
Puget Sound B-IBI Restoration & Protection Project Fair Site Summaries and Potential Restoration Strategies

(Continuation of Appendix L from Main Report)

Main report:

<http://your.kingcounty.gov/dnrp/library/2015/kcr2693/kcr2693-rpt.pdf>

Prepared for:

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Department of
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This document contains supporting materials for the 2015 King County report “Strategies for Protecting and Restoring Puget Sound B-IBI Basins”, prepared by Jo Wilhelm and others (<http://your.kingcounty.gov/dnrp/library/2015/kcr2693/kcr2693-rpt.pdf>).

Appendix L of that report includes a summary table of possible restoration and management actions that may be applicable in basins that have been identified for potential restoration actions (see report for context and details). Appendix L references summaries for 54 individual basins, and this document contains those summaries.

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INTRODUCTION

The 54 B-IBI sites, shown in Figure 1 below, represent the basins targeted for restoration actions.

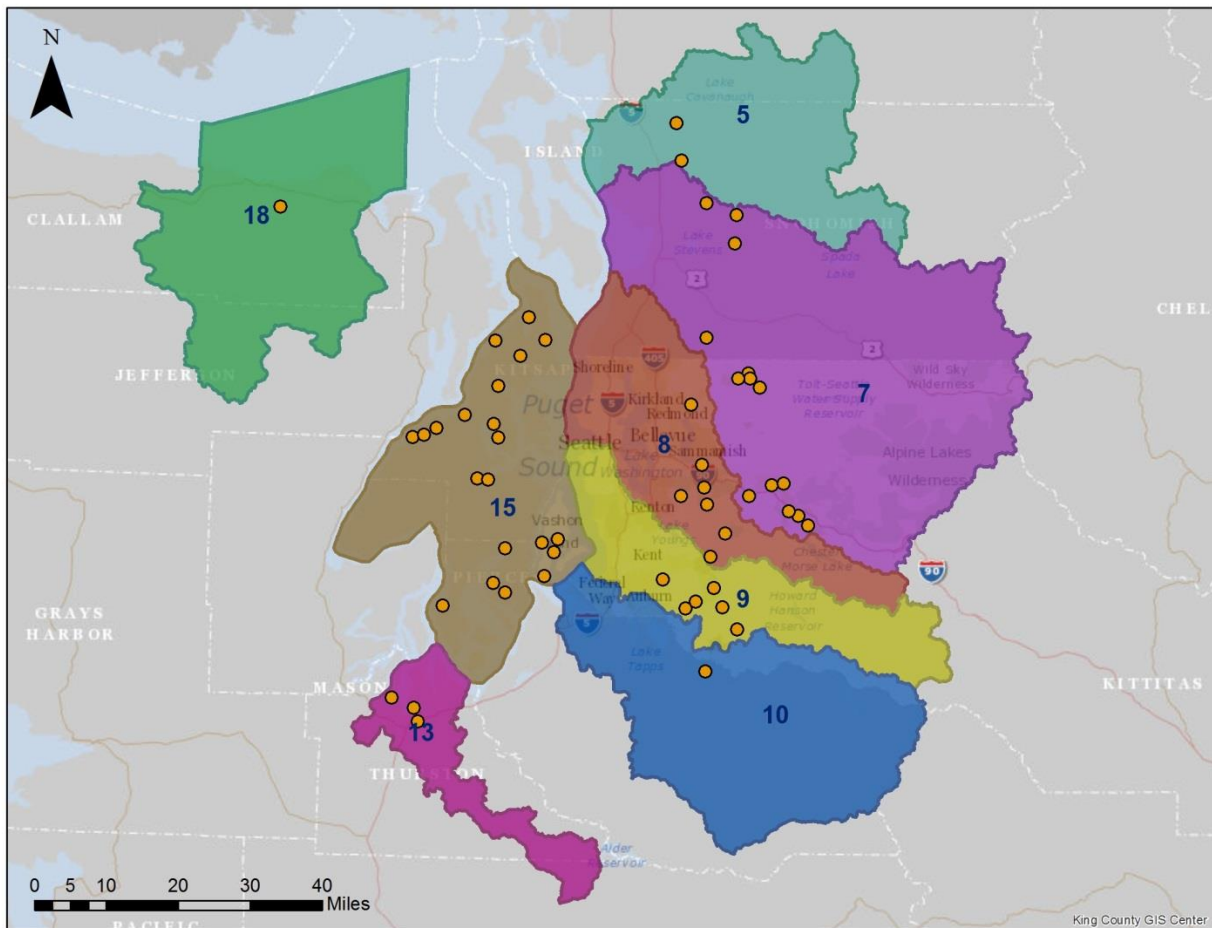


Figure 1: B-IBI sites (yellow points) that represent the 54 basins targeted for restoration. WRIAs that include at least one targeted restoration basin are noted by number and are colored.

This document contains a portfolio for each basin, organized in order of WRIA (low to high), then by site ID. The portfolio for each basin includes a map indicating the B-IBI sampling site, the basin upstream of the site, and any major roads or cities in the immediate area. Portfolios also include all of the B-IBI scores that are available as of May 2015; the median B-IBI score for the site that was used for the initial selection of basins was calculated using data from 1999 through 2012. Appendix K of the main report (see citation section above) includes the complete list of land use and land cover measures that were considered, but several that were particularly relevant are included in the portfolio pages. Potential restoration and management actions were evaluated for each basin, and the results of that preliminary effort are summarized in a table for each basin. The individual actions were rated on a scale from 0 to 4 (see table below), with 0 being “not applicable,” “1” indicating the action is likely not needed in the basin, and “4” indicating that a particular action is likely needed and if implemented, it would likely help restore the basin. This assessment is based on best professional judgment, as described in the main

document. Finally, the key types of restoration or management actions recommended for each basin are listed and a summary paragraph highlights observations that may be relevant when prioritizing or planning future actions for that basin.

Key for colors and numbers used in table:

not applicable	unlikely	possibly	likely	highly likely
0	1	2	3	4

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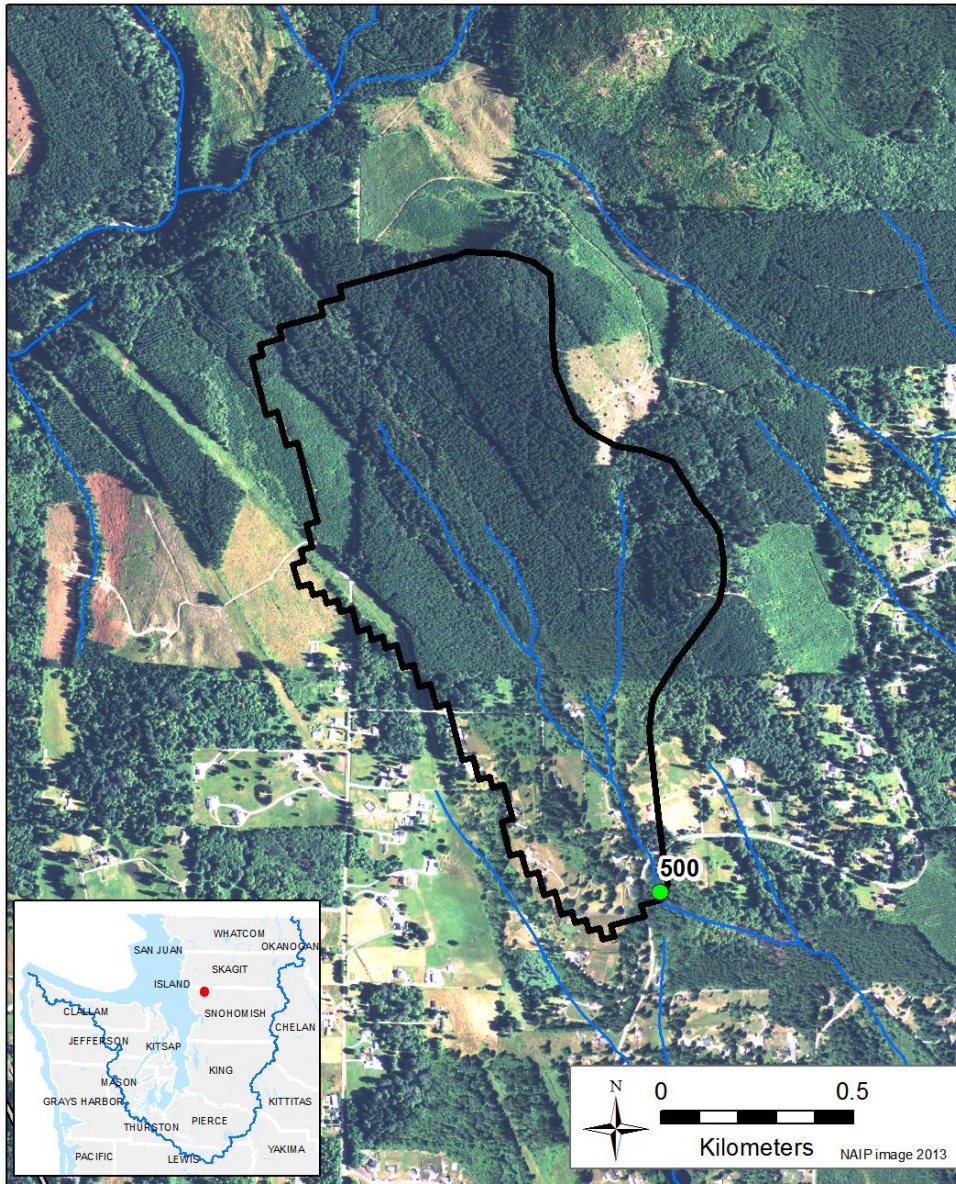
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Harvey Creek in the Stillaguamish Flats subbasin

WRIA 5; Site code (site ID): CAR2B (500)



Year	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	1999-2012 Median
B-IBI										32	28	42					32

Basin area (acres)	% urban within basin 1-km of site	% urban in whole basin	% pasture in whole basin	% natural in 90-m buffer in whole basin	% impervious in 2011 in whole basin
291.2	1.58%	0.76%	3.40%	93.68%	0.72%

Potential restoration or management actions for: Harvey Creek in the Stillaguamish Flats subbasin – WRIA 5; Site code (site ID): CAR2B (500)

Restoration and Management Actions		Likelihood action would help restore the basin
In-stream	add wood	2
	add substrate	2
	enhance sinuosity	2
	replace culverts	2
	stabilize stream banks	2
Riparian	stabilize slopes	2
	plant vegetation, extend buffer	4
Agricultural BMPs	exclude livestock	4
	manage waste	4
	prevent soil loss	2
Forest BMPs	road maintenance	4
	minimize clearcutting	4
	replant	3
Mining BMPs	mining BMPs	2
Stormwater BMPs	flow controls	3
	treatment	3
	maintain storage and treatment facilities	2
	street sweeping	1
Other Approaches and Actions	limit pesticide use	3
	outreach and education campaign	4
	create incentives to follow BMPs	3
	purchase and protect property	3
	seed invertebrates	3
Is the basin at risk of further degradation?		4

Key for colors and numbers used in table:

not applicable	unlikely	possibly	likely	highly likely
0	1	2	3	4

Key restoration or management action(s) recommended and summary notes:

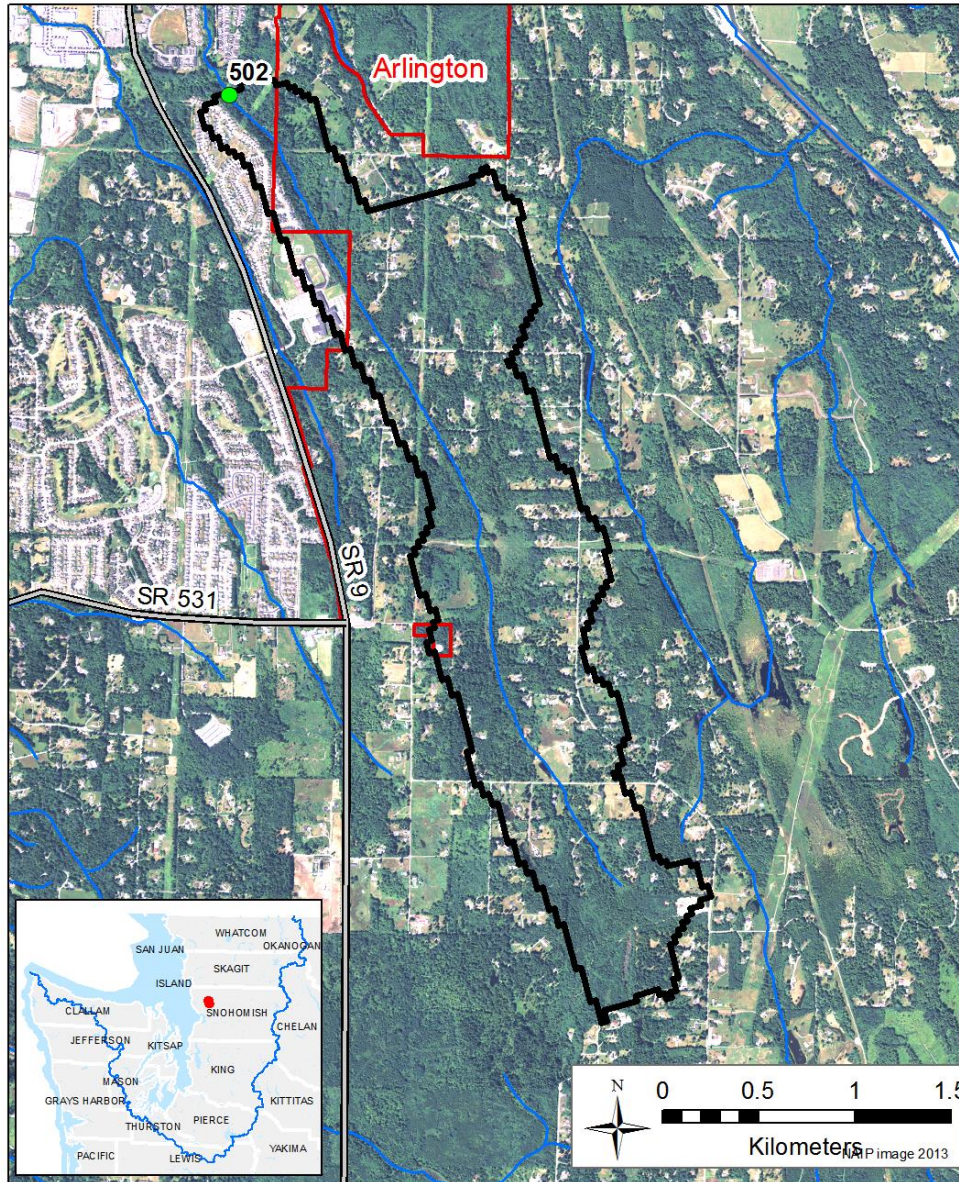
Outreach to landowners to encourage agricultural BMPs; expand buffers where applicable; forest and stormwater BMPs

The Harvey Creek basin is zoned for a variety of land uses, including rural residential, forest harvest and mining. Despite this, the forest in the upper basin appears to be young, but intact with no current mining activity visible in photos. The lower portion of the basin, zoned for rural residential, has been extensively cleared and many parcels appear to have small scale agricultural activities. Local managers

report agricultural and septic systems may be ditched to the creek. The buffers along the creek and tributaries are largely intact in the upper basin, but are typically less than 50 m on either side in the lower 500-m reach. Protecting the creek from future forest harvest and mining is critical, and in-channel restoration may be needed to ameliorate effects of previous logging. Stormwater runoff from farms and the road may also be impacting the site. Additional B-IBI samples should be collected upstream of the road to determine if road runoff is a major stressor. Stormwater BMPs targeting flows from agricultural land and the road may be needed. Outreach to landowners encouraging agricultural BMPs may also help the stream community recover. Seeding may also be appropriate, as there are no nearby sources of diverse and sensitive invertebrates.

Portage Creek in the Stillaguamish Flats subbasin

WRIA 5; Site code (site ID): CAR3C (502)



Year	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	1999-2012 Median
B-IBI										34	32	36					34

Basin area (acres)	% urban within basin 1-km of site	% urban in whole basin	% pasture in whole basin	% natural in 90-m buffer in whole basin	% impervious in 2011 in whole basin
959.2	25.63%	16.53%	0.09%	90.70%	6.35%

Potential restoration or management actions for: Portage Creek in the Stillaguamish Flats subbasin – WRIA 5; Site code (site ID): CAR3C (502)

Restoration and Management Actions		Likelihood action would help restore the basin
In-stream	add wood	2
	add substrate	2
	enhance sinuosity	2
	replace culverts	2
	stabilize stream banks	2
Riparian	stabilize slopes	2
	plant vegetation, extend buffer	3
Agricultural BMPs	exclude livestock	1
	manage waste	1
	prevent soil loss	1
Forest BMPs	road maintenance	0
	minimize clearcutting	0
	replant	0
Mining BMPs	mining BMPs	0
Stormwater BMPs	flow controls	4
	treatment	4
	maintain storage and treatment facilities	4
	street sweeping	3
Other Approaches and Actions	limit pesticide use	3
	outreach and education campaign	3
	create incentives to follow BMPs	3
	purchase and protect property	3
	seed invertebrates	3
Is the basin at risk of further degradation?		4

Key for colors and numbers used in table:

not applicable	unlikely	possibly	likely	highly likely
0	1	2	3	4

Key restoration or management action(s) recommended and summary notes:

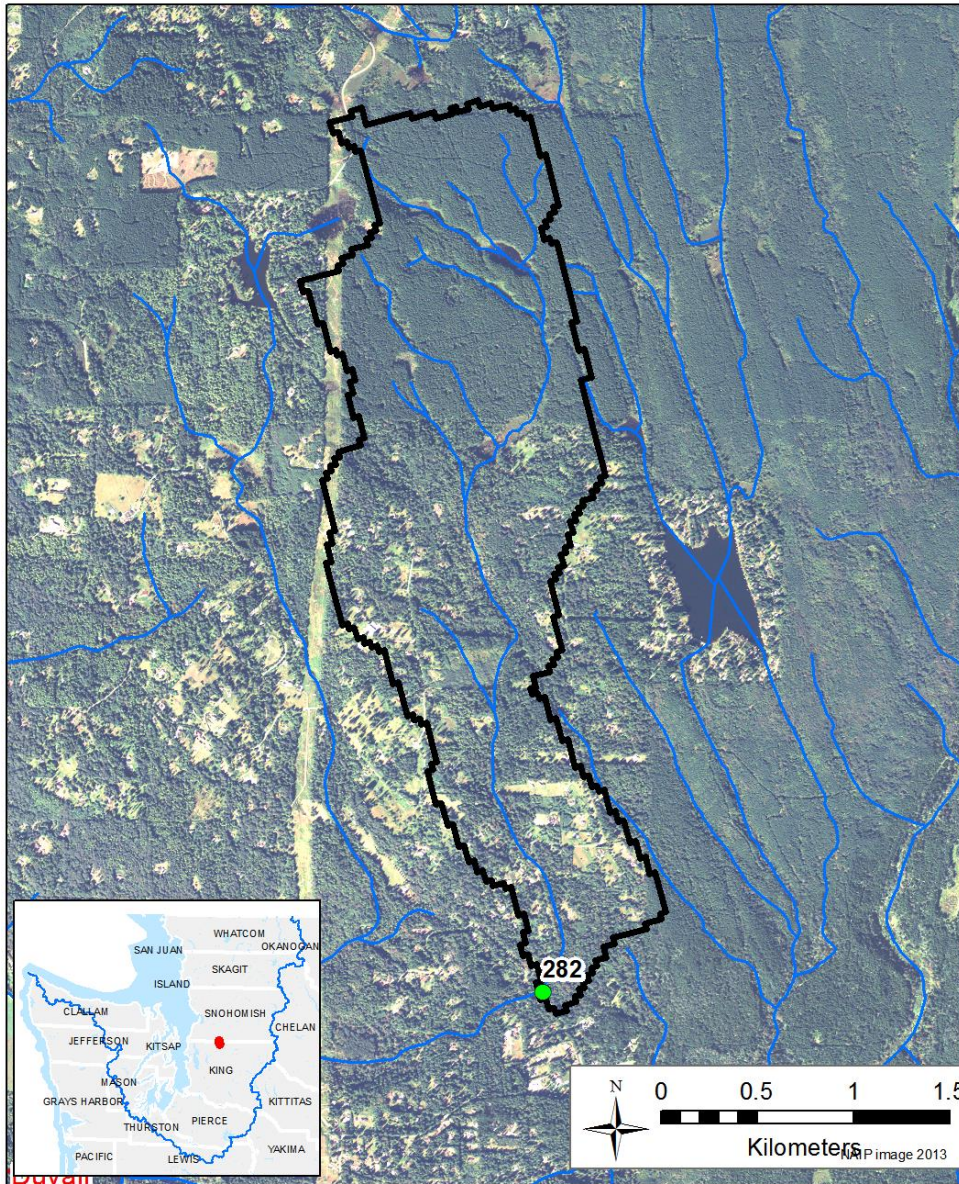
Stormwater BMPs, outreach

The Portage Creek basin is zoned primarily for rural residential except for 4.5% zoned for urban residential located near the site and zoned urban residential. A dense development just south of the site and in the lower 1-km basin was built in 2001; stormwater infrastructure near these homes should be cleaned and maintained. The PSWC process analysis indicated flow processes and water quality have been degraded, suggesting flow processes across the basin could be improved. Snohomish County staff

indicated the B-IBI site is located in a low-gradient area and an established channel does not form until farther downstream. The low gradient habitat may be naturally limiting the composition of the invertebrate community, but it appears there are still some sensitive taxa present. For example the Heptageniid mayfly *Cinygmula* has been abundant in the three years the site has been sampled, and while it is more tolerant of slower moving water than some mayflies, it is not tolerant of fine sediment and metals. If seeding is implemented, imported invertebrates should be from similar low-gradient streams. If more development occurs, buffers should be maintained and stormwater BMPs should be installed. The intrinsic potential for fish is relatively high at this site (rank of 8), and thus restoration actions within the channel could create more complex habitat for both invertebrates and fish.

Cherry Ck. - North Fork in the Cherry Creek subbasin

WRIA 7; Site code (site ID): E1078 (282)



Year	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	1999-2012 Median
B-IBI	16	20	34	34		32	36	36	46	42		32					34

Basin area (acres)	% urban within basin 1-km of site	% urban in whole basin	% pasture in whole basin	% natural in 90-m buffer in whole basin	% impervious in 2011 in whole basin
1124.9	16.55%	5.73%	0.00%	98.08%	1.87%

Potential restoration or management actions for: Cherry Ck. - North Fork in the Cherry Creek subbasin – WRIA 7; Site code (site ID): E1078 (282)

Restoration and Management Actions		Likelihood action would help restore the basin
In-stream	add wood	2
	add substrate	2
	enhance sinuosity	1
	replace culverts	1
	stabilize stream banks	1
Riparian	stabilize slopes	2
	plant vegetation, extend buffer	3
Agricultural BMPs	exclude livestock	4
	manage waste	0
	prevent soil loss	0
Forest BMPs	road maintenance	0
	minimize clearcutting	4
	replant	0
Mining BMPs	mining BMPs	0
Stormwater BMPs	flow controls	3
	treatment	3
	maintain storage and treatment facilities	2
	street sweeping	1
Other Approaches and Actions	limit pesticide use	3
	outreach and education campaign	4
	create incentives to follow BMPs	4
	purchase and protect property	2
	seed invertebrates	2
Is the basin at risk of further degradation?		4

Key for colors and numbers used in table:

not applicable	unlikely	possibly	likely	highly likely
0	1	2	3	4

Key restoration or management action(s) recommended and summary notes:

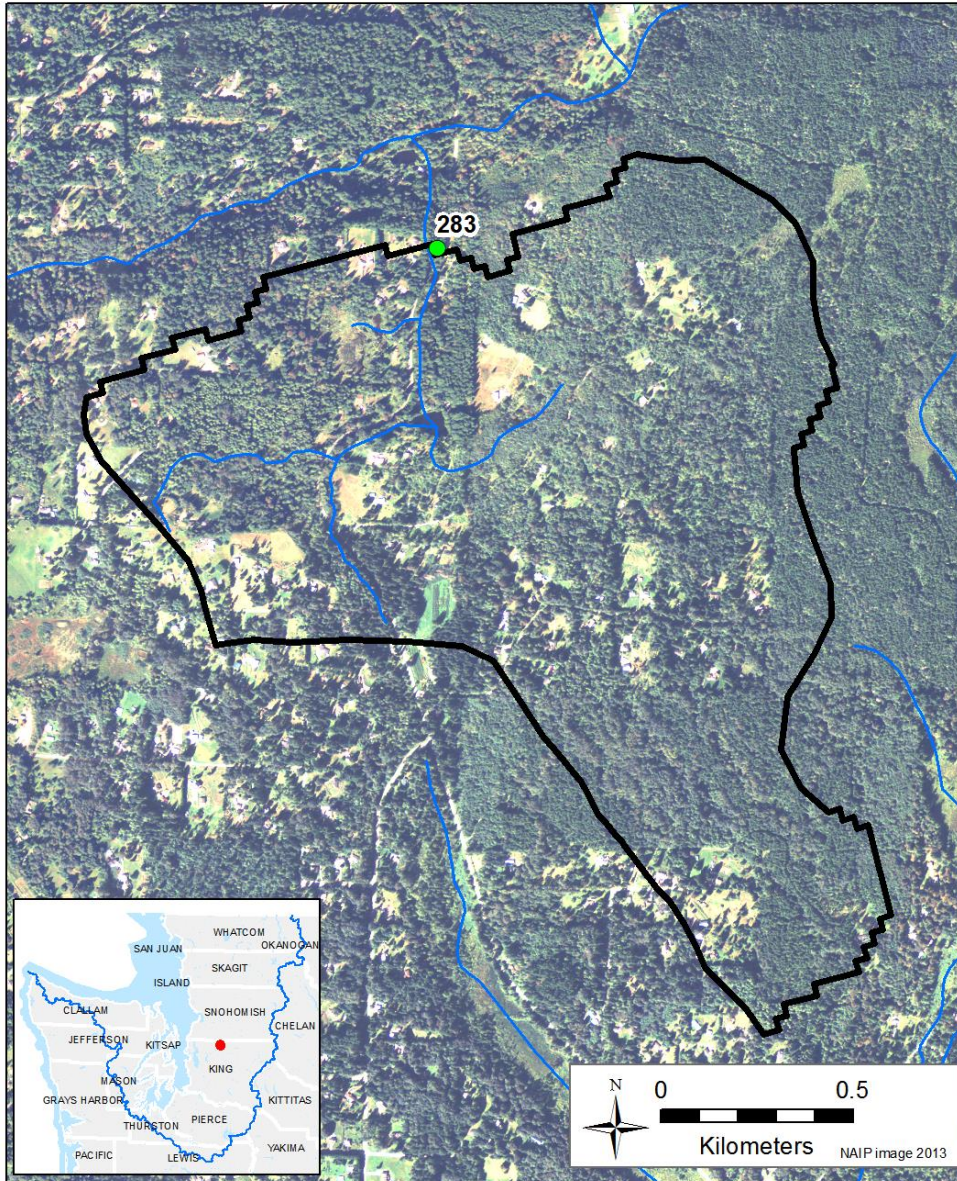
Outreach to landowners to encourage agricultural BMPs

The North Fork Cherry Creek basin is zoned as rural residential in the lower portion and resource forest in upper portion, and development ranges in age and type. Structures range from barns, to mobile homes to 3000+ square foot single-family residences. Some homes appear to be very old (e.g., 1916), it is uncertain what the current status of sewer and/or septic systems may be. Photos suggest there may also be a small resort or property with multiple units (e.g., multiple yurts and out buildings present, and

high density of cars) near a large wetland west of Soup Hole and northwest of Lake Margaret. In the lower portion of the basin, many parcels have been cleared for hobby farms. The buffer is largely intact, but in some areas buildings and fields are within 20 m of the channel. There may be parcel-specific issues that could be affecting water quality (e.g., pesticide use, failing septic, livestock, and abandoned cars within 20m of channel). Forested land appears multi-aged and intact, and there are several wetlands in the upper basin. Minimizing impacts from future forest harvest should be prioritized. The PSWC processes analysis indicates surface storage and discharge scored "2," while other processes scored "1." Actions should likely target landowners, and include education efforts to protect flow and water quality processes. There is likely local and agency support for restoration actions; the WRIA group has identified Cherry Creek as a prime restoration area and multiple projects are being implemented in reaches downstream of the B-IBI site.

Cherry Ck. Tributary in the Cherry Creek subbasin

WRIA 7; Site code (site ID): E1076 (283)



Year	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	1999-2012 Median
B-IBI	24	36	28	36	36	42	36	30	40	36	34	38					36

Basin area (acres)	% urban within basin 1-km of site	% urban in whole basin	% pasture in whole basin	% natural in 90-m buffer in whole basin	% impervious in 2011 in whole basin
584.4	7.95%	7.96%	0.00%	89.49%	2.61%

Potential restoration or management actions for: Cherry Ck. Tributary in the Cherry Creek subbasin – WRIA 7; Site code (site ID): E1076 (283)

Restoration and Management Actions		Likelihood action would help restore the basin
In-stream	add wood	2
	add substrate	2
	enhance sinuosity	2
	replace culverts	2
	stabilize stream banks	2
Riparian	stabilize slopes	2
	plant vegetation, extend buffer	3
Agricultural BMPs	exclude livestock	0
	manage waste	0
	prevent soil loss	0
Forest BMPs	road maintenance	2
	minimize clearcutting	3
	replant	0
Mining BMPs	mining BMPs	0
Stormwater BMPs	flow controls	4
	treatment	4
	maintain storage and treatment facilities	2
	street sweeping	1
Other Approaches and Actions	limit pesticide use	4
	outreach and education campaign	4
	create incentives to follow BMPs	4
	purchase and protect property	2
	seed invertebrates	2
Is the basin at risk of further degradation?		2

Key for colors and numbers used in table:

not applicable	unlikely	possibly	likely	highly likely
0	1	2	3	4

Key restoration or management action(s) recommended and summary notes:

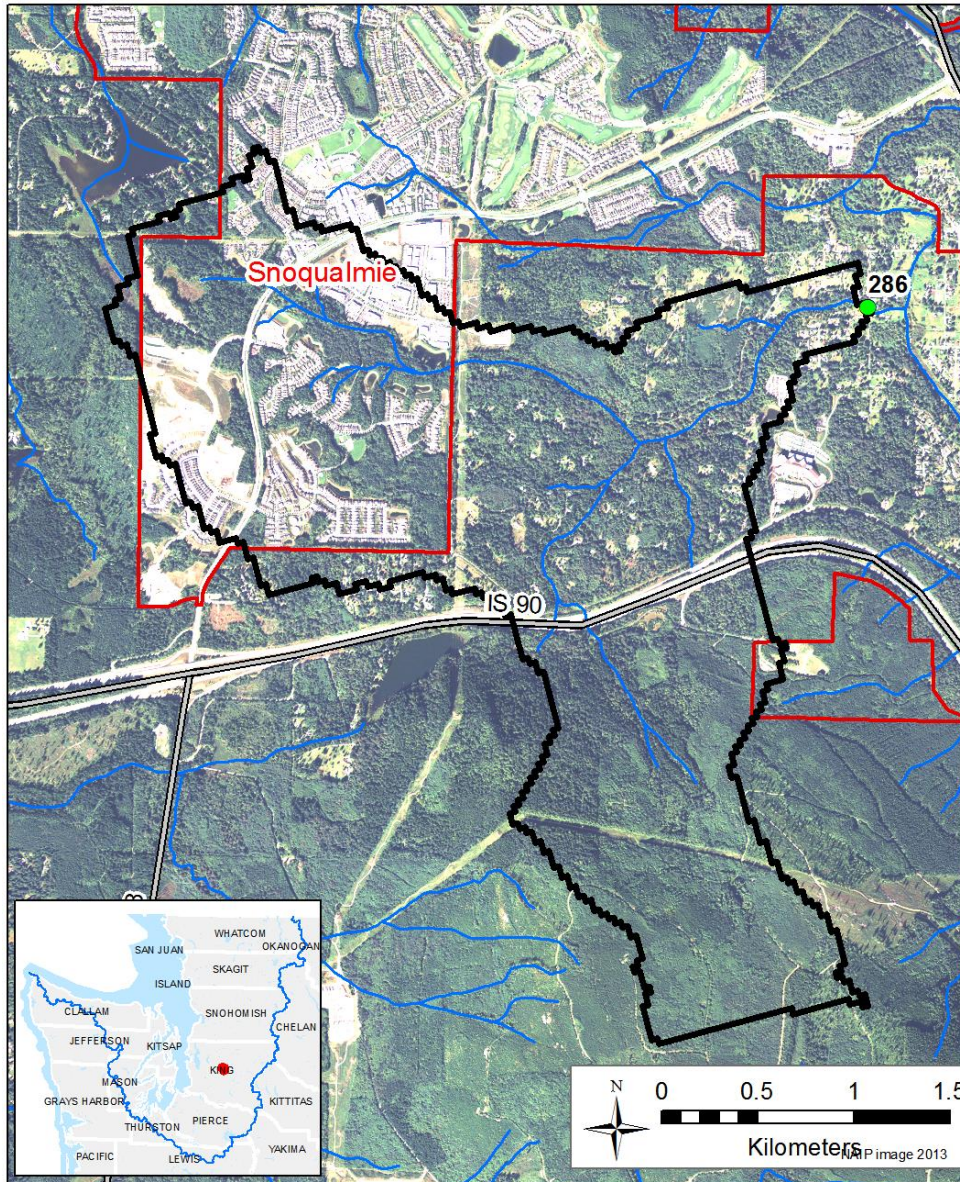
Stormwater BMPs that target road runoff; increasing buffer width; outreach to landowners

The basin for this Cherry Creek tributary is primarily zoned as rural residential, with the rest as resource forest. Land use in the basin is similar to site 282 (another Cherry Creek tributary), with 1 to 5 acre parcels with single family residences and small farms. There are several wetlands in this small basin, and relatively little impervious surface; however, the PSWC processes analysis indicated surface storage and discharge were degraded at the basin scale (score of "2"). The creek follows Kelly Road NE, and

tributaries cross the road at several points; stormwater runoff from the road may be impacting the creek and actions that reduce and treat road runoff may be appropriate. The PSWC prioritized the basin for stormwater BMPs, and there may be local support for restorations actions, because Chinook salmon use the mainstem of Cherry Creek.

Coal Ck. (Snoqualmie R.) in the Kimball Creek subbasin

WRIA 7; Site code (site ID): E1191 (286)



Year	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	1999-2012 Median
B-IBI						42	34	38	34	36	36	32					36

Basin area (acres)	% urban within basin 1-km of site	% urban in whole basin	% pasture in whole basin	% natural in 90-m buffer in whole basin	% impervious in 2011 in whole basin
1949.1	15.65%	16.39%	0.03%	86.30%	9.07%

Potential restoration or management actions for: Coal Ck. (Snoqualmie R.) in the Kimball Creek subbasin
 – WRIA 7; Site code (site ID): E1191 (286)

Restoration and Management Actions		Likelihood action would help restore the basin
In-stream	add wood	2
	add substrate	2
	enhance sinuosity	2
	replace culverts	2
	stabilize stream banks	2
Riparian	stabilize slopes	2
	plant vegetation, extend buffer	4
Agricultural BMPs	exclude livestock	0
	manage waste	0
	prevent soil loss	0
Forest BMPs	road maintenance	2
	minimize clearcutting	4
	replant	1
Mining BMPs	mining BMPs	0
Stormwater BMPs	flow controls	4
	treatment	4
	maintain storage and treatment facilities	4
	street sweeping	4
Other Approaches and Actions	limit pesticide use	4
	outreach and education campaign	4
	create incentives to follow BMPs	4
	purchase and protect property	2
	seed invertebrates	2
Is the basin at risk of further degradation?		4

Key for colors and numbers used in table:

not applicable	unlikely	possibly	likely	highly likely
0	1	2	3	4

Key restoration or management action(s) recommended and summary notes:

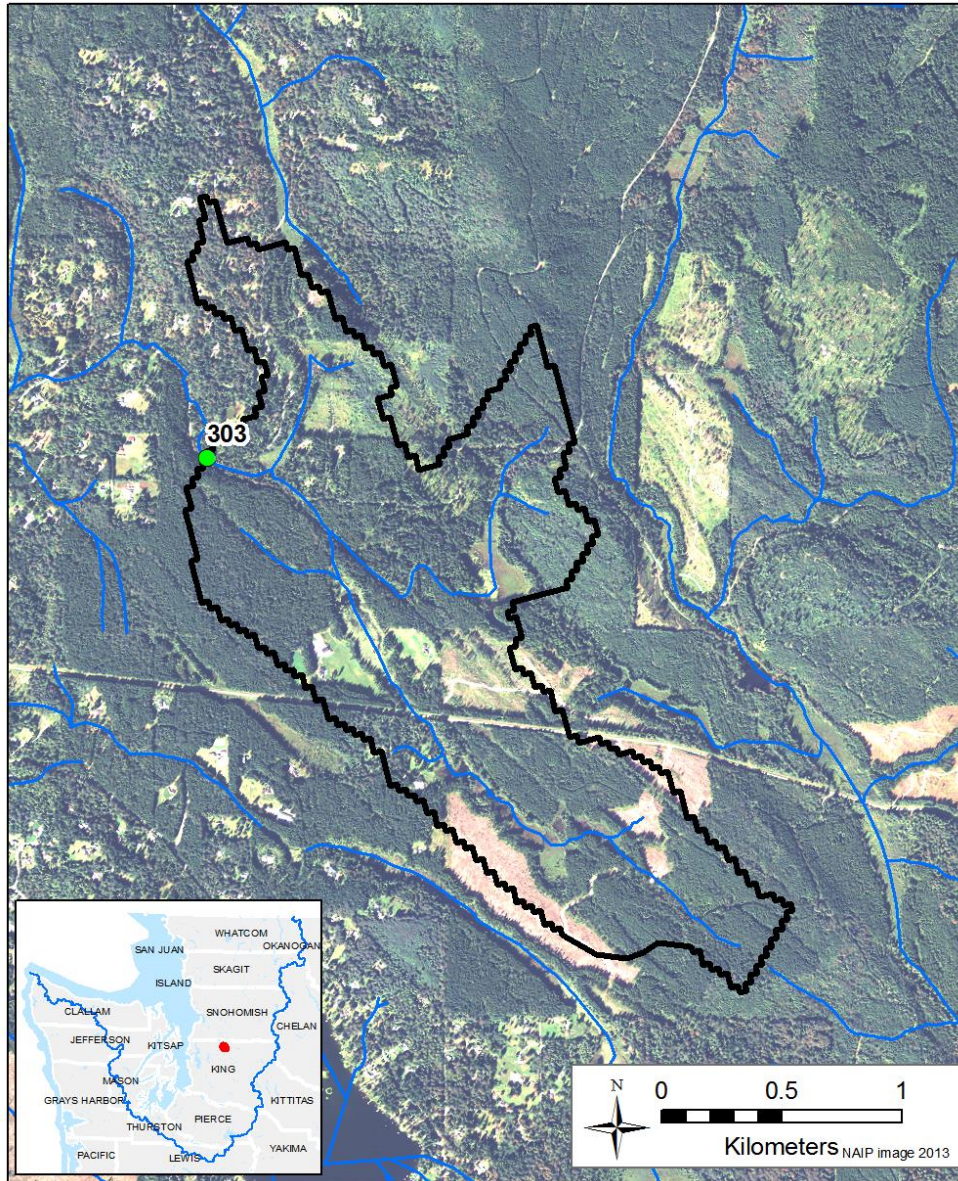
Protect conditions as much as possible; install or retrofit stormwater BMPs in lower basin; maintain stormwater BMPs in northwest upper basin; minimize forest harvest in southwest upper basin

There are multiple potential stressors in the Kimball Creek basin, including runoff from major roads and highways (I-90, Snoqualmie Parkway and SE North Bend Way), runoff from older developments that likely lack stormwater BMPs and runoff from new commercial and residential developments that are extremely dense. The lower portion of basin is zoned urban character residential; most of the homes

were built in the 1980s or earlier, and it is unclear if current development is as dense as the zoning would allow. There would likely be opportunities to install or retrofit older stormwater systems in this lower basin. Protecting and expanding buffers is recommended, especially if new housing will be built in the lower basin. Most of the 1-km basin nearest to the site and much of the upper northwest basin is within the Urban Growth Area, and the increase in impervious surface in the last decade has been dramatic (>6%). Photos indicate extensive forest clearing had begun in the northwest portion of the basin by 2006, and 2015 photos (Google maps) indicate housing developments are not yet complete. Photos also suggest multiple stormwater ponds have been built in the new developments. Photos reveal logging in the southwest portion of the basin (south of I-90), and while the age of the new growth is uncertain, the crowns appear small in the 2013 photos. Water flow processes (including surface storage and recharge) and water quality processes received a score of "2," supporting the observations that road runoff and impacts on flow dynamics are likely affecting much of the basin. The southwest fork south of I-90 may be a source of diverse invertebrates, but this should be verified.

