



**Technical Memorandum
December 2, 2020**

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

From: Kate Knox Machata, PWS
Wetland Ecologist
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Re: 2020 HGM Monitoring Summary at 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 three sites: Bakerview Park East, Logan Creek, and Kulshan Creek (Figure 1). Bakerview Park West completed the 10th year of monitoring in 2018. Following the initial phased project installation, maintenance is scheduled to occur several times each year under contract to Shelterbelt. Annual monitoring activities are carried out by 7K Environmental LLC 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 2020 as described in Table 1 which outlines restoration timing and monitoring reports completed to date at four City waters/wetlands reserve restoration sites. In 2020, monitoring site visits were completed on August 1, 2020 to review site progress and ensure maintenance activities are progressing as scheduled. This 2020 season is not a regularly scheduled monitoring year Logan Creek site, but is Year 10 for Bakerview East and Year 7 for Kulshan Creek. Photographs are included in Appendix A.

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 sites in 2019 using the Mount Vernon HGM Guidebook (Lee et al. 2008). The following documentation compiles results of the HGM analyses for Bakerview Park East, 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. This HGM summary report has been prepared annually (7K 2015, 2016, 2017, 2018, 2019).

Table 2 provides HGM functional assessment variable scores for the pre-project and 2020 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 2020. 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, and 2020 monitoring years (see also 7K 2015, 2016, 2017, 2018, 2019). However, as the site progresses to meet additional tree canopy thresholds, there are a few increases in the FCI/FCU tables and graphs this year. There are slow incremental increases in functions as plant coverage increases and the sites develop.

At Logan Creek in 2018, the HGM review exhibited lift in several variables as the installed trees are reaching tree canopy height. No additional change in variables was observed in 2019 or 2020. In 2020, the supplemental plant stock appears to be healthy and is showing good survival. Trees and shrubs are reaching canopy thresholds and are starting to provide a more contiguous habitat in the riparian area. As the plant communities continue to develop, lift is expected in several additional functions.

This year, 2020, is the twelfth year following installation of the Bakerview West mitigation area, so it is beyond the required 10-year monitoring period. A final summary report was completed for that site dated August 31, 2018 (7K 2018). The Bakerview west site will not be fully re-evaluated in future years as the project had a 10-year monitoring period unless additional phases of planting are undertaken at this site. We aim to continue brief site visit to this mitigation area and to run the HGM assessment every 5 years.

There were increases in variable scores and functions at Bakerview Park East in 2020 as tree and shrub growth meets additional thresholds. Alders were thinned on the west part of the Bakerview East mitigation area by the Shelterbelt team to reduce competition with planted stock while preserving cover to reduce weed pressure. Tree and shrub cover is creating a larger and more contiguous native habitat patch that prior to restoration. This site has developed well and is in line with performance standards.

Slight increases were realized in 9 of 12 functions at Kulshan Creek from baseline to Year 7 (2020) as additional plant community thresholds are been met. Trees installed at this site starting to meet height thresholds to realize lift in plant community functions.

Supplemental planting was undertaken as of March 16, 2019 by Shelterbelt (Noah Booker) as follows at the three active mitigation sites. Installed plants are listed by site below:

1. Logan Creek: Shelterbelt planted 10 *Thuja plicata* and 25 *Pseudotsuga menziesii* in blue tubes.
2. Bakerview East: Shelterbelt planted 14 *Thuja plicata* and 16 *Populus tremuloides* in blue tubes. *Populus tremuloides* installed mostly south of trail where site very wet.
3. Kulshan Creek: Shelterbelt planted 30 *Thuja plicata* and 5 *Pseudotsuga menziesii* in blue tubes.

In 2020, survival of these remains high. Additionally, note that Shelterbelt completed alder thinning in the western portion of Bakerview East mitigation area in 2020.

