

Water and Sediment Quality in the Sammamish River

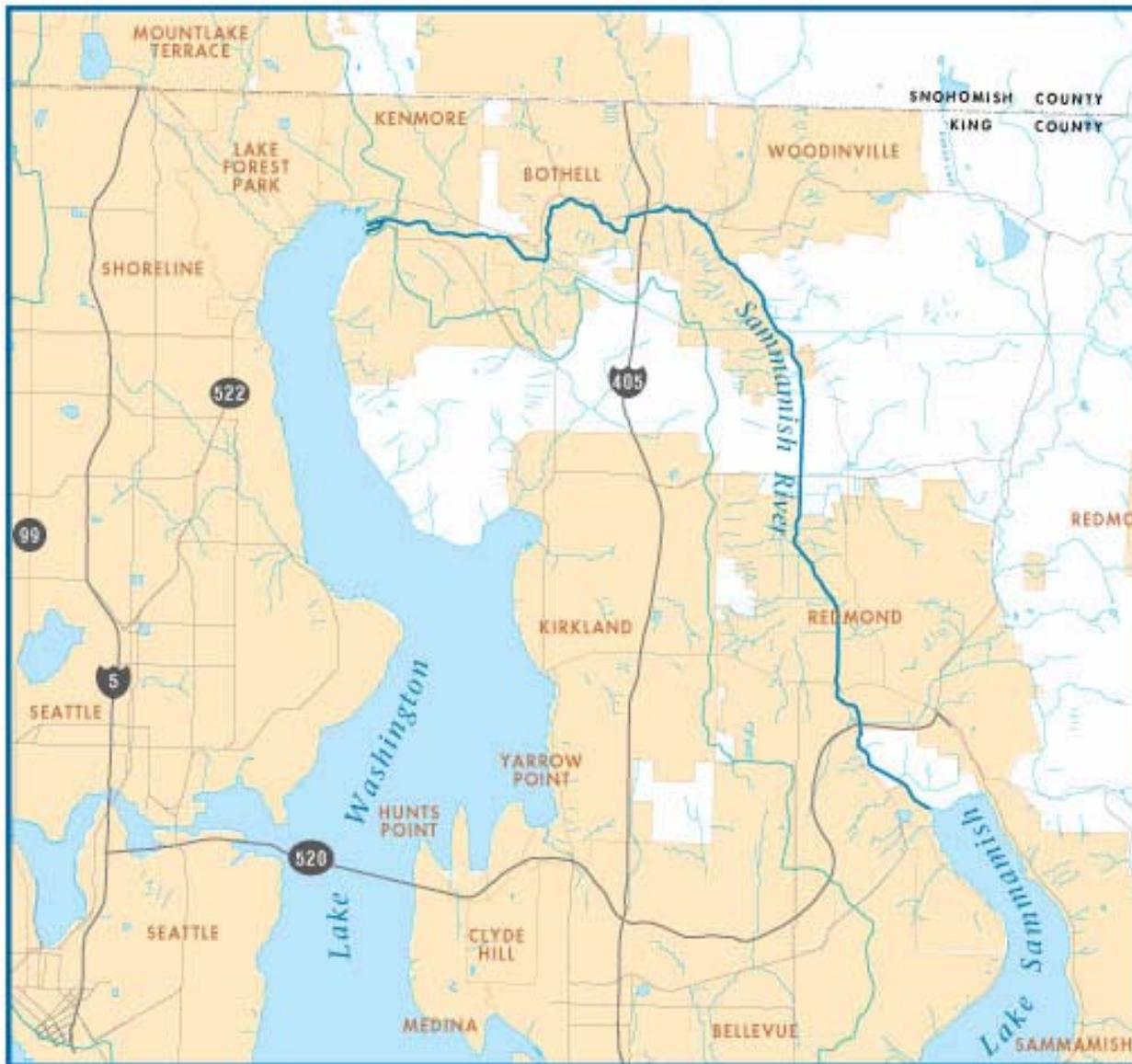
Results of a 3 Year Study
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Today

- ☛ Sammamish River background
- ☛ Study objectives
- ☛ Study design
- ☛ Data analysis
- ☛ Results
 - metals and organics only
 - no EDCs
- ☛ Summary and Conclusions

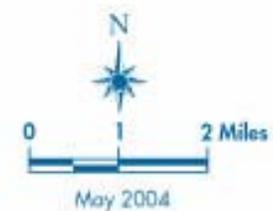
The Sammamish River

- ☞ Heavily modified system
- ☞ Slow-moving river
- ☞ Migration corridor for fish and wildlife
- ☞ Increasing human development
- ☞ Surrounded by cities of Redmond, Woodinville, Bothell
- ☞ Very little chemistry data exist



Sammamish River

-  Watershed Boundary
-  River
-  Major Road
-  Lake
-  Incorporated Area



 **King County**
 Department of Natural Resources and Parks
 Water and Land Resources Division
 Map produced by: GIS & Visual Communications Unit, WLRD
 File Name: D:\Sammamish\Drawings\Map.mxd

