



Technical Memorandum
October 21, 2018

To: Rebecca Bradley-Lowell
City of Mount Vernon
Community & Economic Development Department

From: Kate Knox Machata, PWS
Wetland Ecologist
7K Environmental, LLC

Re: 2018 HGM Monitoring Summary at Four Waters/Wetlands Reserve Sites (Kulshan, Logan, Bakerview East and Bakerview West)

This document is an update to the annual HGM monitoring summary for the four waters/wetlands reserve sites in City of Mount Vernon.

I. Introduction & Background

The City of Mount Vernon has developed a reserve system of waters/wetlands and their buffers managed by the City as part of their Critical Areas Ordinance program. The City designated a series of locations on City property as priority areas for restoration activities. As funding allows, restoration activities are being implemented on the waters/wetlands reserve sites. To date, restoration is in progress at four sites: Bakerview Park East, Bakerview Park West, Logan Creek, and Kulshan Creek (Figure 1). Following the initial phased project installation, maintenance is scheduled to occur several times each year. Annual monitoring activities are carried out on each site with monitoring reports being prepared for the typical monitoring schedule (e.g., typically Years 1, 2, 5, 7, and 10).

Scheduled monitoring efforts were completed in 2018 as described in Table 1 which outlines restoration timing and monitoring reports completed to date at four City waters/wetlands reserve restoration sites. In 2018, monitoring site visits were completed on May 4, July 1, and August 14 at Bakerview Park East and West, on May 4 and July 27 at Logan Creek, and May 4 and August 14 at Kulshan Creek restoration areas to review site progress and ensure maintenance activities are progressing as scheduled. The 2018 season is a regularly scheduled monitoring year for Bakerview West, Logan and Kulshan Creek restoration areas. 2018 is not a scheduled monitoring year for Bakerview East.

To characterize site progress and to provide information for annual City reporting on the waters/wetlands reserve program, an Hydrogeomorphic (HGM) functional assessment was run for each site in 2018 using the Mount Vernon HGM Guidebook (Lee et al. 2008). The following documentation compiles results of the HGM analyses for Bakerview Park East and West, Logan Creek, and Kulshan Creek Restoration efforts. Results of the HGM analysis for these sites are summarized in this document for use in reviewing the City waters/wetlands reserve program. Photographs are provided for each restoration area showing site conditions in 2018. HGM summary reports have been prepared annually (7K 2015, 2016, 2017).

Table 2 provides HGM functional assessment variable scores for the pre-project and 2018 current year conditions for each site. Tables 3A and 3B provide Functional Capacity Index (FCI) values for ecosystem functions defined for riverine and slope wetlands at each restoration site in 2018. Figures

2 through 5 graphically represent the change in FCI for restoration site from pre-project to current conditions. Lift has been observed in many of the ecosystem functions relative following baseline conditions. Table 4 calculates Functional Capacity Units (FCU = FCI X Project Area, in acres) across the restoration sites. Many variables have remained unchanged between 2015, 2016, 2017, and 2018 monitoring years (see also 7K 2015, 2016, and 2017). Thus, there are few changes to the FCI/FCU tables and graphs between successive monitoring year reports. There are slow incremental increases in functions as plant coverage increases and the sites develop.

At Logan Creek, the installed trees are beginning to reach the tree canopy and lift was observed in several additional functions over prior year monitoring results. The HGM review at Logan Creek exhibited lift in several variables as the installed trees are reaching tree canopy height. As the plant communities continue to develop, additional lift is expected in many functions in coming years. Overview photographs which show current conditions are provided in section IV.

This year, 2018, is the tenth and final year of monitoring for the Bakerview West. A final summary report was completed for that site dated August 31, 2018 (7K 2018). The Bakerview west site will not be re-evaluated in future years as the project had a 10-year monitoring period unless additional phases of planting are undertaken at this site.

There were no changes in variable scores for Bakerview Park East from 2015 to 2018 as tree and shrub growth has not met additional thresholds.

Slight increases in V_{SHRUB} and V_{NATIVE} were realized at Kulshan Creek from baseline to 2016 but no additional functional lift occurred from 2016 to 2018 as additional plant community thresholds have not been met.

Based on limited available funding in 2018 and opportunity for reduced rate supplemental planting offered by Shelterbelt Inc, supplemental planting is proposed as follows for the 2018-2019 winter season.

1. Plant at Logan Creek site 35 conifers with mix of *Pseudotsuga menziesii* and *Thuja plicata*.
2. Plant at Bakerview East site 20 *Thuja plicata* and 10 *Pseudotsuga menziesii* (Be careful if selecting microsites for planting on south side of trail as it stays very wet across much of this and we have lost lots of trees there in the wettest parts)
3. Plant at Kulshan Creek site 35 conifers with mix of *Thuja plicata*, and *Pseudotsuga menziesii*.

These sites will be reviewed in 2019.

II. Tables

Table 1. Summary of reporting status for Mount Vernon waters/wetlands restoration reserve sites.