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 2020
Bakerview Park West – Riverine Wetland	Spring 2008	April 2008	N/A	N/A	N/A	July 8, 2013	Oct. 19, 2015	Aug. 31, 2018	Monitoring Period Complete
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 9
Kulshan Creek – Riverine Wetland	2011-2013	Nov. 21, 2013	Nov. 12, 2014	Nov. 13, 2015	N/A	Oct. 23, 2018	Dec 2, 2020	TBD 2023	Year 7
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	Dec 1, 2020	Year 10

Table 2. Summary of 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 8	Year 0	Year 7	Year 0	Year 10
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	0.5
V _{PATCHLATCON}	0.1	0.1	0.5	0.5	0.25	0.25	0.25	0.5
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	0.5	0.1	0.75
V _{FLOODTREE}	0.75	0.75	0.25	0.5	0.25	0.5	-	-
V _{SHRUB}	0.75	0.75	0.75	0.5	0.25	0.5	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	0.5	-	-
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	0.5	0.1	0.75
V _{SLOPETREE}	0.1	0.25	0.1	0.25	0.1	0.5	-	-
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	0.1	-	-
V _{SUBOUT}	Variables Not Applicable to Riverine HGM						0.1	0.25
V _{SURFIN}							0.1	0.5
V _{BUFFWIDTH}							0.25	0.5
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 2020 FCI scores for Riverine HGM restoration sites. Note Bakerview West will not be reassessed until Year 15; Year 10 values are reported.

Function		Bakerview Park West			Logan Creek			Kulshan Creek		
		Baseline Pre-project	Year 10 (2018)	Pre-project to Year 10	Baseline Pre-project	Year 9 (2020)	Pre-project to Year 9	Baseline Pre-project	Year 7 (2020)	Pre-project to Year 7
		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	0.34	0.06
	3. Channel Migration	0.30	0.47	0.17	0.42	0.52	0.05	0.24	0.34	0.10
	B. Biogeochemistry									
	4. Cycling of Elements and Compounds	0.44	0.48	0.04	0.29	0.33	0.04	0.23	0.34	0.11
	5. Detention of Imported Elements and Compounds	0.39	0.53	0.14	0.35	0.49	0.14	0.18	0.23	0.05
	6. Detention of Imported Particulates	0.35	0.40	0.05	0.48	0.65	0.17	0.24	0.32	0.08
7. Organic Carbon Export	0.58	0.67	0.09	0.46	0.54	0.08	0.25	0.33	0.08	
BIOLOGICAL	C. Plant Community									
	8. Plant Community	0.44	0.75	0.31	0.34	0.38	0.04	0.21	0.50	0.29
	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	0.31	0.16
	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	0.29	0.06	

Table 3B. Summary of 2020 FCI scores for Slope HGM restoration site – Bakerview Park East. Note that minor discrepancies in subtraction in this table are due to rounding error.

		Bakerview Park East		
		Baseline Pre-project	Year10 (2020)	Pre-project to Year 10
		FCI	FCI	Δ_b
PHYSICAL	A. Hydrology			
	1. <i>Surface and Subsurface Water Storage and Exchange</i>	0.10	0.59	0.49
	2. <i>Landscape Hydrologic Connections</i>	0.14	0.47	0.33
	B. Biogeochemistry			
	3. <i>Cycling of Elements and Compounds</i>	0.12	0.59	0.47
	4. <i>Retention and Detention of Particulates</i>	0.15	0.59	0.44
	5. <i>Organic Carbon Export</i>	0.15	0.53	0.38
BIOLOGICAL	C. Plant Community			
	6. <i>Plant Community</i>	0.10	0.75	0.46
	7. <i>Detrital System</i>	0.07	0.67	0.60
	D. Faunal Support			
	8. <i>Spatial Structure of Habitats</i>	0.15	0.65	0.50
	9. <i>Interspersion of Connectivity of Habitats</i>	0.26	0.41	0.15

