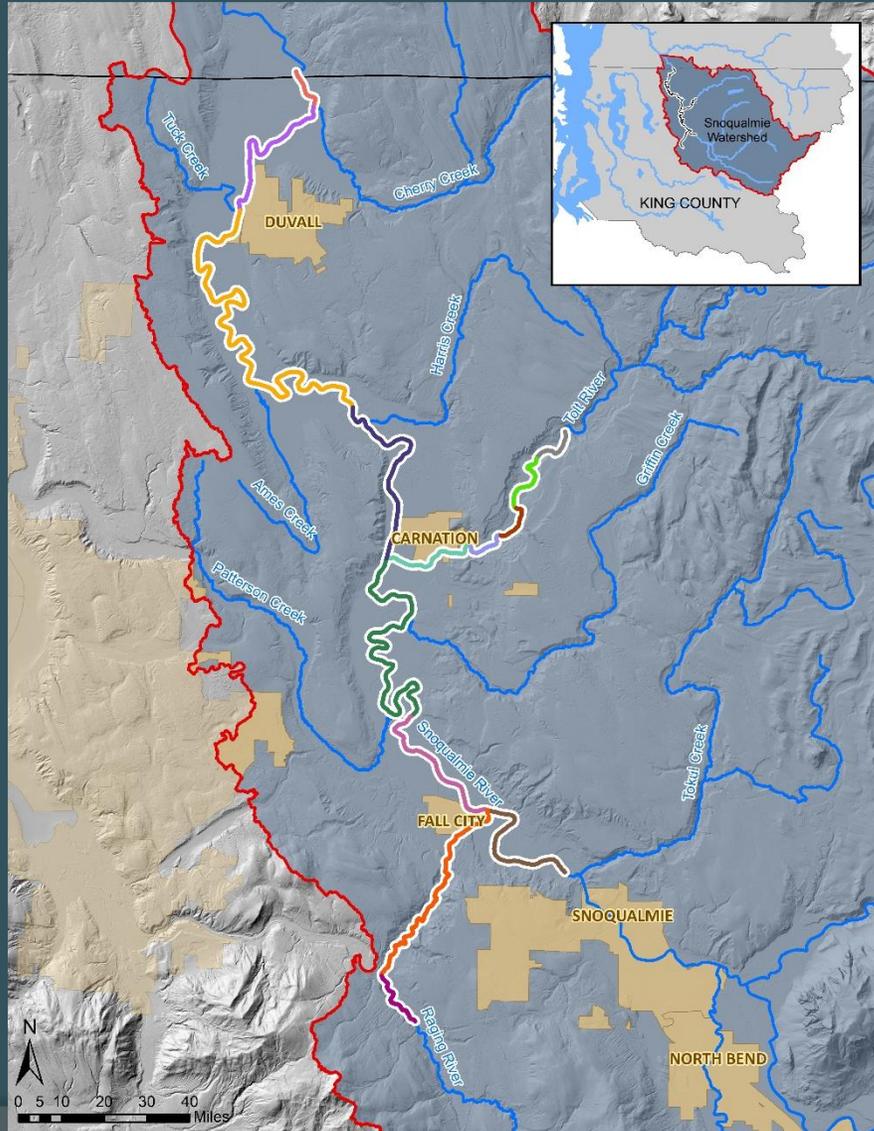
- Snoqualmie River (RM 5.3 - 37.8)
- Tolt River (RM 0 - 6)
- Raging River (RM 0 - 6)



2017 Habitat Surveys



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- Snoqualmie River (RM 5.3 - 37.8)
- Tolt River (RM 0 - 6)
- Raging River (RM 0 - 6)
- EDT Reaches used in 2005 Salmon Plan



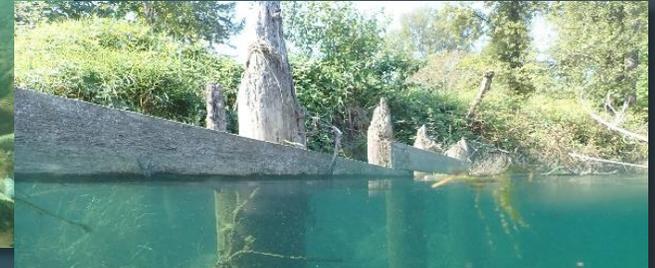
Surveyed Attributes



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Field Surveys

- Bank conditions
- Large woody debris
- Instream habitats and floodplain features
- Channel and floodplain modifications



Desktop Evaluation

- Riparian conditions



Evaluating Progress



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SNOQUALMIE WATERSHED AQUATIC HABITAT CONDITIONS REPORT: SUMMARY OF 1999-2001 DATA

November 2002

Fran Solomon and Melissa Boles

Snohomish River Basin Salmon Conservation Plan



JUNE 2005

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2005 Salmon Plan

50yr goal

10yr goal

Progress

Progress provided by the
Snoqualmie Watershed Forum

Stream Bank Conditions



Stream Bank Conditions



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Armored Banks

- Snoqualmie River = 40%
- Tolt River = 30%
- Raging River = 40%



Stream Bank Conditions



King County

Since Adoption of 2005 Salmon Plan

-  Armor = Snoqualmie_3 (Stillwater, Camp Gilead, Chinook Bend), Snoqualmie_5 (Upper Carlson), and Tolt_1A (Lower Tolt)