Harris Creek in the Harris Creek subbasin

WRIA 7; Site code (site ID): E1105 (303)



Year	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	1999-2012 Median
B-IBI		24	36	38	26	26	32	28	30	32		32					31

Basin area (acres)	% urban within basin 1-km of site	% urban in whole basin	% pasture in whole basin	% natural in 90-m buffer in whole basin	% impervious in 2011 in whole basin
770.0	2.40%	1.53%	0.00%	98.59%	0.99%

Potential restoration or management actions for: Harris Creek in the Harris Creek subbasin – WRIA 7;
Site code (site ID): E1105 (303)

Restoration and Management Actions		Likelihood action would help restore the basin
In-stream	add wood	3
	add substrate	3
	enhance sinuosity	3
	replace culverts	2
	stabilize stream banks	2
Riparian	stabilize slopes	1
	plant vegetation, extend buffer	2
Agricultural BMPs	exclude livestock	0
	manage waste	0
	prevent soil loss	0
Forest BMPs	road maintenance	3
	minimize clearcutting	4
	replant	4
Mining BMPs	mining BMPs	0
Stormwater BMPs	flow controls	2
	treatment	2
	maintain storage and treatment facilities	1
	street sweeping	1
Other Approaches and Actions	limit pesticide use	2
	outreach and education campaign	3
	create incentives to follow BMPs	3
	purchase and protect property	2
	seed invertebrates	2
Is the basin at risk of further degradation?		4

Key for colors and numbers used in table:

not applicable	unlikely	possibly	likely	highly likely
0	1	2	3	4

Key restoration or management action(s) recommended and summary notes:

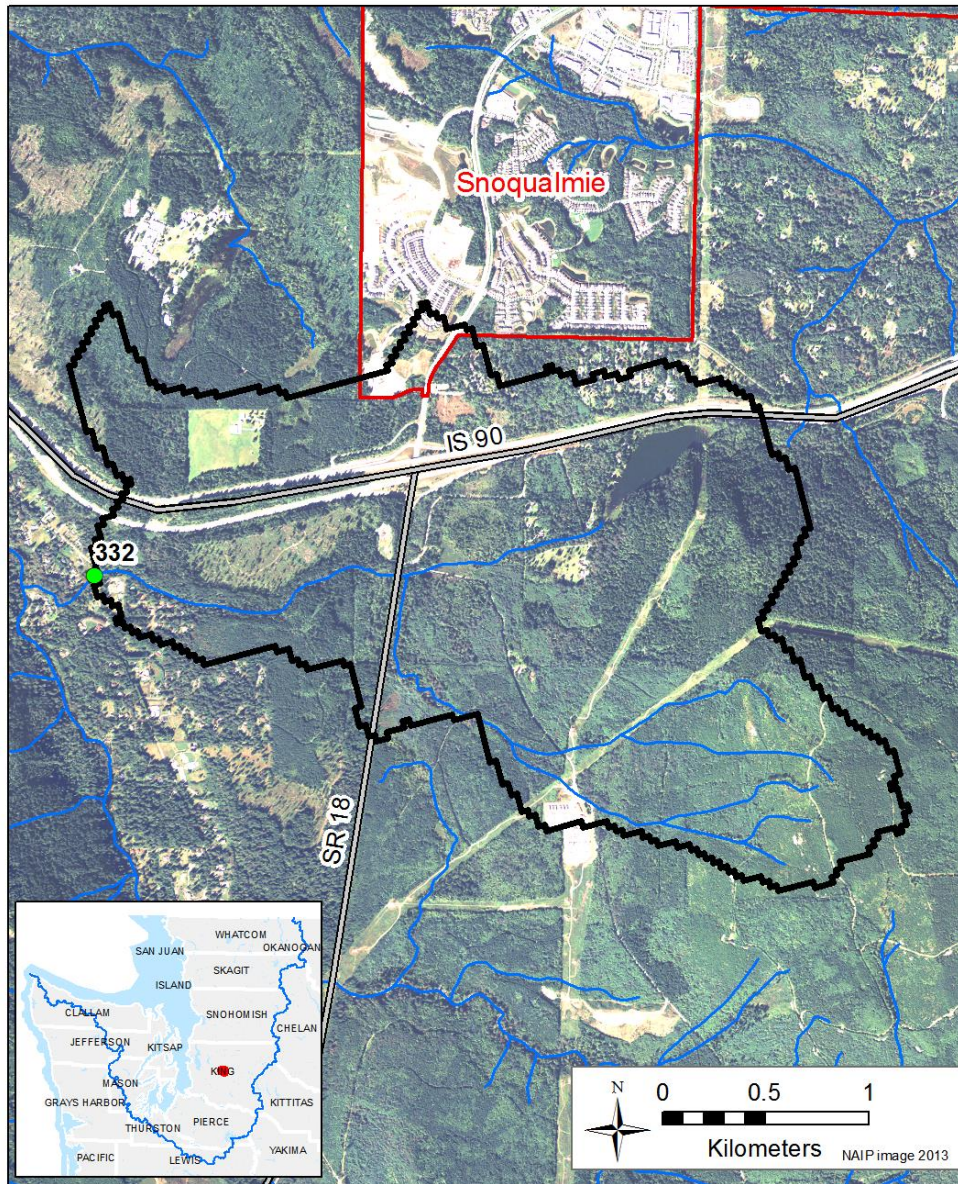
Protecting land would be first priority; Forest BMPs, and in-channel actions.

The Harris Creek basin is zoned primarily as forest resource, and the 2013 photos show recent and extensive clearcutting. This clearing likely occurred after the last B-IBI samples were collected in 2010, and therefore conditions and scores may have worsened since then. Collecting current B-IBI samples will be important for confirming or establishing a new baseline. Logging likely affected basin conditions prior to 2010, as previous forest clearing is evident in 2006 photos. The stream follows Stossel Creek Way for

about 400 m upstream of the B-IBI site, and therefore runoff and local habitat may be affected by the road. The portion of the basin zoned for rural residential (26%) could be further developed (many plots are 20+ acres). Wetlands are extensive throughout the basin, and the PSWC analysis indicate most flow and water quality processes are minimally degraded at the basin scale. Mayfly taxa richness has been consistently low, and surprisingly *Baetis* have almost never been found. Additionally, Odonata and Megaloptera are occasionally present. These invertebrate community characteristics indicate the stream gradient is low and water flows are stable; natural conditions may limit the richness of some taxa better adapted to high energy systems. This site ranked high as a site with intrinsic potential for fish; however Kollin Higgins of King County reports there is a fish passage barrier downstream.

Raging River Tributary in the Raging River subbasin

WRIA 7; Site code (site ID): E818 (332)



Year	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	1999-2012 Median
B-IBI	22	30		34	32	40	28	40	42	42	40	36					36

Basin area (acres)	% urban within basin 1-km of site	% urban in whole basin	% pasture in whole basin	% natural in 90-m buffer in whole basin	% impervious in 2011 in whole basin
1595.2	6.35%	7.93%	0.15%	97.01%	4.31%

Potential restoration or management actions for: Raging River Tributary in the Raging River subbasin – WRIA 7; Site code (site ID): E818 (332)

Restoration and Management Actions		Likelihood action would help restore the basin
In-stream	add wood	2
	add substrate	2
	enhance sinuosity	2
	replace culverts	2
	stabilize stream banks	2
Riparian	stabilize slopes	2
	plant vegetation, extend buffer	2
Agricultural BMPs	exclude livestock	0
	manage waste	0
	prevent soil loss	0
Forest BMPs	road maintenance	2
	minimize clearcutting	4
	replant	3
Mining BMPs	mining BMPs	0
Stormwater BMPs	flow controls	4
	treatment	4
	maintain storage and treatment facilities	4
	street sweeping	1
Other Approaches and Actions	limit pesticide use	3
	outreach and education campaign	4
	create incentives to follow BMPs	3
	purchase and protect property	2
	seed invertebrates	2
Is the basin at risk of further degradation?		4

Key for colors and numbers used in table:

not applicable	unlikely	possibly	likely	highly likely
0	1	2	3	4

Key restoration or management action(s) recommended and summary notes:

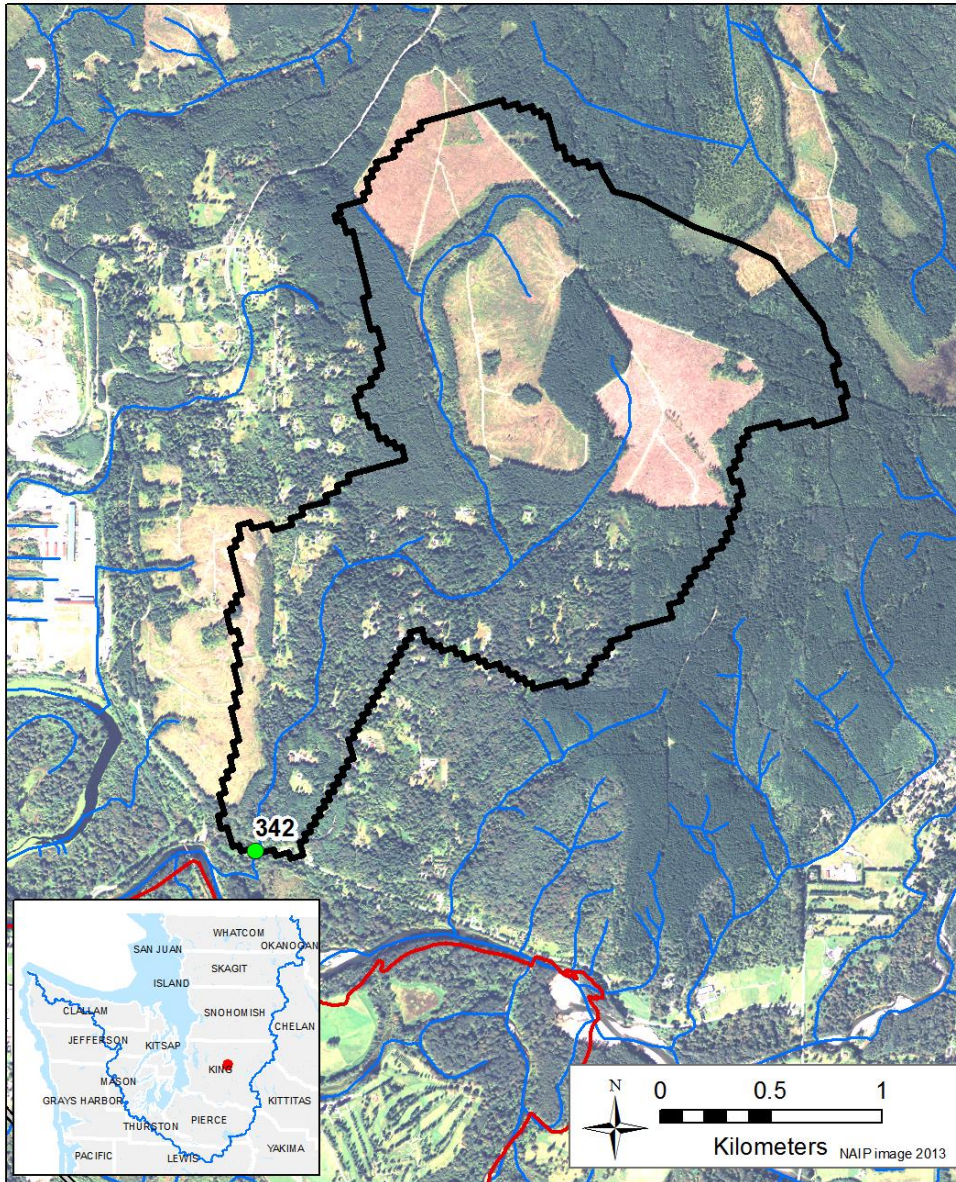
Stormwater BMPs, in older and new developments; Forest BMPs, outreach

The basin of this Raging River tributary has likely been affected by a variety of stressors. Stormwater runoff from I-90 and Highway 18 presumably drains to this basin, and there has been extensive forest harvest in the past. The basin is zoned for rural residential (57%) and forest resource (41%), with the most recent clearing occurring between 2006 and 2013. A ~50-acre clearcut in the lower basin (most of which is within 1 km of site) appears to have been cleared for a housing development (Zillow indicated

Pulte Homes will be developing the area, but this could not be confirmed). Other lots in the lower 1-km basin are for sale with notes about subdividing plots, and most of the area zoned for rural residential south of the stream has not yet been developed. Presumably new development will include stormwater BMPs. Other homes in the lower basin are older and have septic systems, indicating older developments may also benefit from stormwater BMPs. Given the creek is a tributary of the Raging River and supports steelhead, coho and Chinook, every effort should be made to maintain a wide buffer to help maintain low water temperatures.

Brockway Creek in the Kimball Creek subbasin

WRIA 7; Site code (site ID): E2153 (342)



Year	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	1999-2012 Median
B-IBI	14	28		30	28	38	30	22	46	38	34	38					30

Basin area (acres)	% urban within basin 1-km of site	% urban in whole basin	% pasture in whole basin	% natural in 90-m buffer in whole basin	% impervious in 2011 in whole basin
1171.2	0.00%	0.27%	0.04%	99.94%	0.35%

Potential restoration or management actions for: Brockway Creek in the Kimball Creek subbasin – WRIA 7; Site code (site ID): E2153 (342)

Restoration and Management Actions		Likelihood action would help restore the basin
In-stream	add wood	2
	add substrate	2
	enhance sinuosity	1
	replace culverts	1
	stabilize stream banks	1
Riparian	stabilize slopes	1
	plant vegetation, extend buffer	2
Agricultural BMPs	exclude livestock	0
	manage waste	0
	prevent soil loss	0
Forest BMPs	road maintenance	4
	minimize clearcutting	4
	replant	4
Mining BMPs	mining BMPs	0
Stormwater BMPs	flow controls	3
	treatment	3
	maintain storage and treatment facilities	3
	street sweeping	1
Other Approaches and Actions	limit pesticide use	3
	outreach and education campaign	3
	create incentives to follow BMPs	3
	purchase and protect property	3
	seed invertebrates	2
Is the basin at risk of further degradation?		4

Key for colors and numbers used in table:

not applicable	unlikely	possibly	likely	highly likely
0	1	2	3	4

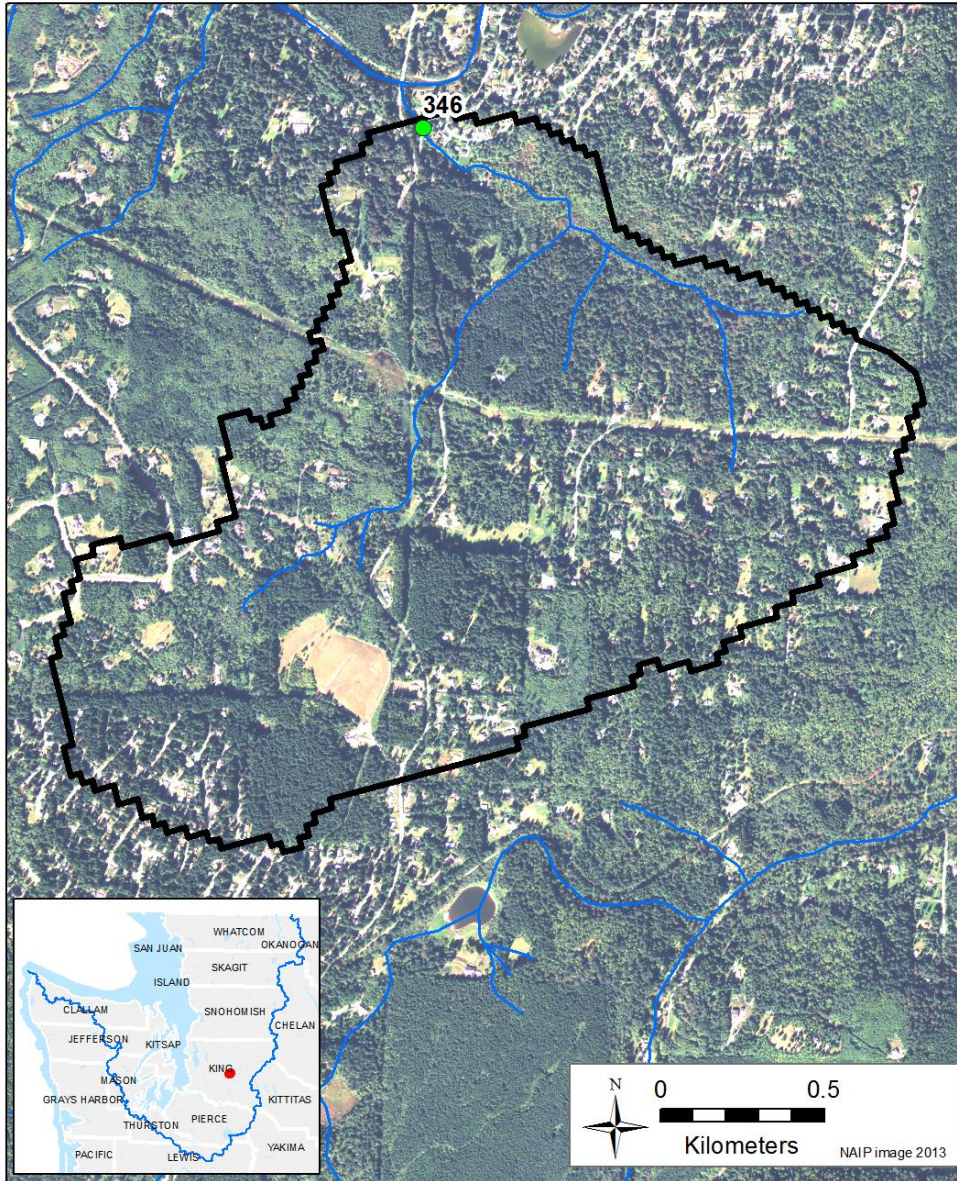
Key restoration or management action(s) recommended and summary notes:

Forest and stormwater BMPs

The lower portion of the Brockway Creek basin is zoned as rural residential and the upper portion is zoned for forest harvest and is owned by Hancock. The majority of the forest harvest land to the west of the creek and in the upper basin was recently cleared (possibly 2012 based on the 2013 photos). The last invertebrate sample was collected in 2010 and Ephemeroptera, Plecoptera, and Trichoptera (EPT) richness was relatively high at 23 taxa. The conditions at the site may have deteriorated since the most

recent clearcuts. In the lower basin, development on 1-12 acre parcels is likely to continue on a parcel by parcel basis. Zillow lists several recently sold, undeveloped lots, as well as lots with older (1980s) and newer (1990s-2000s) homes. Some homes are as close as 50 m from the stream, and homes appear to be on septic systems. There are no known residential or commercial stormwater facilities within the basin, but they would likely be beneficial as building continues. The basin may benefit from the knotweed control that is taking place along the upper Snoqualmie, although it is unclear whether those actions are within the Brockway Creek basin itself. If the upper basin is not a source of diverse invertebrates, seeding may be an appropriate action (if remaining forest is not harvested and if additional actions are taken). The basin is located above Snoqualmie Falls, and thus the creek is not accessible to anadromous fish.

Snoqualmie R. - South Fork Tributary in the South Fork Snoqualmie subbasin
 WRIA 7; Site code (site ID): E1031 (346)



Year	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	1999-2012 Median
B-IBI	14	24	30	30	34	30	22	30	32	28	34	24					30

Basin area (acres)	% urban within basin 1-km of site	% urban in whole basin	% pasture in whole basin	% natural in 90-m buffer in whole basin	% impervious in 2011 in whole basin
826.3	3.55%	8.10%	0.05%	94.33%	4.19%

Potential restoration or management actions for: Snoqualmie R. – South Fork Tributary in the South Fork Snoqualmie subbasin – WRIA 7; Site code (site ID): E1031 (346)

Restoration and Management Actions		Likelihood action would help restore the basin
In-stream	add wood	2
	add substrate	2
	enhance sinuosity	2
	replace culverts	2
	stabilize stream banks	2
Riparian	stabilize slopes	2
	plant vegetation, extend buffer	2
Agricultural BMPs	exclude livestock	0
	manage waste	0
	prevent soil loss	0
Forest BMPs	road maintenance	0
	minimize clearcutting	0
	replant	0
Mining BMPs	mining BMPs	0
Stormwater BMPs	flow controls	4
	treatment	4
	maintain storage and treatment facilities	4
	street sweeping	2
Other Approaches and Actions	limit pesticide use	3
	outreach and education campaign	4
	create incentives to follow BMPs	3
	purchase and protect property	2
	seed invertebrates	3
Is the basin at risk of further degradation?		4

Key for colors and numbers used in table:

not applicable	unlikely	possibly	likely	highly likely
0	1	2	3	4

Key restoration or management action(s) recommended and summary notes:

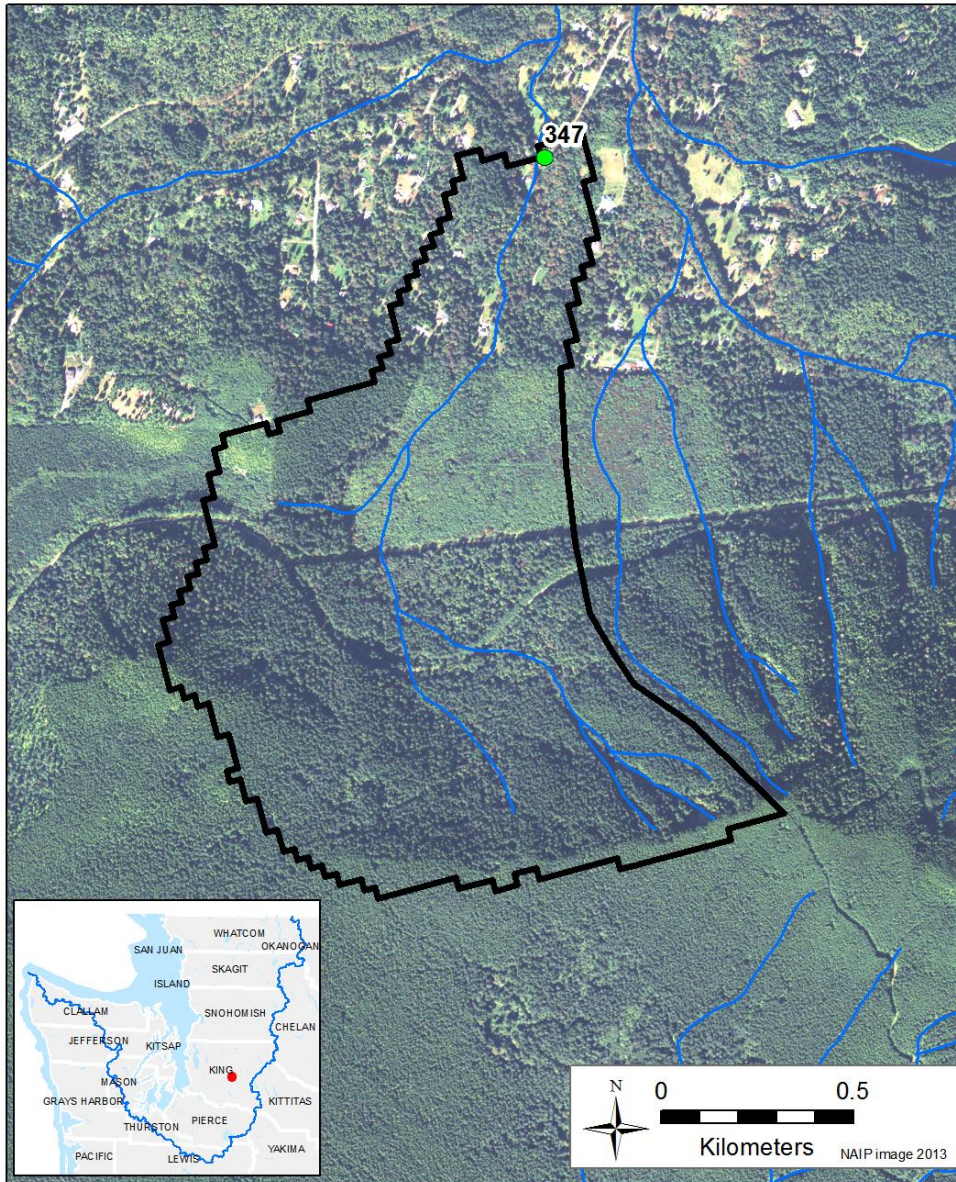
Stormwater BMPs, outreach

This Snoqualmie River tributary is within a basin zoned almost entirely for rural residential development. Most homes appear to have been built between 1970 and 2010 on lots <1 to 20+ acres. Currently installed stormwater BMPs should be maintained and additional stormwater BMPs may be helpful in areas developed before the current regulations were established. The riparian buffer appears to be intact for much of the creek's length, but on-site surveys are needed to assess in-channel habitat.

Outreach to landowners including information about land and septic maintenance may be worthwhile. Seeding may be appropriate once additional stormwater BMPs are implemented.

Boxley Creek Tributary in the South Fork Snoqualmie subbasin

WRIA 7; Site code (site ID): E1045 (347)



Year	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	1999-2012 Median
B-IBI	22	28		36	36	40	32	36	46	38	46	32					36

Basin area (acres)	% urban within basin 1-km of site	% urban in whole basin	% pasture in whole basin	% natural in 90-m buffer in whole basin	% impervious in 2011 in whole basin
398.3	0.00%	0.00%	0.00%	100.00%	0.01%

Potential restoration or management actions for: Boxley Creek Tributary in the South Fork Snoqualmie subbasin – WRIA 7; Site code (site ID): E1045 (347)

Restoration and Management Actions		Likelihood action would help restore the basin
In-stream	add wood	3
	add substrate	3
	enhance sinuosity	2
	replace culverts	1
	stabilize stream banks	1
Riparian	stabilize slopes	1
	plant vegetation, extend buffer	1
Agricultural BMPs	exclude livestock	0
	manage waste	0
	prevent soil loss	0
Forest BMPs	road maintenance	3
	minimize clearcutting	4
	replant	0
Mining BMPs	mining BMPs	0
Stormwater BMPs	flow controls	1
	treatment	1
	maintain storage and treatment facilities	1
	street sweeping	1
Other Approaches and Actions	limit pesticide use	3
	outreach and education campaign	4
	create incentives to follow BMPs	4
	purchase and protect property	4
	seed invertebrates	2
Is the basin at risk of further degradation?		4

Key for colors and numbers used in table:

not applicable	unlikely	possibly	likely	highly likely
0	1	2	3	4

Key restoration or management action(s) recommended and summary notes:

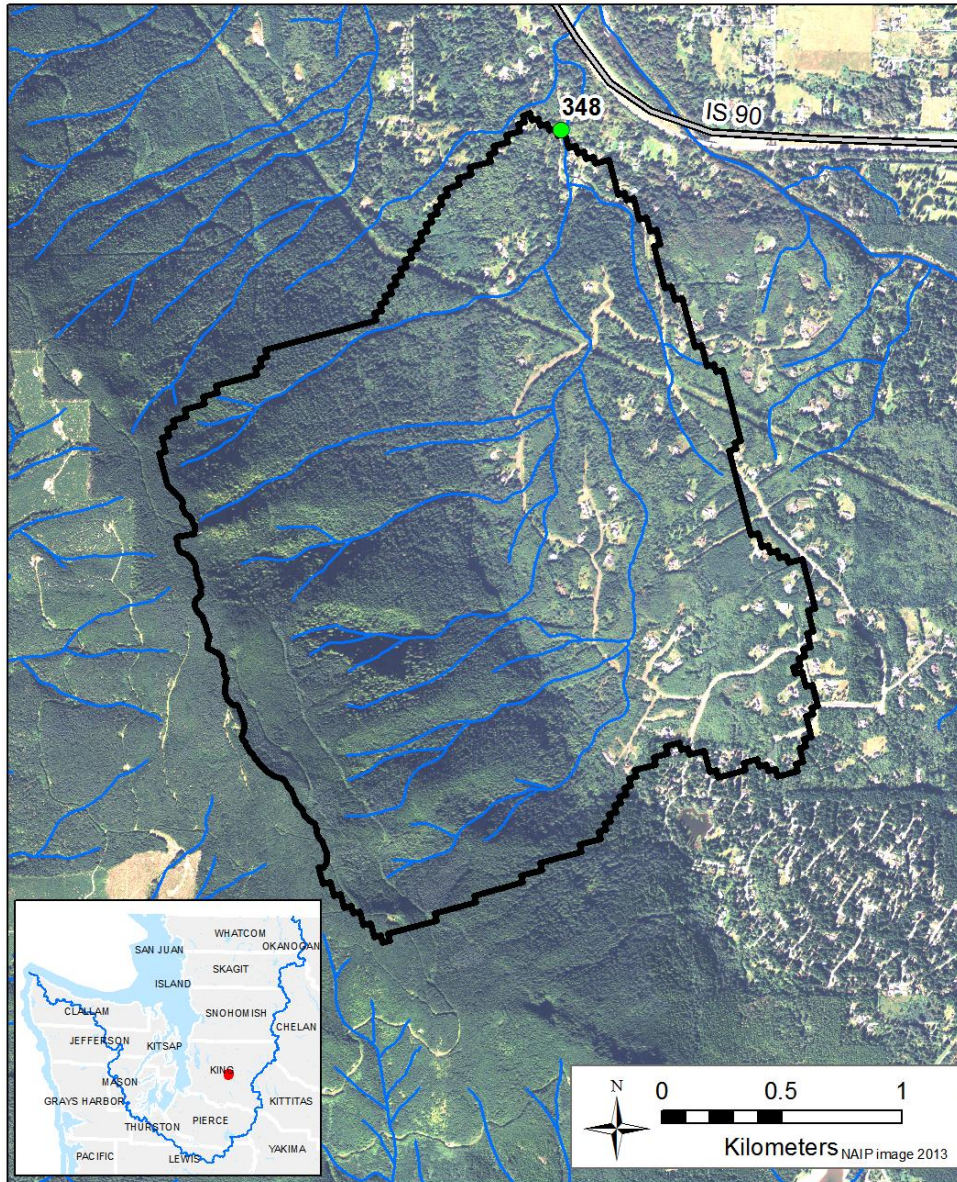
Forest BMPs and in-channel restoration that may ameliorate effects of past logging

The majority of the basin for this tributary of Boxley Creek, including the entire upper watershed, is zoned as forest resource. However, the upper watershed is also part of Iron Horse State Park, and the Iron Horse Trail cuts across the basin. Photos from 2006 and 2013 indicate forest clearing occurred in the past (in an area included in the park), although it is unclear from the zoning and park designation whether additional land clearing is likely. In the lower reach, there are relatively few parcels and they

appear to range from less than 1 acre to over 10 acres. Homes were built primarily in the 1980s and 1990s, and all appear to be on septic systems with wells. Outreach to landowners in the basin may be helpful. If the upper basin is protected as park and if landowners were receptive, bug seeding may be appropriate.

Clough Creek in the South Fork Snoqualmie subbasin

WRIA 7; Site code (site ID): E1023 (348)



Year	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	1999-2012 Median
B-IBI	20	36		38	44	28	40	30	40	38	32	34					36

Basin area (acres)	% urban within basin 1-km of site	% urban in whole basin	% pasture in whole basin	% natural in 90-m buffer in whole basin	% impervious in 2011 in whole basin
1382.1	9.59%	3.78%	0.00%	95.33%	0.44%

Potential restoration or management actions for: Clough Creek in the South Fork Snoqualmie subbasin – WRIA 7; Site code (site ID): E1023 (348)

Restoration and Management Actions		Likelihood action would help restore the basin
In-stream	add wood	3
	add substrate	3
	enhance sinuosity	3
	replace culverts	3
	stabilize stream banks	3
Riparian	stabilize slopes	2
	plant vegetation, extend buffer	2
Agricultural BMPs	exclude livestock	0
	manage waste	0
	prevent soil loss	0
Forest BMPs	road maintenance	2
	minimize clearcutting	4
	replant	2
Mining BMPs	mining BMPs	0
Stormwater BMPs	flow controls	3
	treatment	3
	maintain storage and treatment facilities	2
	street sweeping	1
Other Approaches and Actions	limit pesticide use	2
	outreach and education campaign	3
	create incentives to follow BMPs	3
	purchase and protect property	3
	seed invertebrates	2
Is the basin at risk of further degradation?		3

Key for colors and numbers used in table:

not applicable	unlikely	possibly	likely	highly likely
0	1	2	3	4

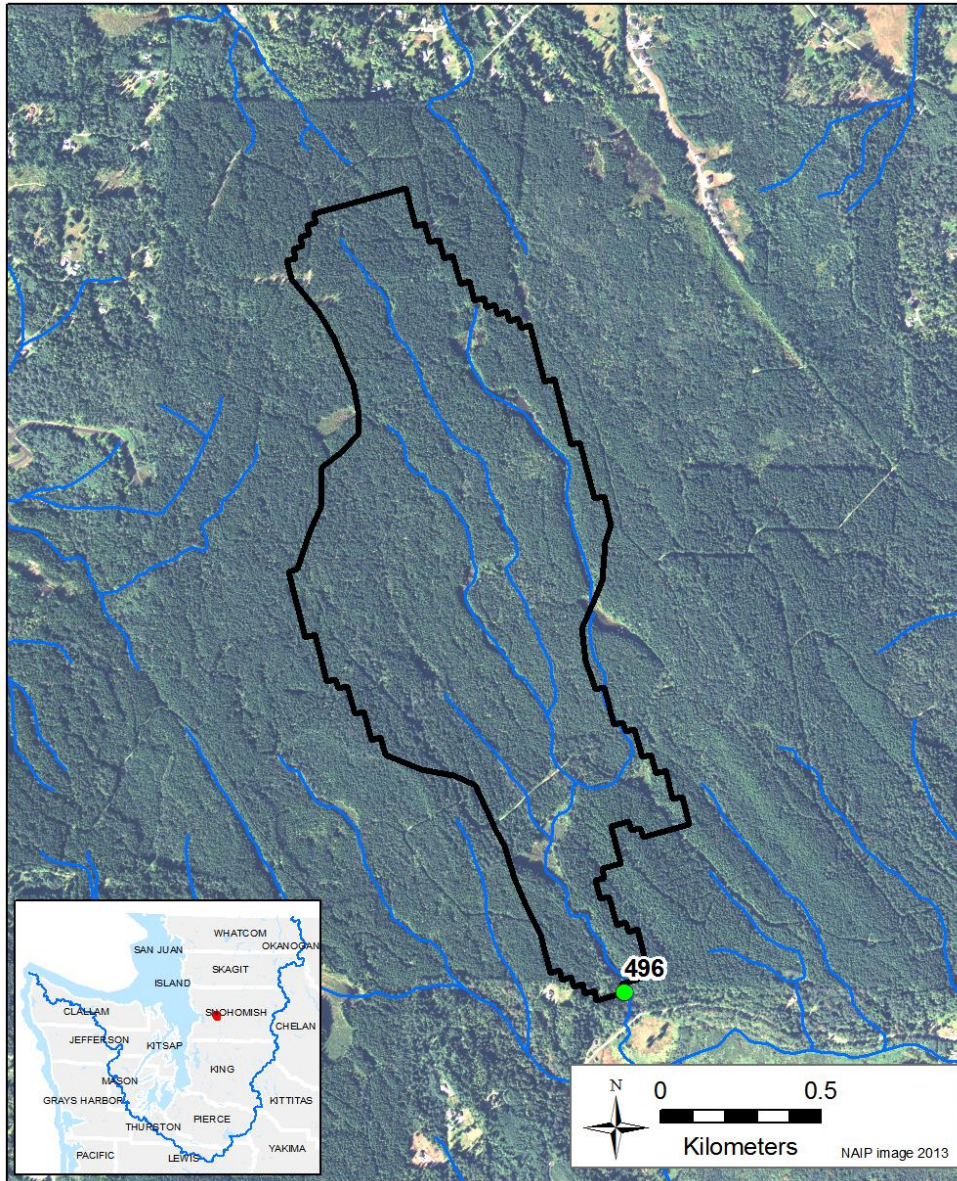
Key restoration or management action(s) recommended and summary notes:

Proceed with restoration actions for mitigating dredging; consider targeting monitoring, and possibly additional in-stream restoration actions, stormwater BMPs and forest BMPs

Restoration plan is in place to mitigate for dredging that has occurred in the Clough Creek basin. This may provide an opportunity for measuring restoration effectiveness. In addition, stormwater and forest BMPs should be considered given the zoning. Parcels in the lower basin range from <1 to 10 acres, and all appear to be on septic systems. There may be opportunities for education and outreach. Upstream

sites should be sampled to assess whether there is a connected source of diverse invertebrates. If there is not a good upstream source, seeding may be appropriate.

Carpenter Ck. (Woods Ck.) Tributary in the Woods Creek subbasin
 WRIA 7; Site code (site ID): CAR1A (496)



Year	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	1999-2012 Median
B-IBI										36	36	20					36

Basin area (acres)	% urban within basin 1-km of site	% urban in whole basin	% pasture in whole basin	% natural in 90-m buffer in whole basin	% impervious in 2011 in whole basin
382.1	0.00%	0.00%	0.00%	100.00%	0.75%

Potential restoration or management actions for: Carpenter Ck. (Woods Ck.) Tributary in the Woods Creek subbasin – WRIA 7; Site code (site ID): CAR1A (496)

Restoration and Management Actions		Likelihood action would help restore the basin
In-stream	add wood	2
	add substrate	2
	enhance sinuosity	2
	replace culverts	2
	stabilize stream banks	2
Riparian	stabilize slopes	1
	plant vegetation, extend buffer	1
Agricultural BMPs	exclude livestock	0
	manage waste	0
	prevent soil loss	0
Forest BMPs	road maintenance	0
	minimize clearcutting	0
	replant	0
Mining BMPs	mining BMPs	0
Stormwater BMPs	flow controls	0
	treatment	0
	maintain storage and treatment facilities	0
	street sweeping	0
Other Approaches and Actions	limit pesticide use	2
	outreach and education campaign	0
	create incentives to follow BMPs	2
	purchase and protect property	2
	seed invertebrates	4
Is the basin at risk of further degradation?		4

Key for colors and numbers used in table:

not applicable	unlikely	possibly	likely	highly likely
0	1	2	3	4

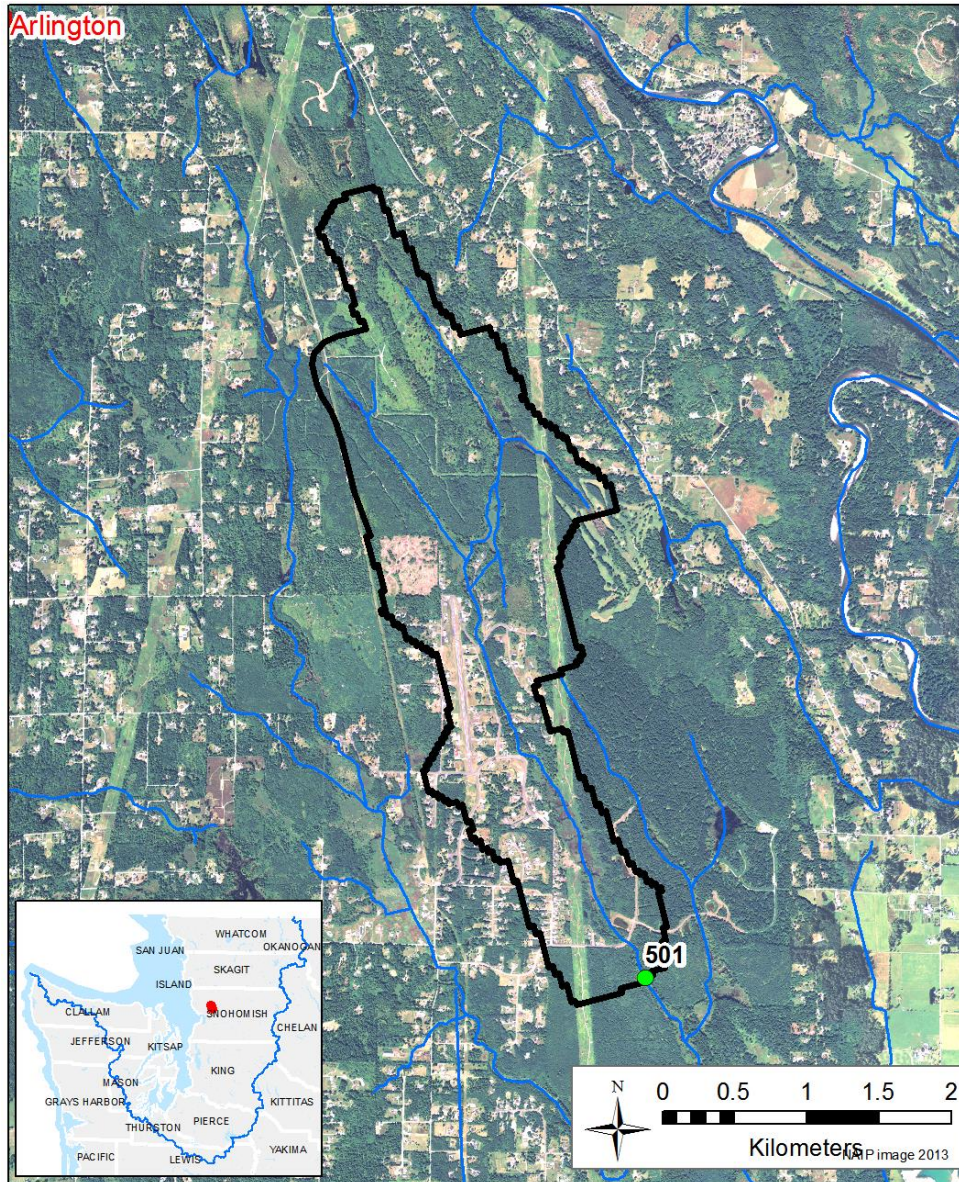
Key restoration or management action(s) recommended and summary notes:

Seeding

The basin of the Carpenter Creek tributary (in the Woods Creek sub-basin) is zoned exclusively for rural residential and yet there has been very little if any development in the basin. The basin appears to be largely Washington State Department of Natural Resources (WADNR) land, although this needs to be confirmed. There are some odd patterns in the 2013 photos - for example radiating lines from one of the dirt roads in the lower part of the basin. The B-IBI scores are based on 3 square feet samples, and in

the three years of sampling, there have never been 500 or more organisms per sample. The most recent sample in 2010 was the least dense, with only 152 organisms per 3 square feet sample. More area may need to be sampled to get a sufficient number of invertebrates, but there may also be natural limitations at the site. There is a large wetland approximately 500 m upstream of the B-IBI site, and this may limit the diversity of invertebrates. An on-site evaluation would be needed to determine what restoration would be needed, but until then, it is unclear what actions would be appropriate for improving B-IBI scores. Seeding may be an appropriate action.