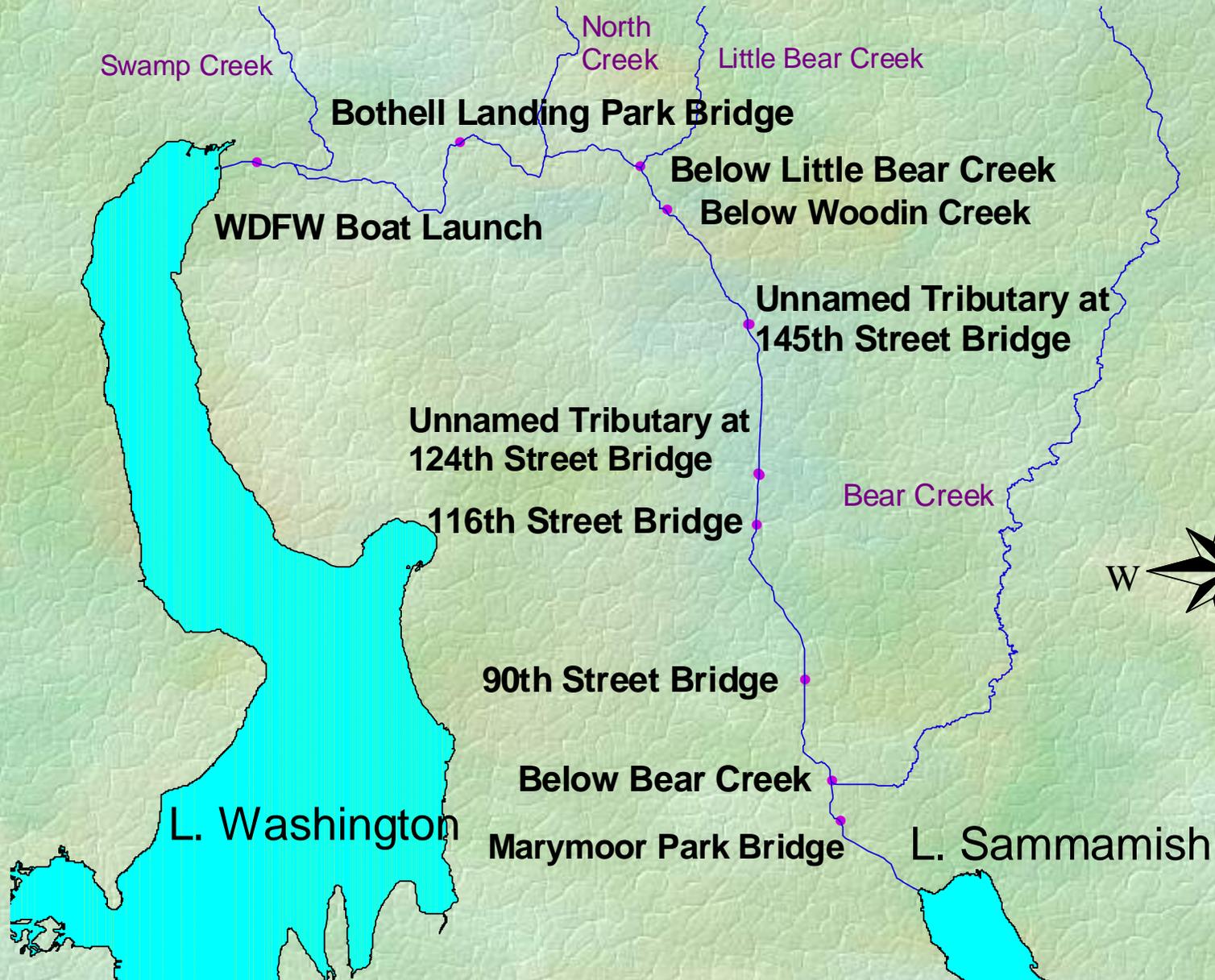




Study Objectives

- ☞ Collect baseline chemistry and benthic macroinvertebrate community data for the river
- ☞ Provide baseline data for water reuse project
- ☞ Provide information for use by other programs (e.g., salmon recovery)

Sampling Stations





Study Design

☛ Sediment

- Collected each fall in 2001, 2003
- Surface grab samples
- Nutrients, conventionals, metals, SEM/AVS, organics analyses

☛ Benthic macroinvertebrate community

- Results not complete

Study Design (continued)

☞ Water

- Collected each fall in 2001, 2002, 2003
- Nutrients, bacteria, conventionals, total and dissolved metals, organics, and EDC analyses
- USGS
 - EDC analysis for 2001
 - Wastewater Method

☞ Presenting only metals and organics results

Data Evaluation

- ☞ Average duplicates
- ☞ Determine maximum for each station
- ☞ Comparison to thresholds
 - Aquatic life thresholds for sediment and water
 - Human health thresholds for water

Ecological Thresholds

☞ Sediment

- TELs/PELs (Smith et al. 1996)
- New Floating Percentile Values (Michelson 2003) - SQS, CSL, STAT