EDT Reach	River Miles	Modified Banks		Percent Change
		2000/2001	2017	
Snoqualmie_3	~19.7 – 23.7	60.6%	51.5%	-9.1% (4001.1')
Snoqualmie_4	~23.7 – 31.4	39.5%	41.2%	1.7% (1361.1')
Snoqualmie_5	~31.4 – 34.6	63.4%	59.1%	-4.3% (1458.9')
Snoqualmie_6	~34.6 – 37.8	28.8%	35.9%	7.0% (2234.9')
Tolt_1A	~0 – 1.8	94.8%	83.2%	-11.6% (2242.4')



Upper Carlson Restoration Project

Stream Bank Conditions

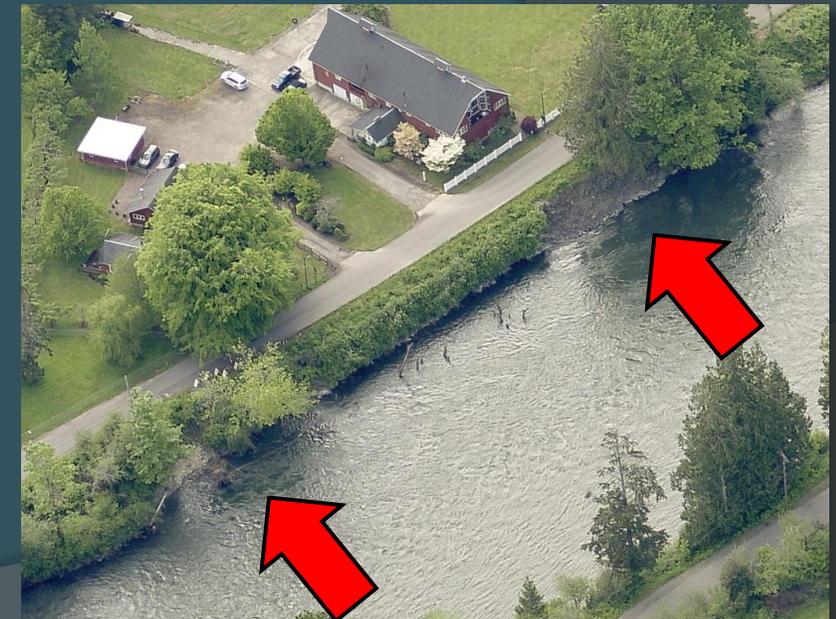


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Since Adoption of 2005 Salmon Plan

-  Armor = Snoqualmie_4 (end of Neal Rd & near Griffin Creek),
Snoqualmie_6 (SE David Powell Rd)

EDT Reach	River Miles	Modified Banks		Percent Change
		2000/2001	2017	
Snoqualmie_3	~19.7 – 23.7	60.6%	51.5%	-9.1% (4001.1')
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SE David Powell Road

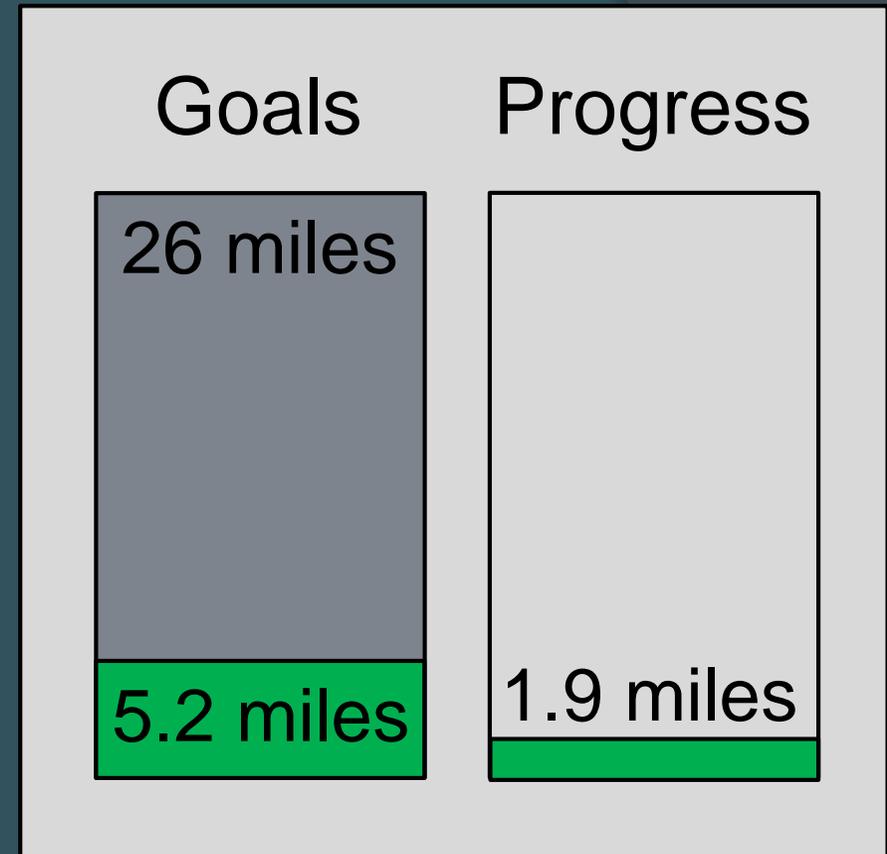
Stream Bank Conditions



King County

Since Adoption of 2005 Salmon Plan

-  Armor = Stillwater, Camp Gilead, Chinook Bend, Upper Carlson, and Lower Tolt
-  Armor = end of Neal Rd & near Griffin Creek, SE David Powell Rd