Little Pilchuck Ck. (Snohomish) in the Lower Pilchuck R. (Snohomish) subbasin
 WRIA 7; Site code (site ID): CAR3A (501)



Year	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	1999-2012 Median
B-IBI										32	30	28					30

Basin area (acres)	% urban within basin 1-km of site	% urban in whole basin	% pasture in whole basin	% natural in 90-m buffer in whole basin	% impervious in 2011 in whole basin
1406.5	11.41%	11.89%	0.52%	93.43%	3.92%

Potential restoration or management actions for: Little Pilchuck Ck. (Snohomish) in the Lower Pilchuck R. (Snohomish) subbasin – WRIA 7; Site code (site ID): CAR3A (501)

Restoration and Management Actions		Likelihood action would help restore the basin
In-stream	add wood	2
	add substrate	2
	enhance sinuosity	2
	replace culverts	2
	stabilize stream banks	2
Riparian	stabilize slopes	2
	plant vegetation, extend buffer	3
Agricultural BMPs	exclude livestock	0
	manage waste	0
	prevent soil loss	0
Forest BMPs	road maintenance	0
	minimize clearcutting	0
	replant	0
Mining BMPs	mining BMPs	0
Stormwater BMPs	flow controls	4
	treatment	4
	maintain storage and treatment facilities	4
	street sweeping	1
Other Approaches and Actions	limit pesticide use	2
	outreach and education campaign	3
	create incentives to follow BMPs	3
	purchase and protect property	3
	seed invertebrates	3
Is the basin at risk of further degradation?		4

Key for colors and numbers used in table:

not applicable	unlikely	possibly	likely	highly likely
0	1	2	3	4

Key restoration or management action(s) recommended and summary notes:

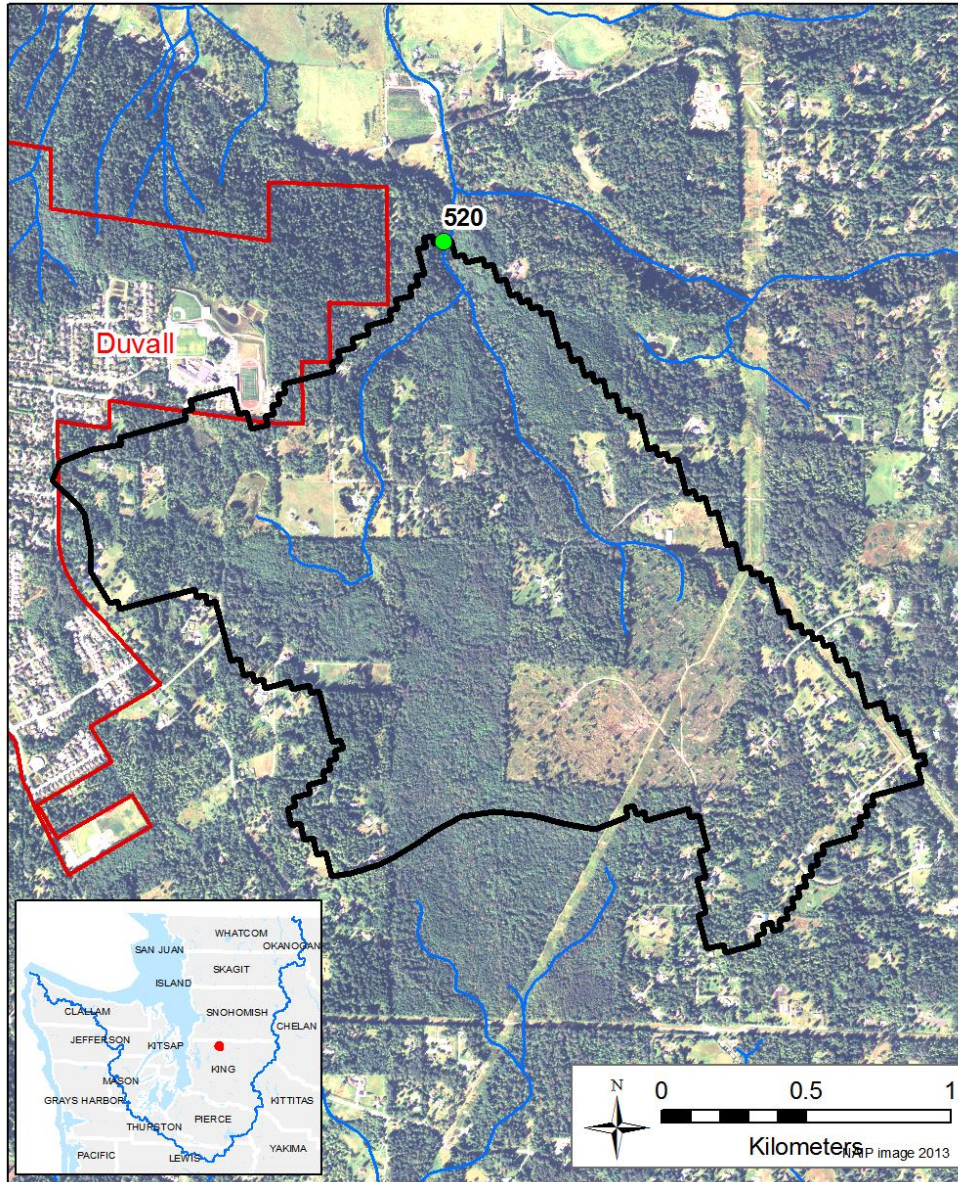
Stormwater BMPs, outreach, widen buffer where possible

The Little Pilchuck Creek basin is zoned entirely for rural residential, but it has not been completely developed. More than half of the lower 1-km portion of the basin has been slated for development, but it is uncertain if and when that development will occur. Outreach confirmed that old detention ponds are still in place, but it is unclear whether specific plans were still permitted. There are also multiple sections of forest in the upper basin that have been cleared within the last several years, and new roads

have been built. There are some large wetlands within 1-km upstream of the site and within the cleared powerline right-of-way; stream community may be limited by low gradient, although productivity is likely high. It will not be possible to revegetate the riparian buffer under the powerlines, but widening the buffer elsewhere may help cool the stream and ensure restoration actions will also benefit fish. Protecting buffers and current in-channel habitat will be especially important if new developments proceeds. Installing stormwater BMPs will also be important. Treating stormwater runoff from the private airport with stormwater BMPs is also recommended. Seeding may be appropriate, as there no known nearby or connected sources of diverse taxa.

Cherry Ck. in the Cherry Creek subbasin

WRIA 7; Site code (site ID): 05B (520)



Year	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	1999-2012 Median
B-IBI										40	28	46	36	36			36

Basin area (acres)	% urban within basin 1-km of site	% urban in whole basin	% pasture in whole basin	% natural in 90-m buffer in whole basin	% impervious in 2011 in whole basin
860.1	3.35%	6.57%	0.16%	98.12%	2.13%

Potential restoration or management actions for: Cherry Ck. in the Cherry Creek subbasin – WRIA 7; Site code (site ID): 05B (520)

Restoration and Management Actions		Likelihood action would help restore the basin
In-stream	add wood	2
	add substrate	2
	enhance sinuosity	2
	replace culverts	2
	stabilize stream banks	2
Riparian	stabilize slopes	2
	plant vegetation, extend buffer	3
Agricultural BMPs	exclude livestock	3
	manage waste	2
	prevent soil loss	2
Forest BMPs	road maintenance	0
	minimize clearcutting	0
	replant	0
Mining BMPs	mining BMPs	0
Stormwater BMPs	flow controls	3
	treatment	3
	maintain storage and treatment facilities	2
	street sweeping	2
Other Approaches and Actions	limit pesticide use	2
	outreach and education campaign	3
	create incentives to follow BMPs	2
	purchase and protect property	2
	seed invertebrates	2
Is the basin at risk of further degradation?		4

Key for colors and numbers used in table:

not applicable	unlikely	possibly	likely	highly likely
0	1	2	3	4

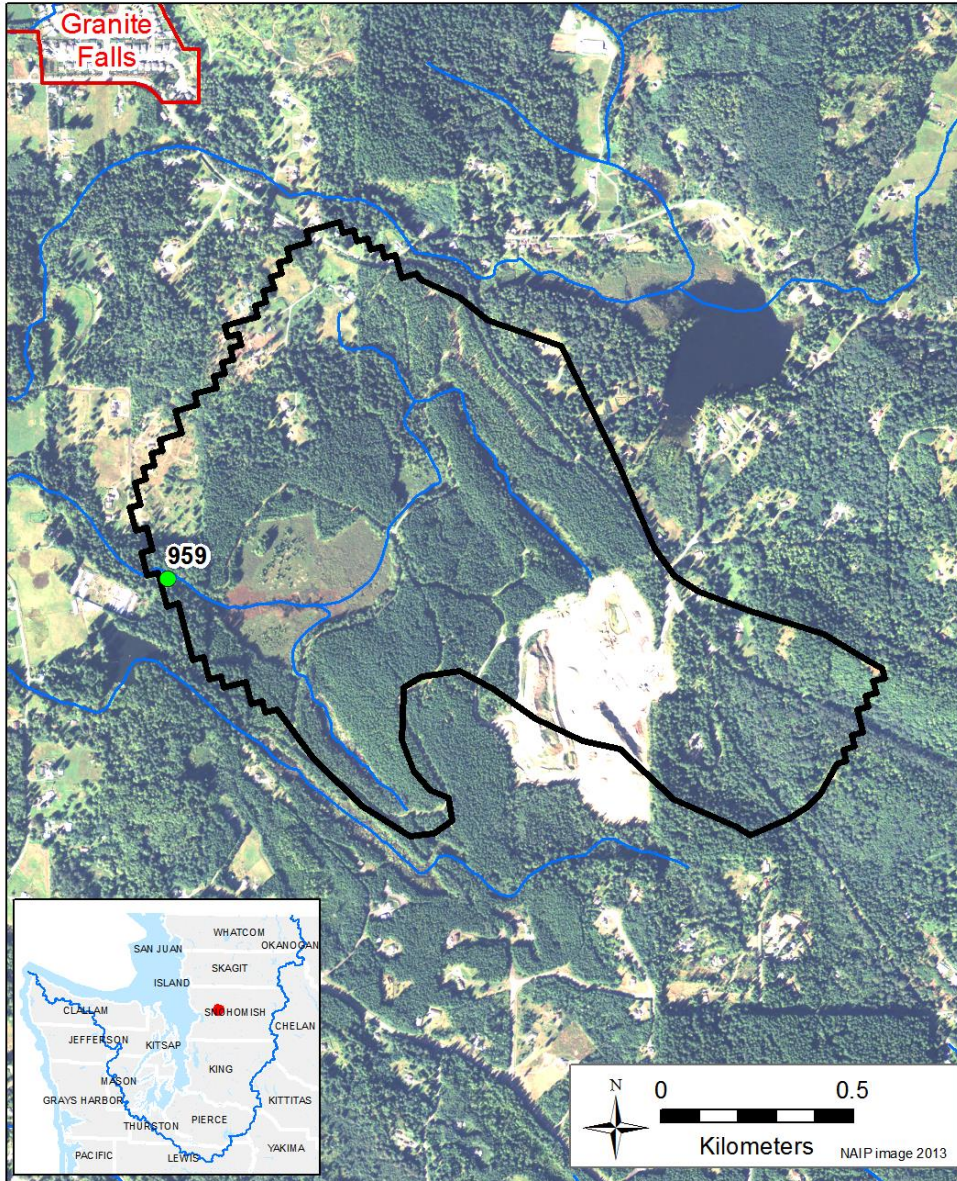
Key restoration or management action(s) recommended and summary notes:

Prevent further degradation

The Cherry Creek basin, upstream of site #520, is zoned primarily for rural residential with a small portion zoned for urban residential. The riparian buffer along the East fork of the creek is wide and intact along most of the creek's length, while the buffer on the West fork is narrow through some cleared parcels. Typical BMPs would be recommended for this basin based on land use, including some stormwater BMPs and outreach to landowners to encourage agricultural BMPs and the extension of the

riparian buffer. Restoration plans for this basin, however, should be delayed until future risks are assessed. Development in the basin is ongoing as indicated by a recent 120-acre clearcut in the upper basin. Large lots are also currently for sale in basin that list "development opportunity" as a selling point. Efforts should be made to minimize the impacts of future clearing and development.

Coon Creek / Swartz Lake Ck. in the Upper Pilchuck R. (Snohomish) subbasin
 WRIA 7; Site code (site ID): 7-981 (959)



Year	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	1999-2012 Median
B-IBI								32			34	20					32

Basin area (acres)	% urban within basin 1-km of site	% urban in whole basin	% pasture in whole basin	% natural in 90-m buffer in whole basin	% impervious in 2011 in whole basin
1845.2	1.75%	3.58%	0.51%	100.00%	0.33%

Potential restoration or management actions for: Coon Creek / Swartz Lake Ck. in the Upper Pilchuck R. (Snohomish) subbasin – WRIA 7; Site code (site ID): 7-981 (959)

Restoration and Management Actions		Likelihood action would help restore the basin
In-stream	add wood	2
	add substrate	2
	enhance sinuosity	2
	replace culverts	2
	stabilize stream banks	2
Riparian	stabilize slopes	2
	plant vegetation, extend buffer	2
Agricultural BMPs	exclude livestock	1
	manage waste	1
	prevent soil loss	1
Forest BMPs	road maintenance	2
	minimize clearcutting	4
	replant	1
Mining BMPs	mining BMPs	4
Stormwater BMPs	flow controls	4
	treatment	4
	maintain storage and treatment facilities	4
	street sweeping	1
Other Approaches and Actions	limit pesticide use	2
	outreach and education campaign	2
	create incentives to follow BMPs	2
	purchase and protect property	2
	seed invertebrates	3
Is the basin at risk of further degradation?		4

Key for colors and numbers used in table:

not applicable	unlikely	possibly	likely	highly likely
0	1	2	3	4

Key restoration or management action(s) recommended and summary notes:

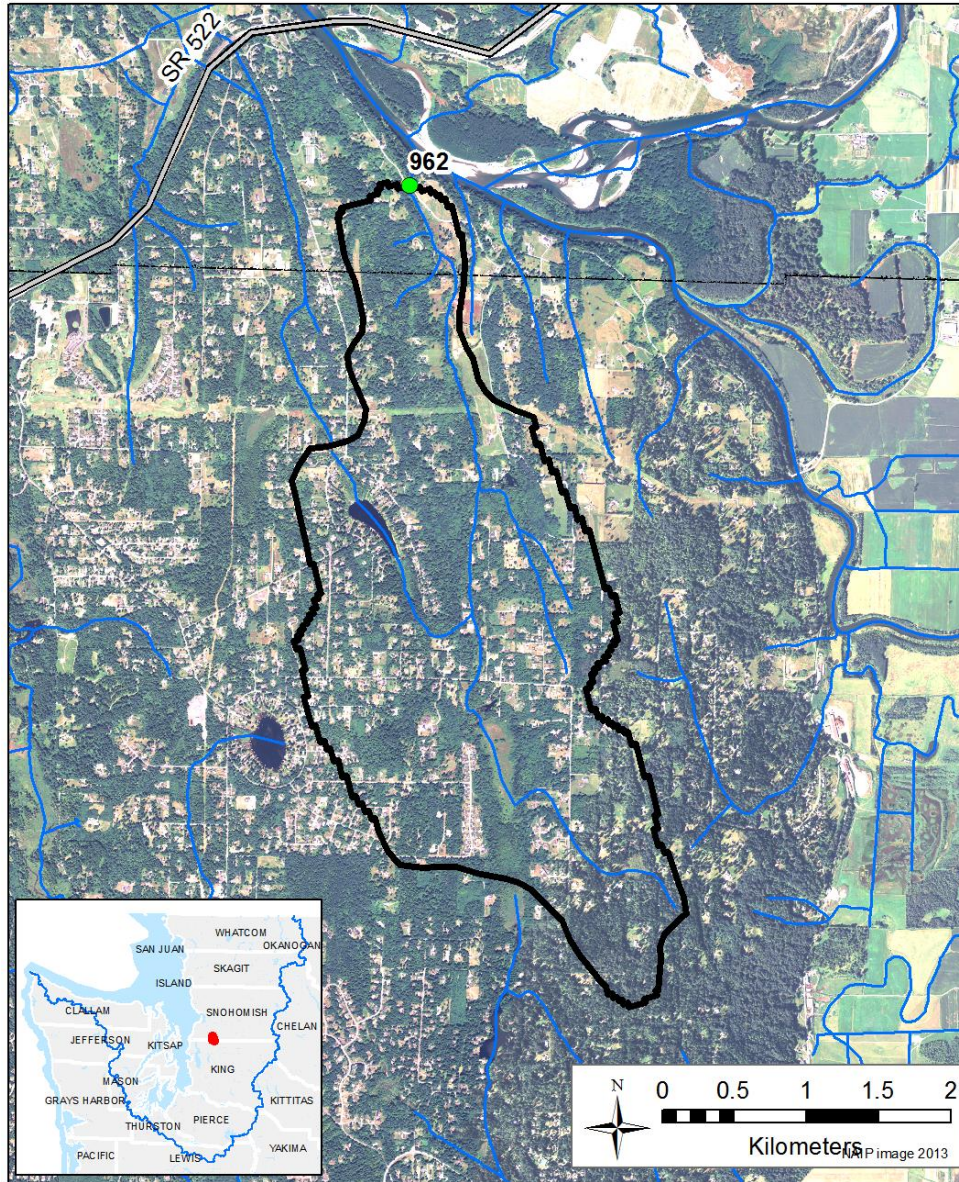
Mining, forestry and stormwater BMPs, then possibly seeding

The Coon Creek basin is zoned primarily for rural residential and forest harvest, with 5% zoned for mining. There is a large mine in the basin, and local managers report mining activity was expanded in 2010, which may account for the drop in the 2010 B-IBI score. Although much of rural residential portion of the basin has not been developed, managers recommend stormwater BMPs be installed to treat runoff from the current homes and roads. There may also be natural limitations, with a large wetland

starting about 150 m upstream of the site and extending another 500 m upstream. Temperatures may be elevated, and flows may be slow. The wetland may also be a natural barrier to possible colonists drifting from upstream reaches. If mining, forestry and stormwater BMPs are implemented, seeding may be needed to jump-start the restoration of the invertebrate community itself.

Ricci Ck. in the Cherry Creek subbasin

WRIA 7; Site code (site ID): 7-279 (962)



Year	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	1999-2012 Median
B-IBI								38			32	32					32

Basin area (acres)	% urban within basin 1-km of site	% urban in whole basin	% pasture in whole basin	% natural in 90-m buffer in whole basin	% impervious in 2011 in whole basin
1976.2	0.51%	8.90%	0.14%	88.98%	4.17%

Potential restoration or management actions for: Ricci Ck. in the Cherry Creek subbasin – WRIA 7; Site code (site ID): 7-279 (962)

Restoration and Management Actions		Likelihood action would help restore the basin
In-stream	add wood	3
	add substrate	1
	enhance sinuosity	1
	replace culverts	2
	stabilize stream banks	2
Riparian	stabilize slopes	2
	plant vegetation, extend buffer	4
Agricultural BMPs	exclude livestock	4
	manage waste	4
	prevent soil loss	2
Forest BMPs	road maintenance	0
	minimize clearcutting	0
	replant	0
Mining BMPs	mining BMPs	0
Stormwater BMPs	flow controls	3
	treatment	3
	maintain storage and treatment facilities	2
	street sweeping	1
Other Approaches and Actions	limit pesticide use	3
	outreach and education campaign	4
	create incentives to follow BMPs	4
	purchase and protect property	2
	seed invertebrates	3
Is the basin at risk of further degradation?		3

Key for colors and numbers used in table:

not applicable	unlikely	possibly	likely	highly likely
0	1	2	3	4

Key restoration or management action(s) recommended and summary notes:

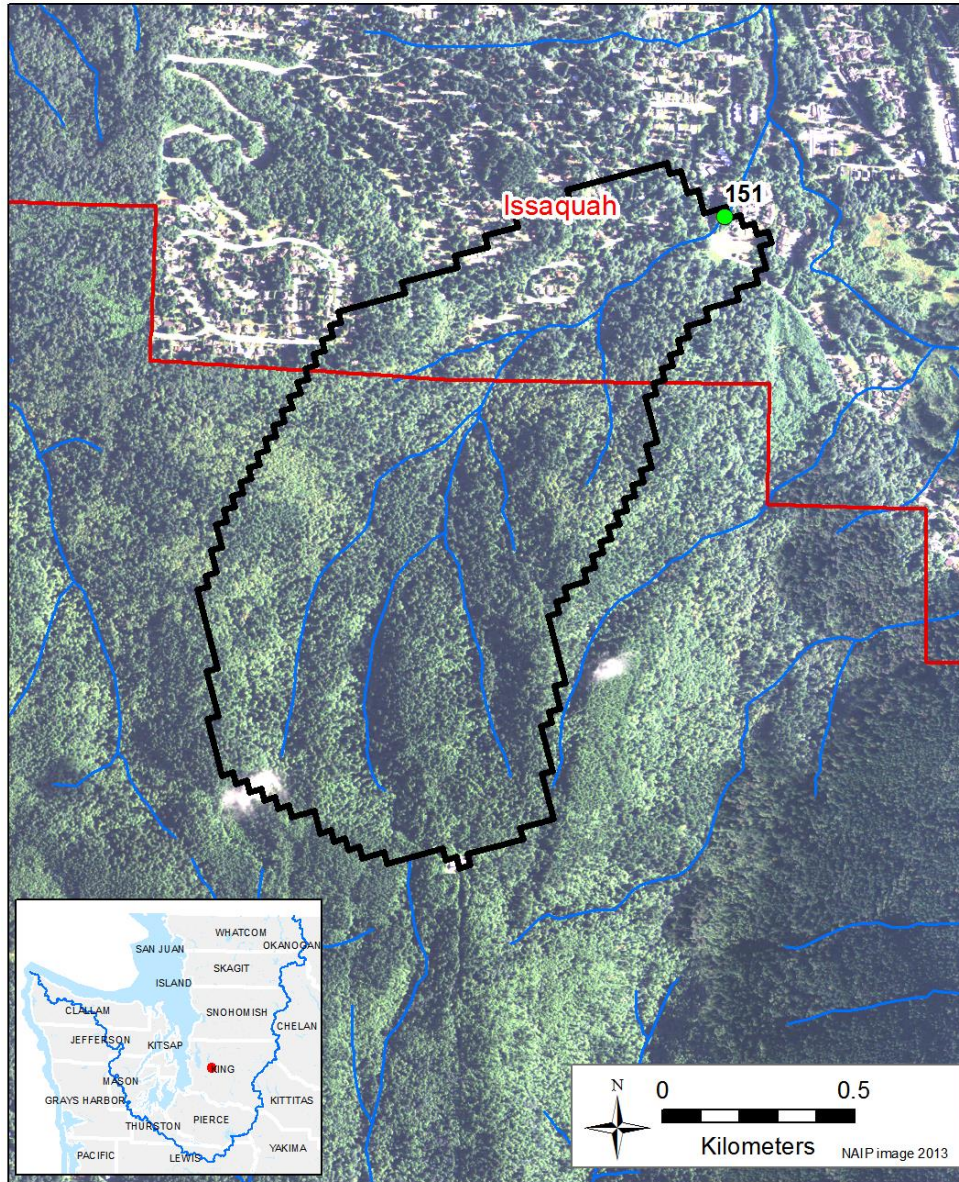
Extend/plant riparian area, agricultural BMPs, outreach

The Ricci Creek basin is zoned almost exclusively for rural residential but there are also several private farm properties within the basin. Much of the cleared land in the basin is bordering the creek channel, and the riparian buffer is narrow (<50 m) on at least one side of the creek in much of the basin. The substrate is reported to be "nice" at the site and dominated by cobble, but water temperatures are often high. Extending and planting the riparian area along the entire channel would be recommended to

help cool water temperatures and contribute organic debris. Although the channel does not appear to be highly constrained, there is likely a lack of large woody debris. Additional agricultural BMPs and outreach encouraging these actions is also recommended. There has been recent development within the basin, including the construction of large homes with more than 5-acre lots in the 1990s and 2000s. Although these parcels are relatively large, and stormwater BMPs may have been installed in the recent development, additional stormwater BMPs may be helpful in treating runoff from older homes and roads.

Cabin Ck. in the Issaquah Ck. subbasin

WRIA 8; Site code (site ID): 08ISS3958 (151)



Year	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	1999-2012 Median
B-IBI				42	36		32	30	36	34	38	36	28			38	36

Basin area (acres)	% urban within basin 1-km of site	% urban in whole basin	% pasture in whole basin	% natural in 90-m buffer in whole basin	% impervious in 2011 in whole basin
369.8	12.97%	5.59%	0.00%	95.76%	2.02%

Potential restoration or management actions for: Cabin Ck. in the Issaquah Ck. subbasin – WRIA 8; Site code (site ID): 08ISS3958 (151)

Restoration and Management Actions		Likelihood action would help restore the basin
In-stream	add wood	2
	add substrate	2
	enhance sinuosity	4
	replace culverts	2
	stabilize stream banks	2
Riparian	stabilize slopes	2
	plant vegetation, extend buffer	2
Agricultural BMPs	exclude livestock	0
	manage waste	0
	prevent soil loss	0
Forest BMPs	road maintenance	0
	minimize clearcutting	0
	replant	0
Mining BMPs	mining BMPs	0
Stormwater BMPs	flow controls	3
	treatment	3
	maintain storage and treatment facilities	2
	street sweeping	1
Other Approaches and Actions	limit pesticide use	1
	outreach and education campaign	2
	create incentives to follow BMPs	2
	purchase and protect property	1
	seed invertebrates	1
Is the basin at risk of further degradation?		4

Key for colors and numbers used in table:

not applicable	unlikely	possibly	likely	highly likely
0	1	2	3	4

Key restoration or management action(s) recommended and summary notes:

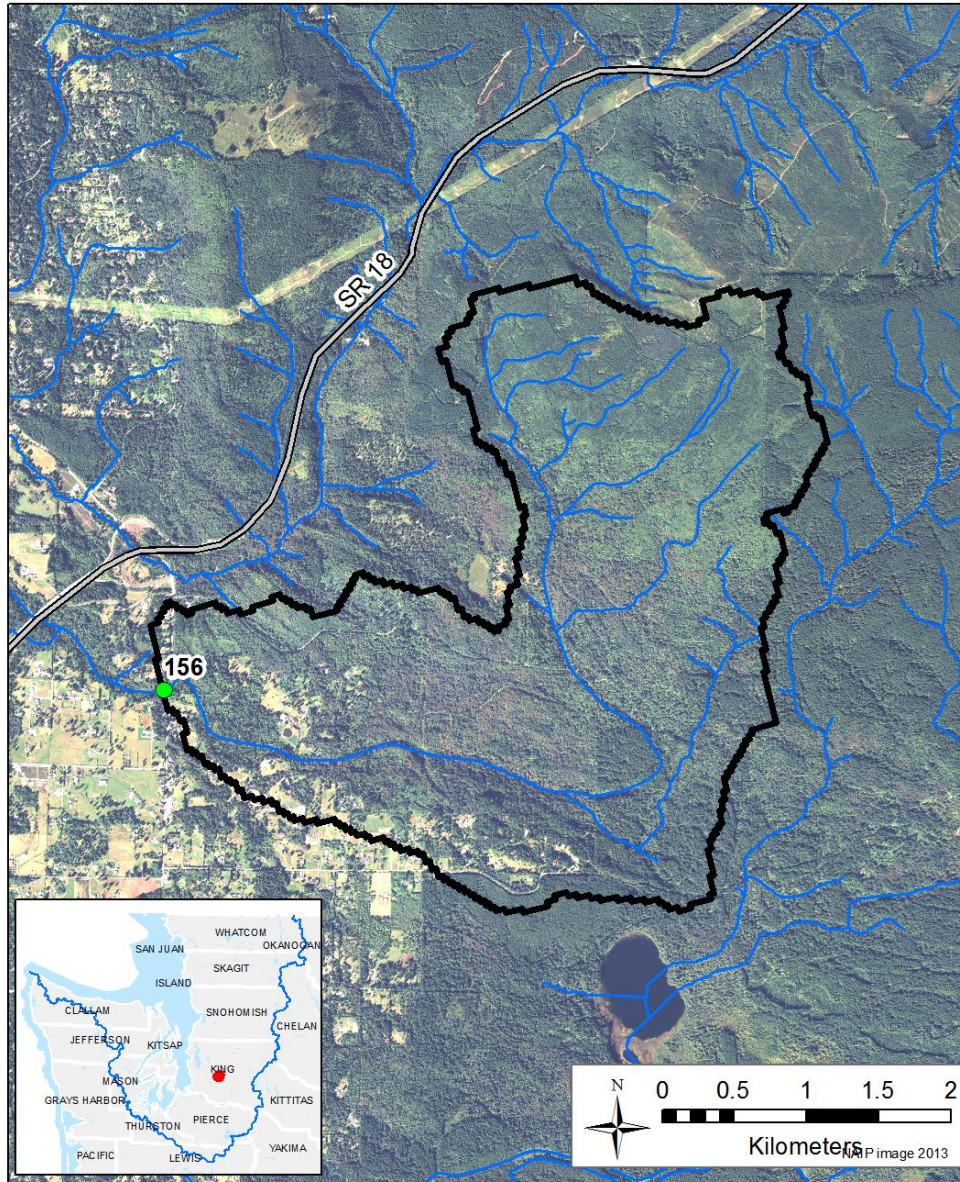
In-channel and local riparian actions; replace riprap with large woody debris or otherwise create more complex in-channel habitat; stormwater BMPs

Most of the upper Cabin Creek basin is located in Squak Mountain State Park Natural Area. Planners should sample upstream to assess colonization potential, but based on land use and protection already in place, upstream conditions are likely reaching their full potential. The park boundary is ~ 800m upstream of site. Reach scale mitigation may be most relevant since recent Ephemeroptera, Plecoptera,

Trichoptera (EPT) richness at this site and site 400 m downstream (924) are relatively high (E: 5-12 taxa, P: 4-7 taxa, T: 8-10 taxa); stormwater BMPs are listed as "likely" because of the site's PSWC listing as stormwater retrofit target. The area immediately upstream of B-IBI site is zoned as intense urban, and the area between this area and the park is zoned as urban residential. If there is further development within that immediate area, additional stormwater BMPs would be recommended.

Carey Ck. in the Issaquah Ck. subbasin

WRIA 8; Site code (site ID): 08ISS4724 (156)



Year	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	1999-2012 Median
B-IBI					42			38	32	32	38	28	36	36	42	36	36

Basin area (acres)	% urban within basin 1-km of site	% urban in whole basin	% pasture in whole basin	% natural in 90-m buffer in whole basin	% impervious in 2011 in whole basin
2844.2	4.71%	1.56%	2.40%	99.45%	0.77%

Potential restoration or management actions for: Carey Ck. in the Issaquah Ck. subbasin – WRIA 8; Site code (site ID): 08ISS4724 (156)

Restoration and Management Actions		Likelihood action would help restore the basin
In-stream	add wood	2
	add substrate	2
	enhance sinuosity	4
	replace culverts	2
	stabilize stream banks	2
Riparian	stabilize slopes	2
	plant vegetation, extend buffer	4
Agricultural BMPs	exclude livestock	2
	manage waste	2
	prevent soil loss	1
Forest BMPs	road maintenance	2
	minimize clearcutting	3
	replant	1
Mining BMPs	mining BMPs	0
Stormwater BMPs	flow controls	3
	treatment	2
	maintain storage and treatment facilities	1
	street sweeping	1
Other Approaches and Actions	limit pesticide use	2
	outreach and education campaign	2
	create incentives to follow BMPs	2
	purchase and protect property	2
	seed invertebrates	0
Is the basin at risk of further degradation?		4

Key for colors and numbers used in table:

not applicable	unlikely	possibly	likely	highly likely
0	1	2	3	4

Key restoration or management action(s) recommended and summary notes:

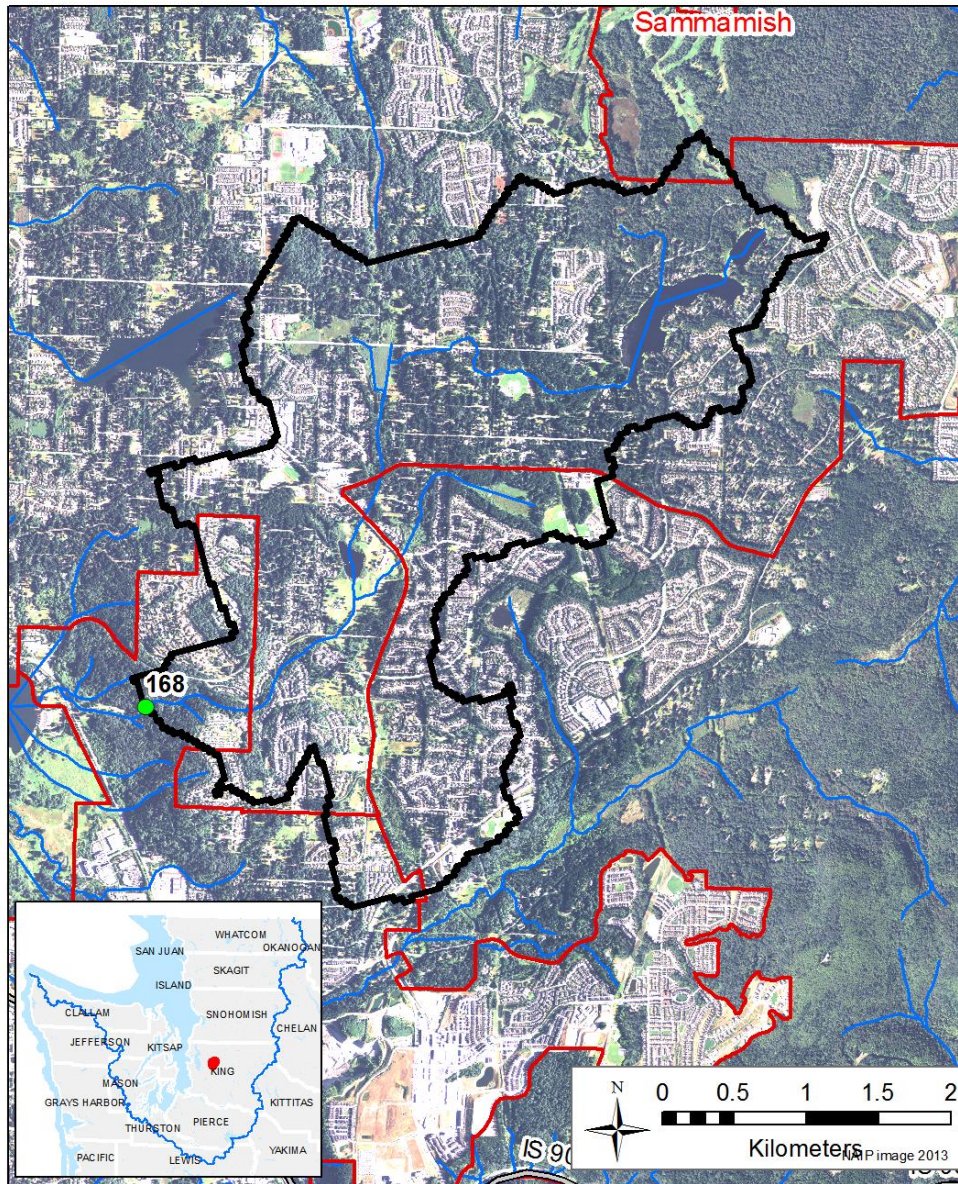
Local instream and/or Agricultural BMPs; increased channel complexity and planting of riparian vegetation where applicable

Nearly half of the Carey Creek basin is in Taylor Mountain Forest; photos indicate a history of clear cutting but a site 4 km upstream (and downstream of the cutting) has scored excellent in 4 of 5 last years. At a B-IBI site ~2.5 km upstream of site #156, scores have ranged from poor to excellent over last 5 years. This suggests upstream conditions (within ~3 km of 156) are variable and may be contributing to

fair scores. Local impacts from small scale agriculture and rural residential may have contributed to the fair scores at 156. Although logging does not appear to explain the decline at this site, minimizing future harvest impacts will help ensure there is a source of diverse insects and sufficient organic matter from upstream. Rural residential zoning throughout portions of the watershed, that are not currently developed, suggests impacts may increase over time.

Laughing Jacobs Ck. in the East Lake Sammamish subbasin

WRIA 8; Site code (site ID): 08LAK3879 (168)



Year	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	1999-2012 Median
B-IBI				28	28		28	28	30	22	32	30	30	28	28	30	28

Basin area (acres)	% urban within basin 1-km of site	% urban in whole basin	% pasture in whole basin	% natural in 90-m buffer in whole basin	% impervious in 2011 in whole basin
2869.8	51.64%	45.73%	0.01%	53.45%	22.19%

Potential restoration or management actions for: Laughing Jacobs Ck. in the East Lake Sammamish subbasin – WRIA 8; Site code (site ID): 08LAK3879 (168)

Restoration and Management Actions		Likelihood action would help restore the basin
In-stream	add wood	4
	add substrate	4
	enhance sinuosity	4
	replace culverts	4
	stabilize stream banks	2
Riparian	stabilize slopes	3
	plant vegetation, extend buffer	4
Agricultural BMPs	exclude livestock	2
	manage waste	2
	prevent soil loss	1
Forest BMPs	road maintenance	0
	minimize clearcutting	0
	replant	0
Mining BMPs	mining BMPs	0
Stormwater BMPs	flow controls	4
	treatment	4
	maintain storage and treatment facilities	4
	street sweeping	3
Other Approaches and Actions	limit pesticide use	3
	outreach and education campaign	3
	create incentives to follow BMPs	2
	purchase and protect property	2
	seed invertebrates	2
Is the basin at risk of further degradation?		4

Key for colors and numbers used in table:

not applicable	unlikely	possibly	likely	highly likely
0	1	2	3	4

Key restoration or management action(s) recommended and summary notes:

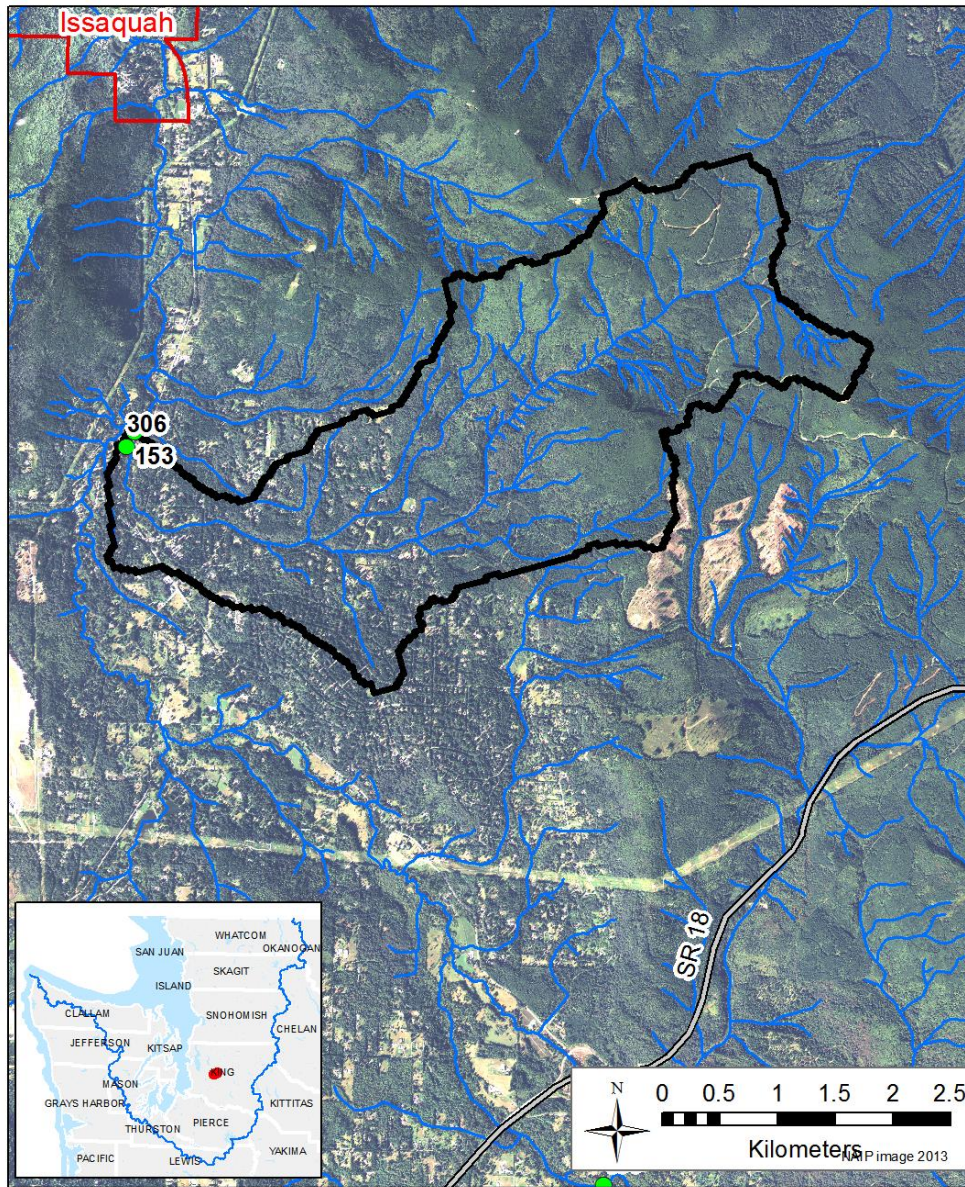
Stormwater BMPs; riparian planting and extension of buffers; agricultural BMPs; in-stream restoration actions

The B-IBI site in the Laughing Jacob's basin is in Hans Jensen Park. At the site, the habitat is relatively complex with some large woody debris in the channel, but the substrate is reportedly embedded. Around the immediate site, the riparian habitat is excellent. Within 0.75-1 km, however, there is high density housing within 30-50 m from the creek. Throughout the basin, it appears there has been

extensive development from mid 1980s through late 1990s, dominated by high density housing. Some agricultural land persists ~2km upstream of the site, and it appears some improvements could be made, such as establishing a buffer and restoring sinuosity. The PSWC analysis indicated water flow and water quality processes have been degraded at the basin-scale and would benefit from restoration. The Kokanee work group has developed a blueprint for this creek which has recommendations for restoration projects that would occur downstream of the B-IBI site; potential actions include replacing a culvert under the Parkway, rerouting the lower reach or restoring in-channel habitat to improve spawning habitat for Kokanee, and enhancing the stream channel within Hans Jensen Park by installing pool-forming structures and adding spawning gravel. Most B-IBI sites in adjacent watersheds have fair B-IBI scores; local managers suggested there should be diverse invertebrates in the area, but data from other sites suggest there are no connected or nearby sources of diverse and sensitive invertebrate taxa.