Table 4A. Summary of 2020 FCU scores for Riverine HGM restoration sites. There was no change in variables for Logan Creek, or Bakerview Park West from 2015 to 2020 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 9 (2020)	Pre- project to Year 9	Baseline Pre- project	Year 7 (2020)	Pre- project to Year 7
		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	0.85	0.15
	3. Channel Migration	0.45	0.71	0.26	0.28	0.35	0.07	0.60	0.85	0.25
	B. Biogeochemistry									
	4. Cycling of Elements and Compounds	0.66	0.72	0.07	0.19	0.22	0.03	0.58	0.84	0.24
	5. Detention of Imported Elements and Compounds	0.585	0.79	0.21	0.23	0.33	0.09	0.45	0.58	0.13
	6. Detention of Imported Particulates	0.525	0.59	0.07	0.32	0.43	0.11	0.60	0.79	0.19
7. Organic Carbon Export	0.87	1.00	0.13	0.31	0.36	0.06	0.63	0.83	0.20	
BIOLOGICAL	C. Plant Community									
	8. Plant Community	0.66	1.13	0.47	0.23	0.25	0.02	0.53	1.25	0.72
	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	0.78	0.4
	11. Interspersion of Connectivity of Habitats	0.51	0.51	0.00	0.39	0.44	0.05	0.95	0.95	0
12. Anadromous & Resident Fish Habitat- mod.	0.375	0.56	0.18	0.26	0.37	0.11	0.58	0.73	0.15	

Table 4B. Summary of 2020 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 10 (2020)	Pre-project to Year 10
		FCU	FCU	Δ_b
PHYSICAL	A. Hydrology			
	1. <i>Surface and Subsurface Water Storage and Exchange</i>	0.13	0.80	0.67
	2. <i>Landscape Hydrologic Connections</i>	0.18	0.63	0.45
	B. Biogeochemistry			
	3. <i>Cycling of Elements and Compounds</i>	0.16	0.79	0.63
	4. <i>Retention and Detention of Particulates</i>	0.20	0.71	0.51
	5. <i>Organic Carbon Export</i>	0.20	1.01	0.81
BIOLOGICAL	C. Plant Community			
	6. <i>Plant Community</i>	0.13	0.88	0.75
	7. <i>Detrital System</i>	0.09	0.55	0.46
	D. Faunal Support			
	8. <i>Spatial Structure of Habitats</i>	0.20	0.63	0.43
	9. <i>Interspersion of Connectivity of Habitats</i>	0.35	0.79	0.44

