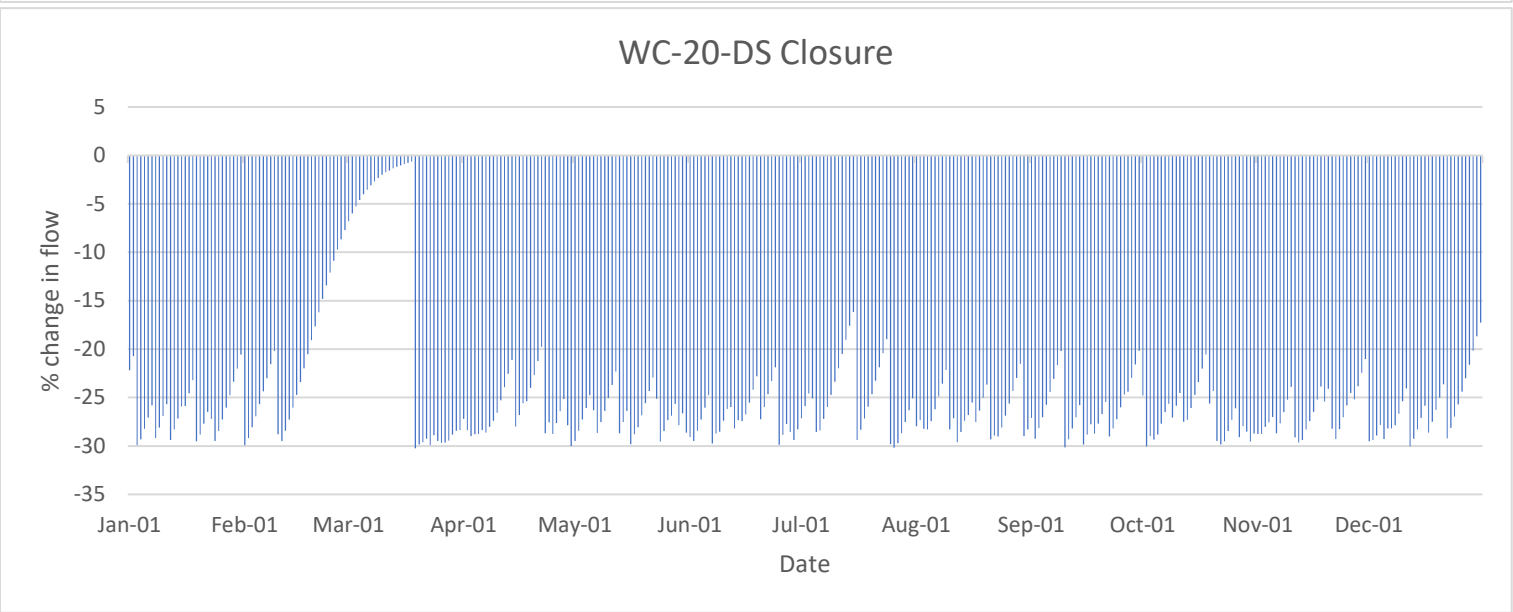
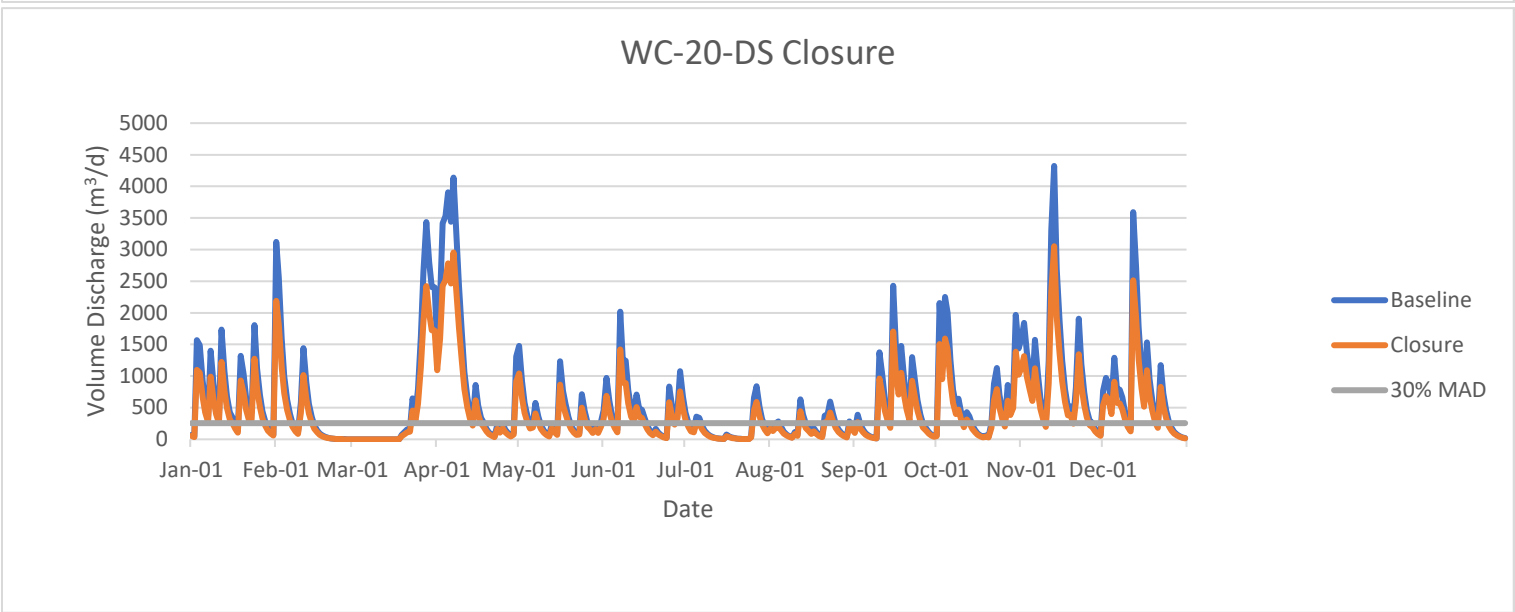
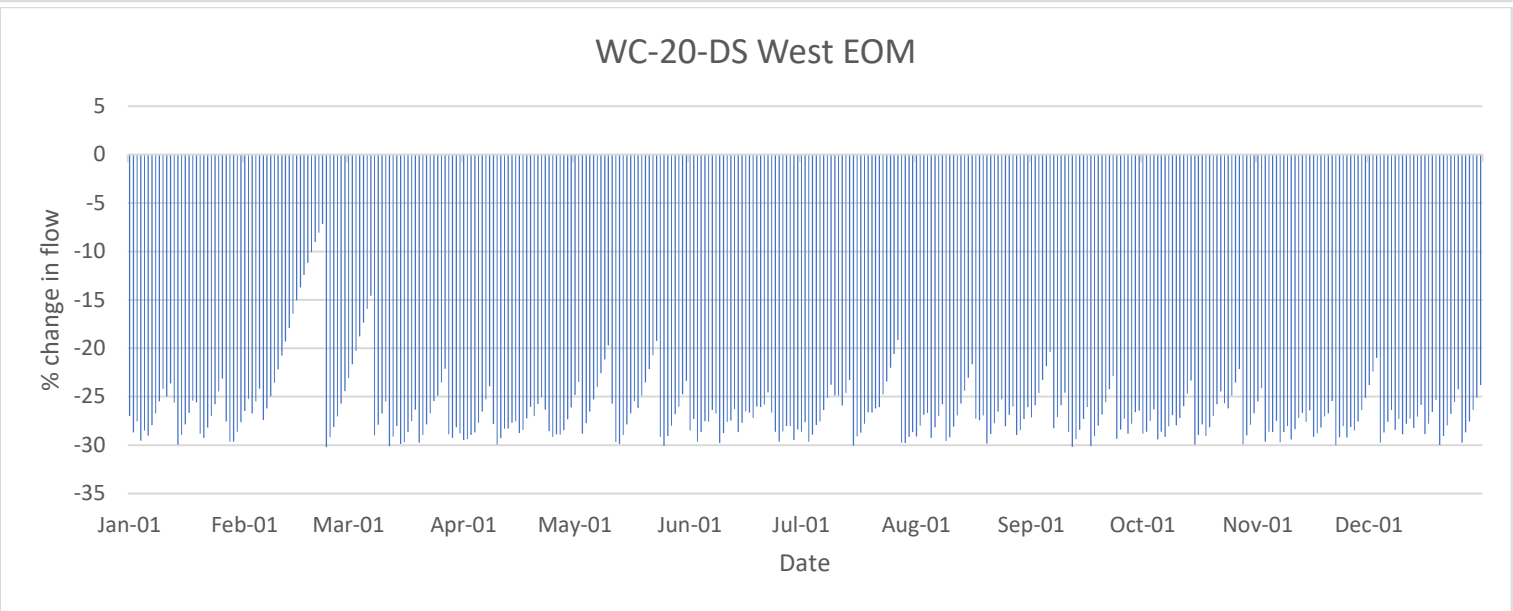