Restoration Site	Year(s) Installed	Baseline Report Year	Year 1 Report	Year 2 Report	Year 3 Report	Year 5 Report	Year 7 Report	Year 10 Report	Monitoring Year Status in 2018
Bakerview Park West – Riverine Wetland	Spring 2008	April 2008	N/A	N/A	N/A	July 8, 2013	Oct.19, 2015	Aug. 31, 2018	Year 10
Logan Creek-Riverine Wetland	Fall 2010	Feb. 28, 2011	March 25, 2012	April 25, 2013	Nov.17, 2014	Dec 2016	Aug. 31, 2018	TBD 2021	Year 7
Kulshan Creek – Riverine Wetland	2011-2013	Nov. 21, 2013	Nov.12, 2014	Nov. 13, 2015	N/A	Oct. 23, 2018	TBD 2019	TBD 2022	Year 5
Bakerview Park East – Slope Wetland	Fall 2009	Combined with Year 1	Feb. 11, 2011	N/A	July 7, 2013	Oct.14, 2015	Dec.21 2017	TBD 2020	Year 8

Table 2. Summary of 2018 HGM variable scoring for each restoration site.

Variables	Riverine Wetland HGM						Slope Wetland HGM	
	Bakerview Park West		Logan Creek		Kulshan Creek		Bakerview Park East	
	Pre-restoration	Conditions after Restoration	Pre-restoration	Conditions after Restoration	Pre-restoration	Conditions after Restoration	Pre-restoration	Conditions after Restoration
	Year 0	Year 10	Year 0	Year 7	Year 0	Year 5	Year 0	Year 8
V _{BARRIER}	0.75	0.75	0.5	0.75	0.5	0.5	-	-
V _{PATCHAREA}	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
V _{PATCHLATCON}	0.1	0.1	0.5	0.5	0.25	0.25	0.25	0.25
V _{PATCHLONGCON}	0.75	0.75	0.75	0.75	0.25	0.25	-	-
V _{PATCHNUMBER}	0.1	0.1	0.75	0.75	0.25	0.25	0.25	0.25
V _{ROADS}	0.25	0.25	0.5	0.5	0.5	0.5	-	-
V _{TREE}	0.25	0.75	0.25	0.5	0.25	0.25	0.1	0.75
V _{FLOODTREE}	0.75	0.75	0.25	0.5	0.25	0.25	-	-
V _{SHRUB}	0.75	0.75	0.75	0.5	0.25	0.50	0.1	0.75
V _{HERB}	0.25	0.25	0.25	0.75	0.25	0.25	0.1	0.75
V _{LITTER}	0.75	0.75	0.25	0.25	0.25	0.25	0.1	0.5
V _{INLW}	0	0.1	0.1	0.1	0.1	0.1	-	-
V _{KEYPIECE}	0	0.25	0.25	0.5	0.1	0.1	-	-
V _{SHADE}	0.1	0.5	0.5	0.75	0.1	0.25	-	-
V _{FPAXS}	0.5	0.5	0.75	1	0.5	0.5	-	-
V _{GEOFORM}	0.25	0.25	0.5	0.75	0.1	0.25	-	-
V _{LONGPROF}	0.75	0.75	0.25	0.75	0.1	0.1	-	-
V _{NATIVE}	0.25	0.75	0.1	0.25	0.1	0.5	0.25	0.75
V _{OFFCHANWOOD}	0.1	0.1	0.1	0.1	0.25	0.5	-	-
V _{SOILINTEG}	0.75	0.75	0.5	0.5	0.25	0.25	0.1	0.5
V _{STRATA}	0.75	0.75	0.5	0.5	0.25	0.25	0.1	0.75
V _{SLOPETREE}	0.1	0.25	0.1	0.25	0.1	0.1	-	-
V _{SED}	0.25	0.25	0.25	0.25	0.1	0.1	-	-
V _{RIPBUFFWIDTH}	0.25	0.5	0.25	0.5	0.1	0.25	-	-
V _{SUBOUT}	Variables Not Applicable to Riverine HGM						0.1	0.25
V _{SURFIN}							0.1	0.5
V _{BUFFWIDTH}							0.25	0.25
V _{BUFFCOND}							0.5	0.5
V _{BUFFCONTIG}							0.1	0.1
V _{LWOOD}							0	0.75
V _{MICRO}							0.1	0.75

Table 3A. Summary of 2018 FCI scores for Riverine HGM restoration sites.