Large Woody Debris



Large Woody Debris (LWD)



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LWD Abundance (pieces per mile)

- Snoqualmie River = 41.4
- Tolt River = 159.7
- Raging River = 76.8





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Large Woody Debris (LWD)

LWD Abundance (pieces per mile)

- Snoqualmie River = 41.4
- Tolt River = 159.7
- Raging River = 76.8

LWD with Rootwads

- Snoqualmie = 63%
- Tolt River = 48%
- Raging River = 49%



Large Woody Debris (LWD)



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Since Adoption of 2005 Salmon Plan

-  in wood abundance
-  in wood jam abundance



Goals

Progress

100 jams

20 jams

18 jams



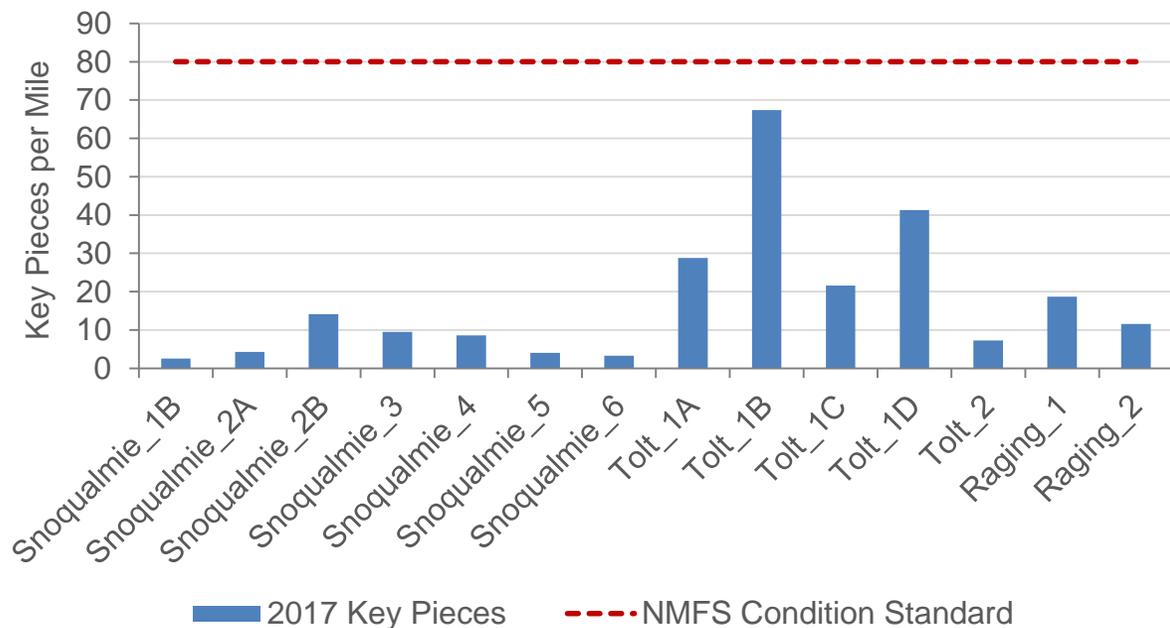
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Large Woody Debris (LWD)

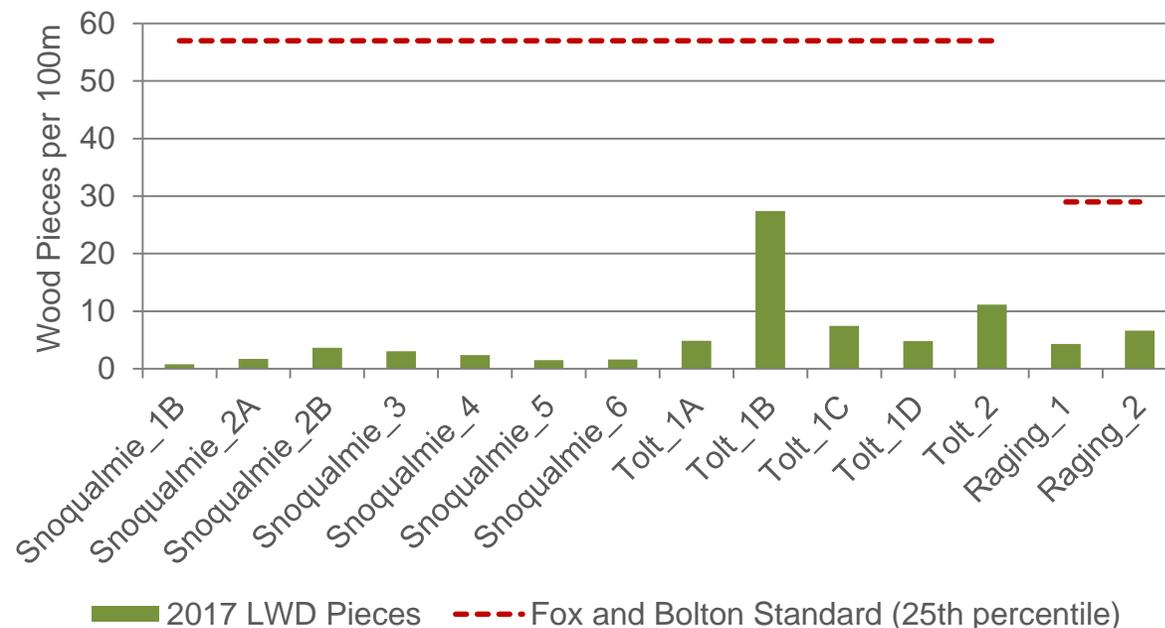
Regional LWD Abundance Standards

- Standard for coastal rivers (NMFS 1996)
- Standard for unmanaged forested basins (Fox and Bolton 2007)