Fifteenmile Ck. in the Issaquah Ck. subbasin

WRIA 8; Site code (site ID): E1139 (306)



Year	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	1999-2012 Median
B-IBI	22	26	36	38	30	34	40	36	38	42	32	32					35

Basin area (acres)	% urban within basin 1-km of site	% urban in whole basin	% pasture in whole basin	% natural in 90-m buffer in whole basin	% impervious in 2011 in whole basin
2996.5	21.29%	5.61%	0.77%	92.63%	2.26%

Potential restoration or management actions for: Fifteenmile Ck. in the Issaquah Ck. subbasin – WRIA 8;
Site code (site ID): E1139 (306)

Restoration and Management Actions		Likelihood action would help restore the basin
In-stream	add wood	3
	add substrate	3
	enhance sinuosity	3
	replace culverts	3
	stabilize stream banks	3
Riparian	stabilize slopes	2
	plant vegetation, extend buffer	4
Agricultural BMPs	exclude livestock	2
	manage waste	2
	prevent soil loss	0
Forest BMPs	road maintenance	4
	minimize clearcutting	4
	replant	0
Mining BMPs	mining BMPs	0
Stormwater BMPs	flow controls	4
	treatment	4
	maintain storage and treatment facilities	4
	street sweeping	1
Other Approaches and Actions	limit pesticide use	4
	outreach and education campaign	4
	create incentives to follow BMPs	4
	purchase and protect property	2
	seed invertebrates	1
Is the basin at risk of further degradation?		4

Key for colors and numbers used in table:

not applicable	unlikely	possibly	likely	highly likely
0	1	2	3	4

Key restoration or management action(s) recommended and summary notes:

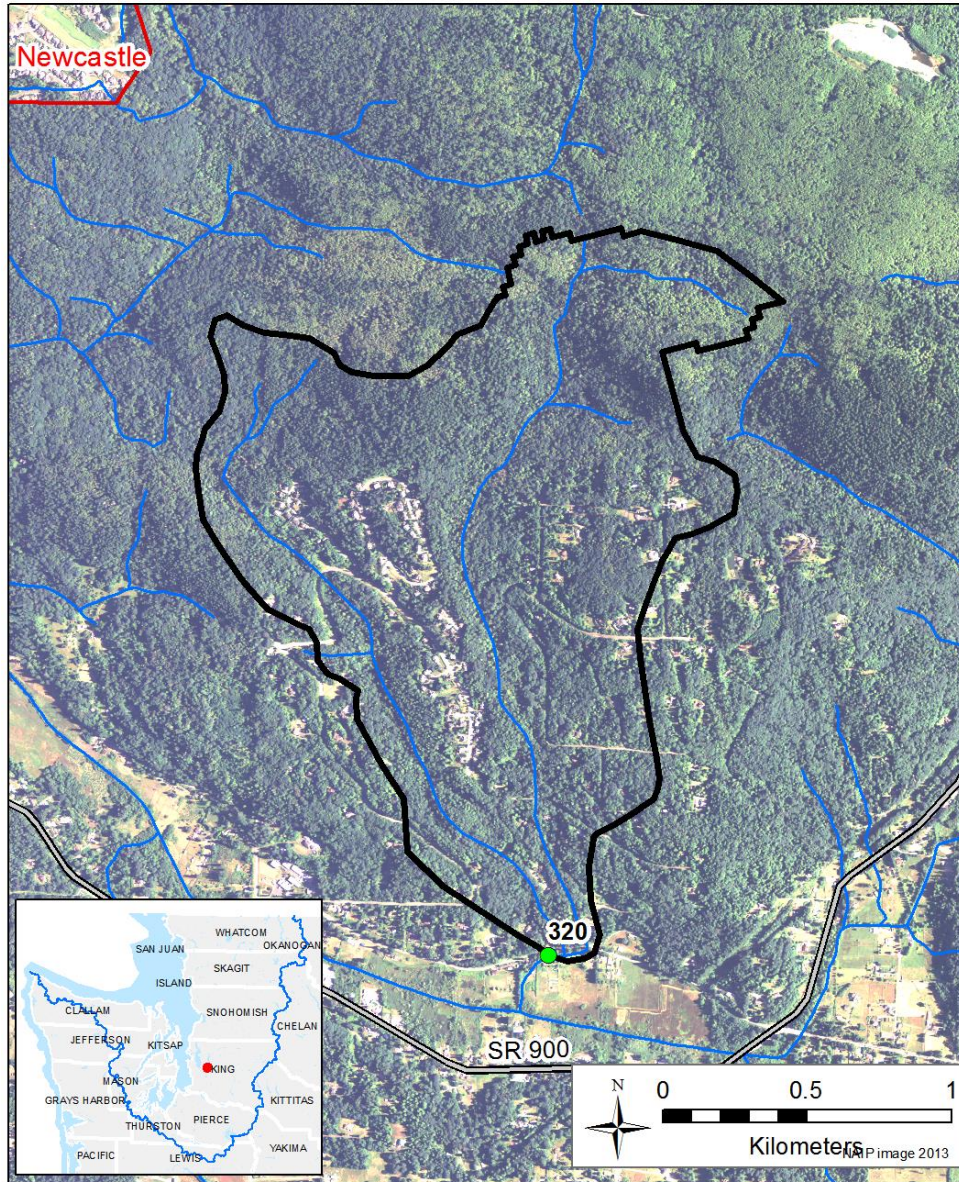
Stormwater BMPs and outreach to landowners in lower basin and in upper basin; minimize effects of future logging

The upper 70% of the Fifteenmile Creek basin is zoned forest resource and the lower 30% is zoned rural residential. Photos from 2006 indicate there had been some clearing (likely between 1995 and 2005), but 2013 photos suggest there has not been extensive clearing since. The majority of the basin had been logged previously, but it is uncertain when it would likely be logged again. In the lower basin, most of

the homes were built on 0.5 to 5-acre lots between 1960 and 1985 and therefore it is likely that the installation of current stormwater BMPs could improve flow processes. Most, if not all, properties appear to have septic systems, and several properties in the lower basin are within 30 m of the stream. Stormwater runoff from the Issaquah-Hobart Road could also be affecting stream conditions in the 1-km basin upstream of the site. Managers familiar with the site also suggested local restoration may be beneficial.

May Ck. (Lake Washington) in the May Ck. subbasin

WRIA 8; Site code (site ID): P325 (320)



Year	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	1999-2012 Median
B-IBI						32	34	36	40	36	36	30					36

Basin area (acres)	% urban within basin 1-km of site	% urban in whole basin	% pasture in whole basin	% natural in 90-m buffer in whole basin	% impervious in 2011 in whole basin
682.6	8.58%	11.74%	0.00%	87.80%	4.15%

Potential restoration or management actions for: May Ck. (Lake Washington) in the May Ck. subbasin – WRIA 8; Site code (site ID): P325 (320)

Restoration and Management Actions		Likelihood action would help restore the basin
In-stream	add wood	2
	add substrate	2
	enhance sinuosity	2
	replace culverts	2
	stabilize stream banks	2
Riparian	stabilize slopes	2
	plant vegetation, extend buffer	2
Agricultural BMPs	exclude livestock	0
	manage waste	0
	prevent soil loss	0
Forest BMPs	road maintenance	0
	minimize clearcutting	0
	replant	0
Mining BMPs	mining BMPs	0
Stormwater BMPs	flow controls	4
	treatment	4
	maintain storage and treatment facilities	4
	street sweeping	1
Other Approaches and Actions	limit pesticide use	3
	outreach and education campaign	4
	create incentives to follow BMPs	3
	purchase and protect property	1
	seed invertebrates	3
Is the basin at risk of further degradation?		4

Key for colors and numbers used in table:

not applicable	unlikely	possibly	likely	highly likely
0	1	2	3	4

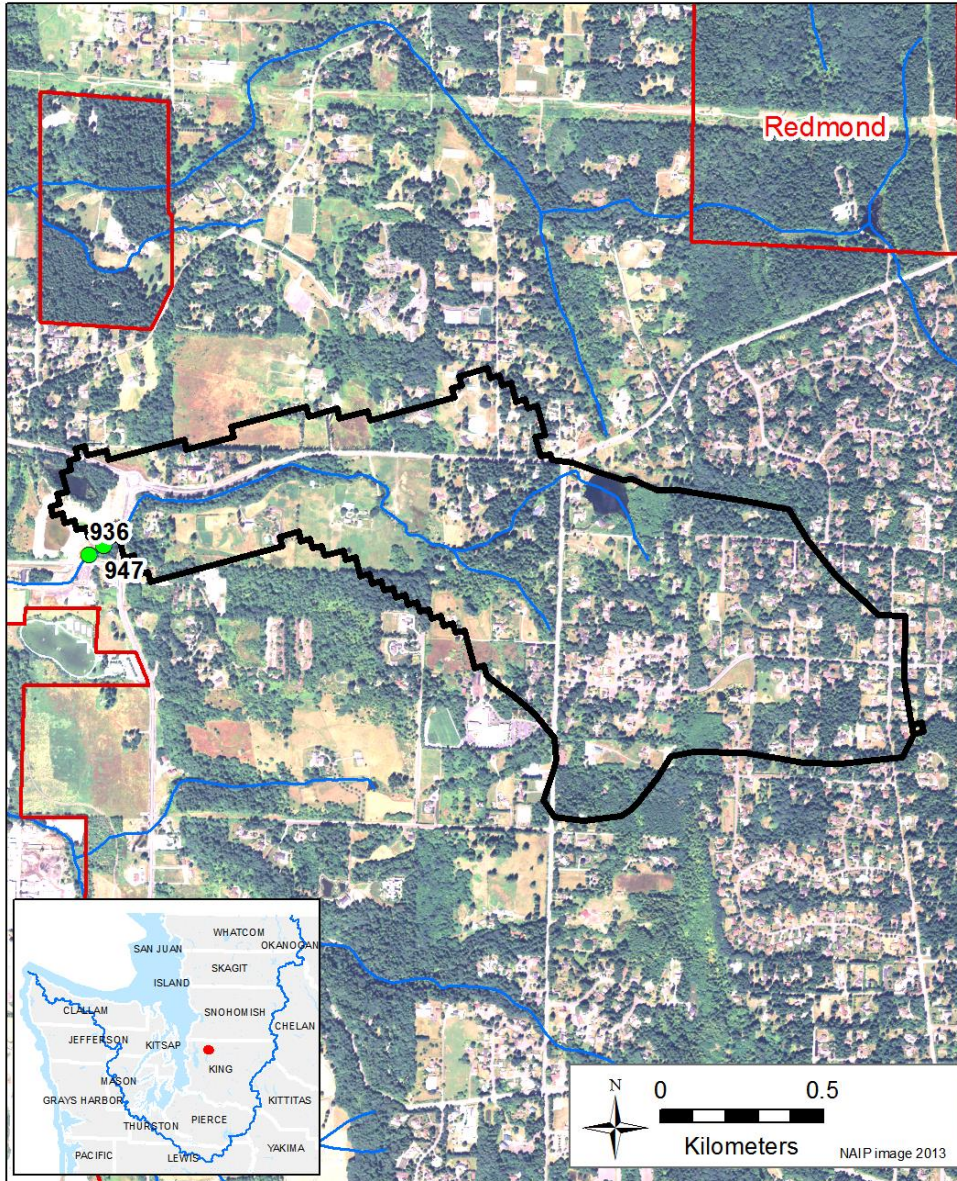
Key restoration or management action(s) recommended and summary notes:

Stormwater BMPs and outreach

Most of the basin of this tributary of May Creek is zoned rural residential, although the upper third of the basin appears to be within the Cougar Mountain Regional Wildland Park. If upper watershed is not a source of diverse invertebrates, this site might be a good candidate for seeding once additional stormwater BMPs are installed. The basin has been identified by PSWC and KC as a priority for stormwater BMPs, and restoration actions in the mainstem of May Creek indicate actions on this

tributary may contribute to efforts in the larger watershed. Parcels near the east tributary are relatively large (1-7 acres), with most homes built between 1975 and 1995. Parcels near the west tributary are smaller and some of the homes are newer. There appear to be 8 residential stormwater facilities within the basin, but additional stormwater BMPs would likely benefit discharge processes. Outreach to homeowners would also be advantageous.

Stensland Ck. in the Bear Ck. subbasin
 WRIA 8; Site code (site ID): Stensland Middle (947)



Year	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	1999-2012 Median
B-IBI											30	38	32	30	28		31

Basin area (acres)	% urban within basin 1-km of site	% urban in whole basin	% pasture in whole basin	% natural in 90-m buffer in whole basin	% impervious in 2011 in whole basin
400.1	16.23%	28.69%	7.08%	52.29%	12.67%

Potential restoration or management actions for: Stensland Ck. in the Bear Ck. subbasin – WRIA 8; Site code (site ID): Stensland Middle (947)

Restoration and Management Actions		Likelihood action would help restore the basin
In-stream	add wood	2
	add substrate	2
	enhance sinuosity	2
	replace culverts	2
	stabilize stream banks	2
Riparian	stabilize slopes	2
	plant vegetation, extend buffer	4
Agricultural BMPs	exclude livestock	3
	manage waste	2
	prevent soil loss	2
Forest BMPs	road maintenance	0
	minimize clearcutting	0
	replant	0
Mining BMPs	mining BMPs	0
Stormwater BMPs	flow controls	4
	treatment	4
	maintain storage and treatment facilities	4
	street sweeping	2
Other Approaches and Actions	limit pesticide use	3
	outreach and education campaign	3
	create incentives to follow BMPs	3
	purchase and protect property	2
	seed invertebrates	3
Is the basin at risk of further degradation?		3

Key for colors and numbers used in table:

not applicable	unlikely	possibly	likely	highly likely
0	1	2	3	4

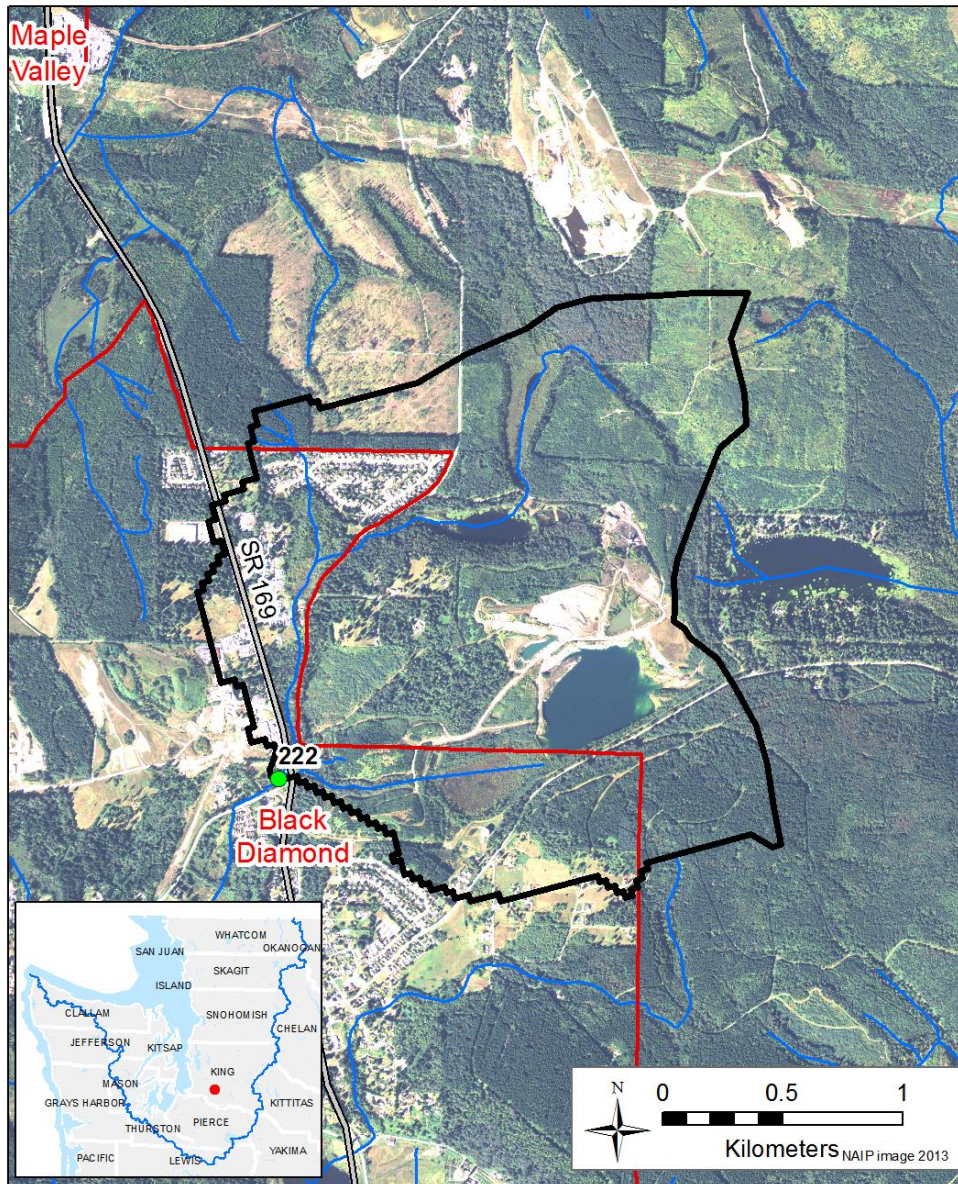
Key restoration or management action(s) recommended and summary notes:

Stormwater and agricultural BMPs, extending and planting riparian areas, outreach, seeding

The Stensland Creek basin is zoned exclusively rural residential, and the basin appears to be developed accordingly. Homes range widely in age, with some built before any stormwater regulations were recommended and others built in the 2000s. Most of the homes appear to be on septic systems. The creek flows under a road (196th Ave NE) and along a large roadway (NE Novelty Hill Rd.) with a small buffer (20 to 25 m per side) for nearly 800 m upstream of the site. Upstream of the sparse wooded area

by the road, the creek runs through pastures with little to no riparian buffer. The buffer width increases in parts of the upper basin, but stormwater runoff from the residential area in the upper basin likely affects the water flow and water quality processes at the basin scale. Coho use the stream, and they and invertebrates would likely benefit from stormwater BMPs throughout the basin, agricultural BMPs (especially in the lower 1-km basin), and extending and planting in the riparian areas. Outreach to landowners, and especially those with large parcels adjacent to the creek, could encourage agricultural BMPs. Seeding may be appropriate after BMPs are established.

Rock Ck. Tributary (Covington) in the Covington Ck. subbasin
 WRIA 9; Site code (site ID): 09COV1862 (222)



Year	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	1999-2012 Median
B-IBI				20			26	30	28	34	34	22	32		36	30	29

Basin area (acres)	% urban within basin 1-km of site	% urban in whole basin	% pasture in whole basin	% natural in 90-m buffer in whole basin	% impervious in 2011 in whole basin
1058.9	16.42%	10.47%	2.98%	77.05%	5.19%

Potential restoration or management actions for: Rock Ck. Tributary (Covington) in the Covington Ck. subbasin – WRIA 9; Site code (site ID): 09COV1862 (222)

Restoration and Management Actions		Likelihood action would help restore the basin
In-stream	add wood	2
	add substrate	2
	enhance sinuosity	2
	replace culverts	2
	stabilize stream banks	2
Riparian	stabilize slopes	2
	plant vegetation, extend buffer	2
Agricultural BMPs	exclude livestock	2
	manage waste	1
	prevent soil loss	0
Forest BMPs	road maintenance	3
	minimize clearcutting	4
	replant	2
Mining BMPs	mining BMPs	4
Stormwater BMPs	flow controls	3
	treatment	3
	maintain storage and treatment facilities	3
	street sweeping	1
Other Approaches and Actions	limit pesticide use	2
	outreach and education campaign	3
	create incentives to follow BMPs	2
	purchase and protect property	2
	seed invertebrates	2
Is the basin at risk of further degradation?		4

Key for colors and numbers used in table:

not applicable	unlikely	possibly	likely	highly likely
0	1	2	3	4

Key restoration or management action(s) recommended and summary notes:

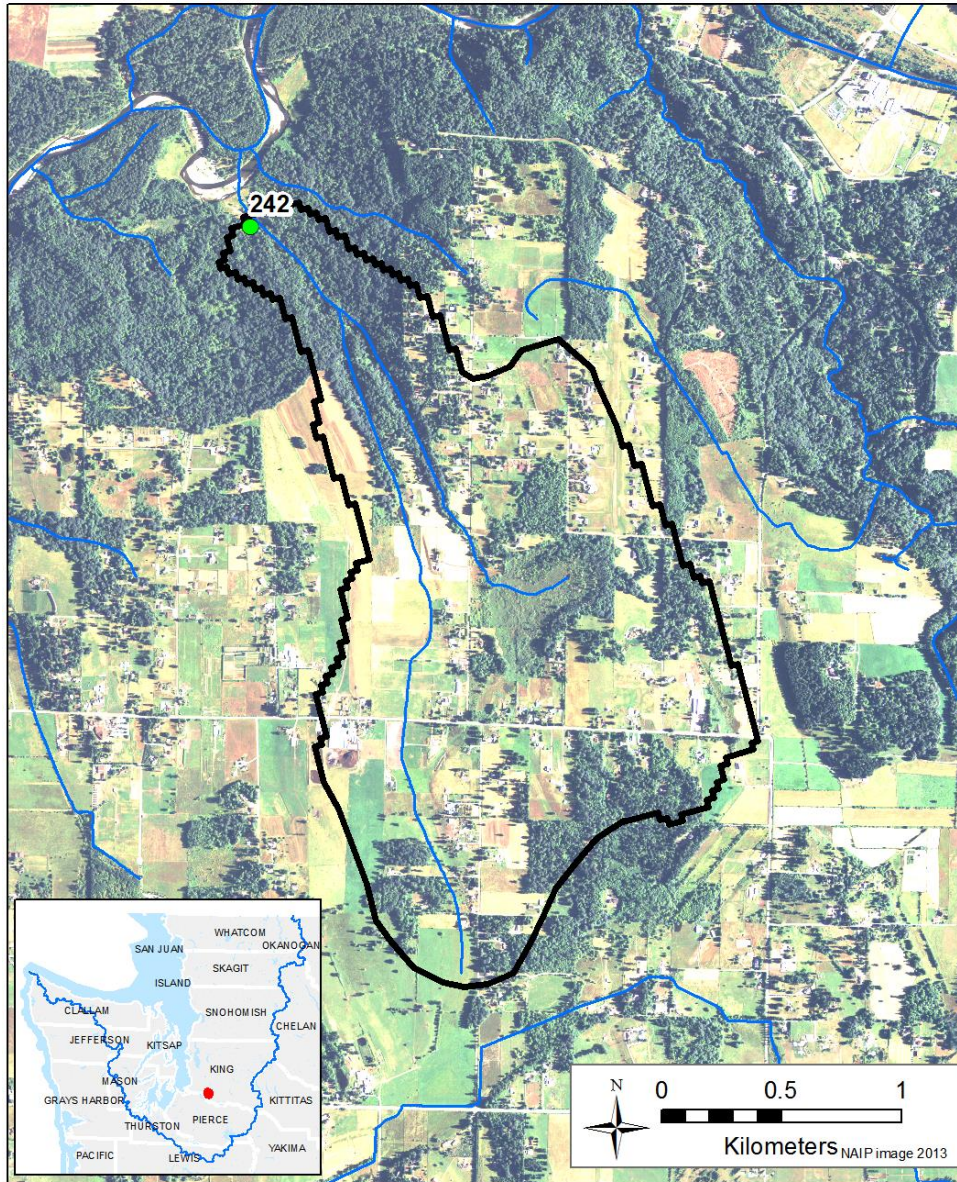
Stormwater, Forest and mining BMPs, outreach

Of all the basins considered, the basin for the Rock Creek tributary in Covington has the most varied land uses and associated zoning. There is rural residential development, higher density urban development (e.g., housing development built in 1990s and mobile home park), active forest harvest, active mining, and small scale agriculture within the rural residential areas. Therefore, it is plausible that BMPs related to all of these land uses could apply. BMPs that limit sediment delivery are recommended because it has

been reported that the substrate at the B-IBI site is dominated by fine sediments. Summer flows are often low, and macroinvertebrate community may be limited by slow water and limited habitat. PSWC processes analysis suggested basin-scale actions may be needed to restore water flow and water quality processes. Of the areas zoned for urban development, only a small portion has been developed thus far, especially in the southwest portion of basin. If development proceeds, stormwater BMPs should be utilized as much as possible to reduce impacts of increased impervious surfaces. In-channel restorations actions may also be needed throughout the basin given the history of logging and the likely impacts on habitat structure and complexity.

O'Grady Ck. in the Middle Green R. subbasin

WRIA 9; Site code (site ID): 09MID1374 (242)



Year	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	1999-2012 Median
B-IBI				30	28		38	38	36	36	34	30	30	38	36	38	35

Basin area (acres)	% urban within basin 1-km of site	% urban in whole basin	% pasture in whole basin	% natural in 90-m buffer in whole basin	% impervious in 2011 in whole basin
903.0	2.52%	6.75%	46.01%	48.68%	3.62%

Potential restoration or management actions for: O'Grady Ck. in the Middle Green R. subbasin – WRIA 9;
Site code (site ID): 09MID1374 (242)

Restoration and Management Actions		Likelihood action would help restore the basin
In-stream	add wood	2
	add substrate	1
	enhance sinuosity	3
	replace culverts	2
	stabilize stream banks	2
Riparian	stabilize slopes	3
	plant vegetation, extend buffer	4
Agricultural BMPs	exclude livestock	3
	manage waste	3
	prevent soil loss	3
Forest BMPs	road maintenance	0
	minimize clearcutting	0
	replant	0
Mining BMPs	mining BMPs	0
Stormwater BMPs	flow controls	2
	treatment	2
	maintain storage and treatment facilities	2
	street sweeping	2
Other Approaches and Actions	limit pesticide use	3
	outreach and education campaign	3
	create incentives to follow BMPs	3
	purchase and protect property	0
	seed invertebrates	3
Is the basin at risk of further degradation?		2

Key for colors and numbers used in table:

not applicable	unlikely	possibly	likely	highly likely
0	1	2	3	4

Key restoration or management action(s) recommended and summary notes:

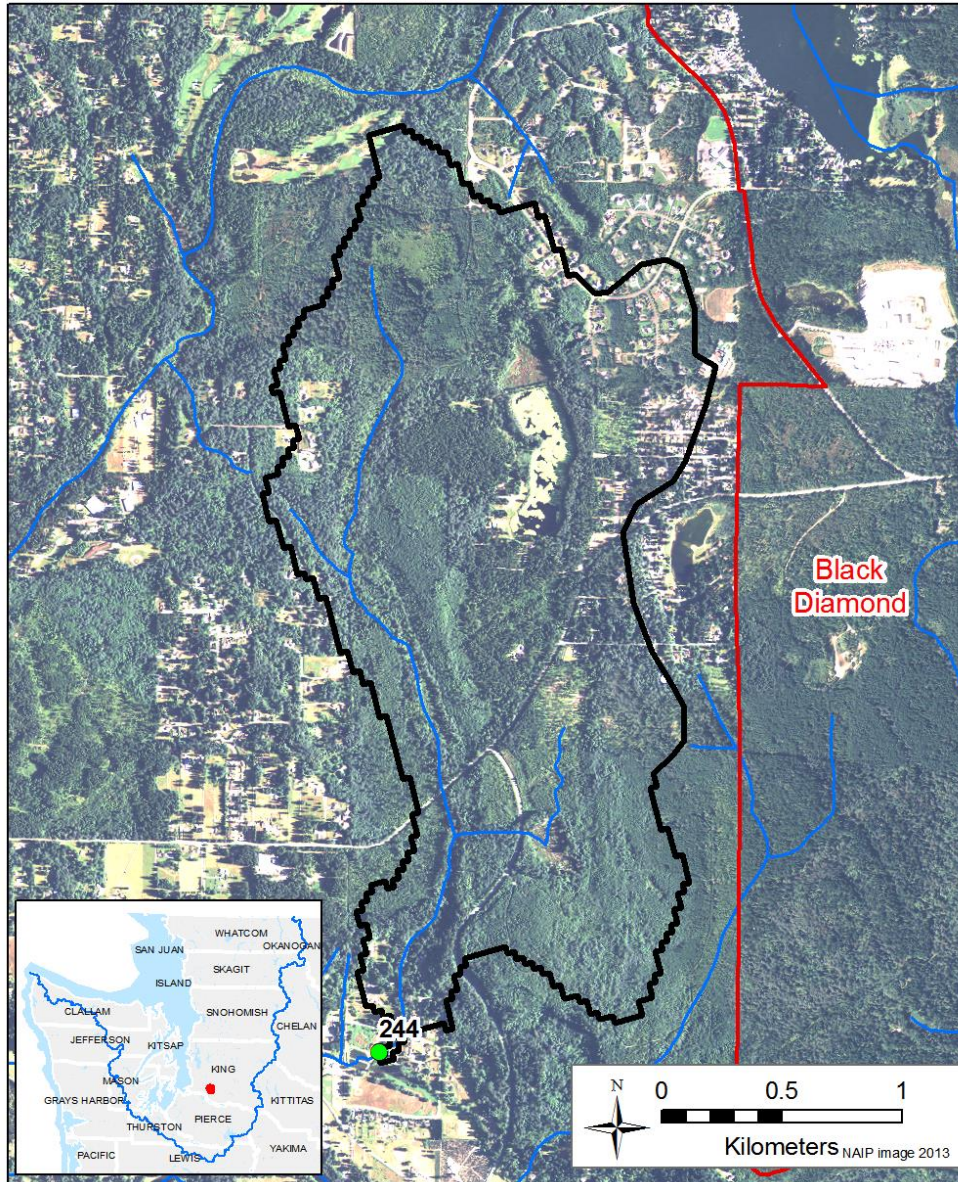
Agricultural BMPs upstream, with increased riparian buffers; channel restoration targeting sand deposition; seeding

The O'Grady Creek basin is the only basin with a "fair" median score that is zoned exclusively for resource agriculture. Within the immediate 1-km basin, the channel has a relatively intact riparian zone. It is unlikely that land cover will change in this reach or forest would be cleared because of the steep topography. The reach just above the B-IBI site was restored in 1999-2001, with a culvert replacement

and channel restoration. Local in-stream conditions appear to be good, although local managers also report that the reach may be affected by deposition and scouring of sand during high flow events. Restoration actions to reduce high flows and dissipate energy upstream of the site may be helpful. At basin scale, the PSWC analysis suggested some flow and water quality processes are highly degraded and may require extensive restoration while others may be easier to restore. Agricultural land (with no buffers) starts ~1.5km upstream of site, and agricultural BMPs are highly recommended in these reaches. Land is classified as Agricultural Production District (APD) land, so adding extensive buffers in upper watershed may be unfeasible. Seeding may be appropriate if the risk of scouring can be reduced.

Crisp Ck. in the Middle Green R. subbasin

WRIA 9; Site code (site ID): 09MID1537 (244)



Year	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	1999-2012 Median
B-IBI				34	30		34	30	26	24	30	20	20	26	22	26	28

Basin area (acres)	% urban within basin 1-km of site	% urban in whole basin	% pasture in whole basin	% natural in 90-m buffer in whole basin	% impervious in 2011 in whole basin
1107.9	3.54%	9.32%	1.72%	90.75%	4.28%

Potential restoration or management actions for: Crisp Ck. in the Middle Green R. subbasin – WRIA 9;
 Site code (site ID): 09MID1537 (244)

Restoration and Management Actions		Likelihood action would help restore the basin
In-stream	add wood	4
	add substrate	4
	enhance sinuosity	4
	replace culverts	4
	stabilize stream banks	4
Riparian	stabilize slopes	4
	plant vegetation, extend buffer	4
Agricultural BMPs	exclude livestock	0
	manage waste	0
	prevent soil loss	0
Forest BMPs	road maintenance	3
	minimize clearcutting	4
	replant	1
Mining BMPs	mining BMPs	0
Stormwater BMPs	flow controls	4
	treatment	4
	maintain storage and treatment facilities	3
	street sweeping	1
Other Approaches and Actions	limit pesticide use	3
	outreach and education campaign	3
	create incentives to follow BMPs	3
	purchase and protect property	4
	seed invertebrates	2
Is the basin at risk of further degradation?		4

Key for colors and numbers used in table:

not applicable	unlikely	possibly	likely	highly likely
0	1	2	3	4

Key restoration or management action(s) recommended and summary notes:

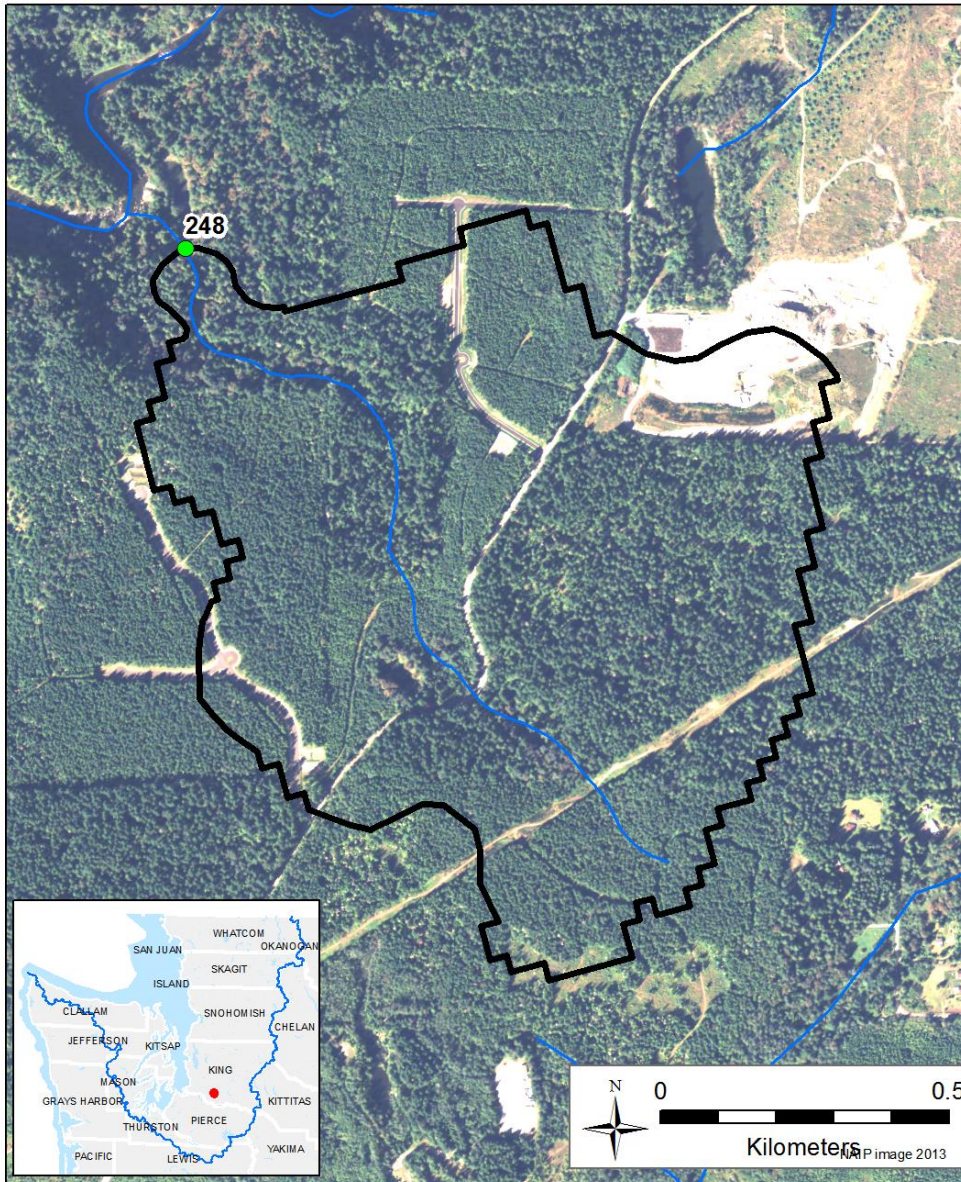
Reach-scale restoration, Stormwater BMPs

The Crisp Creek basin is zoned exclusively for rural residential although several parcels in the central part of the basin are designated forest land in the King County Assessor's report. Within ~500 m of the B-IBI site, the channel is ditched and flows along gravel roads. Riparian cover in this lower reach is limited to reed canary grass and blackberry. Reach-scale restoration actions should likely include restoring channel sinuosity, adding structure to increase habitat complexity, and restoring the riparian zone. The reach

above this is likely in better condition, although in-channel restorations actions may be needed as well due to previous impacts of logging and naturally high sediment loads. Starting about 500-m upstream of the B-IBI site, the creek flows through the Black Diamond Natural Area. The forest in the central basin appears to be relatively young (i.e., recently cleared patches are visible in the 2006 photos). If existing forest patches are cleared (for harvest or development), forest and/or construction BMPs should be employed as much as possible. The development in the basin ranges in age (1960s - 2010s), and while there are stormwater ponds in areas with newer development, additional stormwater BMPs may be helpful. If invertebrate communities upstream are diverse, it may be relatively easy to improve site conditions and allow for colonization from upstream. If invertebrate communities upstream are not diverse, seeding may be appropriate once site conditions are restored.

Icy Ck. in the Middle Green R. subbasin

WRIA 9; Site code (site ID): 09MID1958 (248)



Year	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	1999-2012 Median
B-IBI				34	38		38	38	26	44	28	34	26	30	30	38	34

Basin area (acres)	% urban within basin 1-km of site	% urban in whole basin	% pasture in whole basin	% natural in 90-m buffer in whole basin	% impervious in 2011 in whole basin
254.7	0.78%	0.61%	0.00%	100.00%	0.42%

Potential restoration or management actions for: Icy Ck. in the Middle Green R. subbasin – WRIA 9; Site code (site ID): 09MID1958 (248)

Restoration and Management Actions		Likelihood action would help restore the basin
In-stream	add wood	3
	add substrate	0
	enhance sinuosity	2
	replace culverts	2
	stabilize stream banks	1
Riparian	stabilize slopes	1
	plant vegetation, extend buffer	1
Agricultural BMPs	exclude livestock	0
	manage waste	0
	prevent soil loss	0
Forest BMPs	road maintenance	0
	minimize clearcutting	0
	replant	0
Mining BMPs	mining BMPs	0
Stormwater BMPs	flow controls	3
	treatment	3
	maintain storage and treatment facilities	3
	street sweeping	0
Other Approaches and Actions	limit pesticide use	1
	outreach and education campaign	1
	create incentives to follow BMPs	1
	purchase and protect property	4
	seed invertebrates	2
Is the basin at risk of further degradation?		4

Key for colors and numbers used in table:

not applicable	unlikely	possibly	likely	highly likely
0	1	2	3	4

Key restoration or management action(s) recommended and summary notes:

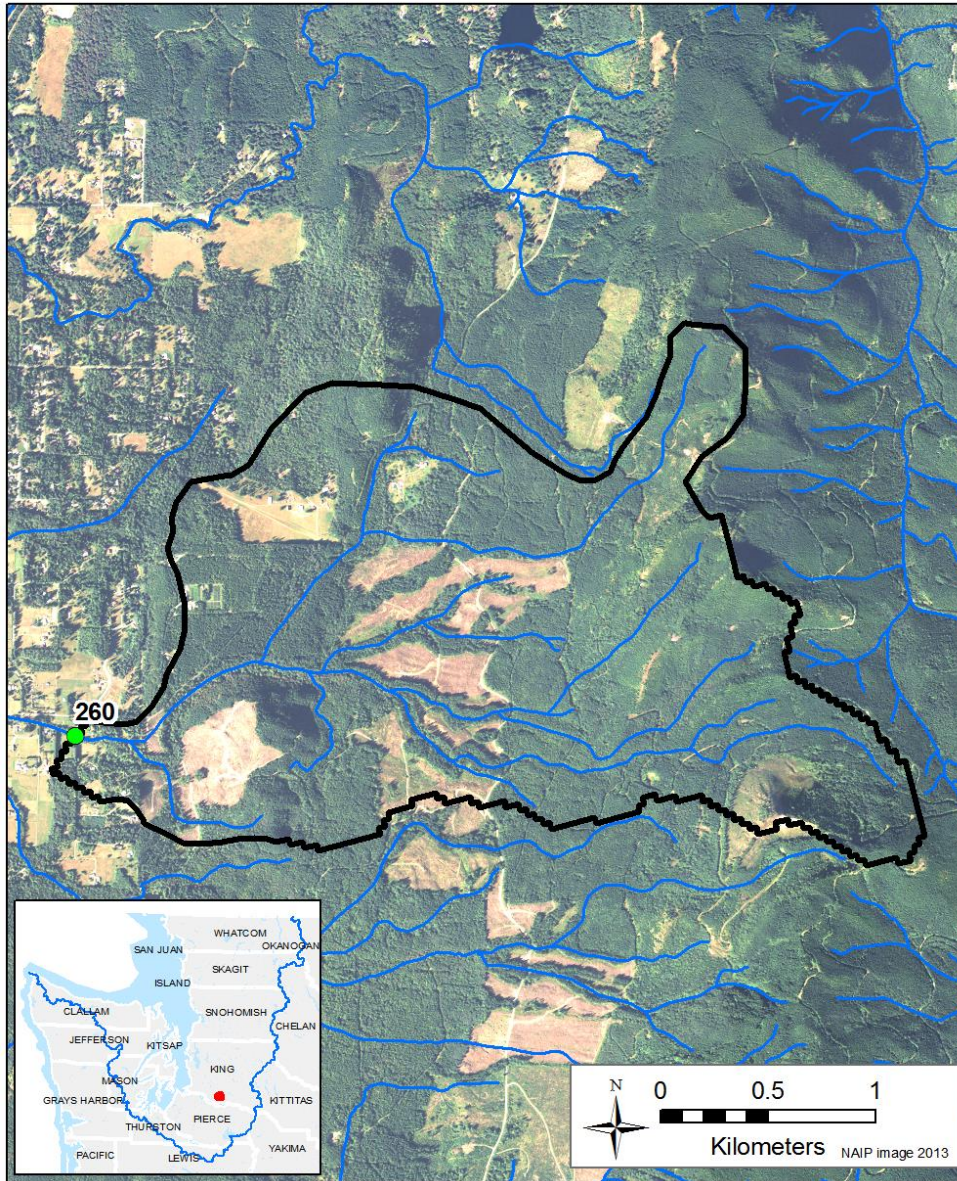
Protect conditions as much as possible, in-channel restoration

The Icy Creek basin has been identified by both PSWC and King County as a candidate for stormwater retrofits, although there is almost no current development in the basin. Some history of forest harvest is apparent in photos, but PSWC process scores indicate degradation is not at the landscape-scale. New paved roads suggest development may be imminent. Staff who have sampled the site report it is in a steep ravine and the substrate is dominated by large cobble. Although there have been a sufficient

number of insects collected here (in 10 of the last 12 years there have been 500 or more per sample), the composition of the community may be limited by the local habitat. For example, a relatively rare caddisfly, *Oligophlebodes*, typically found in the most turbulent sections of streams was the most abundant taxa in most samples. The focus should be on preventing further decline if and when development proceeds.