Function		Bakerview Park West			Logan Creek			Kulshan Creek		
		Baseline Pre-project	Year 10 (2018)	Pre-project to Year 10	Baseline Pre-project	Year 7 (2018)	Pre-project to Year 7	Baseline Pre-project	Year 5 (2018)	Pre-project to Year 5
		FCI	FCI	Δ_b	FCI	FCI	Δ_b	FCI	FCI	Δ_b
PHYSICAL	A. Hydrology									
	1. Surface and Subsurface Water Storage and Exchange	0.63	0.63	0.00	0.63	0.75	0.12	0.38	0.38	0.00
	2. Surface Water Flow	0.56	0.61	0.05	0.47	0.78	0.31	0.28	0.28	0.00
	3. Channel Migration	0.30	0.47	0.17	0.42	0.52	0.05	0.24	0.24	0.00
	B. Biogeochemistry									
	4. Cycling of Elements and Compounds	0.44	0.48	0.04	0.29	0.33	0.04	0.23	0.29	0.06
	5. Detention of Imported Elements and Compounds	0.39	0.53	0.14	0.35	0.49	0.14	0.18	0.18	0.00
	6. Detention of Imported Particulates	0.35	0.40	0.05	0.48	0.65	0.17	0.24	0.28	0.04
7. Organic Carbon Export	0.58	0.67	0.09	0.46	0.54	0.08	0.25	0.25	0.00	
BIOLOGICAL	C. Plant Community									
	8. Plant Community	0.44	0.75	0.31	0.34	0.38	0.04	0.21	0.25	0.04
	9. Detrital Biomass	0.21	0.30	0.09	0.18	0.24	0.26	0.18	0.24	0.06
	D. Faunal Support									
	10. Spatial Structure of Habitats	0.44	0.60	0.16	0.34	0.56	0.22	0.15	0.20	0.05
	11. Interspersion of Connectivity of Habitats	0.34	0.34	0.00	0.59	0.66	0.07	0.38	0.38	0.00
12. Anadromous & Resident Fish Habitat - moderate	0.25	0.37	0.12	0.37	0.56	0.17	0.23	0.26	0.03	

Table 3B. Summary of 2018 FCI scores for Slope HGM restoration site – Bakerview Park East. Note that minor discrepancies in subtraction in this table are due to rounding error. There was no change in scores for Bakerview Park East from 2015 to 2018 as this site is moderately mature and no additional plant community thresholds have been met.

		Bakerview Park East		
		Baseline Pre-project	Year 8 (2018)	Pre-project to Year 8
		FCI	FCI	Δ_b
PHYSICAL	A. Hydrology			
	1. <i>Surface and Subsurface Water Storage and Exchange</i>	0.10	0.51	0.41
	2. <i>Landscape Hydrologic Connections</i>	0.14	0.46	0.32
	B. Biogeochemistry			
	3. <i>Cycling of Elements and Compounds</i>	0.12	0.43	0.30
	4. <i>Retention and Detention of Particulates</i>	0.15	0.49	0.34
	5. <i>Organic Carbon Export</i>	0.15	0.43	0.28
BIOLOGICAL	C. Plant Community			
	6. <i>Plant Community</i>	0.10	0.56	0.46
	7. <i>Detrital System</i>	0.07	0.47	0.41
	D. Faunal Support			
	8. <i>Spatial Structure of Habitats</i>	0.15	0.49	0.34
	9. <i>Interspersion of Connectivity of Habitats</i>	0.26	0.26	0.00

Table 4A. Summary of 2017 FCU scores for Riverine HGM restoration sites. There was no change in variables for Logan Creek, or Bakerview Park West from 2015 to 2017 as these sites are moderately mature. Slight increases were realized at Kulshan Creek from 2015 to 2017.

Function		Bakerview Park West 1.5 acres			Logan Creek 0.67 acres			Kulshan Creek Phase 1 is part of 2.5 acres		
		Baseline Pre- project	Year 10 (2018)	Pre- project to Year 10	Baseline Pre- project	Year 7 (2018)	Pre- project to Year 7	Baseline Pre- project	Year 5 (2018)	Pre- project to Year 5
		FCU	FCU	Δ_b	FCU	FCU	Δ_b	FCU	FCU	Δ_b
PHYSICAL	A. Hydrology									
	1. Surface and Subsurface Water Storage and Exchange	0.94	0.94	0.00	0.42	0.50	0.08	0.95	0.95	0.00
	2. Surface Water Flow	0.84	0.92	0.08	0.31	0.52	0.21	0.70	0.70	0.00
	3. Channel Migration	0.45	0.71	0.26	0.28	0.35	0.07	0.60	0.60	0.00
	B. Biogeochemistry									
	4. Cycling of Elements and Compounds	0.66	0.72	0.07	0.19	0.22	0.03	0.58	0.73	0.15
	5. Detention of Imported Elements and Compounds	0.585	0.79	0.21	0.23	0.33	0.09	0.45	0.45	0.00
	6. Detention of Imported Particulates	0.525	0.59	0.07	0.32	0.43	0.11	0.60	0.70	0.10
7. Organic Carbon Export	0.87	1.00	0.13	0.31	0.36	0.06	0.63	0.63	0.00	
BIOLOGICAL	C. Plant Community									
	8. Plant Community	0.66	1.13	0.47	0.23	0.25	0.02	0.53	0.63	0.10
	9. Detrital Biomass	0.315	0.45	0.14	0.12	0.29	0.17	0.45	0.60	0.15
	D. Faunal Support									
	10. Spatial Structure of Habitats	0.66	0.90	0.24	0.23	0.38	0.15	0.38	0.50	0.13
	11. Interspersion of Connectivity of Habitats	0.51	0.51	0.00	0.39	0.44	0.05	0.95	0.95	0.00
12. Anadromous & Resident Fish Habitat- mod.	0.375	0.56	0.18	0.26	0.37	0.11	0.58	0.65	0.08	

Table 4B. Summary of 2017 FCU scores for Slope HGM restoration site – Bakerview East. Note that minor discrepancies in subtraction in this table are due to rounding error. There was no change in scores for Bakerview Park East from 2015 to 2018 as this site is moderately mature and no additional plant community thresholds have been reached.