☞ Water - Prioritized

- WAC
- AWQC
- ECOTOX database sources

Human Health Thresholds

- ☞ National Toxics Rule - mandated by EPA
- ☞ National Recommended Quality Criteria - guidelines by EPA
- ☞ Sediment quality not assessed for human health

Results

☞ Detected in sediment

- 10 metals, TBT and its derivatives,
- 11 PAHs,
- 2 phthalates,
- 6 other organics

☞ Detected in water

- 14 metals,
- 6 pesticides,
- 8 PAHs,
- 3 phthalates,
- 2 other organics

Results - Metals in Sediment

Station	Arsenic			Nickel
	TEL	PEL	FP STAT	TEL
WDFW Boat Launch	ND	ND	ND	1.6
Bothell Landing Park Bridge	1.1	<1.1	<1.1	1.4
Below Little Bear Creek	ND	ND	ND	1.2
Below Woodin Creek	3.8	1.3	1.1	1.9
145th St. Bridge	<1.1	<1.1	<1.1	1.2
124th St. Bridge	3.5	1.2	<1.1	1.3
116th St. Bridge	<1.1	<1.1	<1.1	1.1
90th St. Bridge	ND	ND	ND	1.2
Below Bear Creek	<1.1	<1.1	<1.1	1.2
Marymoor Park Bridge	<1.1	<1.1	<1.1	1.1

Results - Organics in Sediment

	Di-N-Octyl Phthalate	Benzo(a)- anthracene	Benzo(a)- pyrene	Fluor- anthene	Phen- anthrene	Pyrene
Station	FP STAT	TEL	TEL	TEL	TEL	TEL
WDFW Boat Launch	ND	<1.1	<1.1	<1.1	<1.1	1.7
Bothell Landing Park Bridge	ND	2.1	<1.1	1.4	1.5	2.8
Below Little Bear Creek	ND	<1.1	<1.1	<1.1	<1.1	1.4
Below Woodin Creek	ND	2.7	4	2.1	1.8	4.3
145th St. Bridge	ND	1.2	<1.1	<1.1	1.1	1.7
124th St. Bridge	ND	1.2	<1.1	<1.1	1.4	1.7
116th St. Bridge	ND	<1.1	ND	ND	ND	ND
90th St. Bridge	1.5	1.6	1.9	1.1	1.1	2.1
Below Bear Creek	ND	<1.1	ND	<1.1	<1.1	<1.1
Marymoor Park Bridge	ND	<1.1	ND	ND	ND	ND

Results - Metals in Water

	Dissolved Iron	Total Arsenic
Station	Acute	NTR/NRHH
WDFW Boat Launch	2.7	16
Bothell Landing Park Bridge	2.8	15
Below Little Bear Creek	4.5	15
Below Woodin Creek	3.2	13
145 St. Bridge	2.9	11
Unnamed Tributary at 145th St.	ND	12
124th St. Bridge	2.0	11
Unnamed Tributary at 124th St.	2.6	10
116th St. Bridge	2.3	10
90th St. Bridge	1.6	10
Below Bear Creek	1.1	13
Marymoor Park Bridge	0.81	8

Results - Water by USGS lab

- ☛ 13 detected organics
- ☛ 3 with aquatic life or human health thresholds
- ☛ No exceedances
- ☛ EDCs being evaluated - some detected

Spatial differences

☞ Unnamed Tributary at 124th Street

- Most exceedances for water (PAHs)
- All exceedances < 2

☞ Below Woodin Creek

- Most exceedances for sediment
- Consistently largest ratios for sediment
- Blank contamination for some PAHs

Summary - Sediment

☞ Arsenic in sediment

- Exceeds TEL and PEL
- Localized
- Not speciated - proportion inorganic?

☞ Nickel in sediment

- Natural element
- Exceedances are all slight (< 2); only TEL

Summary - Sediment

☞ PAHs in sediment

- Only TEL exceeded
- Blank contamination in 2001 BAP data
- PAHs are ubiquitous; sources may not be local

☞ Di-N-Octyl Phthalate

- Only detected at 90th Street Bridge
- Exceedance is slight (Ratio = 1.5)

Summary - Water

☞ Iron in Water (Aquatic Life)

- No Washington or EPA acute standard for iron
- Iron threshold for water based on a single toxicity study

☞ PAHs in water (Human health)

- Exceedances slight
- Mainly at one station (Unnamed trib. At 124th)

☞ Bis(2-ethylhexyl)phthalate in water (Human health)

- Exceeds both criteria at three stations
- Blank contamination may be a factor

Summary - Water

☞ Arsenic in water (Human health)

- Consistent across stations
- Within range measured in WA lakes (Jack 2003)
- Below range of anthropogenic input for WA streams (Johnson and Golding 2002)

☞ USGS

- No exceedances
- EDCs - work in progress

Conclusions

- ☞ Water quality is very good
- ☞ Sediment quality is good
- ☞ Investigate source of discharge water at 124th Street?
- ☞ Examine possible sources of elevated PAHs in sediment below Woodin Creek