III. Figures

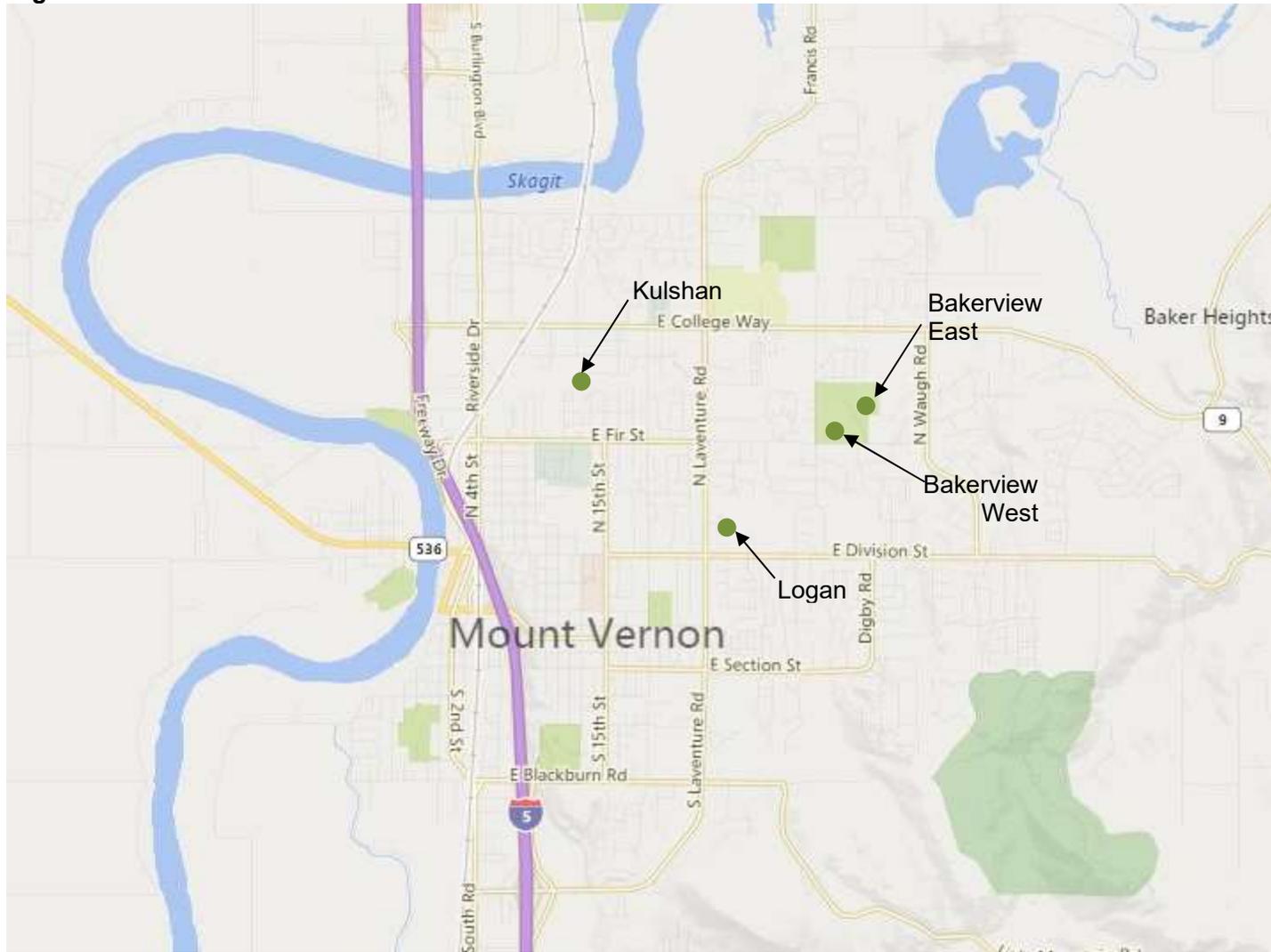


Figure 1. Approximate project locations of four City of Mount Vernon waters/wetlands reserve sites