2017 LWD with NMFS (1996)



2017 LWD with Fox and Bolton (2007)





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Instream Habitats

Instream Habitats

- Snoqualmie River = pools and glides
- Tolt and Raging river = pools and riffles
- Snoqualmie River riffles = downstream of Tokul Creek, Raging River, and Tolt River



Snoqualmie River



Tolt River



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Instream Habitats

Pool forming Features

- Snoqualmie River = rip-rap
- Tolt and Raging = wood, bedrock, and boulders

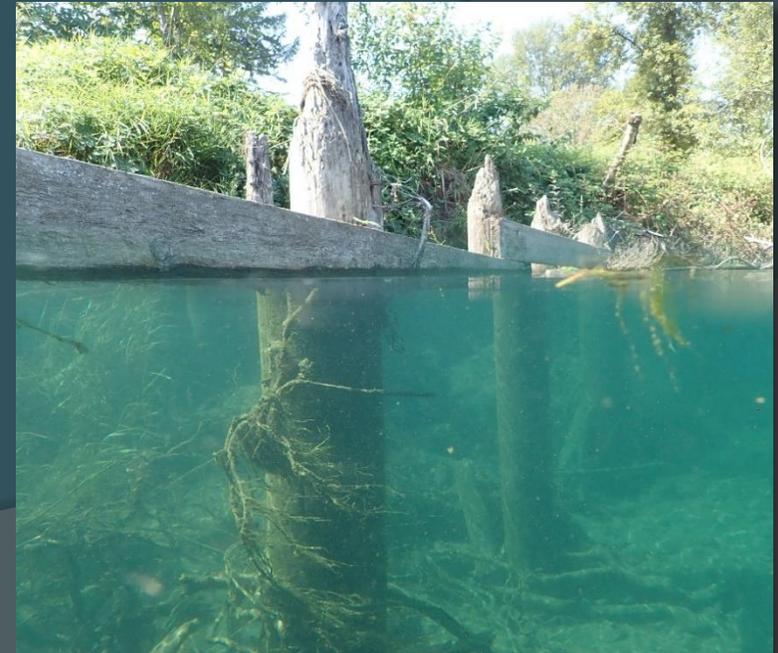


Channel and Floodplain Modifications



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- Culverts and outfalls (21)
- Piling arrays (29)
- Flap gates (5)
- Water irrigation pumps (24)

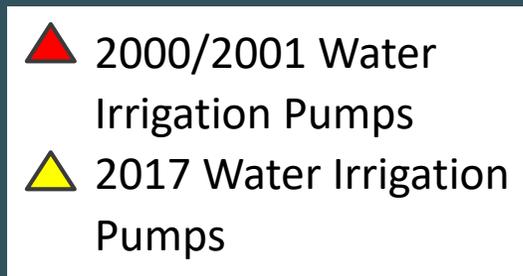


Channel and Floodplain Modifications



King County

- Culverts and outfalls (21)
- Piling arrays (29)
- Flap gates (5)
- **Water irrigation pumps (24)**