		Bakerview Park East slope 1.34 acres		
		Baseline Pre-project	Year 8 (2018)	Pre-project to Year 8
		FCU	FCU	Δ_b
PHYSICAL	A. Hydrology			
	<i>1. Surface and Subsurface Water Storage and Exchange</i>	0.13	0.68	0.55
	<i>2. Landscape Hydrologic Connections</i>	0.18	0.61	0.43
	B. Biogeochemistry			
	<i>3. Cycling of Elements and Compounds</i>	0.16	0.57	0.41
	<i>4. Retention and Detention of Particulates</i>	0.20	0.65	0.46
	<i>5. Organic Carbon Export</i>	0.20	0.57	0.37
BIOLOGICAL	C. Plant Community			
	<i>6. Plant Community</i>	0.13	0.74	0.61
	<i>7. Detrital System</i>	0.09	0.63	0.54
	D. Faunal Support			
	<i>8. Spatial Structure of Habitats</i>	0.20	0.65	0.46
	<i>9. Interspersion of Connectivity of Habitats</i>	0.35	0.35	0.00

III. Figures

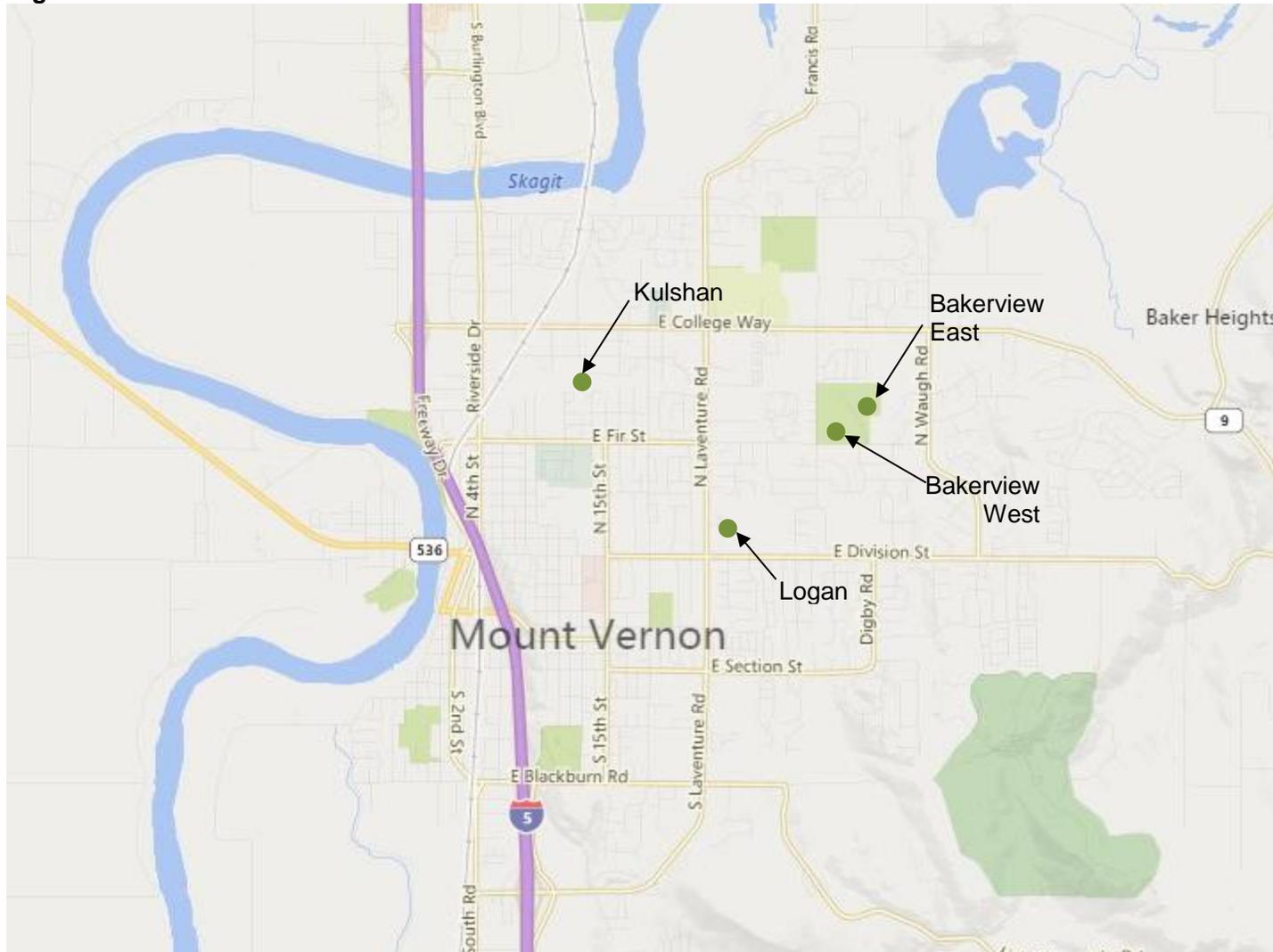


Figure 1. Approximate project locations of four City of Mount Vernon waters/wetlands reserve sites

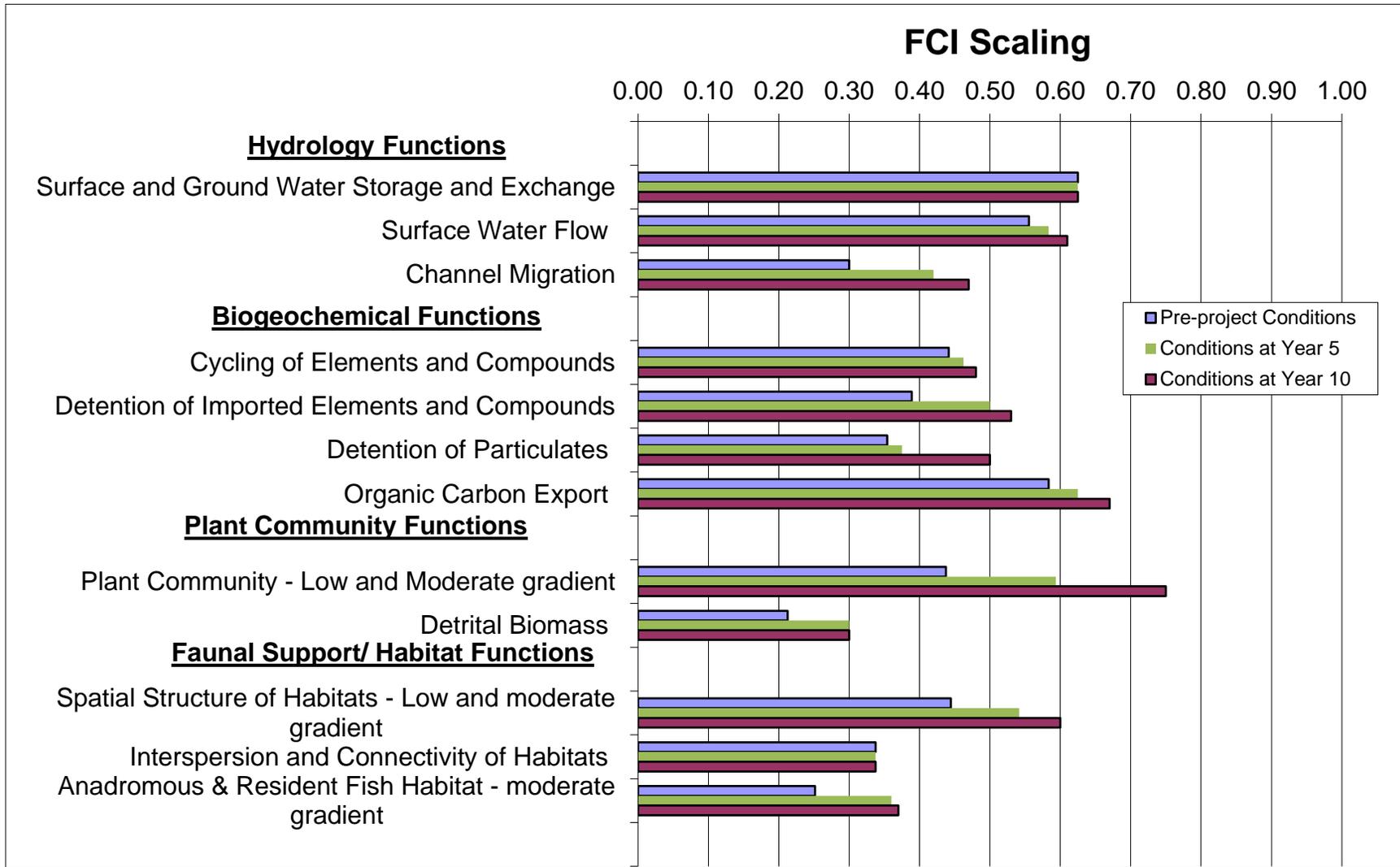


Figure 2. Bakerview Park West Riverine Wetland HGM Functional Capacity Index (FCI) scaling comparing pre-project, Year 5, and Year 10.