Newaukum Ck. - North Fork in the Newaukum Ck. subbasin

WRIA 9; Site code (site ID): 09NEW2128 (260)



Year	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	1999-2012 Median
B-IBI				30	32		36	26	46	38	38	32	30	36	44	36	34

Basin area (acres)	% urban within basin 1-km of site	% urban in whole basin	% pasture in whole basin	% natural in 90-m buffer in whole basin	% impervious in 2011 in whole basin
1409.6	1.91%	0.76%	0.08%	99.04%	0.39%

Potential restoration or management actions for: Newaukum Ck. - North Fork in the Newaukum Ck. subbasin – WRIA 9; Site code (site ID): 09NEW2128 (260)

Restoration and Management Actions		Likelihood action would help restore the basin
In-stream	add wood	4
	add substrate	2
	enhance sinuosity	4
	replace culverts	2
	stabilize stream banks	3
Riparian	stabilize slopes	3
	plant vegetation, extend buffer	3
Agricultural BMPs	exclude livestock	0
	manage waste	0
	prevent soil loss	0
Forest BMPs	road maintenance	2
	minimize clearcutting	4
	replant	4
Mining BMPs	mining BMPs	0
Stormwater BMPs	flow controls	0
	treatment	0
	maintain storage and treatment facilities	0
	street sweeping	0
Other Approaches and Actions	limit pesticide use	2
	outreach and education campaign	0
	create incentives to follow BMPs	2
	purchase and protect property	2
	seed invertebrates	1
Is the basin at risk of further degradation?		4

Key for colors and numbers used in table:

not applicable	unlikely	possibly	likely	highly likely
0	1	2	3	4

Key restoration or management action(s) recommended and summary notes:

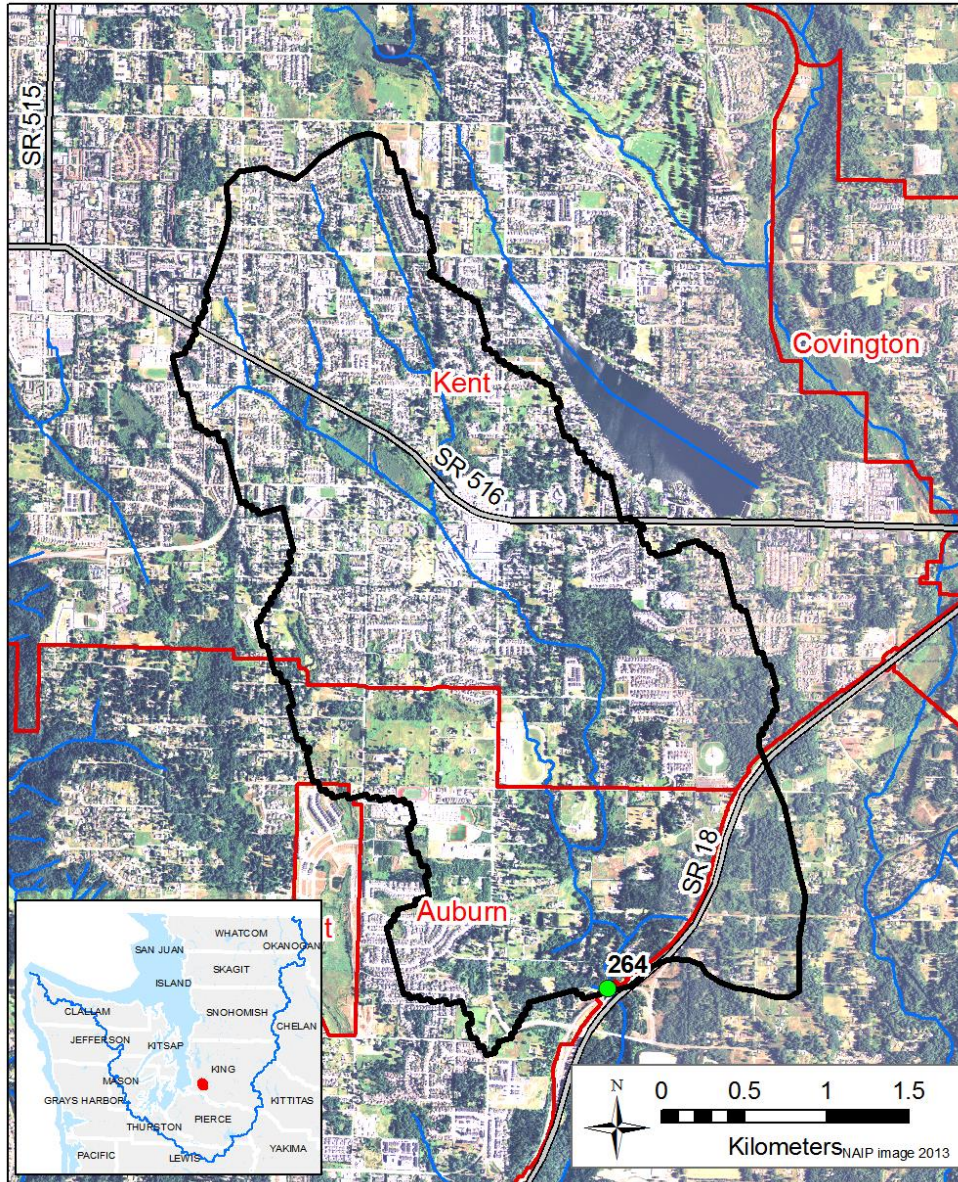
Forest BMPs, channel restoration

Most of the basin of the North Fork of Newaukum Creek is zoned for resource forest, and there have been large clearcuts throughout the basin since 2006. PSWC process analysis indicates surface storage has been degraded, and this corroborates on-site observations that the channel is down cut at the B-IBI site. Restoration actions designed to control flows and sediment transport from logged lands would be most appropriate, and would likely be needed at the landscape-scale. Although surface storage

processes have been disrupted by logging rather than urban development, the site has been prioritized by King County for stormwater retrofits. Photos illustrate buffers were maintained along stream corridor in logged areas; the typical buffer appears to be approximately 35 to 50 m on each side of the channel. In-channel restoration at site would likely include large woody debris additions, channel widening and bank stabilization to enhance fish and invertebrate habitat.

Soosette Ck. in the Soos Ck. subbasin

WRIA 9; Site code (site ID): 09SOO1022 (264)



Year	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	1999-2012 Median
B-IBI				28	36			32	30	40	38	32	34	36	36	28	34

Basin area (acres)	% urban within basin 1-km of site	% urban in whole basin	% pasture in whole basin	% natural in 90-m buffer in whole basin	% impervious in 2011 in whole basin
2797.4	27.67%	56.44%	8.47%	30.94%	28.38%

Potential restoration or management actions for: Soosette Ck. in the Soos Ck. subbasin – WRIA 9; Site code (site ID): 09SOO1022 (264)

Restoration and Management Actions		Likelihood action would help restore the basin
In-stream	add wood	3
	add substrate	3
	enhance sinuosity	3
	replace culverts	3
	stabilize stream banks	3
Riparian	stabilize slopes	4
	plant vegetation, extend buffer	4
Agricultural BMPs	exclude livestock	3
	manage waste	3
	prevent soil loss	2
Forest BMPs	road maintenance	0
	minimize clearcutting	0
	replant	0
Mining BMPs	mining BMPs	0
Stormwater BMPs	flow controls	3
	treatment	3
	maintain storage and treatment facilities	3
	street sweeping	3
Other Approaches and Actions	limit pesticide use	2
	outreach and education campaign	3
	create incentives to follow BMPs	3
	purchase and protect property	1
	seed invertebrates	1
Is the basin at risk of further degradation?		1

Key for colors and numbers used in table:

not applicable	unlikely	possibly	likely	highly likely
0	1	2	3	4

Key restoration or management action(s) recommended and summary notes:

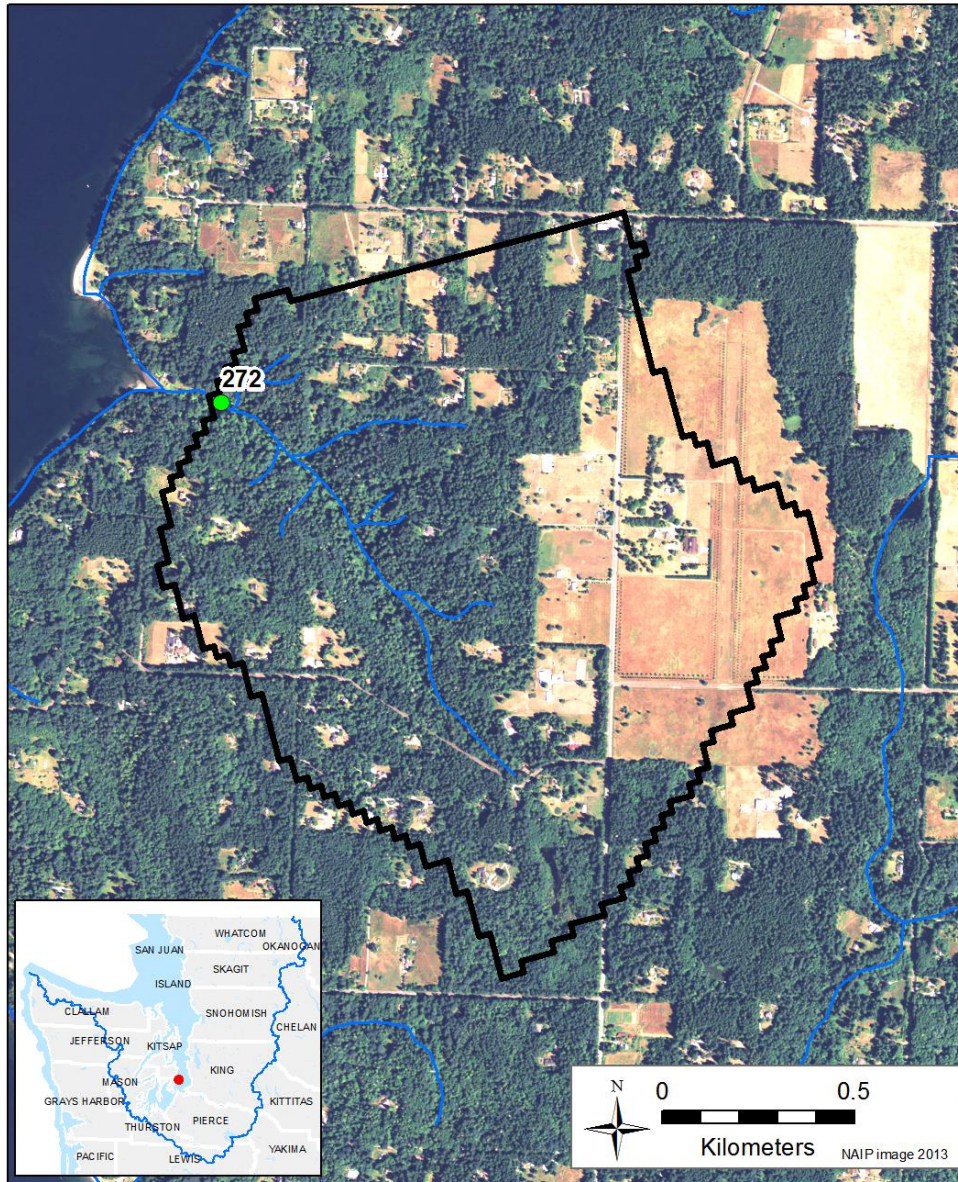
Stormwater and agricultural BMPs; in-channel habitat and riparian actions

The Soosette Creek basin is highly developed with housing developments from the 1970s through the 2000s. The biopotential score of greater than 6 indicates that B-IBI scores are relatively high given the development and extent of impervious surface. Likewise, the PSWC analysis suggested flow and water quality are highly degraded across the basin and B-IBI scores are higher than expected given that degradation. The basin is known for having high water temperatures, and the B-IBI reach has a 303(d)

listing for fecal coliform. The City of Kent has done some restoration actions, but many additional local and basin-scale actions would be warranted. It is unclear why the B-IBI score has remained as high as it has, and consequently it appears the chance of improving the score is small.

Christenson Ck. in the Vashon-Maury Island subbasin

WRIA 9; Site code (site ID): VashChris (272)



Year	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	1999-2012 Median
B-IBI							28	34	32	22	34	34	26	34	32	40	33

Basin area (acres)	% urban within basin 1-km of site	% urban in whole basin	% pasture in whole basin	% natural in 90-m buffer in whole basin	% impervious in 2011 in whole basin
500.8	0.16%	2.66%	25.44%	100.00%	1.72%

Potential restoration or management actions for: Christenson Ck. in the Vashon-Maury Island subbasin – WRIA 9; Site code (site ID): VashChris (272)

Restoration and Management Actions		Likelihood action would help restore the basin
In-stream	add wood	3
	add substrate	3
	enhance sinuosity	1
	replace culverts	1
	stabilize stream banks	1
Riparian	stabilize slopes	1
	plant vegetation, extend buffer	1
Agricultural BMPs	exclude livestock	2
	manage waste	2
	prevent soil loss	0
Forest BMPs	road maintenance	0
	minimize clearcutting	0
	replant	0
Mining BMPs	mining BMPs	0
Stormwater BMPs	flow controls	0
	treatment	0
	maintain storage and treatment facilities	0
	street sweeping	0
Other Approaches and Actions	limit pesticide use	3
	outreach and education campaign	3
	create incentives to follow BMPs	3
	purchase and protect property	2
	seed invertebrates	4
Is the basin at risk of further degradation?		3

Key for colors and numbers used in table:

not applicable	unlikely	possibly	likely	highly likely
0	1	2	3	4

Key restoration or management action(s) recommended and summary notes:

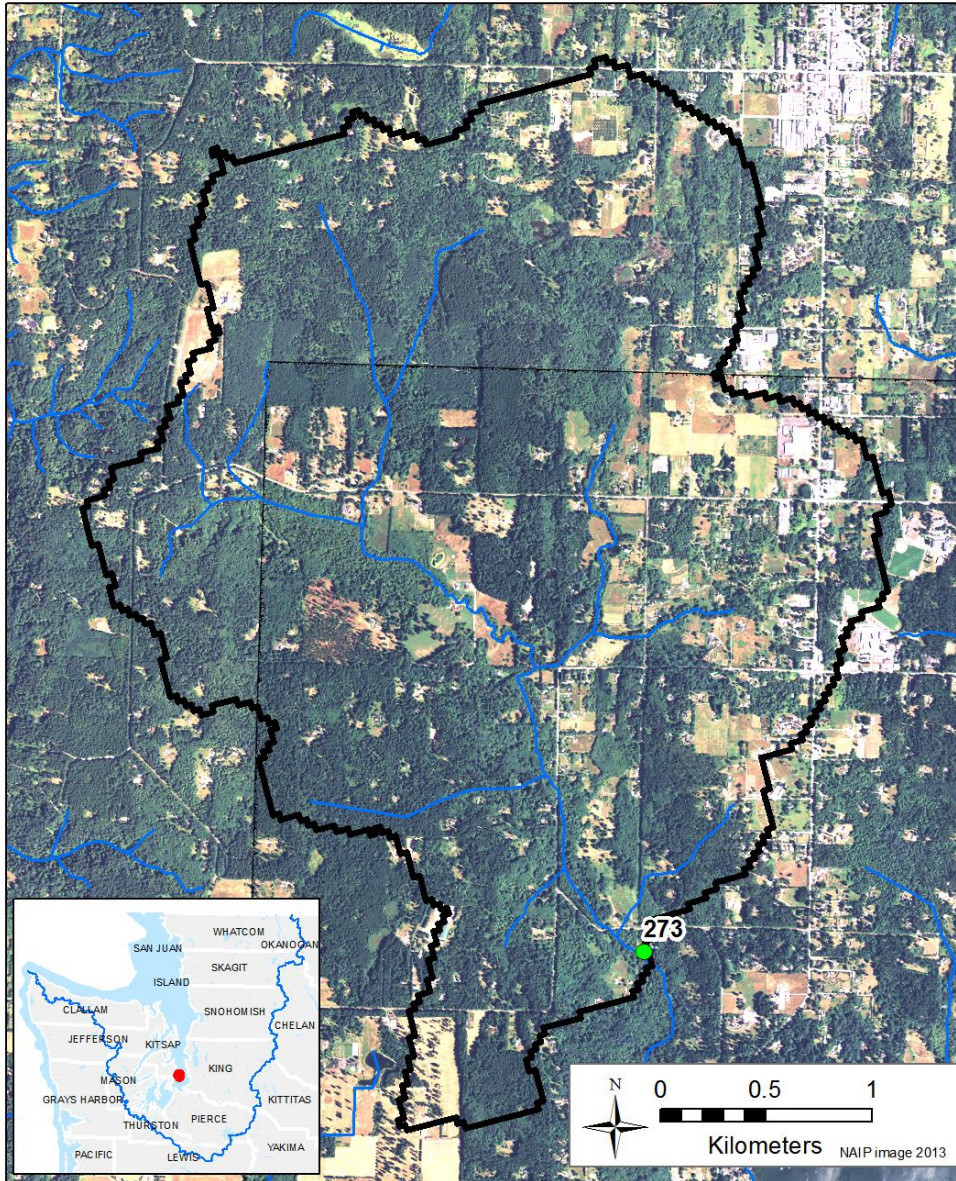
Bug seeding, other approaches and actions

The B-IBI site in the Christenson Creek basin is at the base of a steep forested ravine in a small watershed on Vashon. Zoning is primarily rural residential, and it is unknown if further development would be permitted or expected. Slightly less than 20% of the basin is zoned for resource agriculture, and photos indicate small farms and clearings around houses account for the pasture land. The riparian buffer appears to be largely intact. Other actions, such as outreach and bug seeding, may be helpful in

this basin. There is local interest in the creek; it was included in the "bio blitz" which is a 24-hour organism count from pond to the creek's mouth organized by the Vashon Nature Center.

Judd Ck. in the Vashon-Maury Island subbasin

WRIA 9; Site code (site ID): VashJudd (273)



Year	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	1999-2012 Median
B-IBI							30	30	30		32	24	32	34			30

Basin area (acres)	% urban within basin 1-km of site	% urban in whole basin	% pasture in whole basin	% natural in 90-m buffer in whole basin	% impervious in 2011 in whole basin
2754.6	1.97%	4.79%	11.44%	85.69%	3.19%

Potential restoration or management actions for: Judd Ck. in the Vashon-Maury Island subbasin – WRIA 9; Site code (site ID): VashJudd (273)

Restoration and Management Actions		Likelihood action would help restore the basin
In-stream	add wood	3
	add substrate	3
	enhance sinuosity	2
	replace culverts	3
	stabilize stream banks	3
Riparian	stabilize slopes	2
	plant vegetation, extend buffer	4
Agricultural BMPs	exclude livestock	3
	manage waste	2
	prevent soil loss	2
Forest BMPs	road maintenance	0
	minimize clearcutting	0
	replant	0
Mining BMPs	mining BMPs	0
Stormwater BMPs	flow controls	4
	treatment	4
	maintain storage and treatment facilities	3
	street sweeping	1
Other Approaches and Actions	limit pesticide use	3
	outreach and education campaign	3
	create incentives to follow BMPs	3
	purchase and protect property	2
	seed invertebrates	3
Is the basin at risk of further degradation?		2

Key for colors and numbers used in table:

not applicable	unlikely	possibly	likely	highly likely
0	1	2	3	4

Key restoration or management action(s) recommended and summary notes:

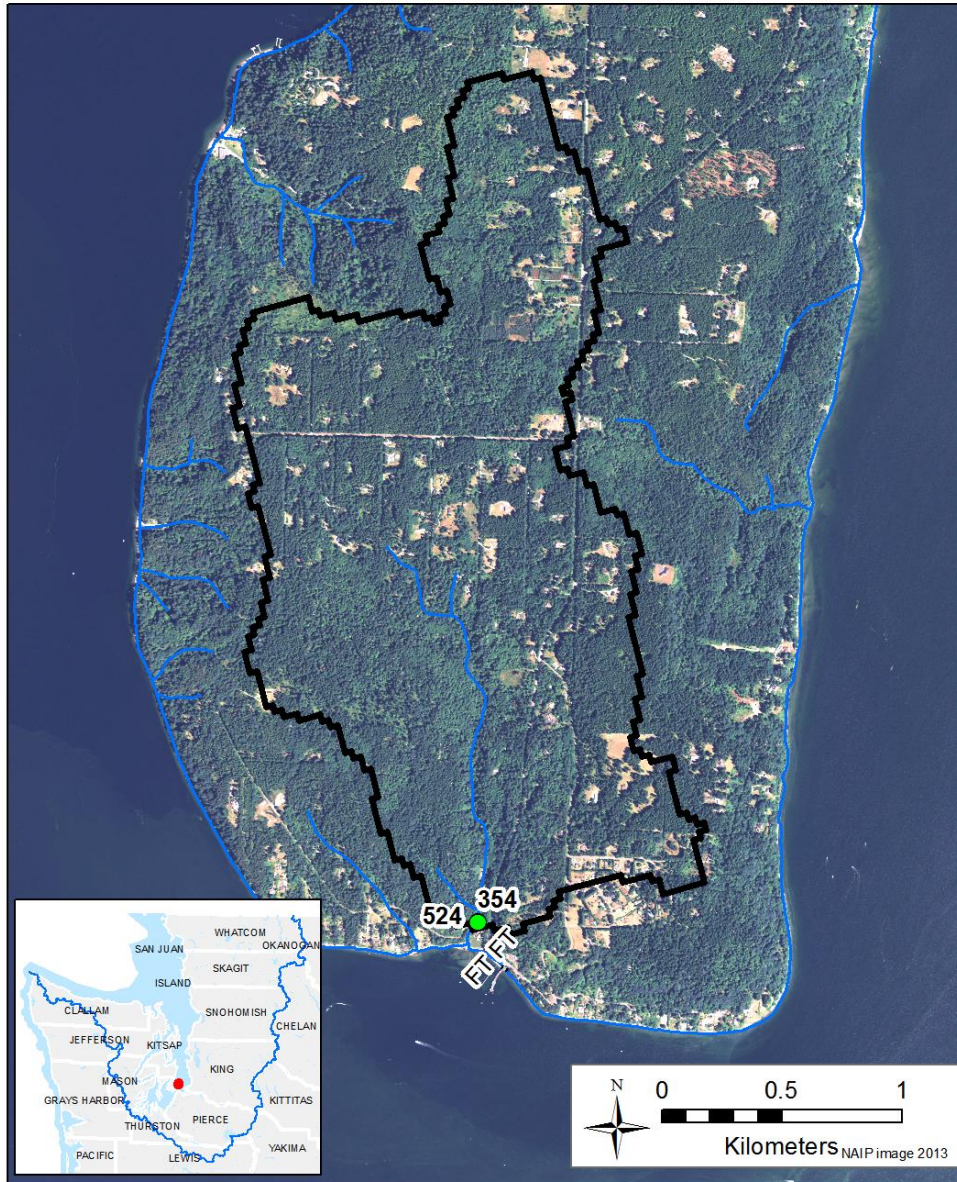
Stormwater BMPs, extending and planting riparian area, outreach to encourage agricultural BMPs

The Judd Creek basin is zoned primarily as rural residential; though photos indicate there are many parcels with barns, pastures and some cultivation. Though the basin is not zoned for forest harvest, there has been some selective logging. KC owns the Island Center Forest Natural Area in the upper portion of the watershed. The basin was identified by KC as candidate for stormwater retrofit, but it was

ranked low and did not receive funding in 2015. PSWC processes scored "2" for surface storage and discharge (and "1" for others), indicating stormwater BMPs throughout the basin could benefit flow processes. There is interest and support for restoration actions in the basin, and some work has been completed. For example, at the confluence about 1.5 km upstream of the B-IBI site, land was purchased in 2009 and the riparian area was replanted. The in-channel habitat at the site and immediately upstream and downstream is reported to be good, but further improvements could be made. For example, in the summer of 2015 a local land trust is adding wood to a reach below the B-IBI site where chum spawn. The best area for coho spawning is located above the site, and therefore in-channel actions could improve habitat complexity to benefit invertebrates and the spawning and rearing of fish. Outreach to landowners in the basin, and especially those with parcels adjacent to the stream, may be appropriate to encourage agricultural BMPs and extending and planting riparian areas. Seeding may also be appropriate given there are no connected or nearby sources of diverse and sensitive invertebrates.

Tahlequah Ck. in the Vashon-Maury Island subbasin

WRIA 9; Site code (site ID): E2887 (354)



Year	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	1999-2012 Median
B-IBI						22	24	32	34	32	28	24					28

Basin area (acres)	% urban within basin 1-km of site	% urban in whole basin	% pasture in whole basin	% natural in 90-m buffer in whole basin	% impervious in 2011 in whole basin
984.1	3.35%	4.93%	0.05%	99.26%	2.37%

Potential restoration or management actions for: Tahlequah Ck. in the Vashon-Maury Island subbasin – WRIA 9; Site code (site ID): E2887 (354)

Restoration and Management Actions		Likelihood action would help restore the basin
In-stream	add wood	3
	add substrate	3
	enhance sinuosity	3
	replace culverts	2
	stabilize stream banks	2
Riparian	stabilize slopes	2
	plant vegetation, extend buffer	1
Agricultural BMPs	exclude livestock	2
	manage waste	0
	prevent soil loss	0
Forest BMPs	road maintenance	0
	minimize clearcutting	0
	replant	0
Mining BMPs	mining BMPs	0
Stormwater BMPs	flow controls	3
	treatment	3
	maintain storage and treatment facilities	2
	street sweeping	2
Other Approaches and Actions	limit pesticide use	2
	outreach and education campaign	2
	create incentives to follow BMPs	2
	purchase and protect property	2
	seed invertebrates	4
Is the basin at risk of further degradation?		4

Key for colors and numbers used in table:

not applicable	unlikely	possibly	likely	highly likely
0	1	2	3	4

Key restoration or management action(s) recommended and summary notes:

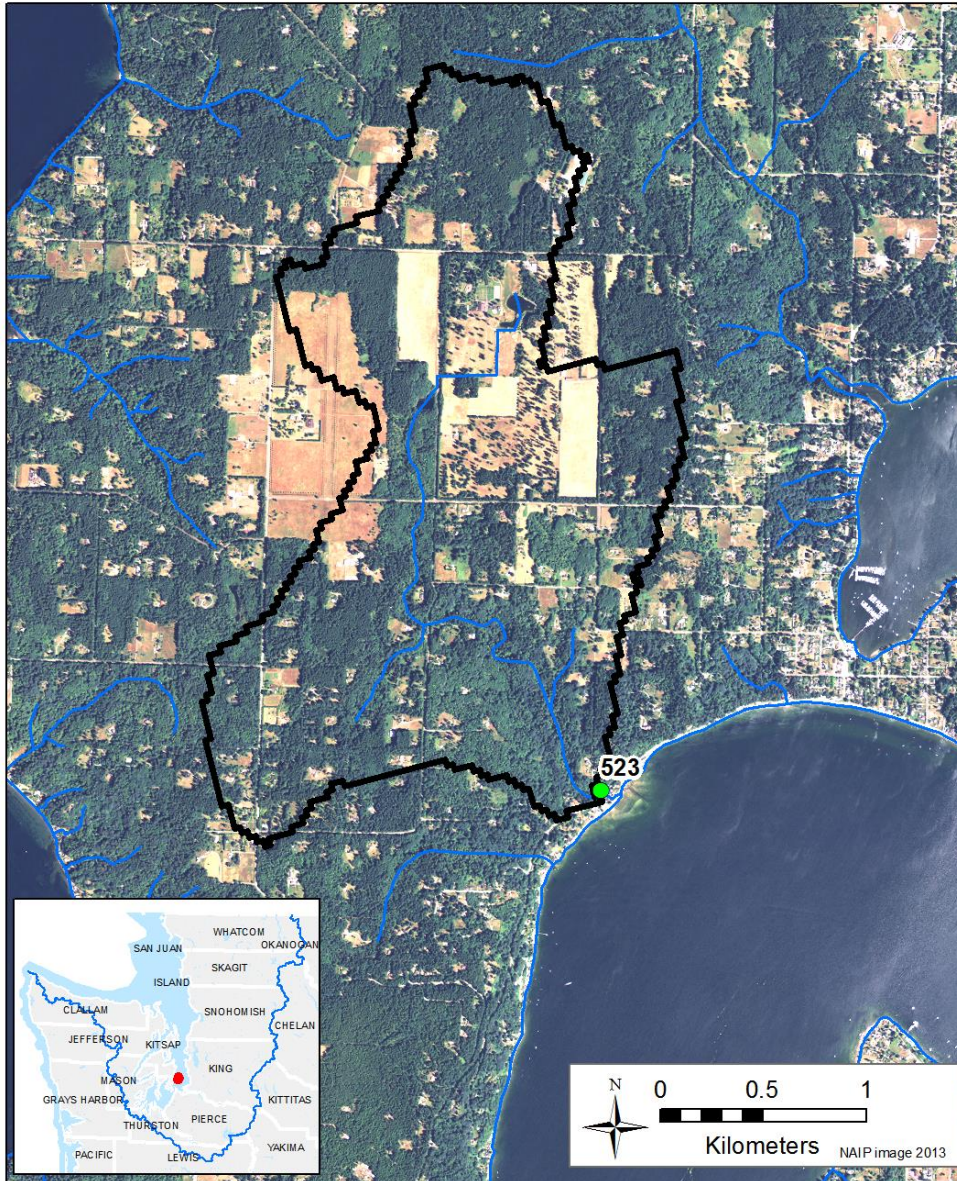
Seeding, some stormwater BMPs along road, possibly in-channel restoration

The Tahlequah Creek basin has a B-IBI score that is considerably lower than what you might expect given the land use. The basin is zoned exclusively for rural residential use, but there are relatively few roads and homes near the stream and in the center of the basin. The age of homes varies considerably (ranging from the 1960s through the 2000s), and the lot sizes range from 1 to more than 10 acres. The PSWC analysis suggests surface storage and discharge are degraded at the basin scale, and there may be

some opportunities for treating stormwater, especially along the Vashon Highway. Reach-scale actions could also include controlling sediment and restoration of the channel as the lower portion of the creek is confined. Also, given the young age of the forest, large woody debris may be needed to increase complexity. The Vashon Nature Center conducts volunteer “Salmonwatcher” surveys in other creeks on the island; volunteer activity may indicate local support for restoration actions and a group of landowners that would be receptive to outreach efforts. The relatively low B-IBI scores may reflect previous logging impacts and the fact that there are no nearby or connected sources of diverse invertebrates. Seeding may be an excellent action to try before attempting more expensive actions.

Fisher Ck. (Vashon) in the Vashon-Maury Island subbasin

WRIA 9; Site code (site ID): 65B (523)



Year	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	1999-2012 Median
B-IBI										32	30	40	32	24			32

Basin area (acres)	% urban within basin 1-km of site	% urban in whole basin	% pasture in whole basin	% natural in 90-m buffer in whole basin	% impervious in 2011 in whole basin
1242.5	2.83%	2.90%	25.45%	80.63%	1.96%

Potential restoration or management actions for: Fisher Ck. (Vashon) in the Vashon-Maury Island subbasin – WRIA 9; Site code (site ID): 65B (523)

Restoration and Management Actions		Likelihood action would help restore the basin
In-stream	add wood	4
	add substrate	4
	enhance sinuosity	3
	replace culverts	2
	stabilize stream banks	3
Riparian	stabilize slopes	3
	plant vegetation, extend buffer	3
Agricultural BMPs	exclude livestock	4
	manage waste	3
	prevent soil loss	3
Forest BMPs	road maintenance	0
	minimize clearcutting	0
	replant	0
Mining BMPs	mining BMPs	0
Stormwater BMPs	flow controls	2
	treatment	2
	maintain storage and treatment facilities	2
	street sweeping	1
Other Approaches and Actions	limit pesticide use	2
	outreach and education campaign	3
	create incentives to follow BMPs	3
	purchase and protect property	2
	seed invertebrates	4
Is the basin at risk of further degradation?		4

Key for colors and numbers used in table:

not applicable	unlikely	possibly	likely	highly likely
0	1	2	3	4

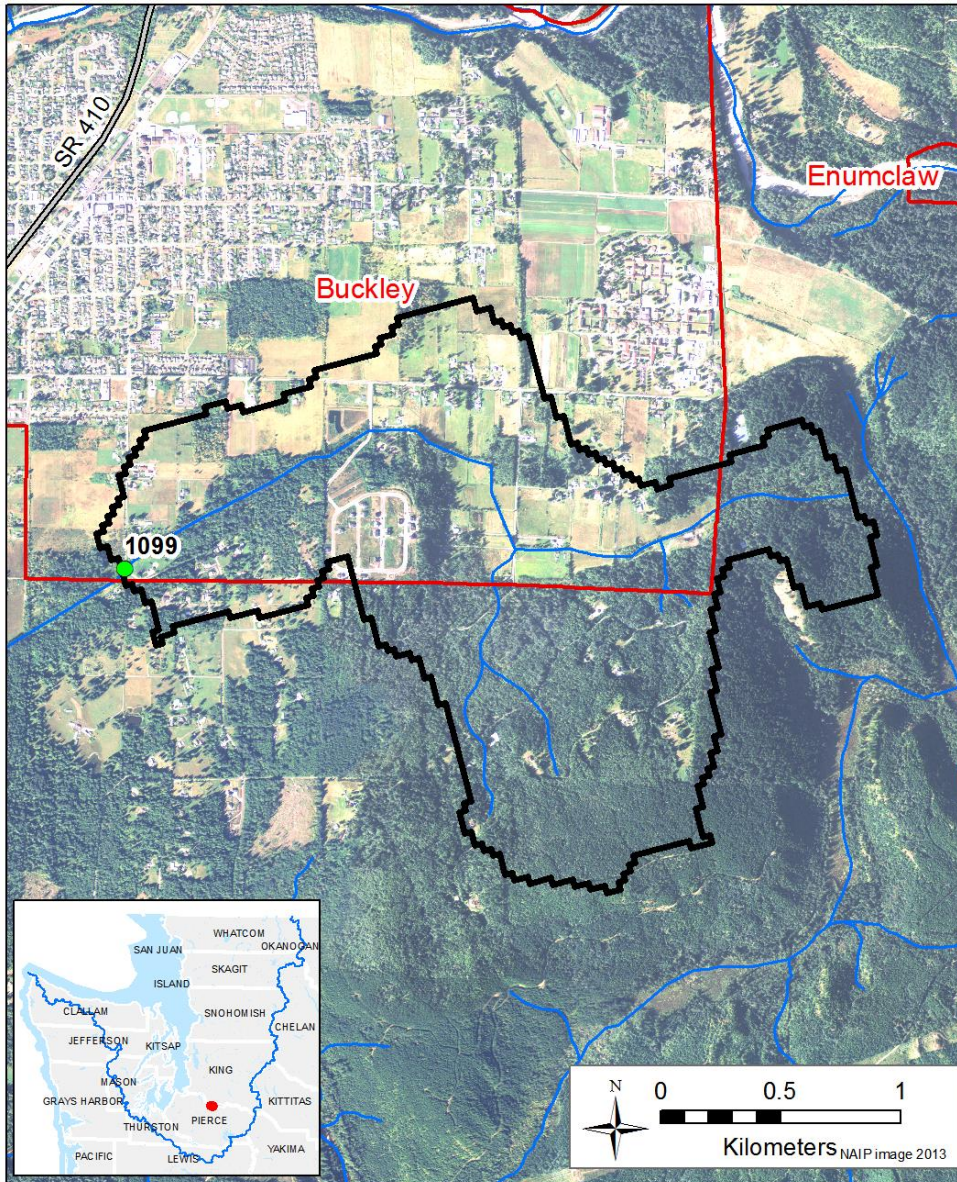
Key restoration or management action(s) recommended and summary notes:

Agricultural BMPs, in-channel restoration, seeding

The Fisher Creek basin is similar to other basins on Vashon Island in that the land use is dominated by rural residential and small farm agriculture. Also like other Vashon basins, the substrate at the B-IBI site is largely sand and finer sediment. The Vashon-Maury Island steward reported that 10 residents have agriculture easements and that Misty Isle Farms (which owns 540 acres in the upper basin) started managing an animal waste lagoon sometime between 2000 and 2005. BMPs that protect the riparian

buffer and target sediment delivery would likely be beneficial. In-channel restoration actions may also be helpful in creating more complex habitat. Seeding may be appropriate as there are no known sources of diverse taxa nearby.

Spiketon Ck. in the South Prairie Ck. subbasin
 WRIA 10; Site code (site ID): BiBi-033 - Spiketon Creek (1099)



Year	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	1999-2012 Median
B-IBI			32			34						26			30		32

Basin area (acres)	% urban within basin 1-km of site	% urban in whole basin	% pasture in whole basin	% natural in 90-m buffer in whole basin	% impervious in 2011 in whole basin
920.9	9.73%	5.12%	15.96%	86.45%	2.16%

Potential restoration or management actions for: Spiketon Ck. in the south Prairie Ck. subbasin – WRIA 10; Site code (site ID): BiBi-033 - Spiketon Creek (1099)

Restoration and Management Actions		Likelihood action would help restore the basin
In-stream	add wood	2
	add substrate	2
	enhance sinuosity	2
	replace culverts	2
	stabilize stream banks	2
Riparian	stabilize slopes	2
	plant vegetation, extend buffer	3
Agricultural BMPs	exclude livestock	3
	manage waste	3
	prevent soil loss	2
Forest BMPs	road maintenance	2
	minimize clearcutting	4
	replant	2
Mining BMPs	mining BMPs	0
Stormwater BMPs	flow controls	4
	treatment	4
	maintain storage and treatment facilities	4
	street sweeping	1
Other Approaches and Actions	limit pesticide use	3
	outreach and education campaign	3
	create incentives to follow BMPs	3
	purchase and protect property	2
	seed invertebrates	3
Is the basin at risk of further degradation?		4

Key for colors and numbers used in table:

not applicable	unlikely	possibly	likely	highly likely
0	1	2	3	4

Key restoration or management action(s) recommended and summary notes:

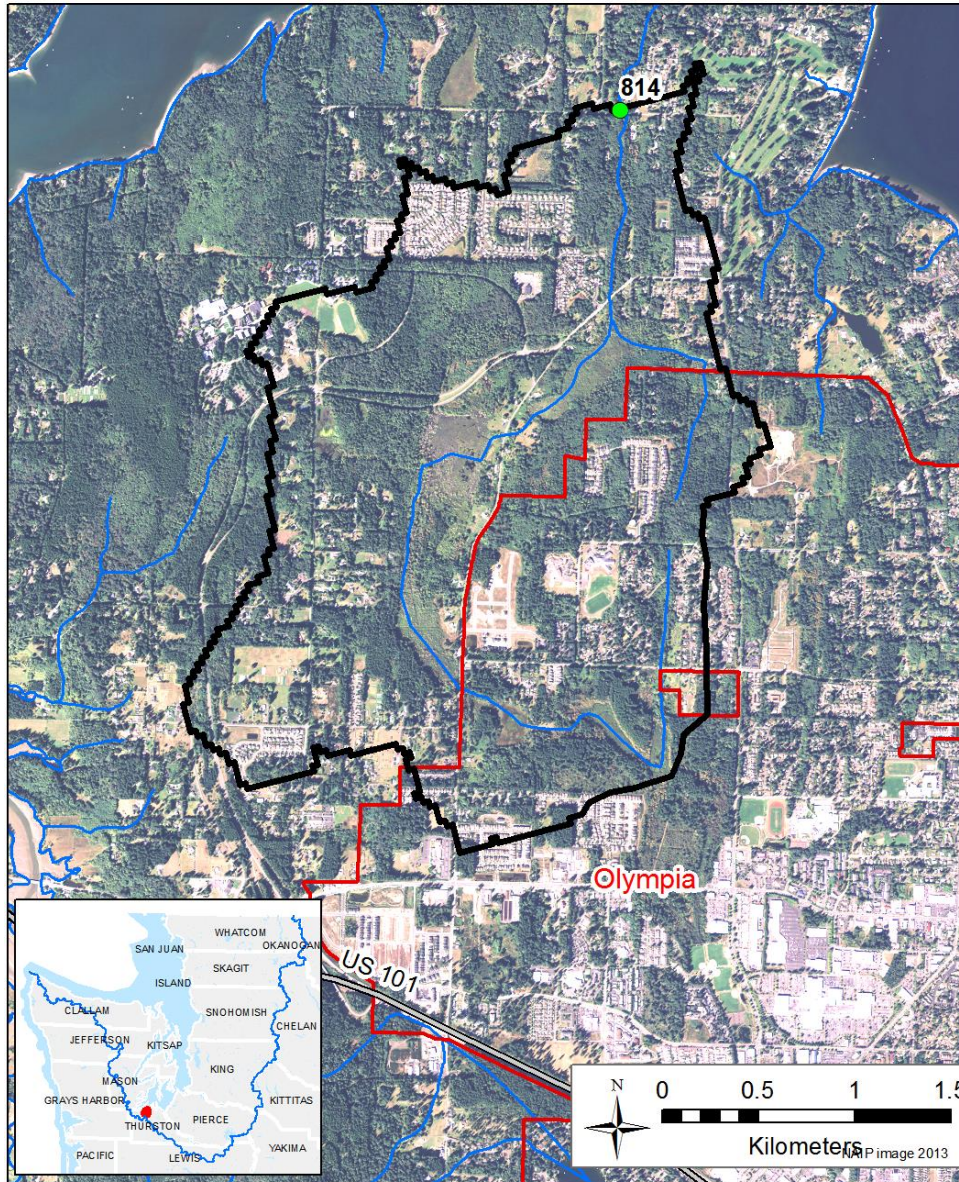
Install and maintain stormwater BMPs, outreach to landowners, Forest BMPs

Nearly half of the Spiketon Creek basin, and the majority of the lower basin, is zoned for urban residential. The areas zoned for urban residential are currently dominated by pasture land and some forest. The construction of a new development has begun (on primarily 0.37 acre lots), but most lots are currently vacant. Other multi-acre lots for sale near and upstream of the site are listed as “great for developers.” Therefore, conditions affecting invertebrate communities are expected to worsen with

time. The upper portions of the basin are zoned for forest harvest; if those are harvested, forest BMPs designed to reduce sediment transport would be especially important in maintaining current conditions in the creek. The PSWC analysis indicated multiple water flow and water quality processes are degraded at the basin scale. In-channel and riparian zone actions may also be advantageous depending on conditions within the reach. Seeding invertebrates is recommended after other restoration actions are implemented.