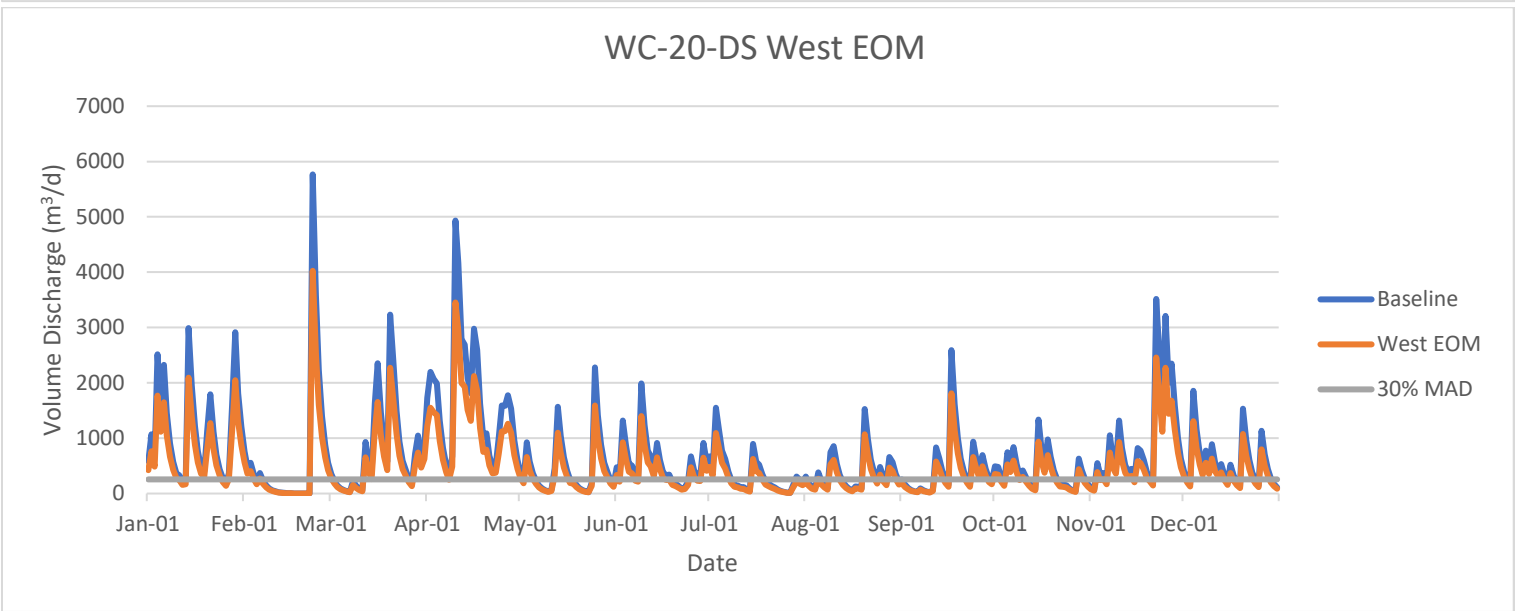
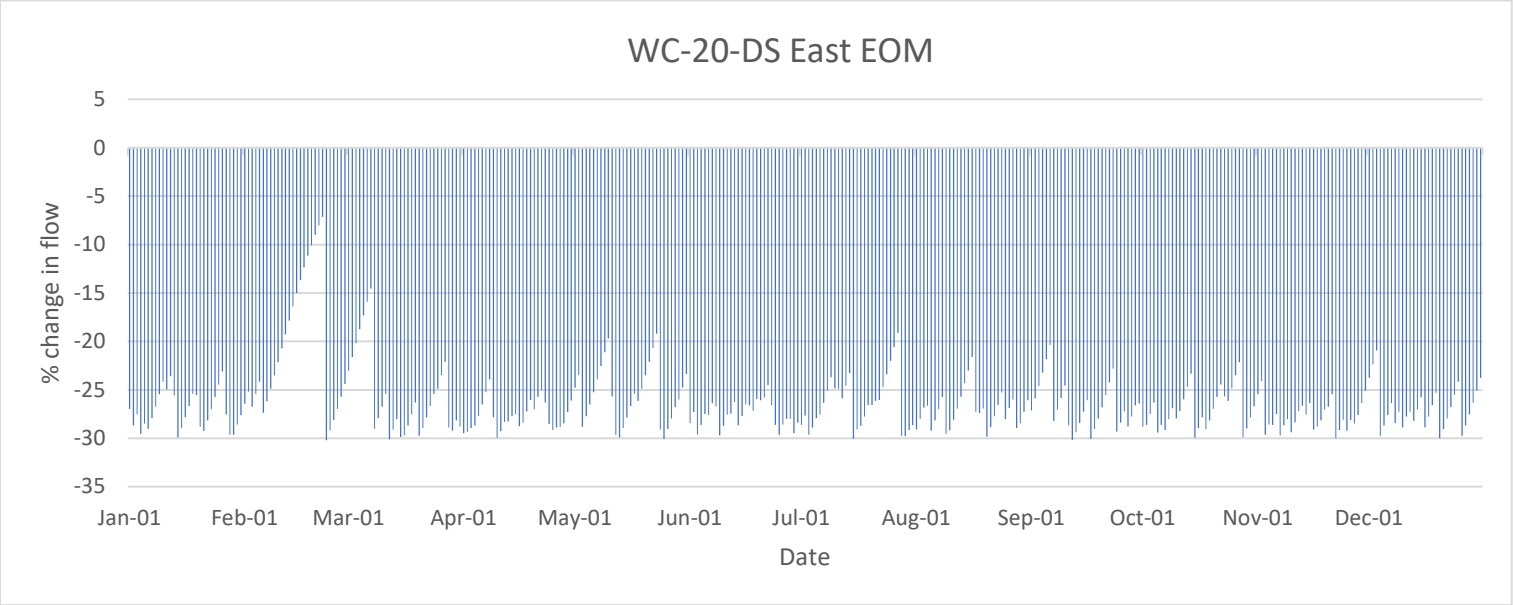