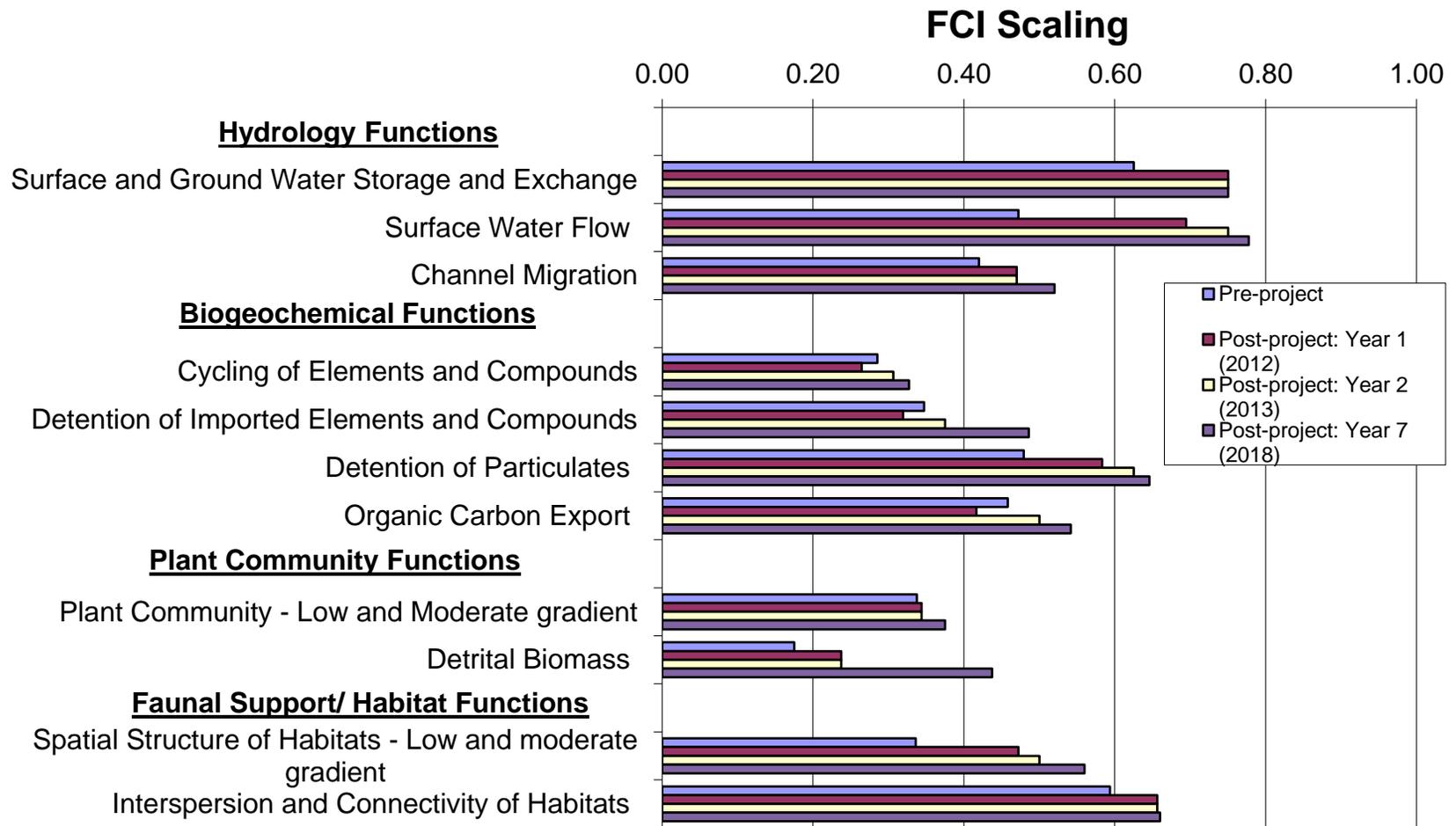


Figure 3. Logan Creek Riverine Wetland HGM Functional Capacity Index (FCI) scaling comparing pre-project and Year 7.