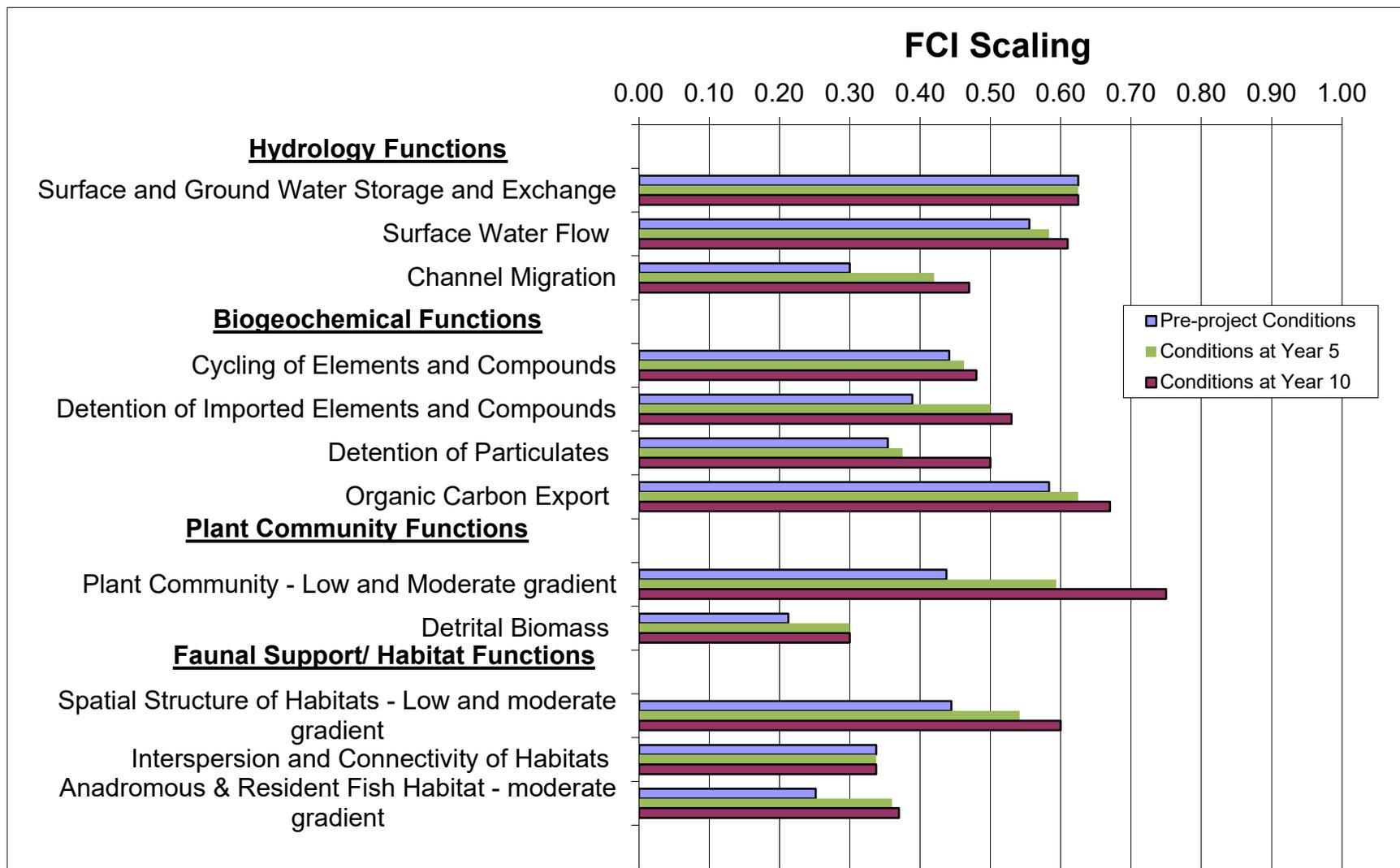


Figure 2. Bakerview Park West Riverine Wetland HGM Functional Capacity Index (FCI) scaling comparing pre-project, Year 5, and Year 10.