Green Cove Ck. in the McLane Ck. subbasin

WRIA 13; Site code (site ID): GreenThCo36th (814)



Year	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	1999-2012 Median
B-IBI				30	38	40	30	30	28	30							30

Basin area (acres)	% urban within basin 1-km of site	% urban in whole basin	% pasture in whole basin	% natural in 90-m buffer in whole basin	% impervious in 2011 in whole basin
1875.1	34.82%	25.84%	0.08%	83.76%	12.72%

Potential restoration or management actions for: Green Cove Ck. in the McLane Ck. subbasin – WRIA 13;
 Site code (site ID): GreenThCo36th (814)

Restoration and Management Actions		Likelihood action would help restore the basin
In-stream	add wood	2
	add substrate	2
	enhance sinuosity	2
	replace culverts	2
	stabilize stream banks	2
Riparian	stabilize slopes	2
	plant vegetation, extend buffer	3
Agricultural BMPs	exclude livestock	2
	manage waste	2
	prevent soil loss	0
Forest BMPs	road maintenance	0
	minimize clearcutting	0
	replant	0
Mining BMPs	mining BMPs	0
Stormwater BMPs	flow controls	4
	treatment	4
	maintain storage and treatment facilities	4
	street sweeping	2
Other Approaches and Actions	limit pesticide use	3
	outreach and education campaign	3
	create incentives to follow BMPs	3
	purchase and protect property	2
	seed invertebrates	3
Is the basin at risk of further degradation?		4

Key for colors and numbers used in table:

not applicable	unlikely	possibly	likely	highly likely
0	1	2	3	4

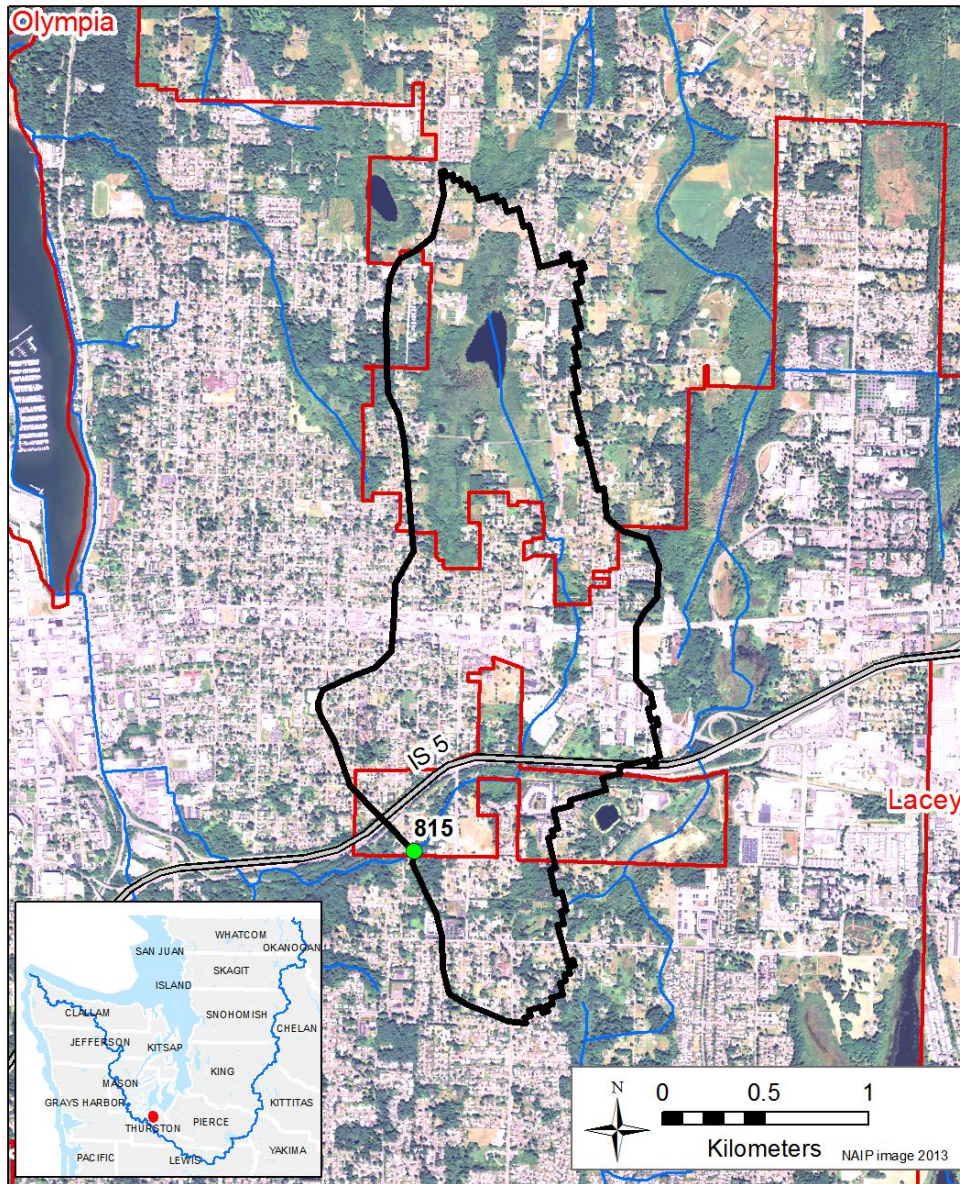
Key restoration or management action(s) recommended and summary notes:

Stormwater BMPs, outreach

The Green Cove Creek basin is zoned primarily for rural residential and secondarily for urban residential. Several large, dense developments have been built between 2000 and 2015, and several stormwater ponds are evident in photos. The largest patch of intact forest is to the west of the creek, and it appears to be part of the Evergreen State College. The last B-IBI samples were collected in 2008, and new samples are needed to confirm or establish the score for the site. The creek flows through several large

wetlands, and the low gradient across much of the basin may be a natural factor limiting invertebrate diversity. Stormwater BMPs may be helpful in treating runoff from roads and in areas with older homes that likely lack any stormwater controls. Seeding may be appropriate as there are no connected or nearby sources of diverse invertebrates. Though not confirmed, there may be local interest in restoration and monitoring efforts from staff and students at Evergreen.

Indian Ck. (Lower Deschutes) in the Lower Deschutes R. subbasin
 WRIA 13; Site code (site ID): IndianThCoWheeler (815)



Year	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	1999-2012 Median
B-IBI					30	30	26	28	32	18							29

Basin area (acres)	% urban within basin 1-km of site	% urban in whole basin	% pasture in whole basin	% natural in 90-m buffer in whole basin	% impervious in 2011 in whole basin
927.1	67.14%	56.74%	2.74%	47.39%	31.25%

Potential restoration or management actions for: Indian Ck. (Lower Deschutes) in the Lower Deschutes R. subbasin – WRIA 13; Site code (site ID): IndianThCoWheeler (815)

Restoration and Management Actions		Likelihood action would help restore the basin
In-stream	add wood	3
	add substrate	3
	enhance sinuosity	3
	replace culverts	3
	stabilize stream banks	3
Riparian	stabilize slopes	3
	plant vegetation, extend buffer	4
Agricultural BMPs	exclude livestock	0
	manage waste	0
	prevent soil loss	0
Forest BMPs	road maintenance	0
	minimize clearcutting	0
	replant	0
Mining BMPs	mining BMPs	0
Stormwater BMPs	flow controls	4
	treatment	4
	maintain storage and treatment facilities	4
	street sweeping	4
Other Approaches and Actions	limit pesticide use	3
	outreach and education campaign	3
	create incentives to follow BMPs	3
	purchase and protect property	2
	seed invertebrates	1
Is the basin at risk of further degradation?		4

Key for colors and numbers used in table:

not applicable	unlikely	possibly	likely	highly likely
0	1	2	3	4

Key restoration or management action(s) recommended and summary notes:

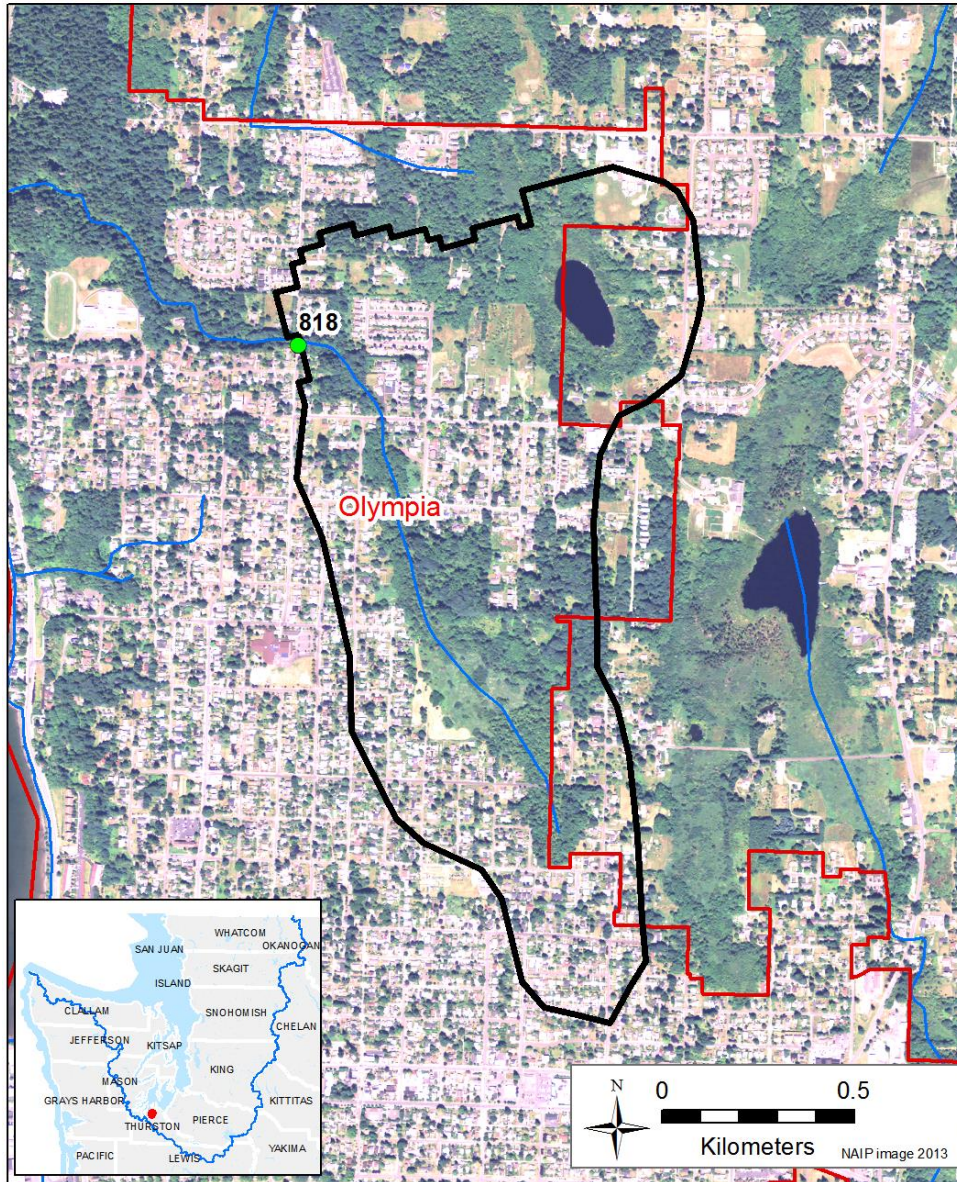
Stormwater BMPs, expand buffers, outreach

The Indian Creek basin is highly developed and zoned exclusively for urban residential and other urban development. Most of the PSWC process scores for water flow and water quality processes are "3," indicating the B-IBI score is higher than expected given the basin-wide degradation. The basin has a large amount of impervious surface, with a high rate of increase between 2001 and 2011. Several undeveloped areas may be developed soon (i.e., land is cleared and/or construction has begun). The

largest intact forested area is in the upper basin and surrounds Bigelow Lake. Protecting the existing forested and wetland areas is paramount, and increasing buffer widths throughout the basin is also recommended. Stormwater runoff has likely affected instream habitat, and the basin may benefit from in-stream restoration actions if additional basin-wide processes are restored. The most recent B-IBI score of 18 in 2008 may be more indicative of current conditions, and additional sampling is advised to establish a current baseline. There are no immediate or local sources of diverse invertebrates, but seeding would not be recommended until there has been basin-wide restoration.

Mission Ck. in the Lower Deschutes R. subbasin

WRIA 13; Site code (site ID): MissionThCoBethel (818)



Year	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	1999-2012 Median
B-IBI					36	30	28	36	28	36							33

Basin area (acres)	% urban within basin 1-km of site	% urban in whole basin	% pasture in whole basin	% natural in 90-m buffer in whole basin	% impervious in 2011 in whole basin
362.2	36.67%	44.08%	3.49%	62.47%	20.63%

Potential restoration or management actions for: Mission Ck. in the Lower Deschutes R. subbasin – WRIA 13; Site code (site ID): MissionThCoBethel (818)

Restoration and Management Actions		Likelihood action would help restore the basin
In-stream	add wood	2
	add substrate	2
	enhance sinuosity	2
	replace culverts	3
	stabilize stream banks	2
Riparian	stabilize slopes	2
	plant vegetation, extend buffer	3
Agricultural BMPs	exclude livestock	0
	manage waste	0
	prevent soil loss	0
Forest BMPs	road maintenance	0
	minimize clearcutting	0
	replant	0
Mining BMPs	mining BMPs	0
Stormwater BMPs	flow controls	4
	treatment	4
	maintain storage and treatment facilities	4
	street sweeping	4
Other Approaches and Actions	limit pesticide use	2
	outreach and education campaign	2
	create incentives to follow BMPs	2
	purchase and protect property	1
	seed invertebrates	3
Is the basin at risk of further degradation?		4

Key for colors and numbers used in table:

not applicable	unlikely	possibly	likely	highly likely
0	1	2	3	4

Key restoration or management action(s) recommended and summary notes:

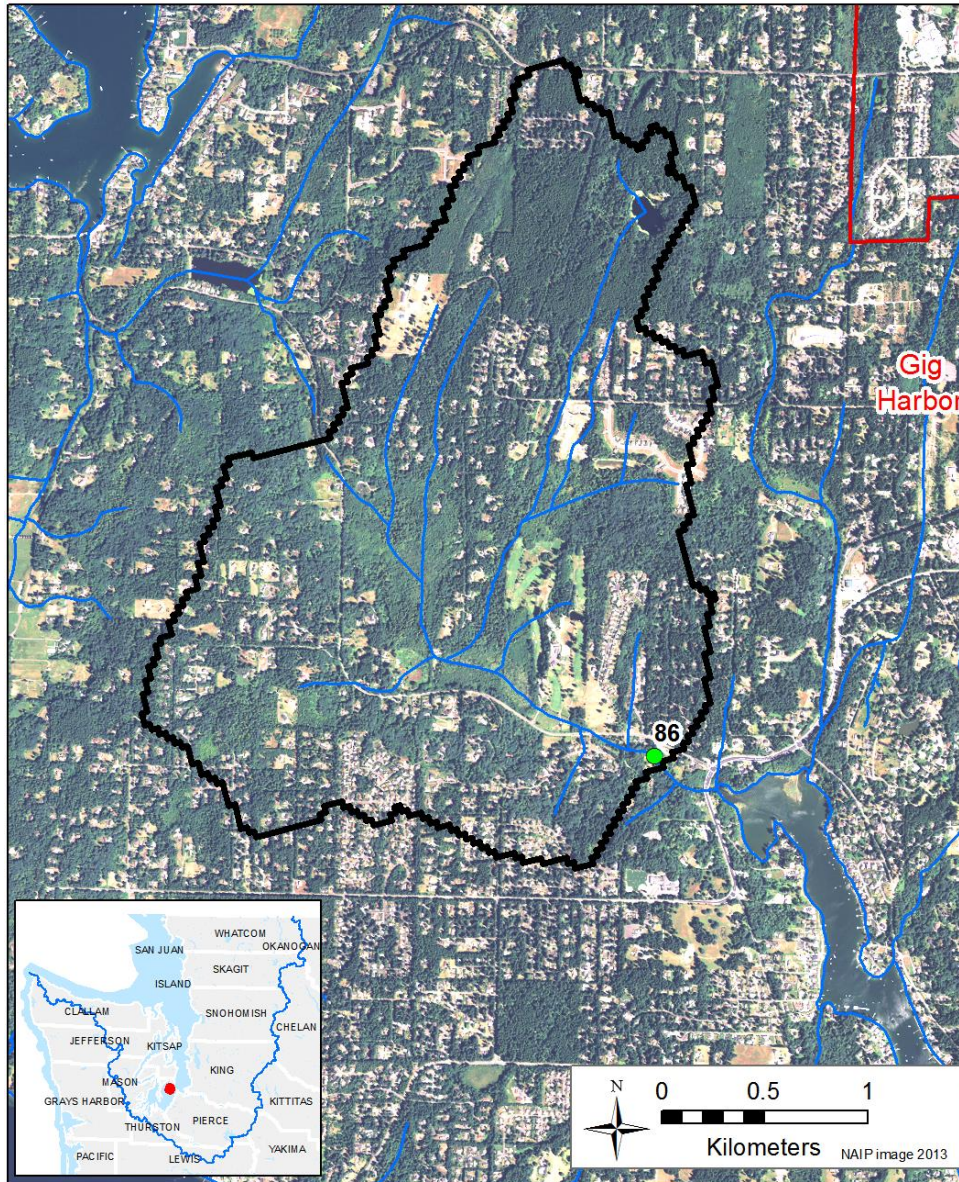
Stormwater BMPs

The Mission Creek basin is zoned primarily for urban residential and is highly developed. The B-IBI score is relatively high given the extent of urbanization in the basin; the biopotential score of 3.2 indicates it is already scoring within the top ten percent of basins with similar proportions of urban development. Likewise, the PSWC process analysis indicates the B-IBI scores are higher than expected given the degraded water quality and flow processes. The creek flows through Mission Creek Park, which provides

a wooded area and buffer. This helps explain the relatively high B-IBI score given the rest of the land use in the basin. A small lake, Setchfield Lake, is located within the basin and is surrounded by undeveloped parcels. Though the lake and creek do not appear to be connected at the surface, there may be some sub-surface connections that are important in moderating flows. Many of the homes in the southwestern portion of the basin were built prior to 1955, which is when the City Of Olympia started requiring new development to have separate stormwater and sanitary conveyance systems. If these older homes are still largely serviced by combined systems and roof gutters are connected to the sanitary lines, there may be less hydrologic stress due to stormwater runoff than would be expected given the extent of impervious surface in the basin. Stormwater BMPs that target runoff from streets, newer development, and re-development would likely be important in both maintaining the stream community and creating conditions that would allow B-IBI scores to improve. Seeding may also be appropriate, as there are no nearby or connected sources of diverse taxa.

Artondale Ck. in the Carr Inlet subbasin

WRIA 15; Site code (site ID): BiBi-001 - Artondale Creek (86)



Year	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	1999-2012 Median
B-IBI		30				32	26	32		26		30		28	28	28	30

Basin area (acres)	% urban within basin 1-km of site	% urban in whole basin	% pasture in whole basin	% natural in 90-m buffer in whole basin	% impervious in 2011 in whole basin
1644.2	16.74%	14.34%	0.05%	80.86%	7.58%

Potential restoration or management actions for: Artondale Ck. in the Carr Inlet subbasin – WRIA 15;
 Site code (site ID): BiBi-001 - Artondale Creek (86)

Restoration and Management Actions		Likelihood action would help restore the basin
In-stream	add wood	2
	add substrate	2
	enhance sinuosity	2
	replace culverts	2
	stabilize stream banks	2
Riparian	stabilize slopes	2
	plant vegetation, extend buffer	3
Agricultural BMPs	exclude livestock	1
	manage waste	1
	prevent soil loss	0
Forest BMPs	road maintenance	0
	minimize clearcutting	0
	replant	0
Mining BMPs	mining BMPs	0
Stormwater BMPs	flow controls	4
	treatment	4
	maintain storage and treatment facilities	4
	street sweeping	2
Other Approaches and Actions	limit pesticide use	3
	outreach and education campaign	3
	create incentives to follow BMPs	3
	purchase and protect property	2
	seed invertebrates	3
Is the basin at risk of further degradation?		4

Key for colors and numbers used in table:

not applicable	unlikely	possibly	likely	highly likely
0	1	2	3	4

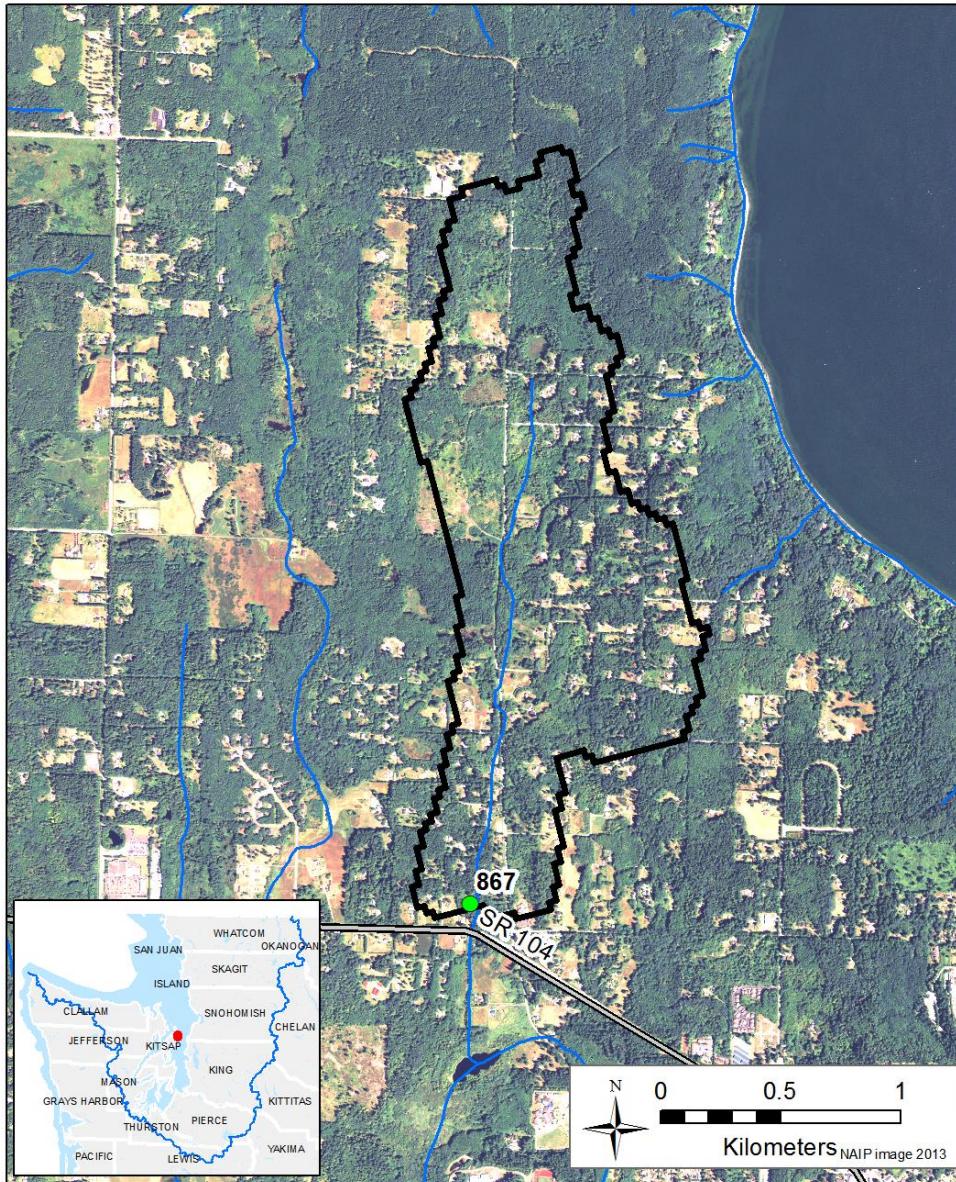
Key restoration or management action(s) recommended and summary notes:

Stormwater BMPs and outreach to golf course and residents

The Artondale Creek basin currently has variety of land uses although it is zoned almost exclusively for rural and urban residential. Much of the area zoned for urban residential has not yet been developed, but the rate of increase in impervious surfaces and the presence of high density, newer developments may indicate further development is likely. It is clear there are some stormwater BMPs in areas with new development (e.g., off of 62nd Street NW), but areas in the southern portion of the watershed have

older developments (1970s) and may benefit from added or improved stormwater infrastructure. The stream also flows through a golf course within 1 km of the B-IBI site, and there is little to no buffer adjacent to the stream. There is no clear source of diverse and sensitive invertebrates nearby or within the watershed, indicating seeding may be appropriate, especially after restoration actions have occurred.

Carpenter Ck. (Kitsap) in the Liberty-Miller-Appletree subbasin
 WRIA 15; Site code (site ID): KCSSWM-022 - Upper (867)



Year	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	1999-2012 Median
B-IBI			24	26	28	28	28	30				24	28		30		28

Basin area (acres)	% urban within basin 1-km of site	% urban in whole basin	% pasture in whole basin	% natural in 90-m buffer in whole basin	% impervious in 2011 in whole basin
564.9	3.81%	6.18%	0.16%	86.87%	3.01%

Potential restoration or management actions for: Carpenter Ck. (Kitsap) in the Liberty-Miller-Appletree subbasin – WRIA 15; Site code (site ID): KCSSWM-022 - Upper (867)

Restoration and Management Actions		Likelihood action would help restore the basin
In-stream	add wood	2
	add substrate	2
	enhance sinuosity	2
	replace culverts	3
	stabilize stream banks	2
Riparian	stabilize slopes	2
	plant vegetation, extend buffer	4
Agricultural BMPs	exclude livestock	4
	manage waste	4
	prevent soil loss	4
Forest BMPs	road maintenance	0
	minimize clearcutting	0
	replant	0
Mining BMPs	mining BMPs	0
Stormwater BMPs	flow controls	4
	treatment	4
	maintain storage and treatment facilities	3
	street sweeping	2
Other Approaches and Actions	limit pesticide use	2
	outreach and education campaign	3
	create incentives to follow BMPs	4
	purchase and protect property	2
	seed invertebrates	3
Is the basin at risk of further degradation?		4

Key for colors and numbers used in table:

not applicable	unlikely	possibly	likely	highly likely
0	1	2	3	4

Key restoration or management action(s) recommended and summary notes:

Stormwater BMPs, small-scale agriculture BMPs, create incentives to follow BMPs

The Carpenter Creek basin is zoned exclusively for rural residential and many lots near the stream have been partially cleared for small-scale agriculture (hobby farms). Kitsap County Public Works (KCPW) has identified Carpenter Creek as a top candidate for focused watershed improvements; multiple BMPs have been prioritized and are being implemented. These include right-of-way ditch enhancements (by KCPW), installation of rain gardens and other infiltrative BMPs (incentivized by King County), improvements to

properties with small-scale agriculture (incentivized by King County), improvements to culverts on private property, and the planting of riparian vegetation. KCPW has also identified the need to create and increase incentives for following BMPs, including agricultural BMPs. Stormwater BMPs may also be appropriate in the basin, as many homes appear to have been built before the 1990s and likely do not have any stormwater controls. The creek follows a road for much of its length, and therefore stormwater BMPs to treat road runoff are also likely appropriate. Outreach to landowners to encourage riparian protection and expansion, as well as prudent pesticide use is likely appropriate. Wild Fish Conservancy has done stream typing on the whole basin, and they may have identified specific restoration opportunities. Seeding may also be needed given there are no connected or nearby sources of diverse invertebrates. The likelihood that restoration actions will be implemented successfully and their effectiveness monitored are very high given there is strong local interest and support from KCPW as well as active community organizations.

Boyce Ck. in the west Kitsap subbasin
 WRIA 15; Site code (site ID): KCSSWM-009 (873)



Year	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	1999-2012 Median
B-IBI		28	36	40	42	40	36						34			42	36

Basin area (acres)	% urban within basin 1-km of site	% urban in whole basin	% pasture in whole basin	% natural in 90-m buffer in whole basin	% impervious in 2011 in whole basin
1006.6	0.64%	2.39%	0.00%	96.31%	1.29%

Potential restoration or management actions for: Boyce Ck. in the west Kitsap subbasin – WRIA 15; Site code (site ID): KCSSWM-009 (873)

Restoration and Management Actions		Likelihood action would help restore the basin
In-stream	add wood	2
	add substrate	2
	enhance sinuosity	2
	replace culverts	2
	stabilize stream banks	2
Riparian	stabilize slopes	2
	plant vegetation, extend buffer	2
Agricultural BMPs	exclude livestock	0
	manage waste	0
	prevent soil loss	0
Forest BMPs	road maintenance	0
	minimize clearcutting	0
	replant	0
Mining BMPs	mining BMPs	0
Stormwater BMPs	flow controls	3
	treatment	3
	maintain storage and treatment facilities	2
	street sweeping	2
Other Approaches and Actions	limit pesticide use	2
	outreach and education campaign	2
	create incentives to follow BMPs	2
	purchase and protect property	3
	seed invertebrates	1
Is the basin at risk of further degradation?		4

Key for colors and numbers used in table:

not applicable	unlikely	possibly	likely	highly likely
0	1	2	3	4

Key restoration or management action(s) recommended and summary notes:

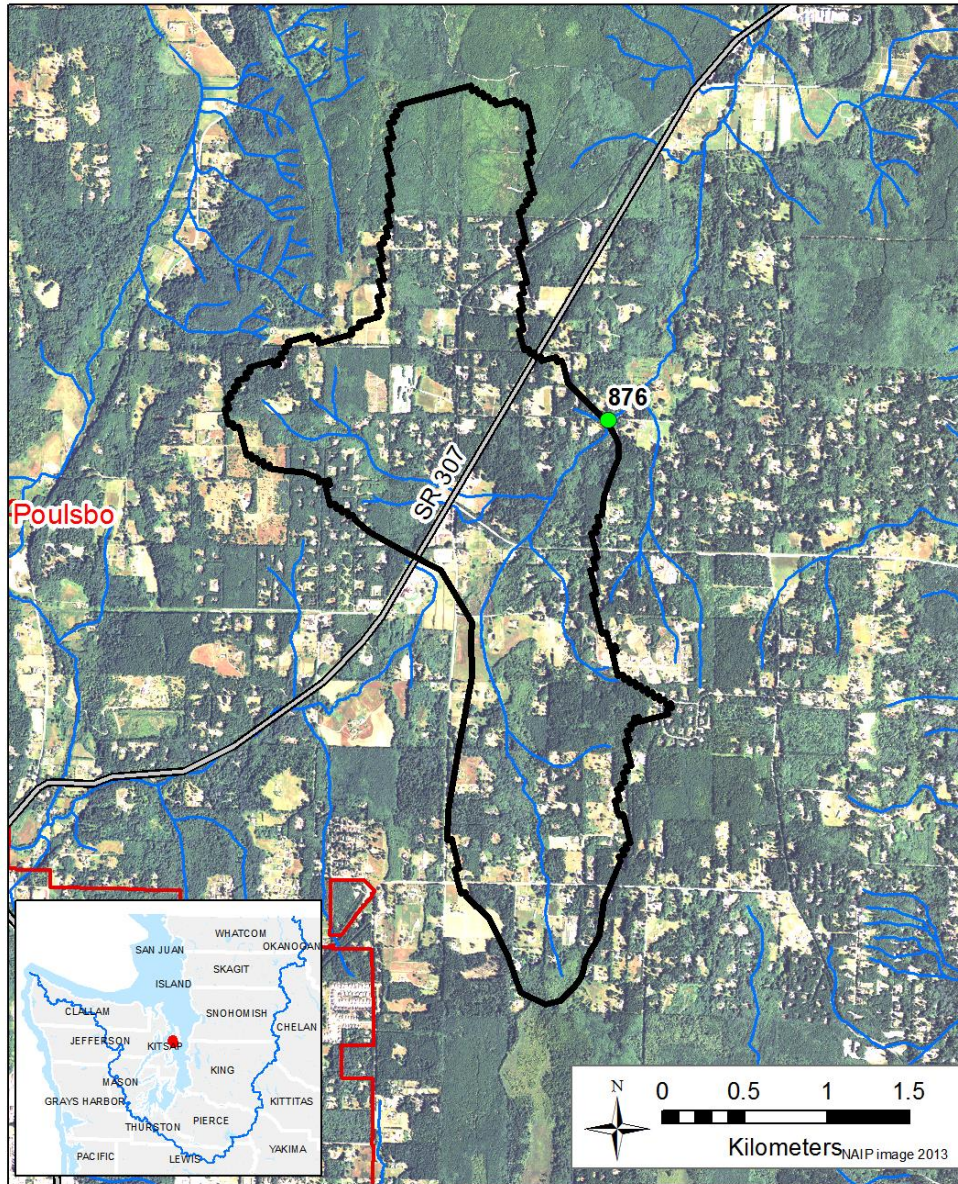
Protect current conditions, stormwater BMPs

The Boyce Creek basin is zoned exclusively for rural residential though most of the lower half has not been developed. The B-IBI site is within the Guillemot Cove Nature Reserve, and the score in 2014 was 42 (excellent). The variability in B-IBI score may be due to the site’s natural low gradient and the predominance of small substrate. There may be restoration actions that could be implemented to help protect the conditions at the site. This could include stormwater BMPs designed to help control flow and

water quality from runoff in the upper basin, where there are some older homes. The focus, however, should be on protecting the current conditions so the diverse community present in 2014 can persist.

Gamble Ck. in the Bangor-Port Gamble subbasin

WRIA 15; Site code (site ID): KCST-7 (876)



Year	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	1999-2012 Median
B-IBI		26	34	34	34	30											34

Basin area (acres)	% urban within basin 1-km of site	% urban in whole basin	% pasture in whole basin	% natural in 90-m buffer in whole basin	% impervious in 2011 in whole basin
1483.4	9.15%	10.17%	3.48%	82.02%	4.14%

Potential restoration or management actions for: Gamble Ck. in the Bangor-Port Gamble subbasin – WRIA 15; Site code (site ID): KCST-7 (876)

Restoration and Management Actions		Likelihood action would help restore the basin
In-stream	add wood	2
	add substrate	2
	enhance sinuosity	2
	replace culverts	2
	stabilize stream banks	2
Riparian	stabilize slopes	2
	plant vegetation, extend buffer	4
Agricultural BMPs	exclude livestock	4
	manage waste	2
	prevent soil loss	2
Forest BMPs	road maintenance	0
	minimize clearcutting	0
	replant	0
Mining BMPs	mining BMPs	0
Stormwater BMPs	flow controls	4
	treatment	4
	maintain storage and treatment facilities	4
	street sweeping	1
Other Approaches and Actions	limit pesticide use	3
	outreach and education campaign	4
	create incentives to follow BMPs	3
	purchase and protect property	2
	seed invertebrates	2
Is the basin at risk of further degradation?		4

Key for colors and numbers used in table:

not applicable	unlikely	possibly	likely	highly likely
0	1	2	3	4

Key restoration or management action(s) recommended and summary notes:

Protection of current conditions, agricultural and stormwater BMPs, outreach, widening buffer

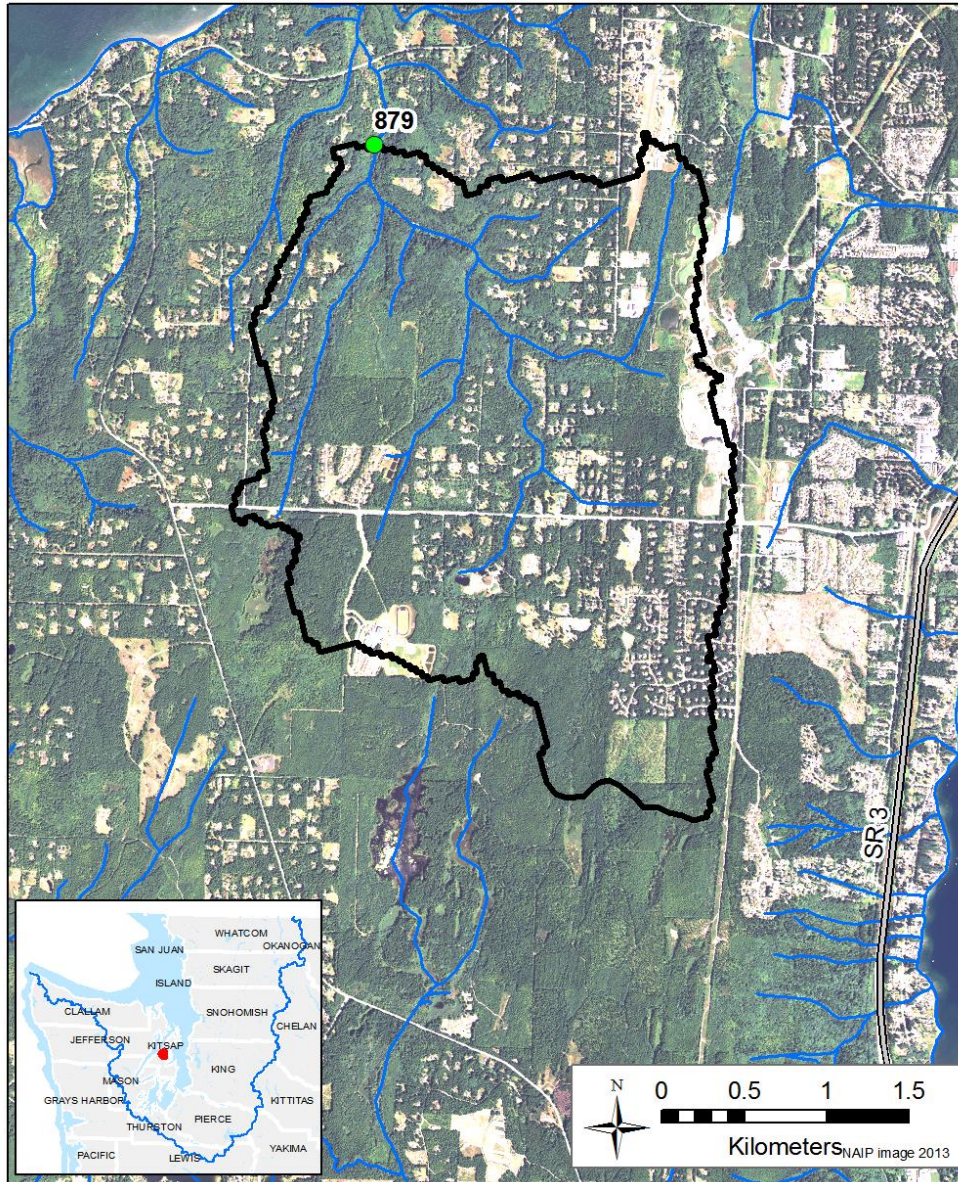
The Gamble Creek basin is zoned primarily for rural residential development, though a small area in the central basin is zoned for more intensive urban development. The last B-IBI sample collected at this site is from 2004, and Kitsap County Public Works (KCPW) has since continued sampling at a site farther downstream (KCSSWM-027). KCPW recommends that this basin be ranked lower for restoration actions

than other Kitsap County sites because of the relatively good B-IBI scores at the old and new sites. Protecting current conditions is likely the most appropriate action for this basin.

If restoration were planned near the older site, new samples should be taken to confirm and/or re-establish a B-IBI baseline score for this site. As for the basin upstream of this site (KCST-7), most of the lots range in size from 1 to greater than 10 acres, and the homes range in age from nearly 100-year old farm houses to homes built in the 2000s. Many homes in the basin were built in the late 1980s or 1990s, and there may be opportunities to install or retrofit stormwater BMPs to slow and treat runoff from roads, driveways and roofs in the basin. Many parcels are also cleared for small-scale agriculture, including some parcels adjacent to the channel. There are also businesses including a tree farm, an auto yard, and a nursery, among others. The riparian buffer is intact for ~80% of the channel, but restoration actions to widen the buffer would be worthwhile along several reaches. Additional in-channel restoration actions may be needed given the history of forest clearing. Outreach to landowners may be appropriate to encourage parcel-scale actions that would help protect and restore the creek. KCPW staff report there has been some planting along the corridor near Highway 104 in 2014, and additional support for basin- and local-scale restoration actions is likely because of the high value of the shellfish beds in Port Gamble Bay. Seeding may be appropriate once stormwater and agricultural BMPs are implemented.