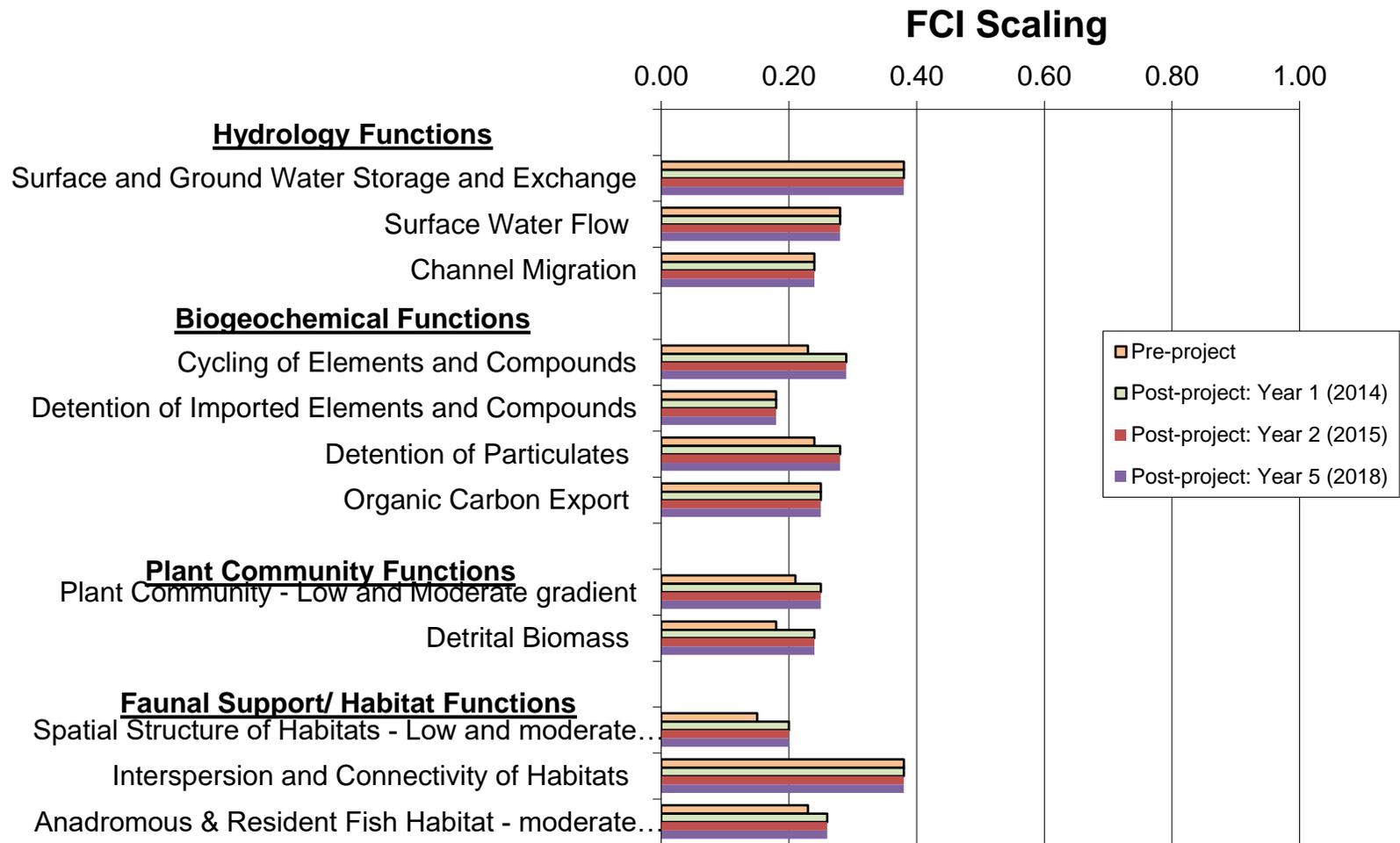


Figure 4. Kulshan Creek Riverine Wetland HGM Functional Capacity Index (FCI) scaling comparing pre-project, Year 1, 2, and 5.