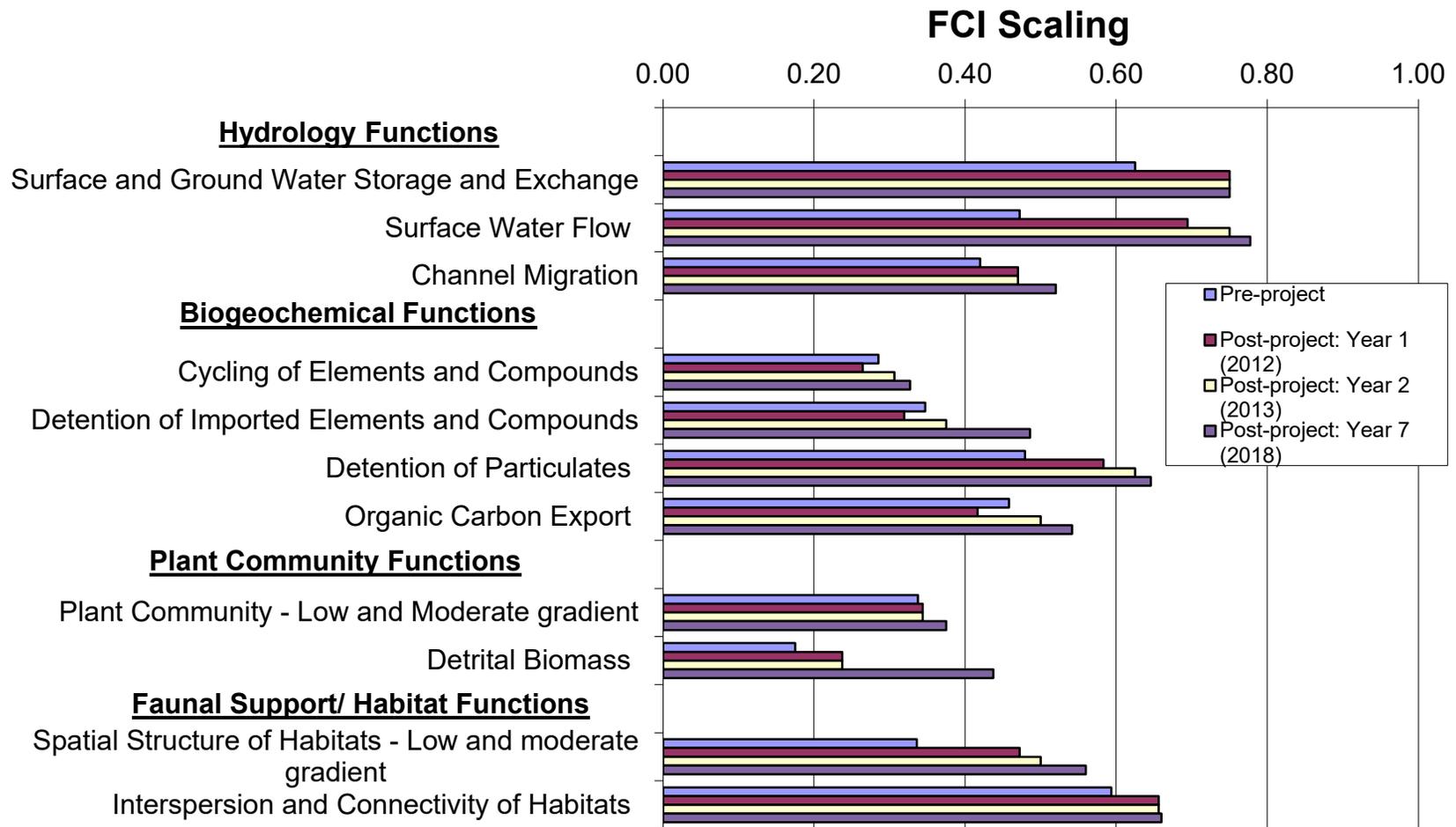


Figure 3. Logan Creek Riverine Wetland HGM Functional Capacity Index (FCI) scaling comparing pre-project and Year 7. Note there are not changes to FCI Scaling in 2020 (Year 9) so this figure was not updated.