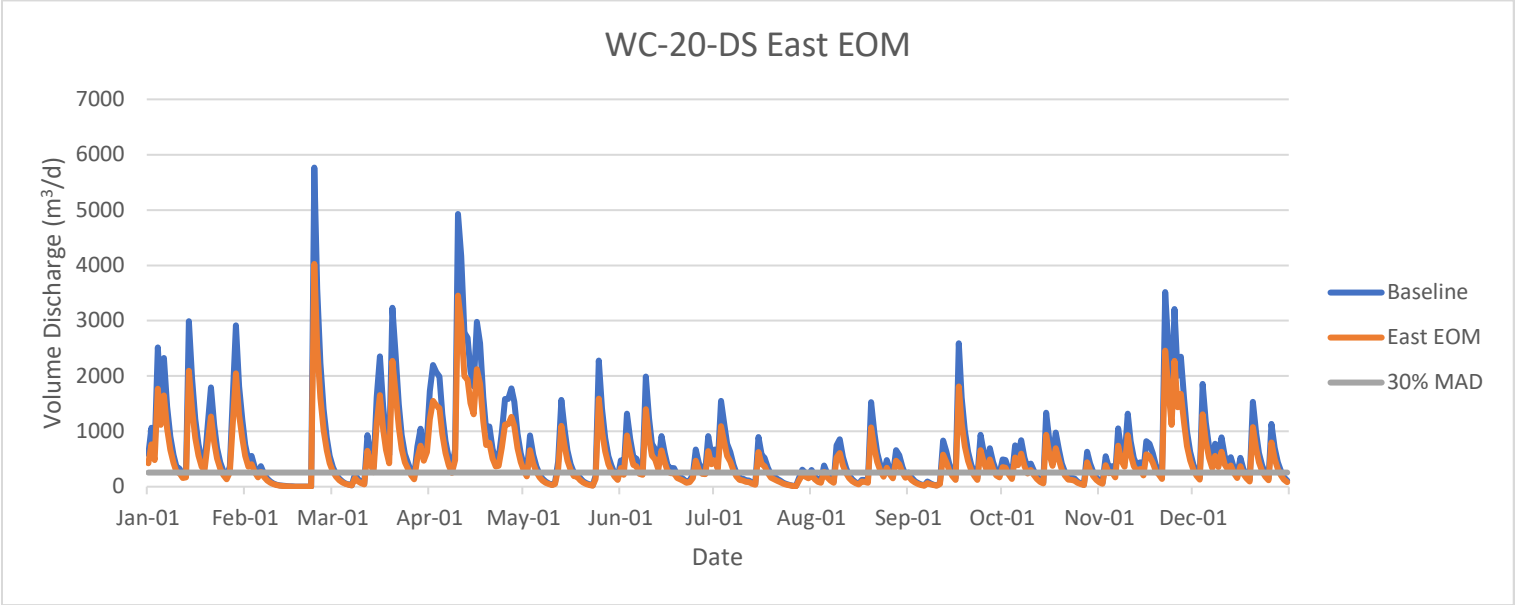


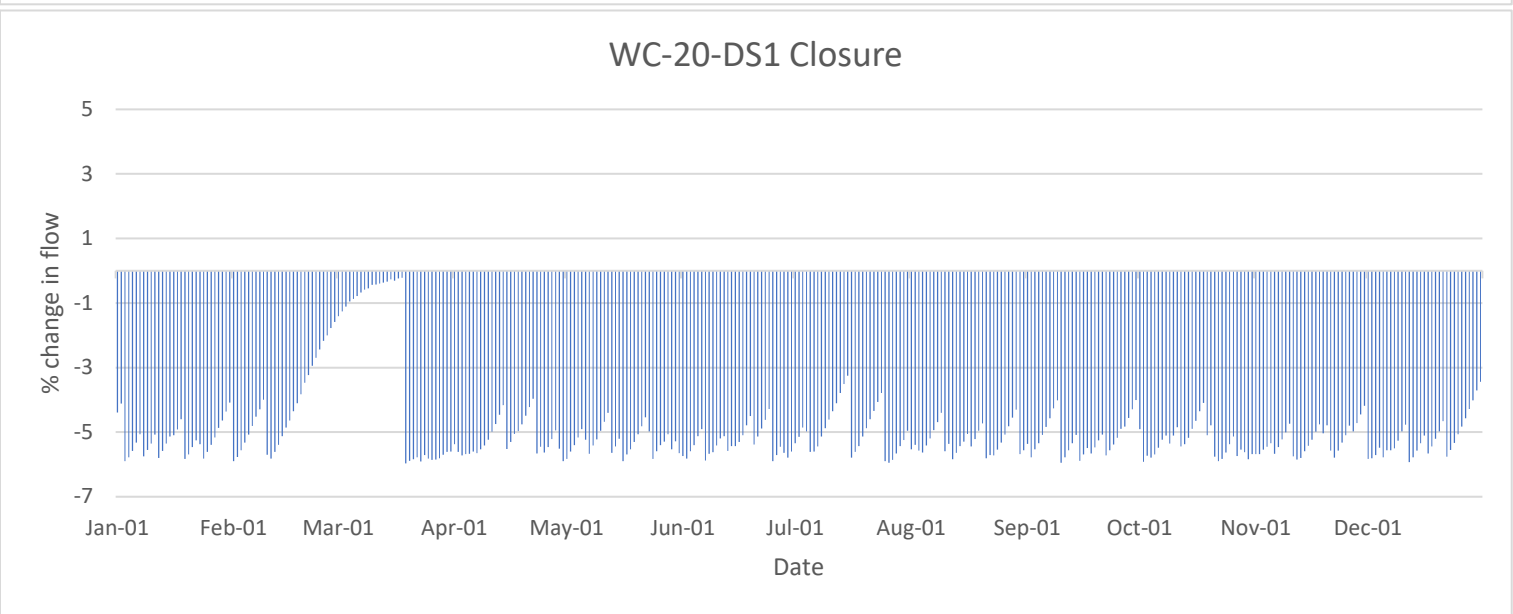
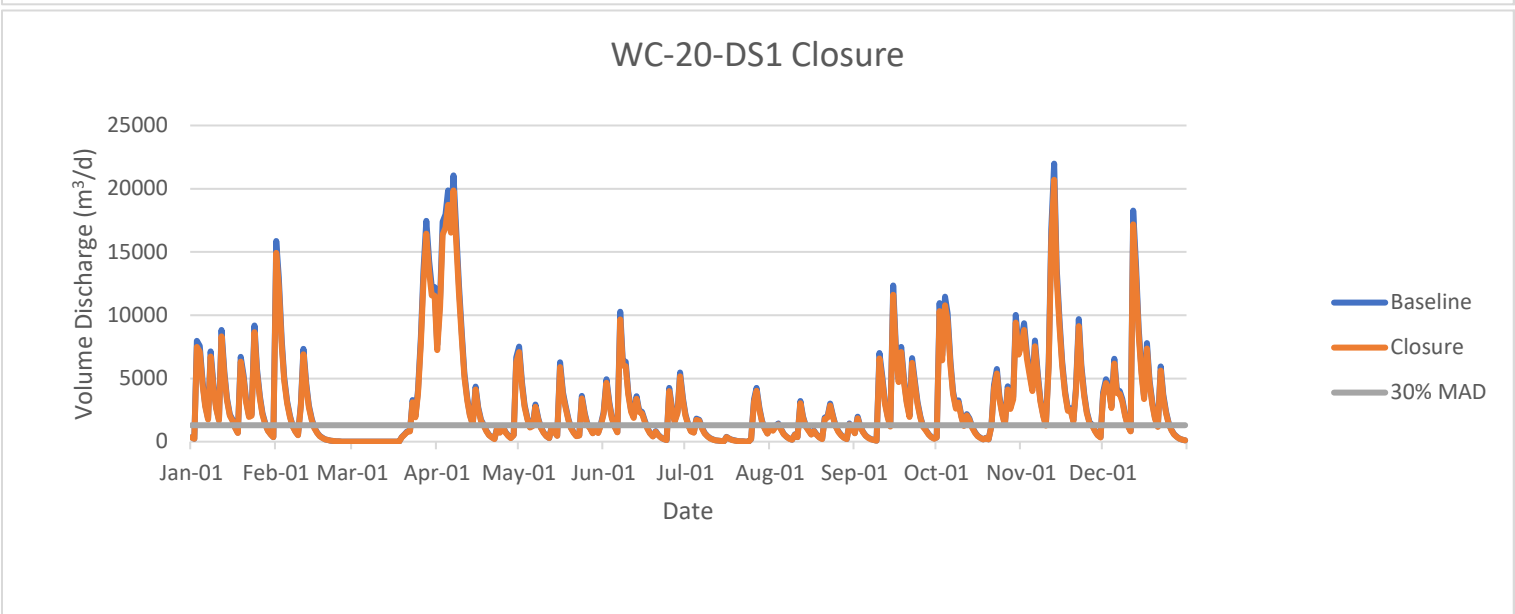