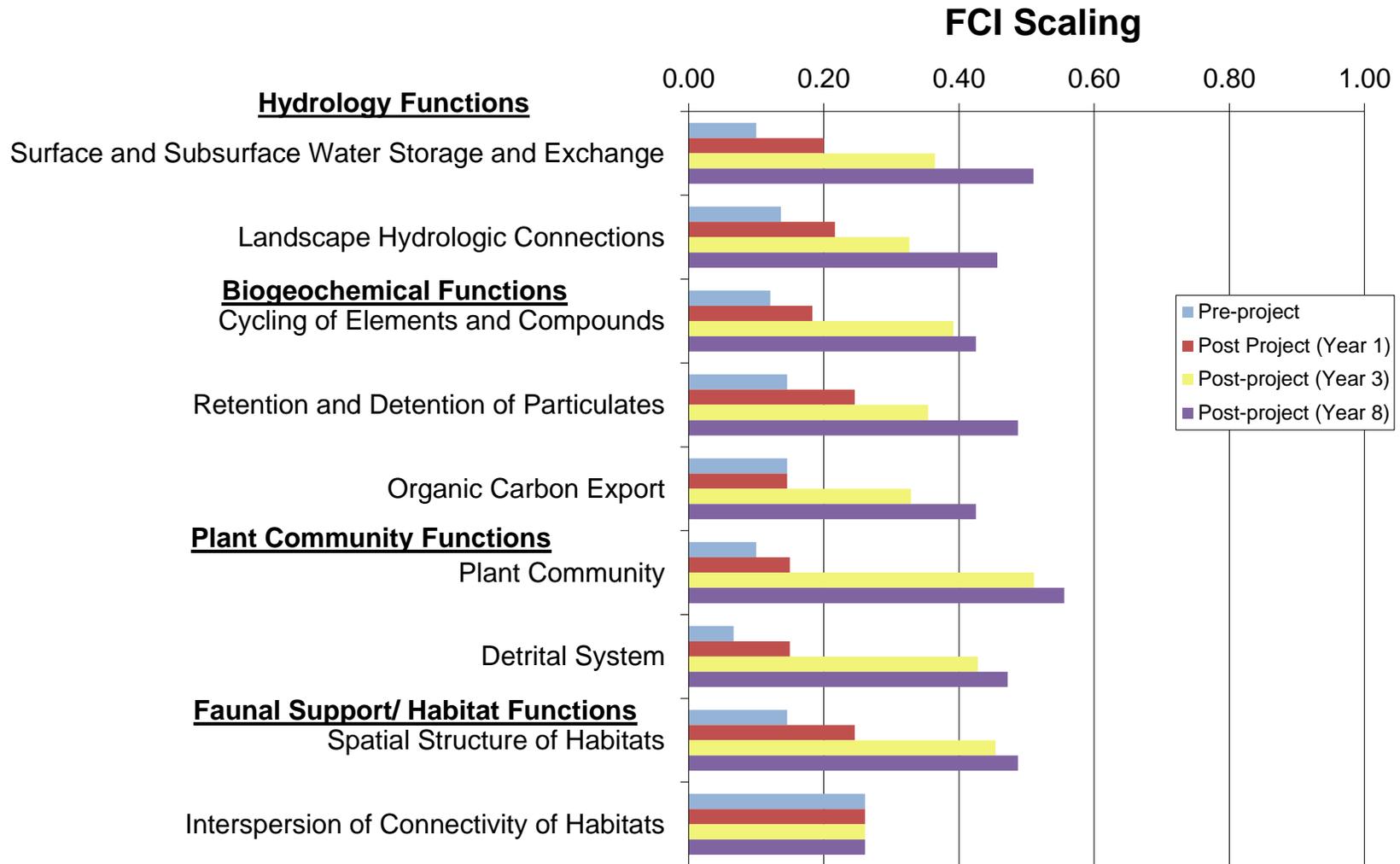


Figure 5. Site trajectory for HGM functional assessment Functional Capacity Indices pre-project, 1st year (2011), 3rd year (2013), and 5th and 8th year (2015 and 2018) post-project at Bakerview Park East slope wetland restoration. Note that there was no additional lift in functions between Years 5 and 8 and thus these results are presented together.

IV. 2018 Site Overview Photographs

A. Bakerview Park West (2018 - Year 10)



Conifer growth at Year 7



Alder recruitment at Year 7 in mowed reed canarygrass.



Conifer growth at Year 7 below existing canopy.



Flagging on understory tree and shrub plantings below alder canopy.

B. Kulshan Creek (2018 - Year 5)



Conifer interplanting below alder canopy.



Conifer interplanting under existing alder canopy.



Trail installation is stable with conifer interplanting and extensive recruitment of cottonwood.



Large wood and microdepression/mound complex with plantings and alder-poplar recruitment. Alder and cottonwood recruitment is extensive in this area.

C. Bakerview Park East (2018 – Year 8)



Planted stock is providing tree and shrub canopy cover in the Bakerview Park East restoration area.



Alder and cottonwood are recruiting within the restoration area.



The microdepressions have native sedge and rush species. *Typha* sp. has recruited in one of the microdepressions.



The slope wetland is dominated by native plants.

D. Logan Creek (2018 - Year 7)



Some conifers have survived on the slope along Logan Creek.



Canopy cover is developing in the planted area.



Plant growth within riparian buffer.



Keypiece installed in Logan Creek remains stable.

V. References cited

- Lee, L.C., K.L. Fetherston, A.K. Knox and P.L. Fiedler. 2008. Draft Guidebook to Assessment of Riverine, Slope and Depressional Waters/Wetlands in the City of Mount Vernon, Washington. Prepared for the City of Mount Vernon by WSP Environmental Strategies.
- 7K Environmental. 2015. HGM Monitoring Summary at Four Waters/Wetlands Reserve Sites (Kulshan, Logan, Bakerview East and Bakerview West). Technical memorandum prepared for Rebecca Lowell, City of Mount Vernon. Dated November 14, 2015.
- 7K Environmental. 2016. HGM Monitoring Summary at Four Waters/Wetlands Reserve Sites (Kulshan, Logan, Bakerview East and Bakerview West). Technical memorandum prepared for Rebecca Lowell, City of Mount Vernon. Dated November 21, 2016.
- 7K Environmental. 2017. HGM Monitoring Summary at Four Waters/Wetlands Reserve Sites (Kulshan, Logan, Bakerview East and Bakerview West). Technical memorandum prepared for Rebecca Lowell, City of Mount Vernon. Dated December 28, 2017.
- 7K Environmental LLC. 2018. Bakerview Park West Riparian Buffer Enhancement: Year 10 HGM Functional Assessment City of Mount Vernon, Skagit County, Washington. Prepared for City of Mount Vernon. 11 pages.