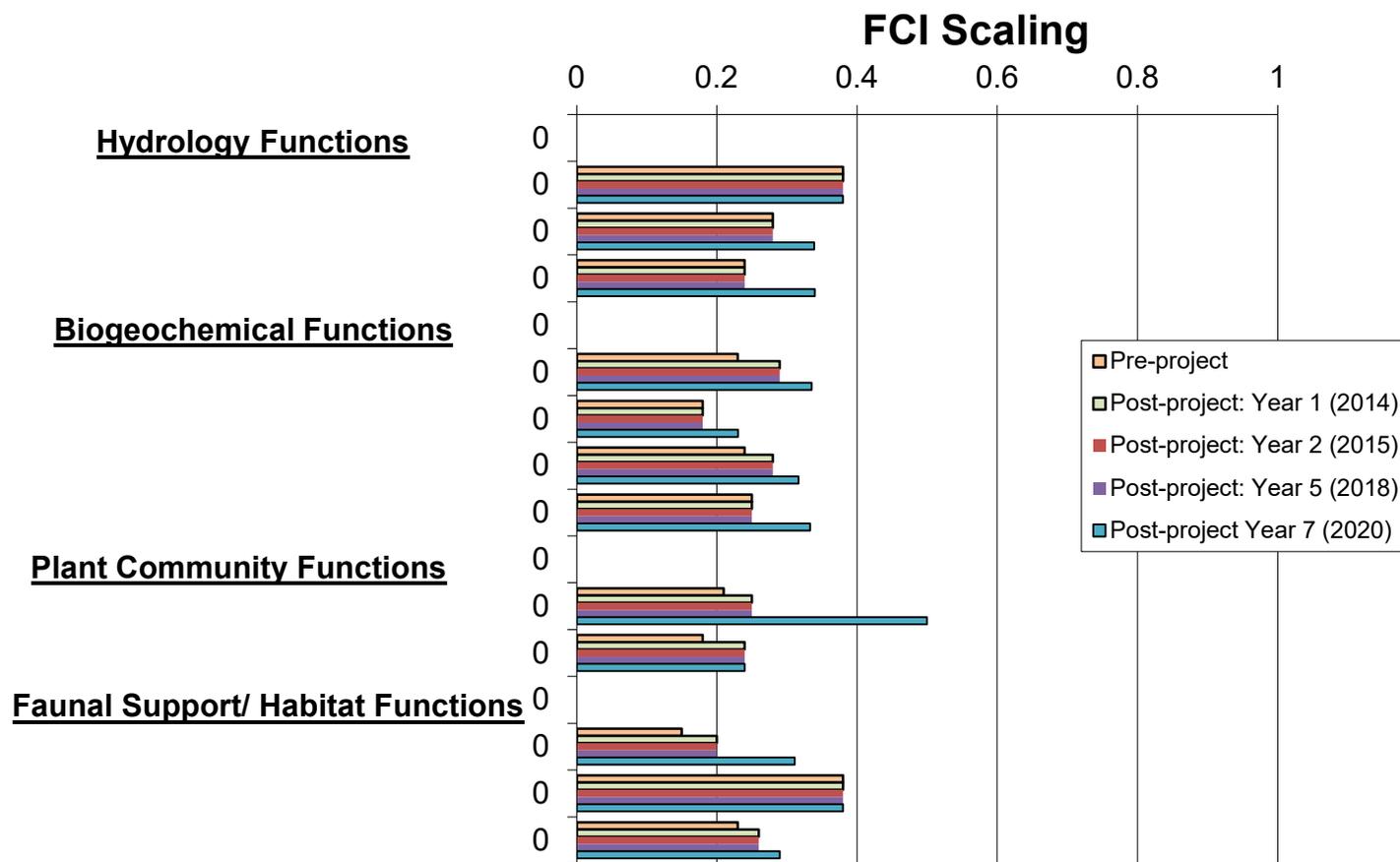


Figure 4. Kulshan Creek Riverine Wetland HGM Functional Capacity Index (FCI) scaling comparing pre-project, Year 1, 2, 5 and 7.