Riparian Conditions



Snoqualmie Valley Historical Society



Puget Sound River History Project

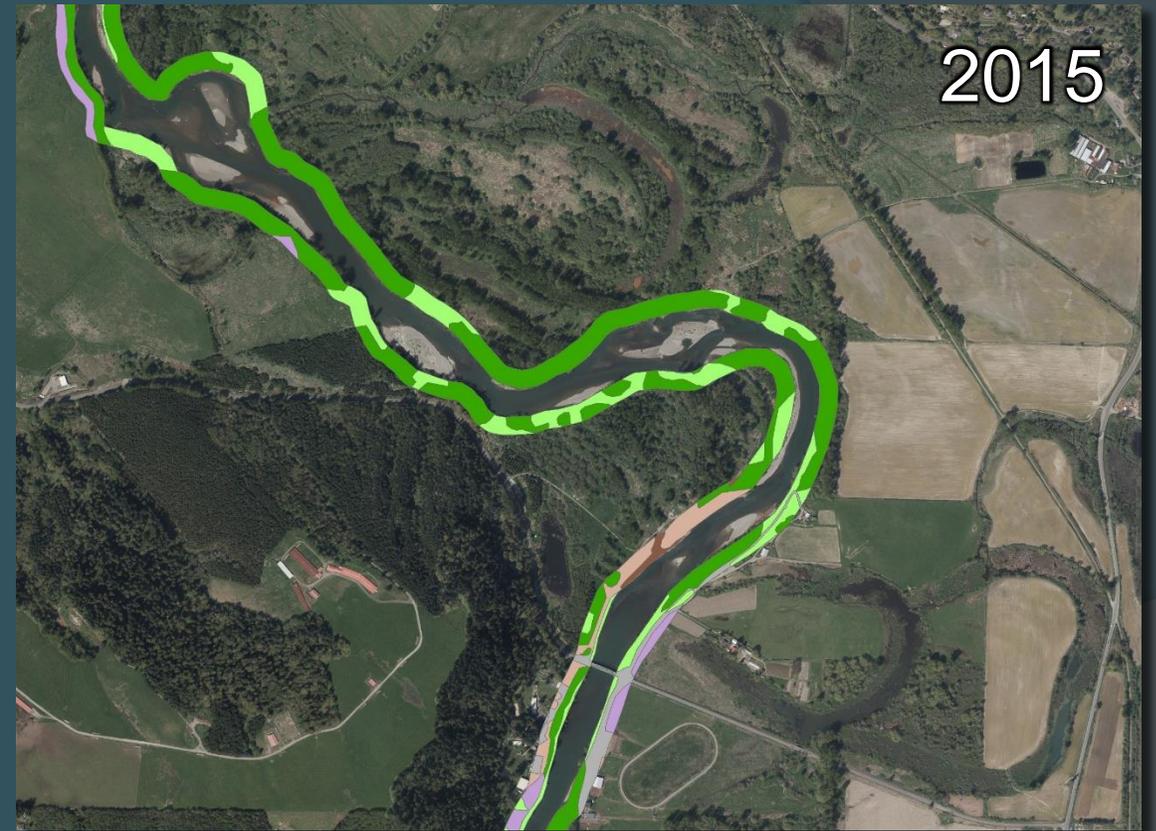
Riparian Conditions



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Prior to 2005 Salmon Plan

Current Land Cover



150-ft wide riparian corridor

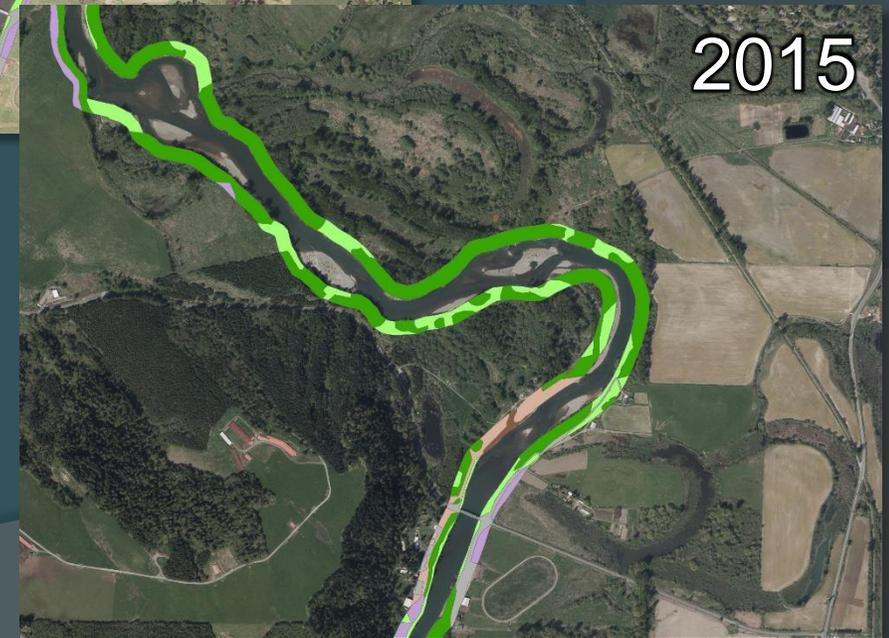
Riparian Conditions



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Riparian Land Cover

- Trees
- Shrubs
- Agriculture (farm fields, pasture, crops, etc.)
- Impervious surfaces
- Bare ground
- Other (water, lawns, rocks, vegetated gravel bars, etc.)



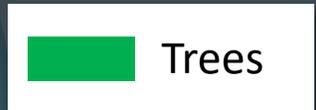
Riparian Conditions



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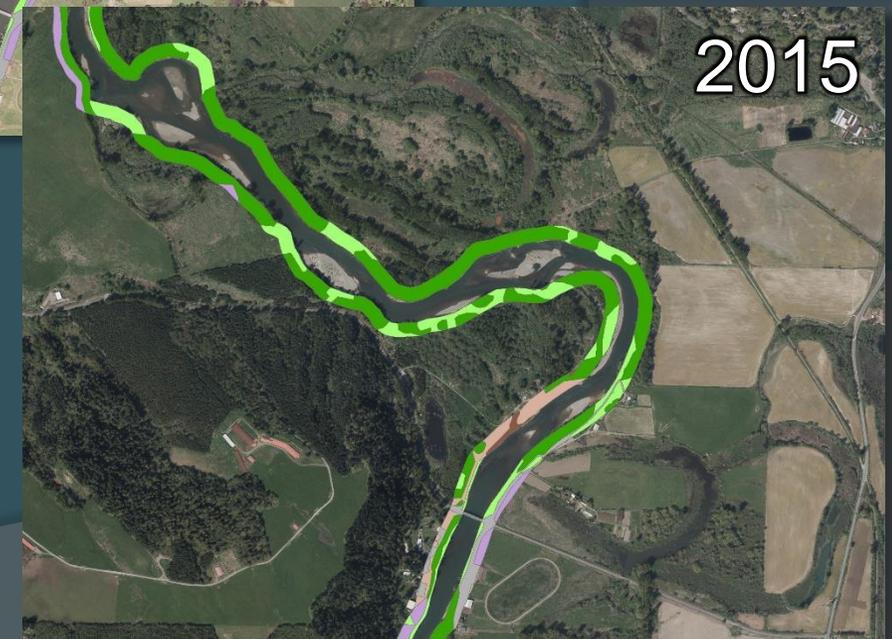
2015 Tree Coverage