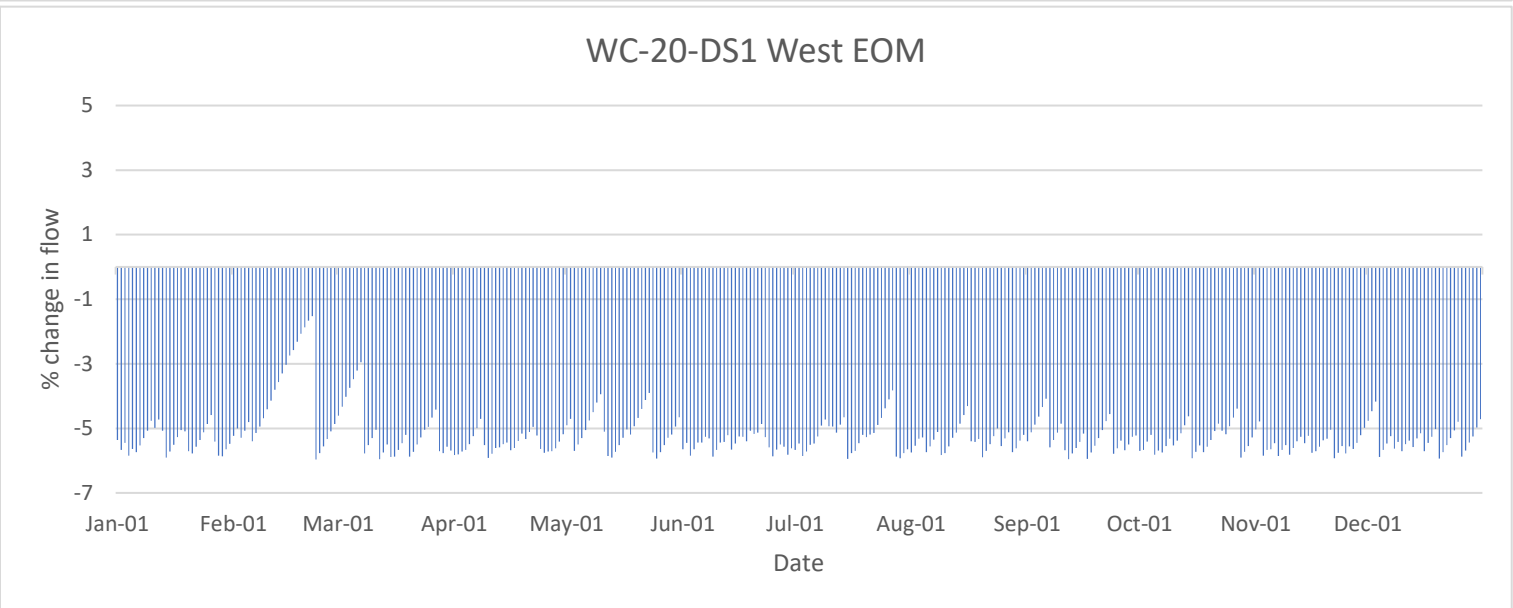
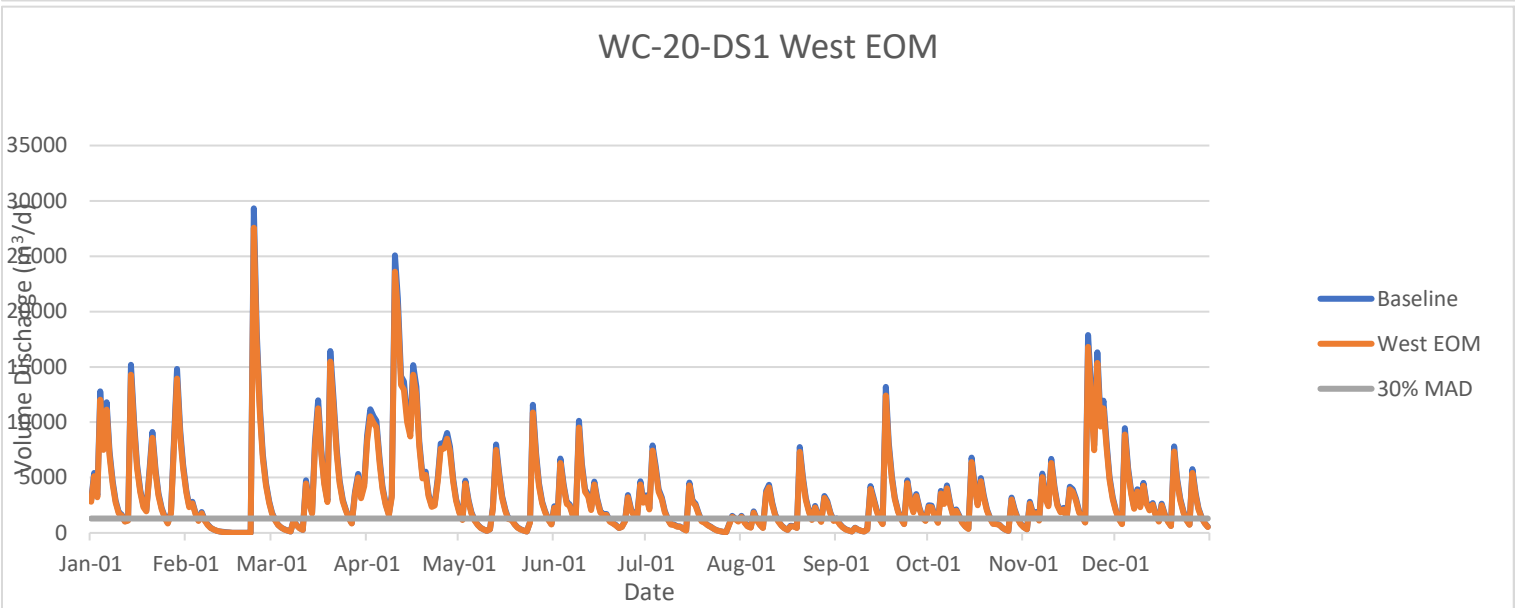