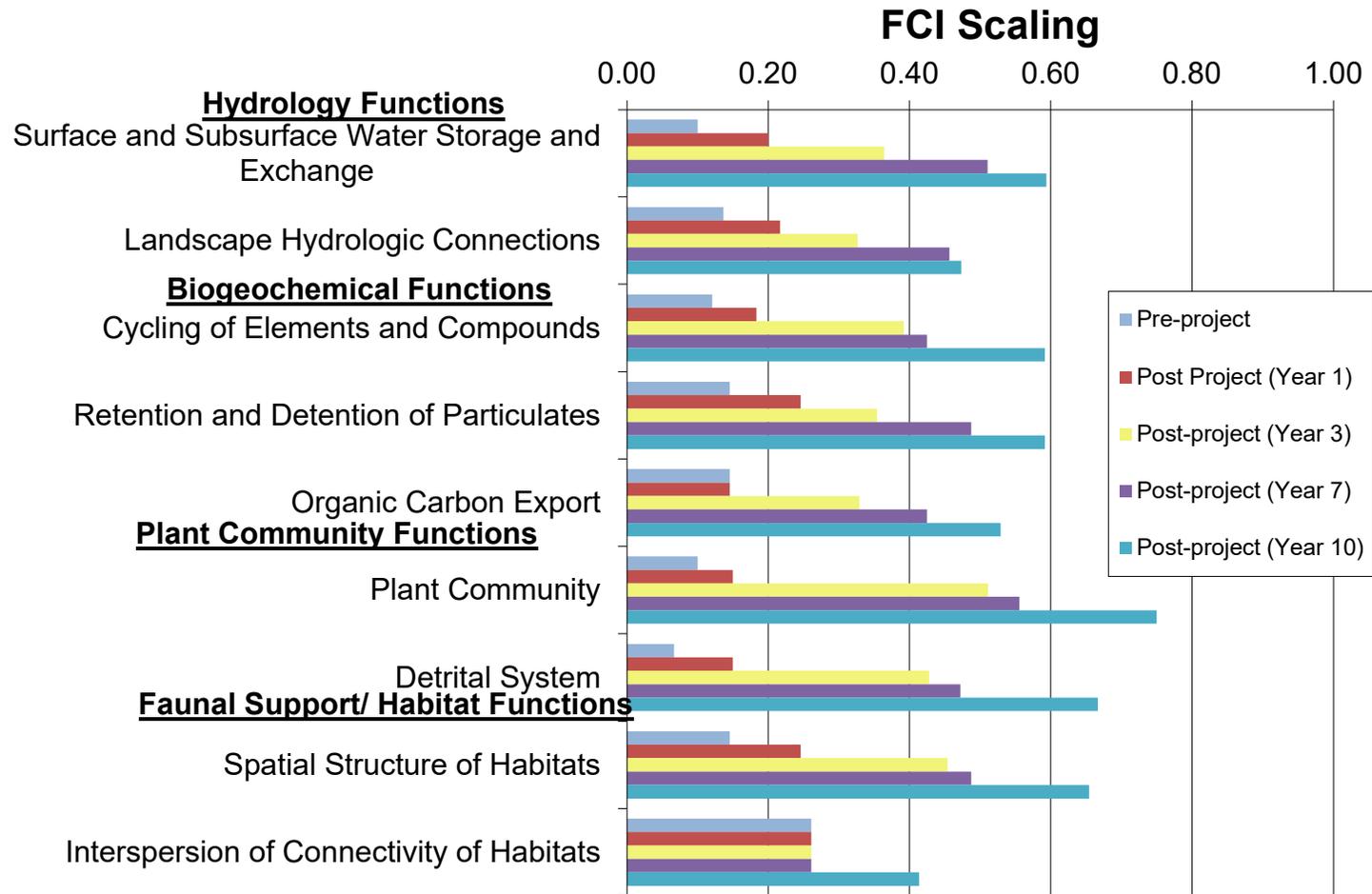


Figure 5. Site trajectory for HGM functional assessment Functional Capacity Indices pre-project, 1st year (2011), 3rd year (2013), and 5th and 8th year (2015 and 2018) and 10th year (2020) post-project at Bakerview Park East slope wetland restoration.

IV. 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. 2018. 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 October 21, 2018.
- 7K Environmental. 2019. 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 January 23, 2020.
- 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.

Appendix A. Photographs



Bakerview East Year 1 versus Year 10 site condition at the northeast end of project area.



Bakerview East Year 1 versus Year 10 site condition at the west end of project area.



Bakerview West Year 5 versus Year 10 site condition



Kulshan Creek Year 1 versus Year 7



Kulshan Creek Year 1 versus Year 7



Logan Creek Year 1 versus Year 9



Logan Creek Year 1 versus Year 9