- Snoqualmie River = 40.4%
- Tolt River = 85.7%
- Raging River = 70.6%



Since Adoption of 2005 Salmon Plan

-  tree coverage in Snoqualmie (4.1%) and Tolt (11.8%), no increase in Raging



Riparian Conditions

Specific Land Cover Changes



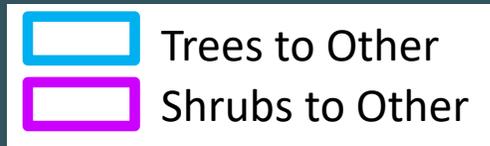
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Riparian Conditions



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Specific Land Cover Changes – areas of channel migration



Riparian Conditions



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Specific Land Cover Changes – areas outside of channel migration

Snoqualmie River

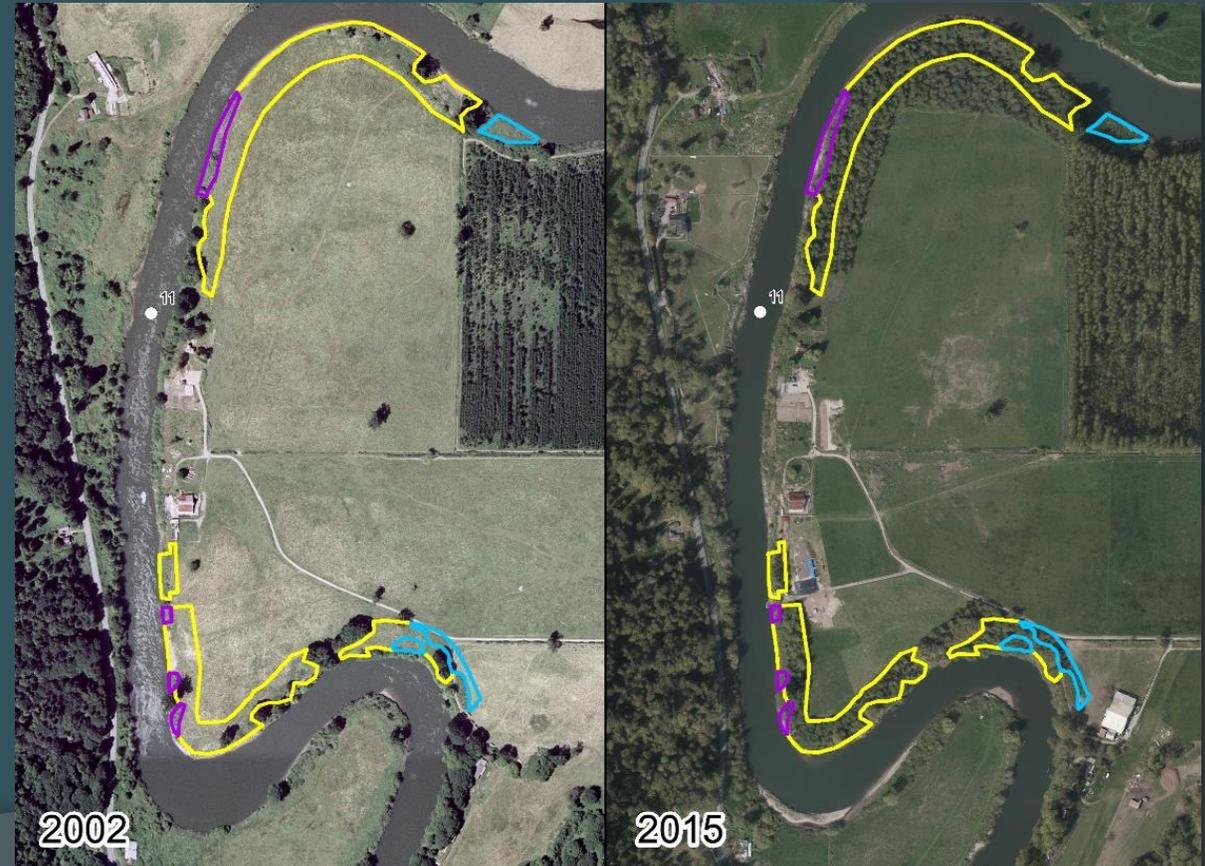
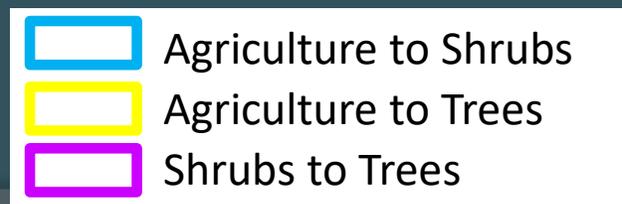
- Agriculture to Shrubs & Trees
- Shrubs to Trees

Tolt River

- Shrubs & Bare Ground to Trees

Raging River

- Shrubs to Trees



Riparian Conditions



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Specific Land Cover Changes – areas outside of channel migration