Little Anderson Ck. in the west Kitsap subbasin

WRIA 15; Site code (site ID): KCSSWM-011 (879)



Year	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	1999-2012 Median
B-IBI		28	40		26	34	32						34			36	33

Basin area (acres)	% urban within basin 1-km of site	% urban in whole basin	% pasture in whole basin	% natural in 90-m buffer in whole basin	% impervious in 2011 in whole basin
2176.2	0.61%	17.28%	0.10%	91.39%	6.13%

Potential restoration or management actions for: Little Anderson Ck. in the west Kitsap subbasin – WRIA 15; Site code (site ID): KCSSWM-011 (879)

Restoration and Management Actions		Likelihood action would help restore the basin
In-stream	add wood	2
	add substrate	2
	enhance sinuosity	2
	replace culverts	2
	stabilize stream banks	2
Riparian	stabilize slopes	2
	plant vegetation, extend buffer	2
Agricultural BMPs	exclude livestock	1
	manage waste	1
	prevent soil loss	0
Forest BMPs	road maintenance	0
	minimize clearcutting	0
	replant	0
Mining BMPs	mining BMPs	2
Stormwater BMPs	flow controls	4
	treatment	4
	maintain storage and treatment facilities	4
	street sweeping	3
Other Approaches and Actions	limit pesticide use	3
	outreach and education campaign	4
	create incentives to follow BMPs	3
	purchase and protect property	4
	seed invertebrates	3
Is the basin at risk of further degradation?		4

Key for colors and numbers used in table:

not applicable	unlikely	possibly	likely	highly likely
0	1	2	3	4

Key restoration or management action(s) recommended and summary notes:

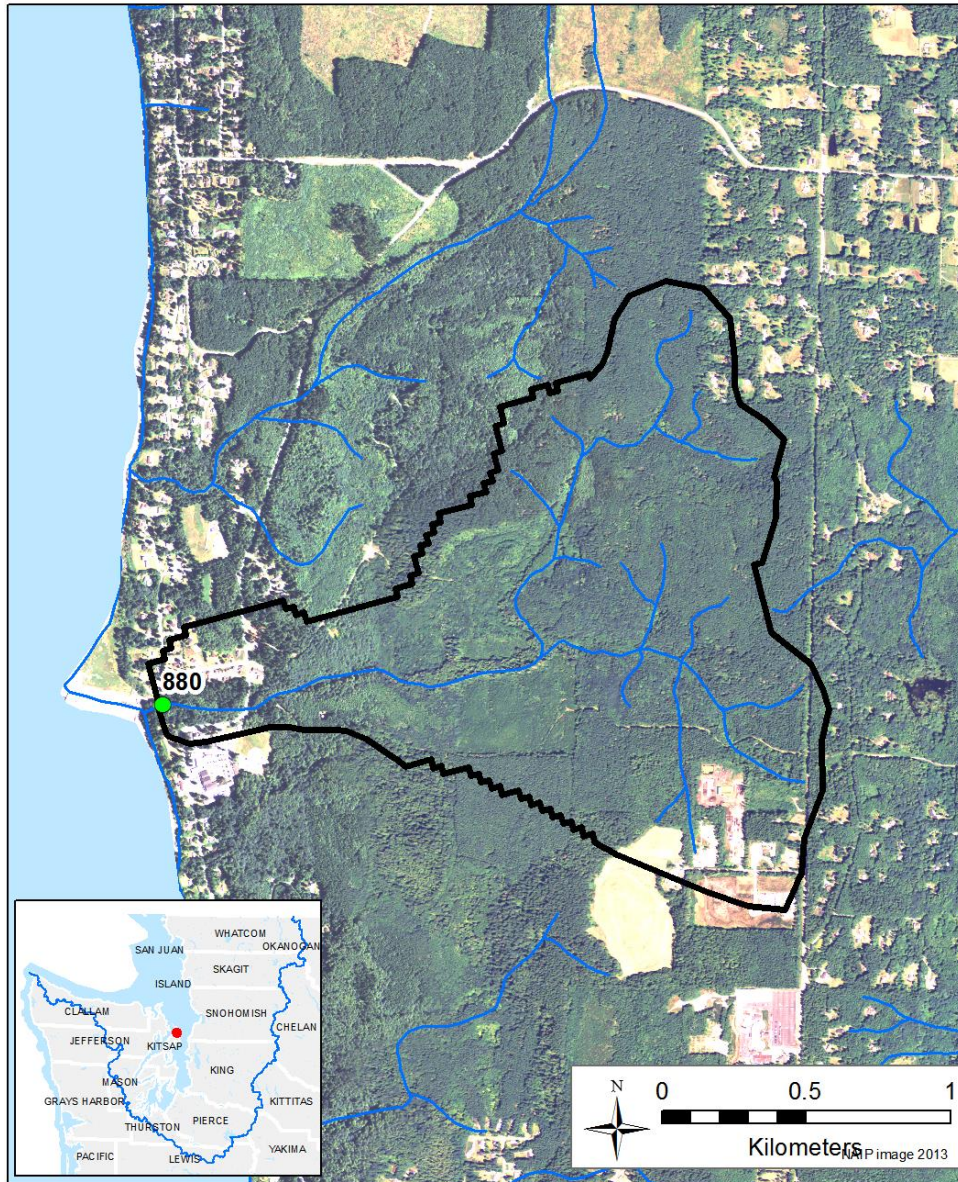
Protect current conditions, stormwater BMPs, outreach

The Little Anderson Creek is zoned primarily for rural residential, although over 20% of the basin is zoned for urban residential, commercial and/or industrial. Much of the lower 1-km basin is forested, especially near the creek channel. Recent B-IBI scores have been relatively good, and because of this, Kitsap County Public Works (KCPW) recommends that this basin be ranked lower for restoration actions than other Kitsap County sites. The most appropriate action may be to protect current conditions,

though this may require active management given that KCPW staff also report the basin is at risk for development. For example, photos suggest there could be additional rural residential development in the lower basin and denser development in the eastern part of the basin. Stormwater ponds have been included in areas with new developments, but additional stormwater BMPs may be beneficial in areas built prior to the most recent stormwater regulations. There is a large gravel and sand operation that is in the eastern part of the basin and operated by Kitsap County. There is a sand and gravel permit for that operation, and there is also an industrial stormwater permit in place for the paving operation in the basin. Containing and/or treating flows from this area is important for protecting water quality within the creek, and BMPs listed in the permits should be enforced. There is a small portion of the upper basin protected in the Newberry Hill Heritage Park and it is reported that retrofits are planned near the park. Outreach to homeowners encouraging low-impact yard care and other protective activities may be worthwhile. Once stormwater BMPs are installed, seeding may be appropriate given there are few nearby sources of diverse and sensitive taxa.

Little Boston in the Bangor-Port Gamble subbasin

WRIA 15; Site code (site ID): KCSSWM-031 (880)



Year	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	1999-2012 Median
B-IBI		34	36	24	32	32						26			24		32

Basin area (acres)	% urban within basin 1-km of site	% urban in whole basin	% pasture in whole basin	% natural in 90-m buffer in whole basin	% impervious in 2011 in whole basin
602.8	8.45%	3.91%	0.00%	95.99%	1.09%

Potential restoration or management actions for: Little Boston in the Bangor-Port Gamble subbasin – WRIA 15; Site code (site ID): KCSSWM-031 (880)

Restoration and Management Actions		Likelihood action would help restore the basin
In-stream	add wood	2
	add substrate	2
	enhance sinuosity	2
	replace culverts	2
	stabilize stream banks	2
Riparian	stabilize slopes	2
	plant vegetation, extend buffer	2
Agricultural BMPs	exclude livestock	0
	manage waste	0
	prevent soil loss	0
Forest BMPs	road maintenance	2
	minimize clearcutting	4
	replant	2
Mining BMPs	mining BMPs	0
Stormwater BMPs	flow controls	1
	treatment	1
	maintain storage and treatment facilities	1
	street sweeping	1
Other Approaches and Actions	limit pesticide use	2
	outreach and education campaign	2
	create incentives to follow BMPs	2
	purchase and protect property	1
	seed invertebrates	3
Is the basin at risk of further degradation?		2

Key for colors and numbers used in table:

not applicable	unlikely	possibly	likely	highly likely
0	1	2	3	4

Key restoration or management action(s) recommended and summary notes:

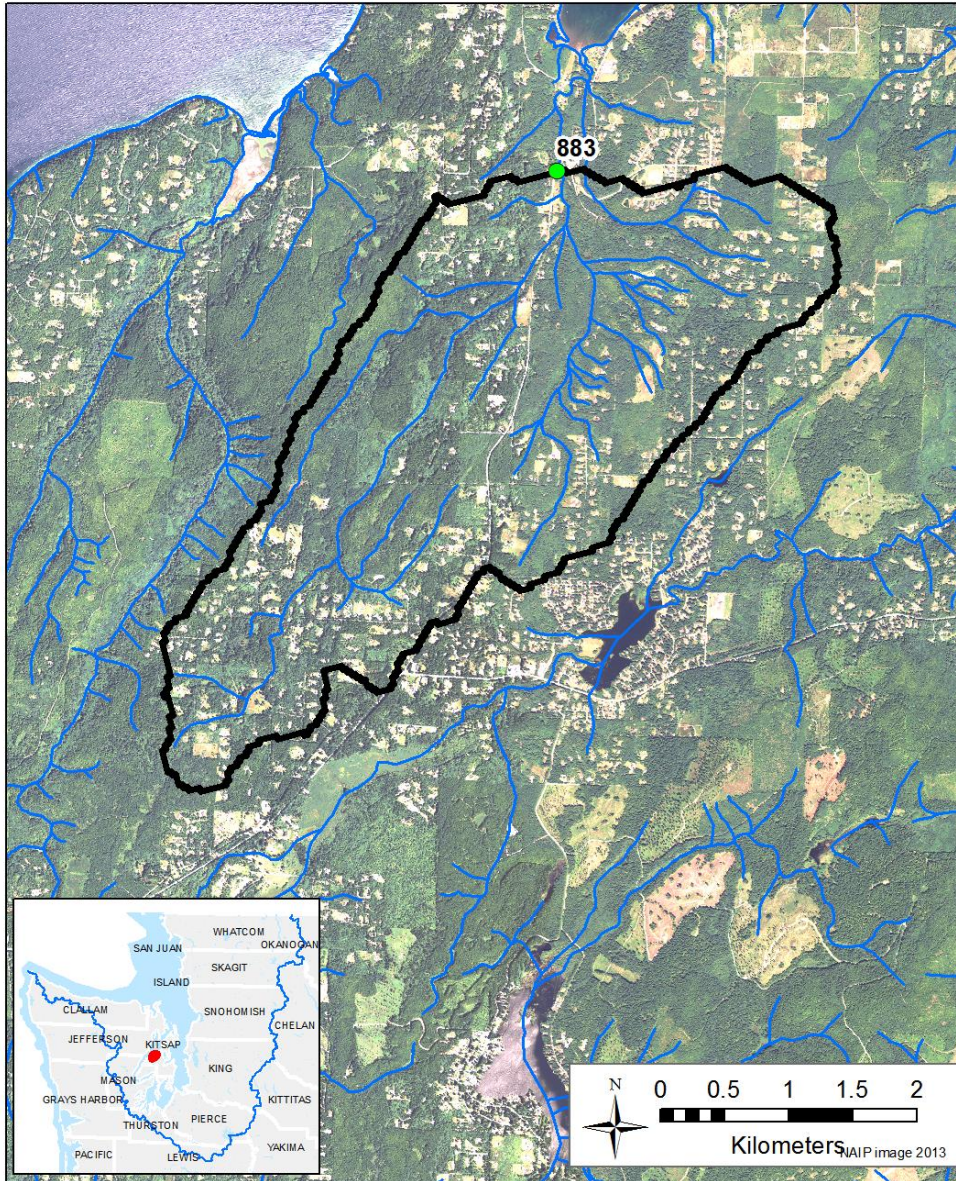
Forest BMPs, seeding

Little Boston Creek flows through the Port Gamble-S’Klallam Reservation for most of its length, and land that is not within the reservation is primarily zoned as rural residential. The forest upstream of the site consists primarily of small, young trees, and it is likely much of the basin has been logged multiple times. Historic and recent logging may have had lasting impacts on the creek, but unlike most basins in the Puget Sound, this is a lowland creek that is likely not affected by stormwater runoff. If there is no further

clearing, habitat conditions may improve slowly over time, but there may also be opportunities to restore in-stream habitat as basin conditions recover. Wild Fish Conservancy has done stream typing on the whole basin, and they may have identified specific restoration opportunities. There are no nearby or connected sources of diverse and sensitive invertebrates; therefore, if in-channel habitat conditions appear suitable, it is likely worthwhile to try seeding before doing more expensive actions.

Seabeck Ck. in the west Kitsap subbasin

WRIA 15; Site code (site ID): KCST-17 (883)



Year	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	1999-2012 Median
B-IBI		40	30	22	36	26	22										28

Basin area (acres)	% urban within basin 1-km of site	% urban in whole basin	% pasture in whole basin	% natural in 90-m buffer in whole basin	% impervious in 2011 in whole basin
2946.1	7.76%	6.48%	0.07%	95.39%	2.47%

Potential restoration or management actions for: Seabeck Ck. in the west Kitsap subbasin – WRIA 15;
 Site code (site ID): KCST-17 (883)

Restoration and Management Actions		Likelihood action would help restore the basin
In-stream	add wood	2
	add substrate	2
	enhance sinuosity	1
	replace culverts	2
	stabilize stream banks	2
Riparian	stabilize slopes	2
	plant vegetation, extend buffer	2
Agricultural BMPs	exclude livestock	0
	manage waste	0
	prevent soil loss	0
Forest BMPs	road maintenance	0
	minimize clearcutting	0
	replant	0
Mining BMPs	mining BMPs	0
Stormwater BMPs	flow controls	3
	treatment	3
	maintain storage and treatment facilities	3
	street sweeping	2
Other Approaches and Actions	limit pesticide use	2
	outreach and education campaign	2
	create incentives to follow BMPs	2
	purchase and protect property	2
	seed invertebrates	3
Is the basin at risk of further degradation?		4

Key for colors and numbers used in table:

not applicable	unlikely	possibly	likely	highly likely
0	1	2	3	4

Key restoration or management action(s) recommended and summary notes:

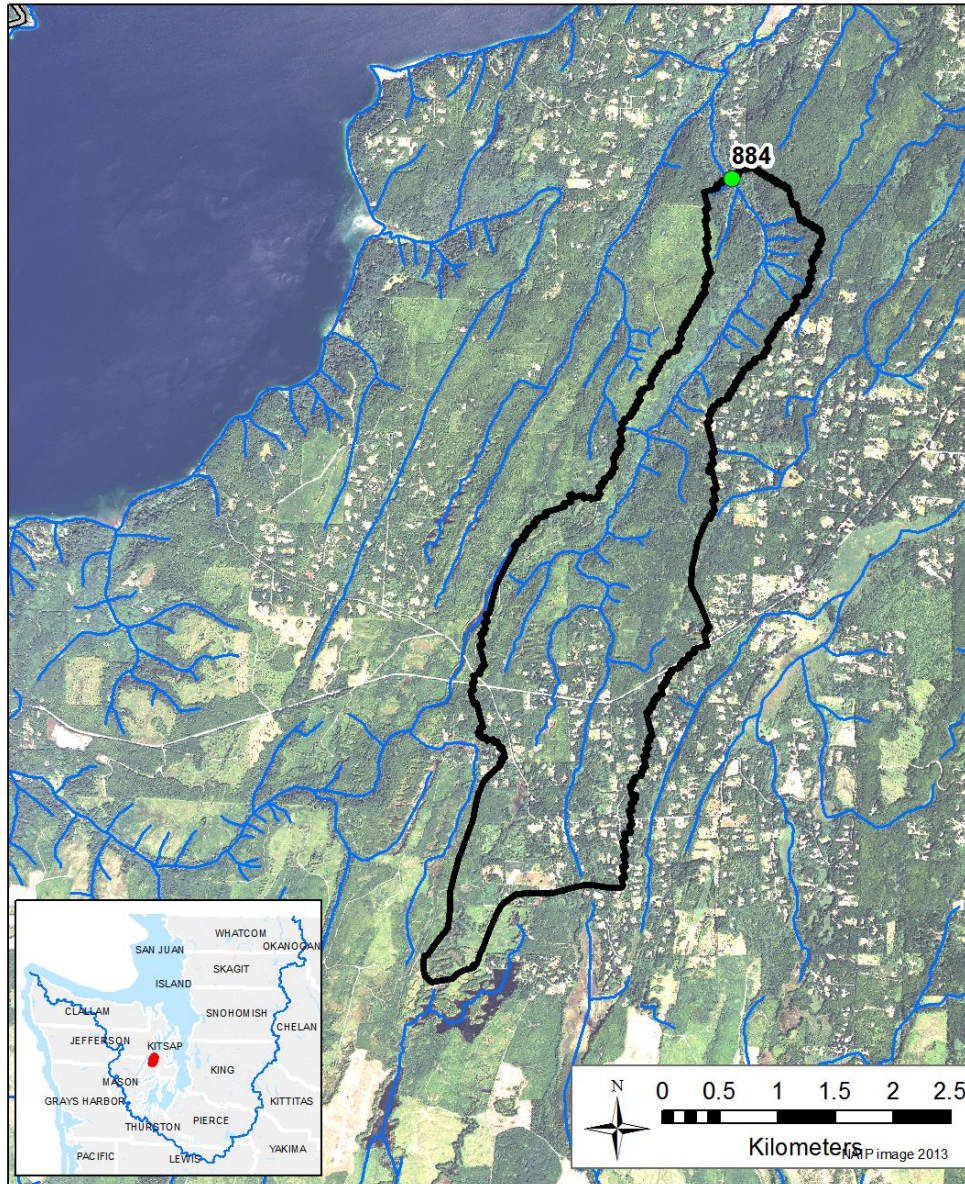
Protect existing riparian areas, seeding, possibly install stormwater BMPs

The Seabeck Creek basin is zoned entirely for rural residential, although there is a small area in the western part of the basin that is protected in the Stavis Natural Resources Conservation Area. Kitsap County Public Works (KCPW) has stopped sampling this site and instead samples a site downstream (KCSSWM-013). Because B-IBI scores from the downstream site have been slightly higher in the last three years, KCPW recommended that this basin should rank lower for restoration actions and instead

monitoring should continue to determine if the increasing trend continues. KCPW has been working on stormwater retrofits downstream of the KCST-17 B-IBI site, but if additional work were warranted, additional stormwater BMPs and/or retrofits upstream of the B-IBI site would presumably help restore surface storage and discharge processes for this basin as well as the larger basin. If reach-scale habitat conditions appear good, seeding would be recommended as there are no nearby sources of diverse invertebrates. If habitat conditions are poor, in-channel actions may be needed but those should be implemented after basin-scale flow processes have been restored. Protecting the channel and riparian zone from the impacts of further development should be prioritized.

Stavis Ck. in the west Kitsap subbasin

WRIA 15; Site code (site ID): KCST-16 (884)



Year	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	1999-2012 Median
B-IBI		24	32	28	24	40											28

Basin area (acres)	% urban within basin 1-km of site	% urban in whole basin	% pasture in whole basin	% natural in 90-m buffer in whole basin	% impervious in 2011 in whole basin
1931.5	0.00%	2.92%	0.00%	97.80%	1.38%

Potential restoration or management actions for: Stavis Ck. in the west Kitsap subbasin – WRIA 15; Site code (site ID): KCST-16 (884)

Restoration and Management Actions		Likelihood action would help restore the basin
In-stream	add wood	3
	add substrate	2
	enhance sinuosity	1
	replace culverts	1
	stabilize stream banks	1
Riparian	stabilize slopes	1
	plant vegetation, extend buffer	1
Agricultural BMPs	exclude livestock	0
	manage waste	0
	prevent soil loss	0
Forest BMPs	road maintenance	0
	minimize clearcutting	0
	replant	0
Mining BMPs	mining BMPs	0
Stormwater BMPs	flow controls	2
	treatment	2
	maintain storage and treatment facilities	2
	street sweeping	2
Other Approaches and Actions	limit pesticide use	2
	outreach and education campaign	2
	create incentives to follow BMPs	2
	purchase and protect property	2
	seed invertebrates	2
Is the basin at risk of further degradation?		4

Key for colors and numbers used in table:

not applicable	unlikely	possibly	likely	highly likely
0	1	2	3	4

Key restoration or management action(s) recommended and summary notes:

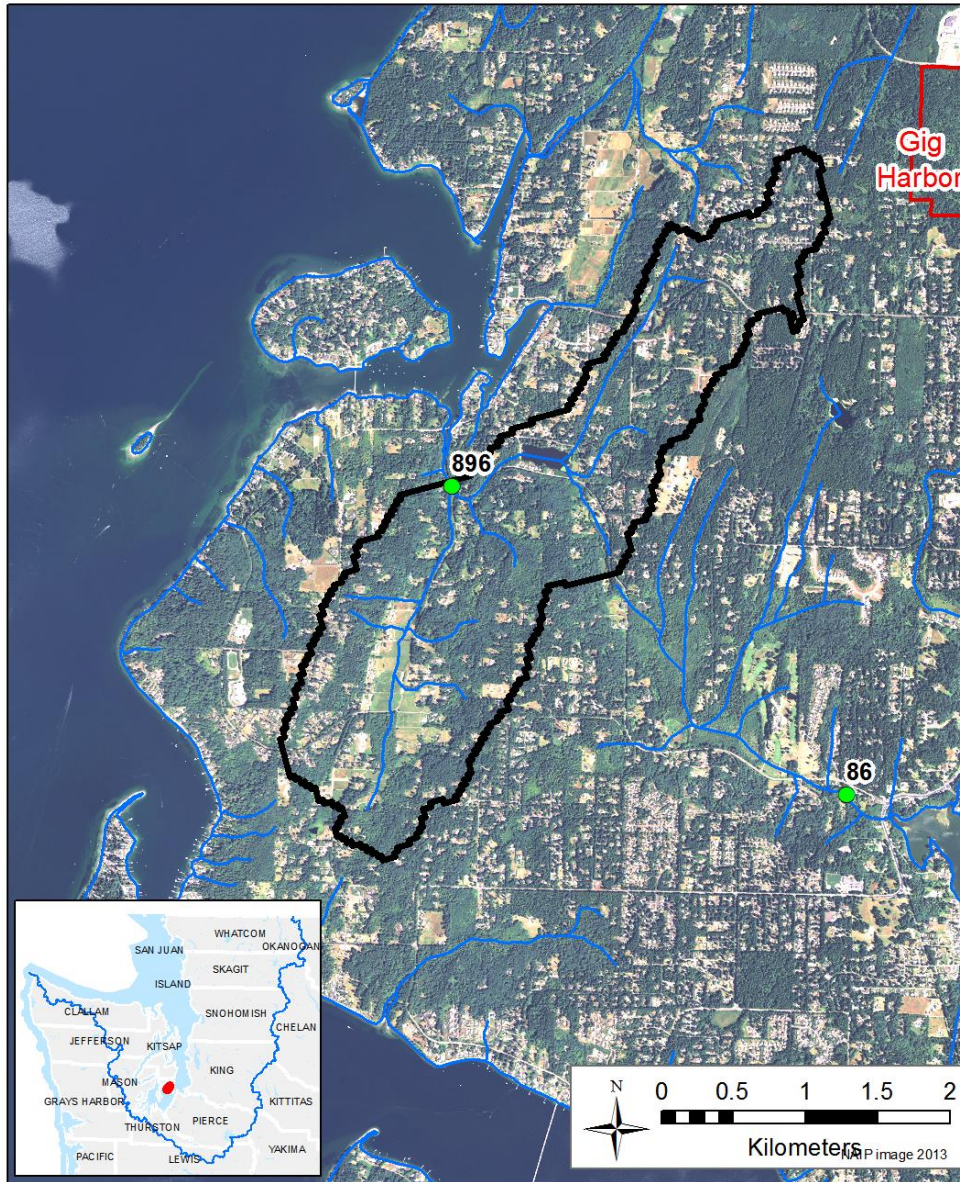
Possible in-channel habitat restoration

The Stavis Creek basin is zoned exclusively for rural residential, though it appears most of the housing is in the upper basin, and few if any homes have been built near the creek. Large intact patches of forest are present, and the buffer appears wide and intact for most of the creek length. Kitsap County Public Works (KCPW) has stopped sampling this site (KCST-16) and is instead sampling a site upstream (KCSSWM-014). KCPW recommends more data are needed from the new site before restoration actions

are prescribed. Additional data are needed to establish a more recent assessment at the new site, but also to determine if the variability is as great as previous samples would suggest. Scores at site #884 ranged from 24 to 40 over 5 years. A site approximately 1.5 km upstream of #884 was sampled once in 2000 with a score of 44. In contrast, a site less than 1 km downstream of #884 scored 16 and 24 in 2011 and 2013, respectively. If sites upstream of site #884 score good or excellent, protecting the upper basin from further development should be a high priority. Restoring in-channel conditions may be appropriate if legacy effects of logging persist. Land upstream of the site is designated as a Washington State Department of Natural Resources (WADNR) conservation area, and restoration in this area may be a good starting point. If scores are still highly variable along the creek, additional work may be needed to identify the cause of the variation before restoration actions could be recommended.

Ray Nash Ck. in the Carr Inlet subbasin

WRIA 15; Site code (site ID): BiBi-025 - Ray Nash Creek (896)



Year	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	1999-2012 Median
B-IBI		24				34				26	34			28	28	30	28

Basin area (acres)	% urban within basin 1-km of site	% urban in whole basin	% pasture in whole basin	% natural in 90-m buffer in whole basin	% impervious in 2011 in whole basin
1391.5	7.33%	13.50%	2.59%	77.47%	6.90%

Potential restoration or management actions for: Ray Nash Ck. in the Carr Inlet subbasin – WRIA 15; Site code (site ID): BiBi-025 - Ray Nash Creek (896)

Restoration and Management Actions		Likelihood action would help restore the basin
In-stream	add wood	2
	add substrate	2
	enhance sinuosity	2
	replace culverts	2
	stabilize stream banks	2
Riparian	stabilize slopes	2
	plant vegetation, extend buffer	4
Agricultural BMPs	exclude livestock	2
	manage waste	2
	prevent soil loss	1
Forest BMPs	road maintenance	0
	minimize clearcutting	0
	replant	0
Mining BMPs	mining BMPs	0
Stormwater BMPs	flow controls	4
	treatment	4
	maintain storage and treatment facilities	4
	street sweeping	1
Other Approaches and Actions	limit pesticide use	3
	outreach and education campaign	3
	create incentives to follow BMPs	2
	purchase and protect property	3
	seed invertebrates	3
Is the basin at risk of further degradation?		4

Key for colors and numbers used in table:

not applicable	unlikely	possibly	likely	highly likely
0	1	2	3	4

Key restoration or management action(s) recommended and summary notes:

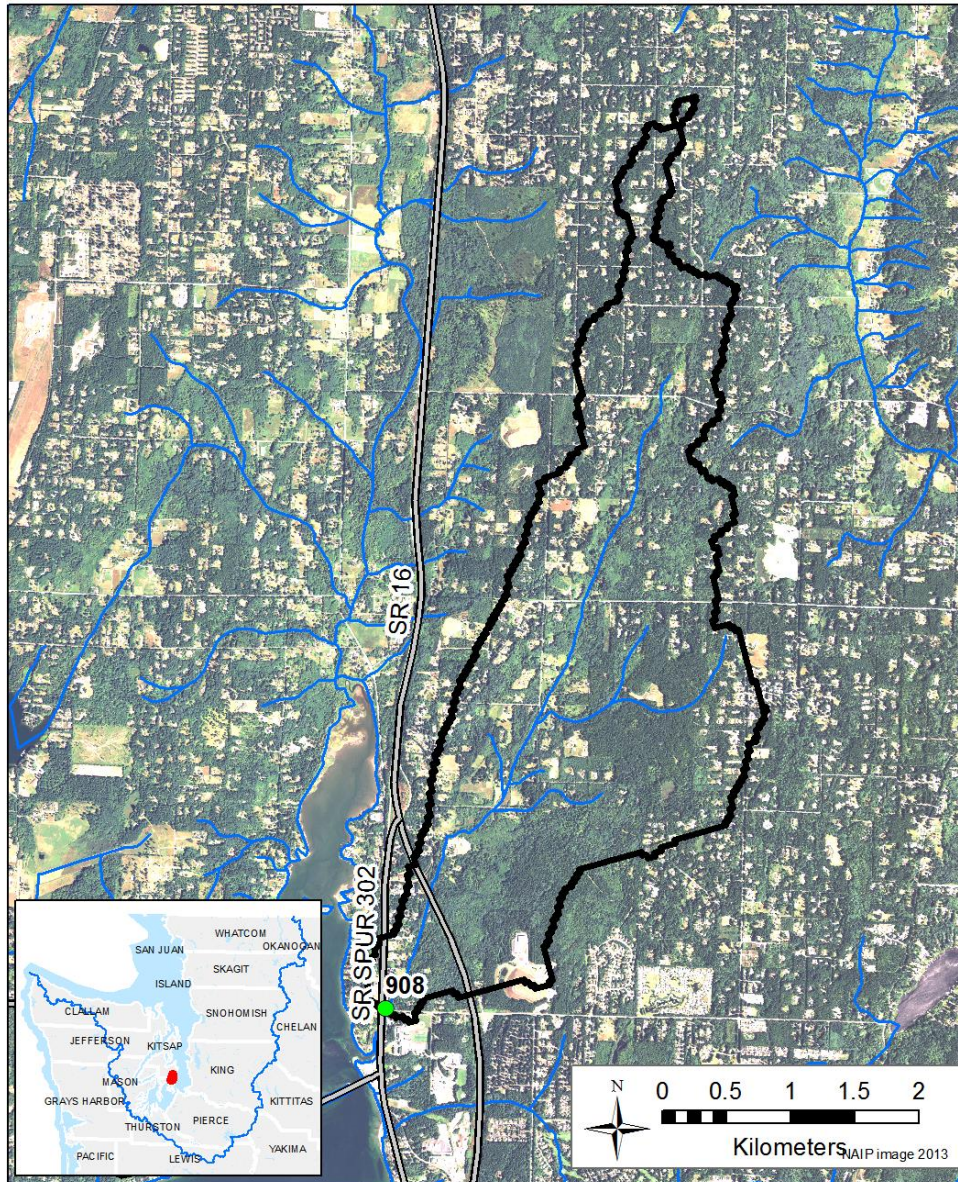
Stormwater BMPs throughout and agricultural BMPs in southern part of the basin, extend and/or plant buffer, outreach and other Other Approaches and Actions

Fifty-one percent of the Ray Nash Creek basin is zoned for urban residential, with most of that along the stream corridor. Despite this zoning, the current density of homes is relatively low. Stormwater BMPs may be recommended given that many homes were built prior to 1990. Most of the remaining basin (48%) is zoned rural residential, and this land is distributed along the edges of the basin. A large portion

of the southern tributary appears to flow through several pastures and the stream channel appears to have little to no buffer. General agricultural BMPs, and especially ones that establish and protect riparian areas, would be recommended. The PSWC analysis indicated most water flow and water quality processes have been degraded across the basin, suggesting stormwater and agricultural BMPs across the basin may be needed. However, protecting current conditions may be more important given most of the area zoned for high density development is not yet developed. In-channel restoration may also be needed, but assessing this will require a site visit and would likely be most appropriate only after current and anticipated basin-scale stressors have been addressed.

Purdy Ck. (Burley Lagoon) in the Carr Inlet subbasin

WRIA 15; Site code (site ID): BiBi-028 - Purdy Creek (908)



Year	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	1999-2012 Median
B-IBI			30				36				26		30		32		30

Basin area (acres)	% urban within basin 1-km of site	% urban in whole basin	% pasture in whole basin	% natural in 90-m buffer in whole basin	% impervious in 2011 in whole basin
2314.2	25.38%	8.45%	0.44%	90.33%	4.38%

Potential restoration or management actions for: Purdy Ck. (Burley Lagoon) in the Carr Inlet subbasin – WRIA 15; Site code (site ID): BiBi-028 - Purdy Creek (908)

Restoration and Management Actions		Likelihood action would help restore the basin
In-stream	add wood	2
	add substrate	2
	enhance sinuosity	2
	replace culverts	2
	stabilize stream banks	2
Riparian	stabilize slopes	2
	plant vegetation, extend buffer	2
Agricultural BMPs	exclude livestock	4
	manage waste	4
	prevent soil loss	4
Forest BMPs	road maintenance	0
	minimize clearcutting	0
	replant	0
Mining BMPs	mining BMPs	0
Stormwater BMPs	flow controls	3
	treatment	3
	maintain storage and treatment facilities	1
	street sweeping	0
Other Approaches and Actions	limit pesticide use	3
	outreach and education campaign	3
	create incentives to follow BMPs	2
	purchase and protect property	2
	seed invertebrates	3
Is the basin at risk of further degradation?		4

Key for colors and numbers used in table:

not applicable	unlikely	possibly	likely	highly likely
0	1	2	3	4

Key restoration or management action(s) recommended and summary notes:

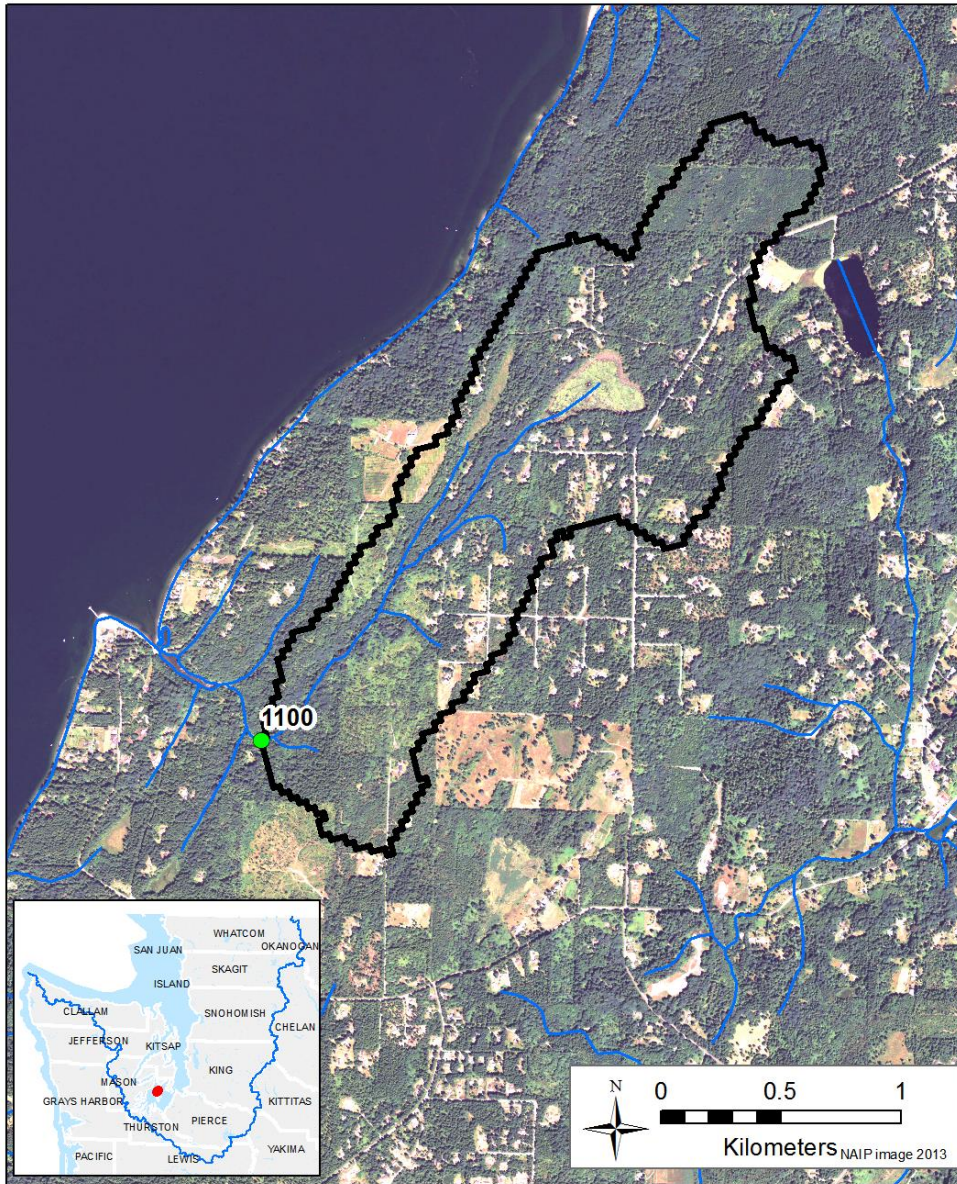
Agricultural BMPs, stormwater BMPs

The Purdy Creek basin is similar to other basins on the Kitsap Peninsula in that it is zoned primarily for rural residential use, and it may not yet be developed to that capacity. There appears to be a large area of intact forest in the lower basin, within 2 km of the B-IBI site; however, much of this area is zoned for urban residential, suggesting the amount of impervious payment in this lower basin may increase dramatically in the future. The homes currently in the basin appear to have been built in the 1990s or

2000s, but many are in areas in basin that are exempt from regional stormwater permits (only 37% of the basin is covered by a current permit). Thus, few if any stormwater BMPs have likely been installed and it may be beneficial to install them now. Stormwater BMPs may be especially appropriate along Rt 16 and other roadways. Outreach to landowners may be advantageous, as there are several parcels with cleared areas near the creek. Seeding may also be appropriate, as there are few nearby sources of diverse invertebrates. A site visit would be needed to assess whether in-channel restoration would be recommended.

Herron Ck. in the Key Peninsula subbasin

WRIA 15; Site code (site ID): BiBi-034 - Herron Creek (1100)



Year	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	1999-2012 Median
B-IBI												30	30	34	22		30

Basin area (acres)	% urban within basin 1-km of site	% urban in whole basin	% pasture in whole basin	% natural in 90-m buffer in whole basin	% impervious in 2011 in whole basin
642.9	1.97%	2.73%	0.00%	99.48%	0.99%

Potential restoration or management actions for: Herron Ck. in the Key Peninsula subbasin – WRIA 15;
Site code (site ID): BiBi-034 - Herron Creek (1100)

Restoration and Management Actions		Likelihood action would help restore the basin
In-stream	add wood	2
	add substrate	2
	enhance sinuosity	2
	replace culverts	2
	stabilize stream banks	2
Riparian	stabilize slopes	1
	plant vegetation, extend buffer	1
Agricultural BMPs	exclude livestock	0
	manage waste	0
	prevent soil loss	0
Forest BMPs	road maintenance	0
	minimize clearcutting	0
	replant	0
Mining BMPs	mining BMPs	0
Stormwater BMPs	flow controls	4
	treatment	4
	maintain storage and treatment facilities	3
	street sweeping	1
Other Approaches and Actions	limit pesticide use	2
	outreach and education campaign	3
	create incentives to follow BMPs	3
	purchase and protect property	2
	seed invertebrates	3
Is the basin at risk of further degradation?		4

Key for colors and numbers used in table:

not applicable	unlikely	possibly	likely	highly likely
0	1	2	3	4

Key restoration or management action(s) recommended and summary notes:

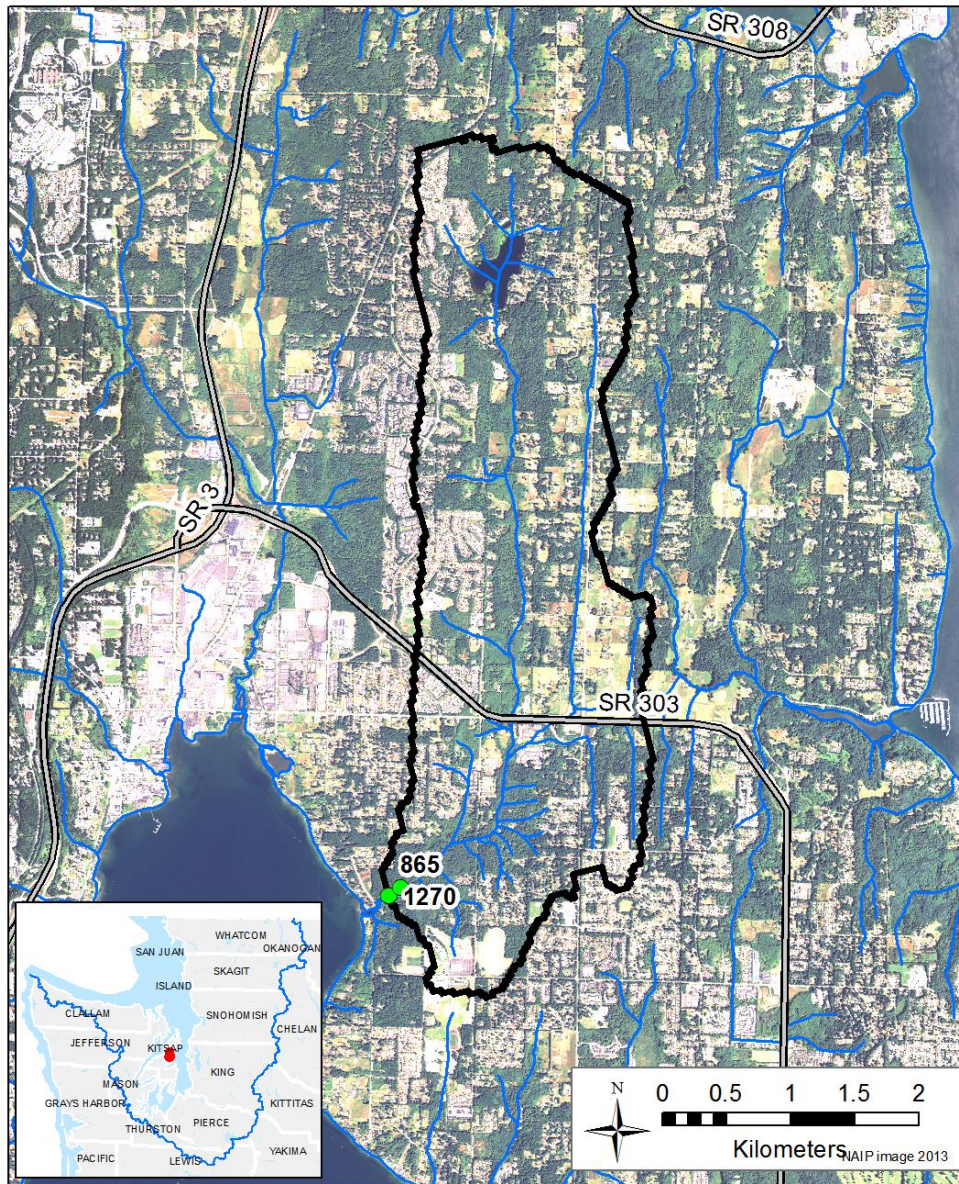
Stormwater BMPs

The Herron Creek basin is zoned primarily for rural residential use, but nearly a third of the area in the stream corridor is zoned for urban residential. Currently, most homes in this corridor are on 5-acre parcels and there appear to be large patches of intact or partially thinned forest. Photos from 2013 suggest there are no immediate developments planned (e.g., no recently graded lots or new roads). Installing stormwater BMPs to address surface storage and discharge processes associated with previous

development may be beneficial. Given current land use, the B-IBI scores are rather low (Biopotential score of -9.7). If a site visit reveals local conditions are good, seeding may be an appropriate action. If local conditions are poor, in-channel restoration may be needed, but this should be undertaken only if further development is not anticipated. Outreach to homeowners with properties on the creek may also be helpful.