Snoqualmie River

- Agriculture to Shrubs & Trees
- Shrubs to Trees

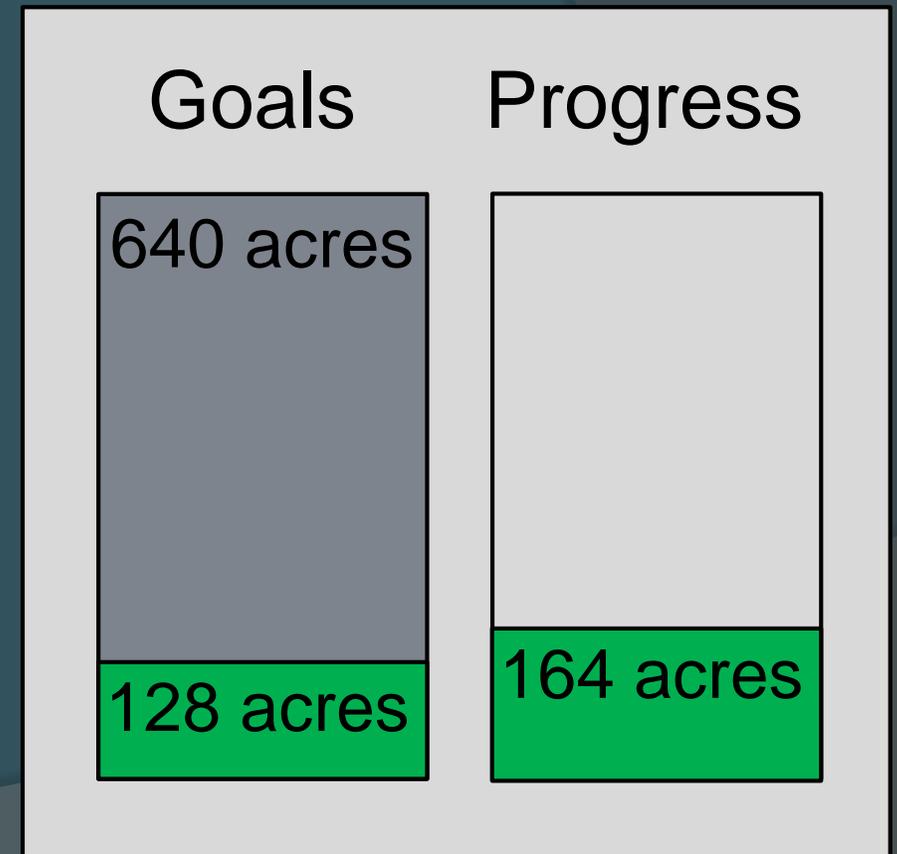
Tolt River

- Shrubs & Bare Ground to Trees

Raging River

- Shrubs to Trees

Various cover → shrubs & trees





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FishViews

- 360° virtual tour with panoramic imagery & hydrologic data
- Mainstem tour = Raging River to Tolt River
- Desktop survey = collected habitat attributes through virtual survey





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FishViews

Stream bank conditions

- Similar observations

Instream & off-channel habitats and floodplain features

- Pool/glide discrepancies
- Fewer backwaters & tributaries observed

Large woody debris and jams

- Similar abundances (except jams)
- Fewer jams observed
- Length/width discrepancies in

Channel and floodplain modifications

- Fewer modifications observed



FishViews



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- Cost effective
- Tours can be archived
- Great way to view restoration projects and riverscapes
- Paired with field surveys





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Conclusions

- **Bank conditions**
- Large woody debris
- Instream habitats and floodplain features
- Channel and floodplain modifications
- Riparian conditions



- 1.9 miles restored
-  &  in armor
- Ongoing bank degradation



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Conclusions

- Bank conditions
- **Large woody debris**
- Instream habitats and floodplain features
- Channel and floodplain modifications
- Riparian conditions



- 18 LWD jams
-  large wood abundance
- Still well below standards



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Conclusions

- Bank conditions
- Large woody debris
- **Instream habitats and floodplain features**
- Channel and floodplain modifications
- Riparian conditions



- Differences in planform
- Pool forming features



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Conclusions

- Bank conditions
- Large woody debris
- Instream habitats and floodplain features
- **Channel and floodplain modifications**
- Riparian conditions



- Several modification
-  water irrigation pumps

Conclusions



King County

- Bank conditions
- Large woody debris
- Instream habitats and floodplain features
- Channel and floodplain modifications
- **Riparian conditions**



- 164 acres planted
-  shrubs & trees
- Reached 10yr goal

Questions



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Aquatic Habitat Conditions in the Lower Snoqualmie, Tolt, and Raging Rivers

September 2018



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Water and Land Resources Division
Science and Technical Support Section
King Street Center, KSC-NR-0600
201 South Jackson Street, Suite 600
Seattle, WA 98104
206-477-4800 TTY Relay: 711
www.kingcounty.gov/EnvironmentalScience





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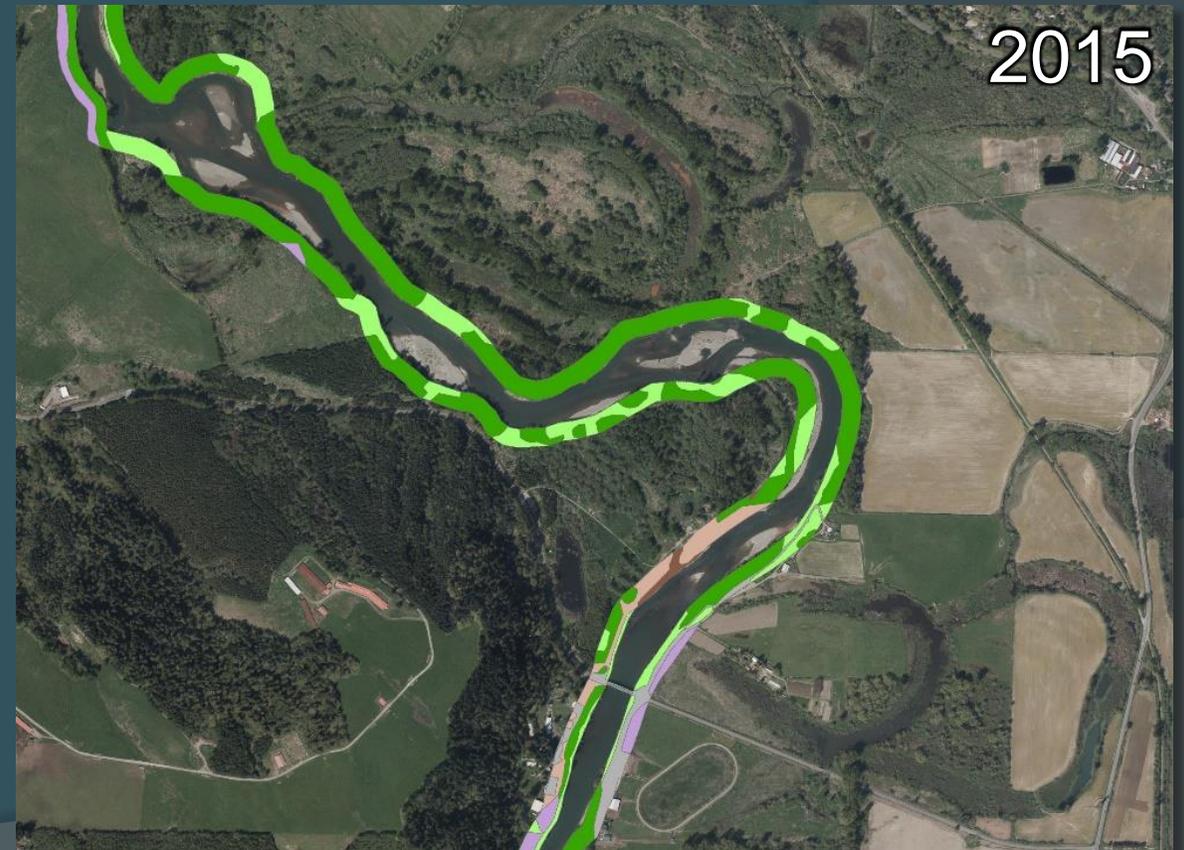
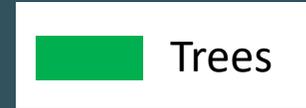
Riparian Conditions



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2015 Tree Coverage

- Snoqualmie River = 40.4%
- Tolt River = 85.7%
- Raging River = 70.6%



Riparian Conditions



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Since Adoption of 2005 Salmon Plan

-  tree coverage in Snoqualmie River (4.1%)

Land Cover Type	Acres		Percent Coverage		Change
	2002	2015	2002	2015	
Agriculture (Farm Fields, Pasture, etc.)	401.3	341.1	30.9%	27.7%	▼
Bare Ground	0.9	3.3	0.1%	0.3%	▲
Impervious Surfaces	72.9	68.7	5.6%	5.6%	–
Other (Water, Lawns, Rock, Vegetated Gravel Bars)	59.9	58.9	4.6%	4.8%	▲
Shrubs	292.7	260.7	22.5%	21.2%	▼
Trees	472.1	497.1	36.3%	40.4%	▲

Riparian Conditions



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Since Adoption of 2005 Salmon Plan

-  tree coverage in Tolt River (11.8%)

Land Cover Type	Acres		Percent Coverage		Change
	2002	2015	2002	2015	
Agriculture (Farm Fields, Pasture, etc.)	0.4	0.6	0.2%	0.2%	–
Bare Ground	7.2	0.5	3.1%	0.2%	▼
Impervious Surfaces	9.7	9.8	4.1%	4.0%	▼
Other (Water, Lawns, Rock, Vegetated Gravel Bars)	12.7	9.1	5.3%	3.7%	▼
Shrubs	32.4	16.0	13.7%	6.5%	▼
Trees	174.5	211.8	73.7%	85.5%	▲

Riparian Conditions



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Since Adoption of 2005 Salmon Plan

- Minimal change in tree coverage in Raging River

Land Cover Type	Acres		Percent Coverage		Change
	2002	2015	2002	2015	
Agriculture (Farm Fields, Pasture, etc.)	1.2	0.5	0.7%	0.3%	▼
Bare Ground	0.4	2.1	0.2%	1.2%	▲
Impervious Surfaces	17.6	18.0	10.0%	10.3%	▲
Other (Water, Lawns, Rock, Vegetated Gravel Bars)	16.3	17.2	9.3%	9.8%	▲
Shrubs	14.7	13.7	8.4%	7.8%	▼
Trees	124.7	123.5	71.3%	70.6%	▼