Barker Ck. in the Dyes Inlet / Central Kitsap subbasin

WRIA 15; Site code (site ID): KCSSWM-001 - Lower (1270)



Year	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	1999-2012 Median
B-IBI												30	24	28	30	32	28

Basin area (acres)	% urban within basin 1-km of site	% urban in whole basin	% pasture in whole basin	% natural in 90-m buffer in whole basin	% impervious in 2011 in whole basin
2512.6	38.91%	33.38%	0.89%	62.15%	16.38%

Potential restoration or management actions for: Barker Ck. in the Dyes Inlet / Central Kitsap subbasin – WRIA 15; Site code (site ID): KCSSWM-001 - Lower (1270)

Restoration and Management Actions		Likelihood action would help restore the basin
In-stream	add wood	3
	add substrate	3
	enhance sinuosity	2
	replace culverts	3
	stabilize stream banks	2
Riparian	stabilize slopes	3
	plant vegetation, extend buffer	4
Agricultural BMPs	exclude livestock	0
	manage waste	0
	prevent soil loss	0
Forest BMPs	road maintenance	0
	minimize clearcutting	0
	replant	0
Mining BMPs	mining BMPs	0
Stormwater BMPs	flow controls	4
	treatment	4
	maintain storage and treatment facilities	4
	street sweeping	3
Other Approaches and Actions	limit pesticide use	2
	outreach and education campaign	3
	create incentives to follow BMPs	3
	purchase and protect property	2
	seed invertebrates	3
Is the basin at risk of further degradation?		4

Key for colors and numbers used in table:

not applicable	unlikely	possibly	likely	highly likely
0	1	2	3	4

Key restoration or management action(s) recommended and summary notes:

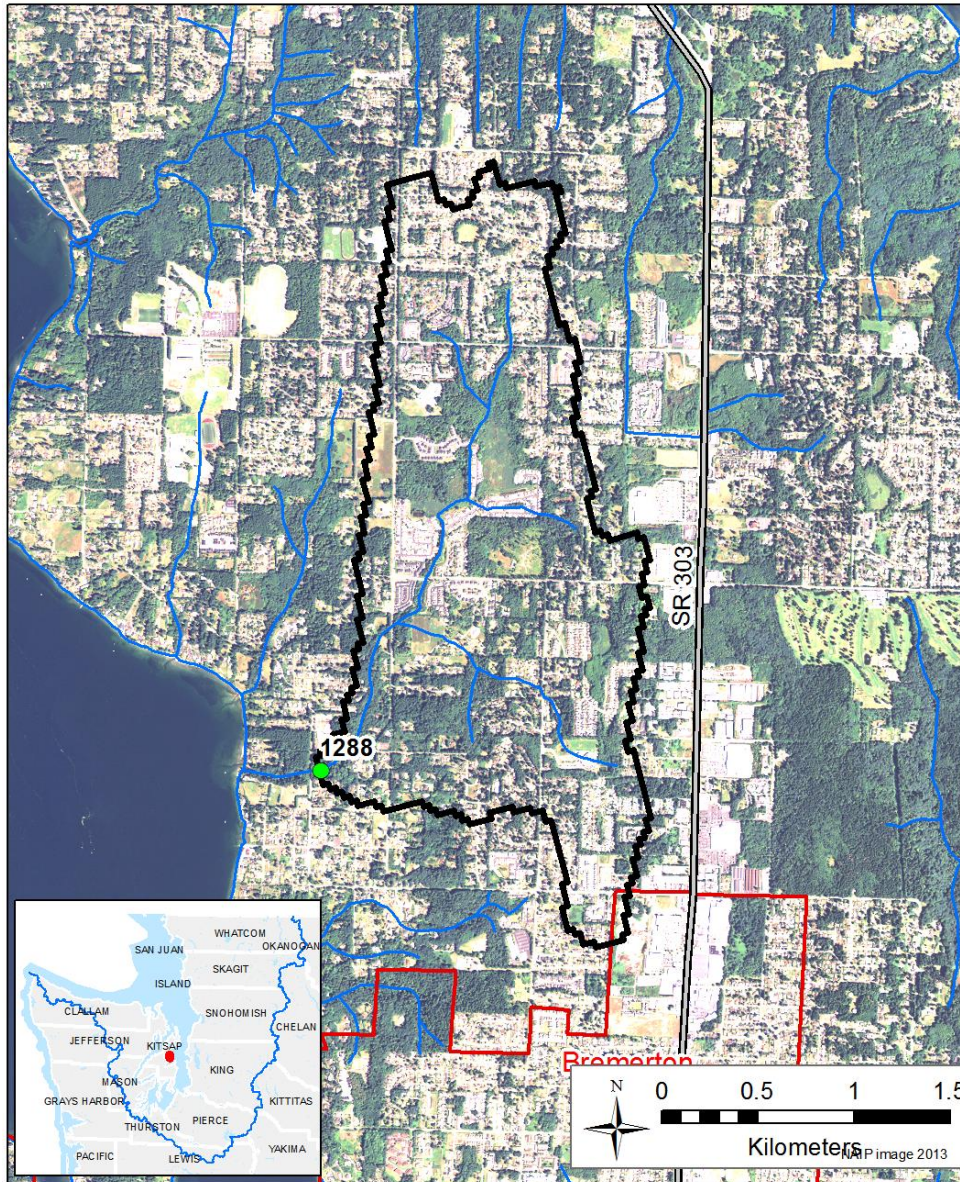
Stormwater BMPs, plant and extend buffer, outreach and in-channel restoration if needed

The Barker Creek basin is unique among those considered because of the extensive restoration and management actions that have already occurred within the basin. Kitsap County Public Works (KCPW) recommends that it be the focus of a retrospective study because of the large number of actions that have occurred and the recent improvements seen in B-IBI scores and other measures of water quality. Stormwater retrofits have been implemented, source control has occurred, land had been protected via

changes in zoning, culverts have been replaced and agricultural activities have been better managed. KCPW reports that there has been a lot of work taking place to protect corridor and manage stormwater, for instance green streets have been added along Fairwood Avenue and twenty stormwater ponds in the basin will be retrofitted. The B-IBI site will be sampled every year which will provide a consistent and reliable indicator for measuring restoration effectiveness for tracking improvements over time. Additional monitoring data (e.g., physical habitat, flow and all available water quality data) should be included in a retrospective analysis of conditions and B-IBI score trends over time. If the richness of sensitive taxa does not increase over the next several years, seeding may be appropriate given there are no connected or nearby sources of diverse and sensitive invertebrate taxa.

Mosher Ck. in the Dyes Inlet / Central Kitsap subbasin

WRIA 15; Site code (site ID): KCSSWM-012 (1288)



Year	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	1999-2012 Median
B-IBI				38	26							30		30		24	30

Basin area (acres)	% urban within basin 1-km of site	% urban in whole basin	% pasture in whole basin	% natural in 90-m buffer in whole basin	% impervious in 2011 in whole basin
1051.9	26.76%	51.40%	0.02%	53.24%	25.06%

Potential restoration or management actions for: Mosher Ck. in the Dyes Inlet / Central Kitsap subbasin
 – WRIA 15; Site code (site ID): KCSSWM-012 (1288)

Restoration and Management Actions		Likelihood action would help restore the basin
In-stream	add wood	2
	add substrate	2
	enhance sinuosity	2
	replace culverts	2
	stabilize stream banks	2
Riparian	stabilize slopes	2
	plant vegetation, extend buffer	4
Agricultural BMPs	exclude livestock	1
	manage waste	1
	prevent soil loss	1
Forest BMPs	road maintenance	0
	minimize clearcutting	0
	replant	0
Mining BMPs	mining BMPs	0
Stormwater BMPs	flow controls	4
	treatment	4
	maintain storage and treatment facilities	4
	street sweeping	1
Other Approaches and Actions	limit pesticide use	2
	outreach and education campaign	2
	create incentives to follow BMPs	2
	purchase and protect property	2
	seed invertebrates	3
Is the basin at risk of further degradation?		4

Key for colors and numbers used in table:

not applicable	unlikely	possibly	likely	highly likely
0	1	2	3	4

Key restoration or management action(s) recommended and summary notes:

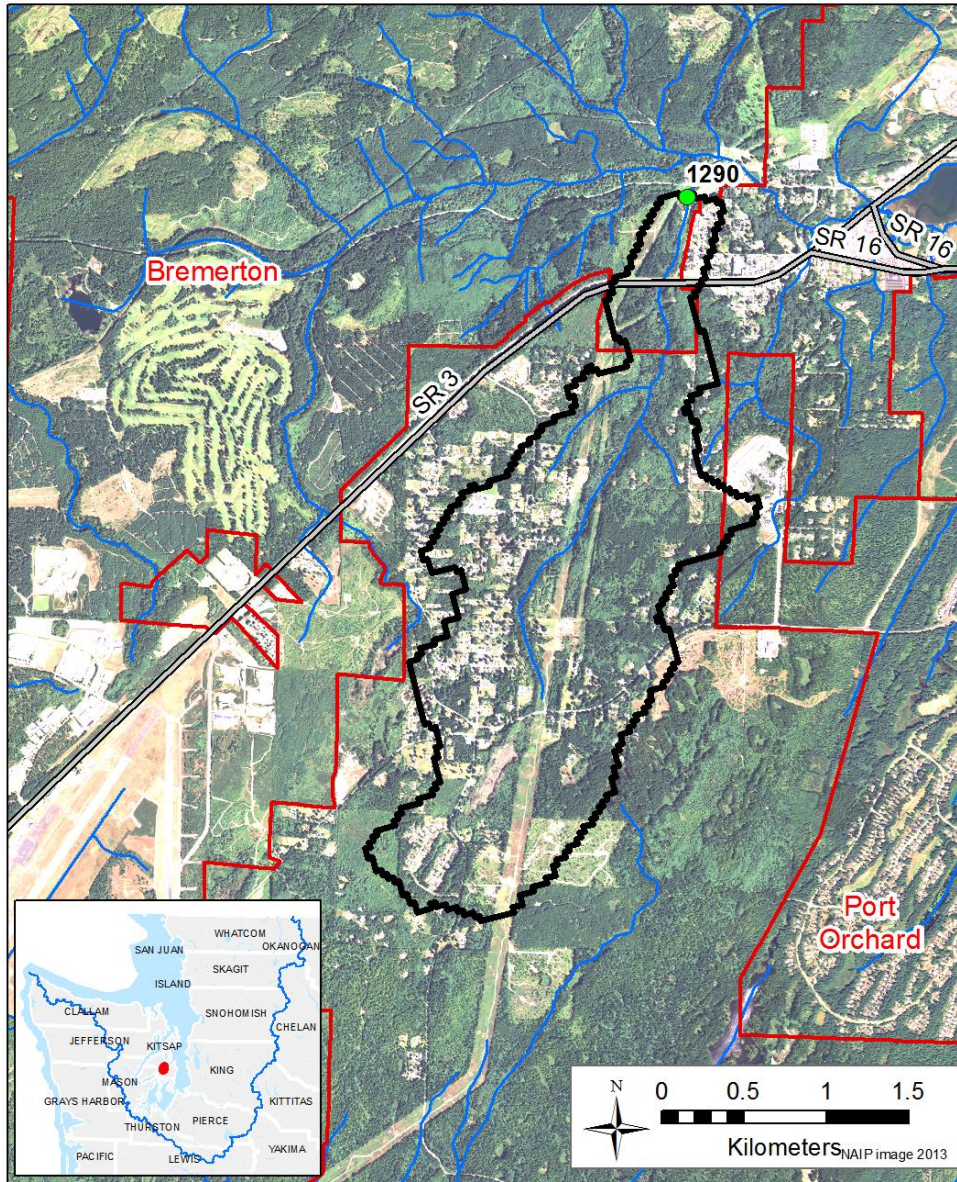
Stormwater BMPs, extend and plant buffer

Nearly 80% of the Mosher Creek basin is zoned for urban residential. The invertebrate community is remarkably diverse given the current land use and rate of development (i.e., the biopotential score of 1.1 indicates it is already scoring in the top 10% of sites with the same % urbanization). Additional development may be planned; a 29 acre parcel was sold in 2014, and several other large parcels adjacent to near the stream may be subdivided and developed in the future. There are some detention

ponds near older developments as well as recent retrofits of existing stormwater facilities, but additional stormwater BMPs are recommended. These could include actions on public land (e.g., pond retrofits, ditch enhancements) and private land (rain gardens). Replacements of culverts may also be helpful (e.g., replacement of Tracyton Blvd. culvert). There does not appear to be a nearby source of diverse taxa, and therefore seeding may be appropriate. Further analysis of the invertebrate community composition may provide insights into which taxa are tolerant to conditions here and which ones may be likely to colonize if added.

Parish Ck. in the south Sinclair Inlet subbasin

WRIA 15; Site code (site ID): KCSSWM-018 – (Gorst Tributary) (1290)



Year	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	1999-2012 Median
B-IBI		36		30	32								32		28		32

Basin area (acres)	% urban within basin 1-km of site	% urban in whole basin	% pasture in whole basin	% natural in 90-m buffer in whole basin	% impervious in 2011 in whole basin
1128.9	16.29%	13.16%	0.18%	88.75%	5.36%

Potential restoration or management actions for: Parish Ck. in the south Sinclair Inlet subbasin – WRIA 15; Site code (site ID): KCSSWM-018 – (Gorst Tributary) (1290)

Restoration and Management Actions		Likelihood action would help restore the basin
In-stream	add wood	3
	add substrate	3
	enhance sinuosity	3
	replace culverts	3
	stabilize stream banks	3
Riparian	stabilize slopes	3
	plant vegetation, extend buffer	3
Agricultural BMPs	exclude livestock	2
	manage waste	2
	prevent soil loss	0
Forest BMPs	road maintenance	0
	minimize clearcutting	0
	replant	0
Mining BMPs	mining BMPs	0
Stormwater BMPs	flow controls	4
	treatment	4
	maintain storage and treatment facilities	2
	street sweeping	1
Other Approaches and Actions	limit pesticide use	2
	outreach and education campaign	3
	create incentives to follow BMPs	3
	purchase and protect property	3
	seed invertebrates	2
Is the basin at risk of further degradation?		4

Key for colors and numbers used in table:

not applicable	unlikely	possibly	likely	highly likely
0	1	2	3	4

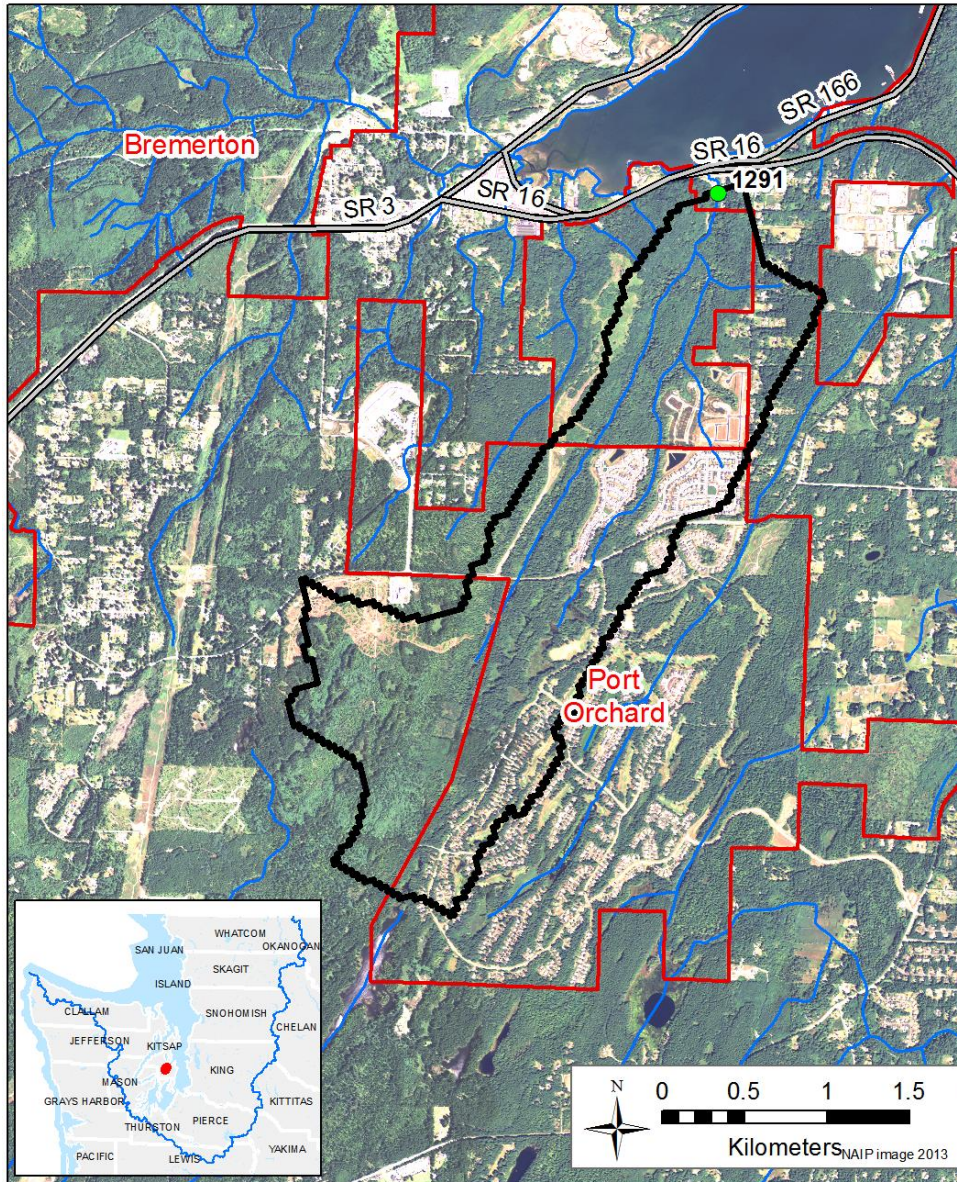
Key restoration or management action(s) recommended and summary notes:

Install stormwater BMPs in older developments, in-channel restoration including actions to control sediment

The Parish Creek basin is zoned primarily for rural residential, though most of the 1-km basin immediately upstream of the site is zoned for urban residential. Much of the development in the basin was built in the 1960s and 1970s with no stormwater controls. The urban zone and much of the eastern portion of the basin have not been developed extensively. In addition to installing stormwater BMPs in

the areas with older homes, any new development should include the most recently required stormwater BMPs that address flow and water quality processes. Kitsap County staff indicated sediment may be limiting the invertebrate community, and therefore in addition to basin-scale stormwater BMPs, actions that target sediment loading and transport may be appropriate. These actions may include extending riparian buffers, bank stabilization and channel restoration. Kitsap County staff also indicated that the Suquamish Tribe is interested in the basin, and therefore there may be regional interest and support for restoration actions. Seeding may be appropriate once restoration actions have been implemented, but there may also be sufficient sources of diverse invertebrates in the nearby basins that have excellent B-IBI scores.

Anderson Ck. (Kitsap) in the south Sinclair Inlet subbasin
 WRIA 15; Site code (site ID): KCSSWM-019 (1291)



Year	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	1999-2012 Median
B-IBI		28		34	34								24		26		31

Basin area (acres)	% urban within basin 1-km of site	% urban in whole basin	% pasture in whole basin	% natural in 90-m buffer in whole basin	% impervious in 2011 in whole basin
1221.8	3.18%	15.76%	0.27%	80.55%	7.61%

Potential restoration or management actions for: Anderson Ck. (Kitsap) in the south Sinclair Inlet subbasin – WRIA 15; Site code (site ID): KCSSWM-019 (1291)

Restoration and Management Actions		Likelihood action would help restore the basin
In-stream	add wood	2
	add substrate	2
	enhance sinuosity	2
	replace culverts	2
	stabilize stream banks	2
Riparian	stabilize slopes	2
	plant vegetation, extend buffer	3
Agricultural BMPs	exclude livestock	0
	manage waste	0
	prevent soil loss	0
Forest BMPs	road maintenance	0
	minimize clearcutting	0
	replant	0
Mining BMPs	mining BMPs	0
Stormwater BMPs	flow controls	4
	treatment	4
	maintain storage and treatment facilities	4
	street sweeping	3
Other Approaches and Actions	limit pesticide use	3
	outreach and education campaign	3
	create incentives to follow BMPs	3
	purchase and protect property	2
	seed invertebrates	2
Is the basin at risk of further degradation?		4

Key for colors and numbers used in table:

not applicable	unlikely	possibly	likely	highly likely
0	1	2	3	4

Key restoration or management action(s) recommended and summary notes:

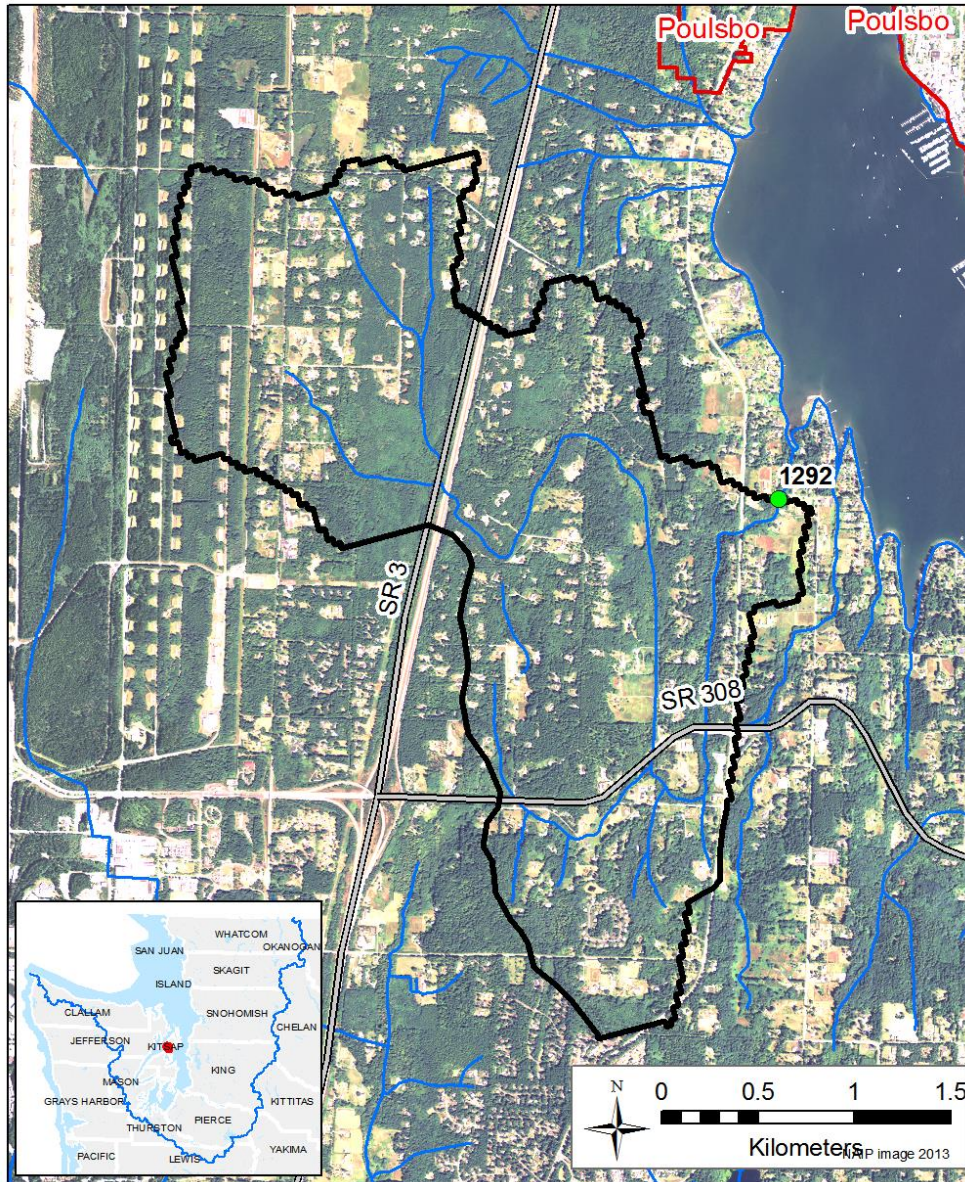
Stormwater BMPs

Recent development in the basin has changed the land use dramatically since 2001; between 2001 and 2011 the percent impervious surface in the watershed increased 6%. Kitsap County staff confirms that the McCormick Woods development was approved in 2008, and before that the watershed provided excellent habitat for fish. Additional high-density development continues in the lower basin (along Anderson Hill Road SW), and further development is likely throughout the basin given that nearly 84% is

zoned for urban residential. An earlier development with homes built in the 1980s and 1990s along a golf course may also be affecting water flow and water quality processes. Installing stormwater BMPs in areas with older development and maintaining stormwater facilities that target flow and water quality in new developments will be critical for maintaining and restoring conditions. As development proceeds, it is recommended to leave as much intact forest as possible, and to leave stream buffers as wide as possible. If flow and water quality processes are protected from further degradation, in-channel habitat actions may be needed to restore local conditions likely affected by the recent development. Outreach to homeowners and the golf course encouraging minimal pesticide use may also be appropriate given the high density of lawns, turf, and gardens, as well as the close proximity of developments to the creek. Seeding may be appropriate if and when restoration actions have been implemented, but there may also be adjacent watersheds with sufficient sources of diverse invertebrates.

Big Scandia Ck. in the Liberty-Miller-Appletree subbasin

WRIA 15; Site code (site ID): KCSSWM-020 (1292)



Year	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	1999-2012 Median
B-IBI		22		24								32		40		38	28

Basin area (acres)	% urban within basin 1-km of site	% urban in whole basin	% pasture in whole basin	% natural in 90-m buffer in whole basin	% impervious in 2011 in whole basin
1750.0	11.17%	14.59%	0.20%	81.99%	6.57%

Potential restoration or management actions for: Big Scandia Ck. in the Liberty-Miller-Appletree subbasin – WRIA 15; Site code (site ID): KCSSWM-020 (1292)

Restoration and Management Actions		Likelihood action would help restore the basin
In-stream	add wood	2
	add substrate	2
	enhance sinuosity	2
	replace culverts	2
	stabilize stream banks	2
Riparian	stabilize slopes	2
	plant vegetation, extend buffer	3
Agricultural BMPs	exclude livestock	4
	manage waste	4
	prevent soil loss	3
Forest BMPs	road maintenance	0
	minimize clearcutting	0
	replant	0
Mining BMPs	mining BMPs	0
Stormwater BMPs	flow controls	3
	treatment	3
	maintain storage and treatment facilities	3
	street sweeping	2
Other Approaches and Actions	limit pesticide use	3
	outreach and education campaign	4
	create incentives to follow BMPs	3
	purchase and protect property	2
	seed invertebrates	3
Is the basin at risk of further degradation?		4

Key for colors and numbers used in table:

not applicable	unlikely	possibly	likely	highly likely
0	1	2	3	4

Key restoration or management action(s) recommended and summary notes:

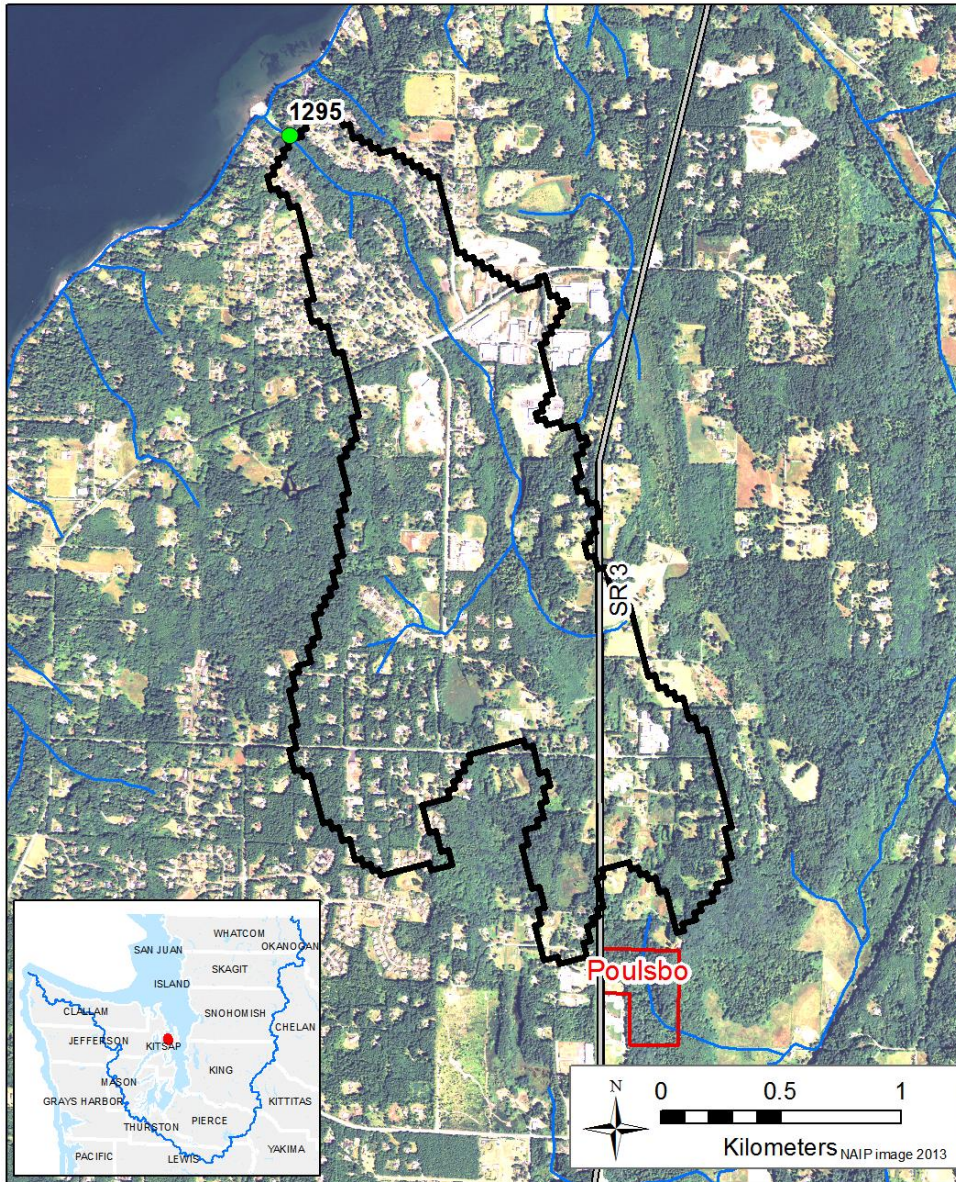
Agricultural BMPs, stormwater BMPs targeting road runoff, seeding

The Big Scandia Creek basin is zoned almost entirely for rural residential development, though there appears to be commercial agriculture on some of the parcels. For example, there is a large pumpkin patch in the eastern portion of the lower basin which is part of the "backyard habitat" project. Outreach to landowners to encourage agricultural BMPs are likely appropriate, especially for parcels adjacent to or near the creek. Stormwater BMPs may be advantageous in some areas of the basin, including BMPs

designed to treat highway runoff from Rt 3 and Rt 308. The most recent B-IBI scores of 40 and 38 in 2012 and 2014, respectively, are encouraging and suggest conditions are perhaps better than the median B-IBI score would suggest. Because of this, Kitsap County Public Works (KCPW) recommends a “wait and see” approach in this basin. Restoration actions on some private property are scheduled for 2015, and monitoring should continue to assess any changes over time. Although there are clearly some sensitive taxa present, seeding may be appropriate as it appears there are few, if any, nearby sources of diverse invertebrates.

Jump Off Ck. in the Bangor-Port Gamble subbasin

WRIA 15; Site code (site ID): KCSSWM-030 (1295)



Year	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	1999-2012 Median
B-IBI		30		22									28		28		28

Basin area (acres)	% urban within basin 1-km of site	% urban in whole basin	% pasture in whole basin	% natural in 90-m buffer in whole basin	% impervious in 2011 in whole basin
830.9	51.07%	28.37%	0.48%	71.10%	13.47%

Potential restoration or management actions for: Jump Off Ck. in the Bangor-Port Gamble subbasin – WRIA 15; Site code (site ID): KCSSWM-030 (1295)

Restoration and Management Actions		Likelihood action would help restore the basin
In-stream	add wood	3
	add substrate	3
	enhance sinuosity	2
	replace culverts	3
	stabilize stream banks	2
Riparian	stabilize slopes	2
	plant vegetation, extend buffer	4
Agricultural BMPs	exclude livestock	0
	manage waste	0
	prevent soil loss	0
Forest BMPs	road maintenance	0
	minimize clearcutting	0
	replant	0
Mining BMPs	mining BMPs	0
Stormwater BMPs	flow controls	4
	treatment	4
	maintain storage and treatment facilities	4
	street sweeping	3
Other Approaches and Actions	limit pesticide use	2
	outreach and education campaign	3
	create incentives to follow BMPs	3
	purchase and protect property	2
	seed invertebrates	4
Is the basin at risk of further degradation?		3

Key for colors and numbers used in table:

not applicable	unlikely	possibly	likely	highly likely
0	1	2	3	4

Key restoration or management action(s) recommended and summary notes:

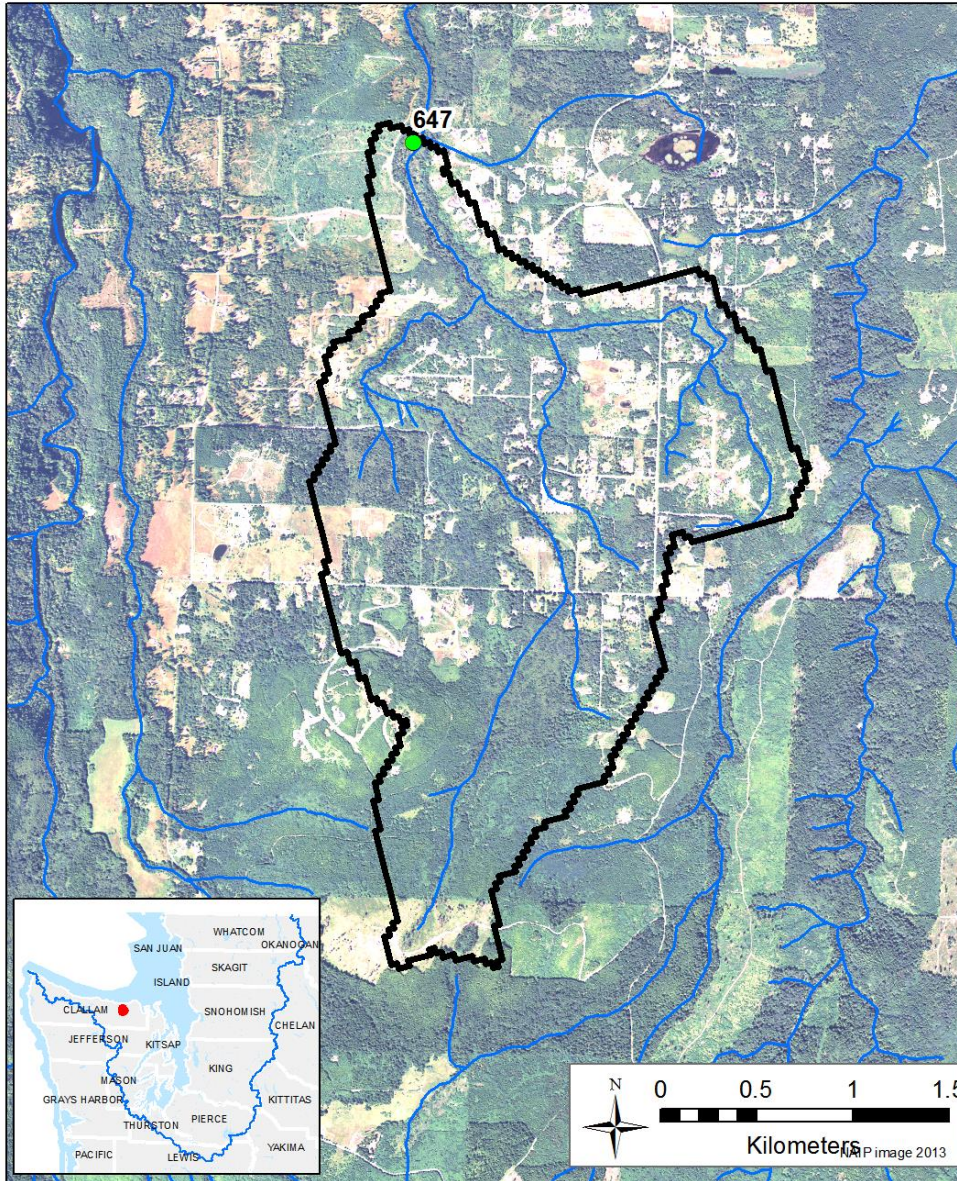
Stormwater BMPs, extend and replant buffer, outreach and in-channel actions if needed

The Jump Off Creek basin is zoned primarily for rural residential development, with a small section zoned for urban commercial/industrial development. From photos, it appears most of the buildable land has been developed, and therefore the risk of further impacts from new development may be limited. Less than half (36%) of the basin is covered under a stormwater permit, and therefore the development in any exempt areas may have included few if any stormwater controls. Stormwater retrofits are

currently planned for facilities in the lower basin (including in areas along NW Edgewood Blvd and NW Mulholland Blvd). Additional planned actions include ditch enhancements (project pending funding), and a retrofit on a private property that will include permeable pavement and bioretention. Kitsap County Public Works has also identified a culvert that needs replacing on Pioneer Way. The PSWC process analysis indicated all water flow processes may be degraded at the basin scale, and therefore stormwater retrofits or new BMPs may be appropriate in the urban and residential areas in the upper basin. In addition, in-channel restoration actions may be worthwhile given hydrologic factors have likely affected habitat conditions and BMPs may help reduce those impacts. Riparian improvements are needed in the upper basin, and outreach to homeowners encouraging minimal pesticide use may also be appropriate given the close proximity of many lawns and gardens to the creek. Seeding may also be advantageous given the basin is relatively isolated.

Bagley Ck. in the Siebert / McDonald Cks. subbasin

WRIA 18; Site code (site ID): BagleyClalCty4.6 (647)



Year	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	1999-2012 Median
B-IBI			28	30					26			30					29

Basin area (acres)	% urban within basin 1-km of site	% urban in whole basin	% pasture in whole basin	% natural in 90-m buffer in whole basin	% impervious in 2011 in whole basin
1481.8	4.78%	2.90%	0.00%	96.01%	0.56%

Potential restoration or management actions for: Bagley Ck. in the Siebert / McDonald Cks. subbasin – WRIA 18; Site code (site ID): BagleyClalCty4.6 (647)

Restoration and Management Actions		Likelihood action would help restore the basin
In-stream	add wood	4
	add substrate	2
	enhance sinuosity	2
	replace culverts	2
	stabilize stream banks	2
Riparian	stabilize slopes	1
	plant vegetation, extend buffer	2
Agricultural BMPs	exclude livestock	0
	manage waste	0
	prevent soil loss	0
Forest BMPs	road maintenance	2
	minimize clearcutting	4
	replant	3
Mining BMPs	mining BMPs	0
Stormwater BMPs	flow controls	3
	treatment	3
	maintain storage and treatment facilities	4
	street sweeping	2
Other Approaches and Actions	limit pesticide use	2
	outreach and education campaign	3
	create incentives to follow BMPs	3
	purchase and protect property	2
	seed invertebrates	3
Is the basin at risk of further degradation?		2

Key for colors and numbers used in table:

not applicable	unlikely	possibly	likely	highly likely
0	1	2	3	4

Key restoration or management action(s) recommended and summary notes:

Maintain stormwater BMPs and possibly install additional stormwater BMPs, forestry BMPs, add wood, outreach

The Bagley Creek basin is zoned primarily for rural residential, with a small portion of the upper basin zoned for forest harvest. Parcels and the age of homes vary in size and age, respectively, but most appear to be 2 to greater than 5 acres with homes built in the 1990s or 2000s. Given the age of the homes, it would be expected that some stormwater BMPs had been required at the time of building and

if this is the case, those should be maintained. Additional stormwater BMPs and outreach to homeowners may also be appropriate. The upper-most portion of the basin was recently logged and replanting may be beneficial to minimize the delivery of sediment to the channel and stabilize flows. Clallum County Public Works staff noted that under the current Critical Areas regulation, forests will continue to regrow. They also noted that large wood additions may be appropriate in this basin, though placement may be difficult due to limited access. If reach-scale habitat conditions appear good, seeding may be beneficial. If habitat conditions are poor, in-channel actions may be needed but those should be implemented after basin-scale flow processes have been restored. Fish passage may be blocked below the site and in general the basin has low intrinsic potential for fish; thus, the basin has not been prioritized in other restoration prioritization efforts.