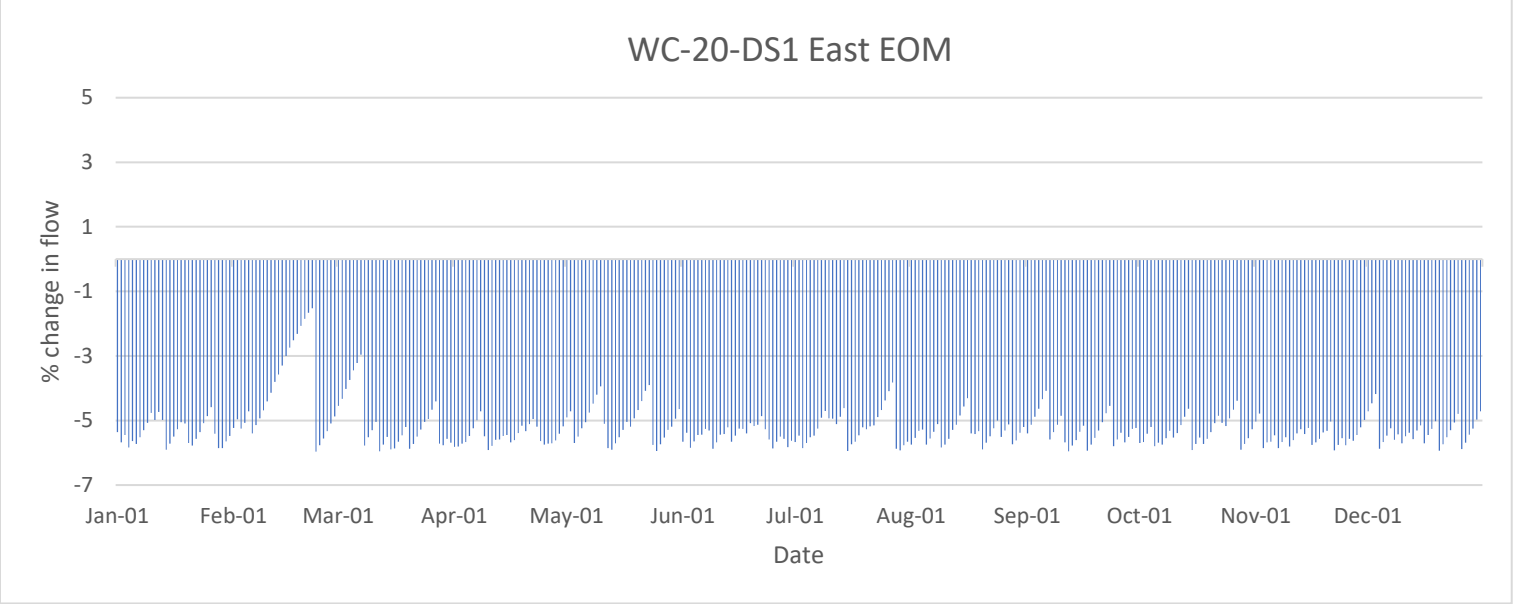
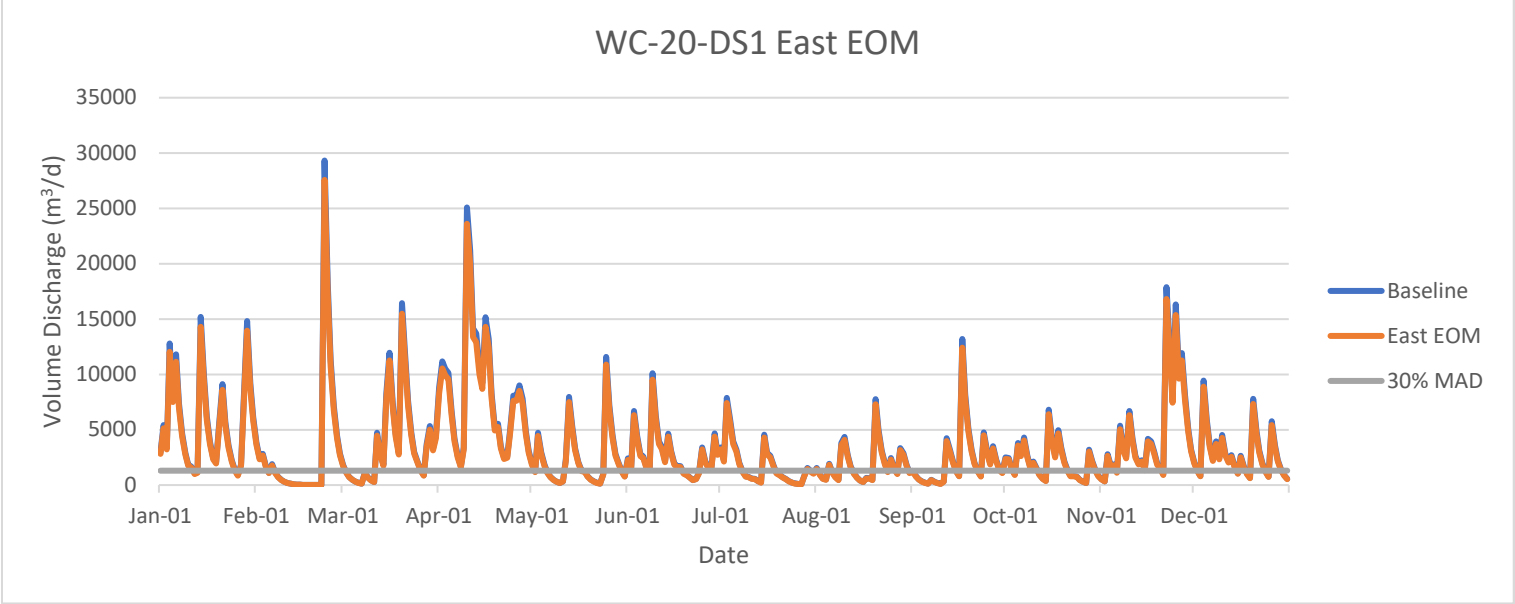
Appendix H.2

Hydrograph Summary and Associated Data

May 2022 – Goldboro Gold Project. – Daily Hydrographs
Figures 1-24. Western Tributary System (WC51 and WC20) Hydrographs showing Normal Year baseline and predicted daily flows during each Project Phase; and associated percent change in flow from baseline to each corresponding Project project phase.







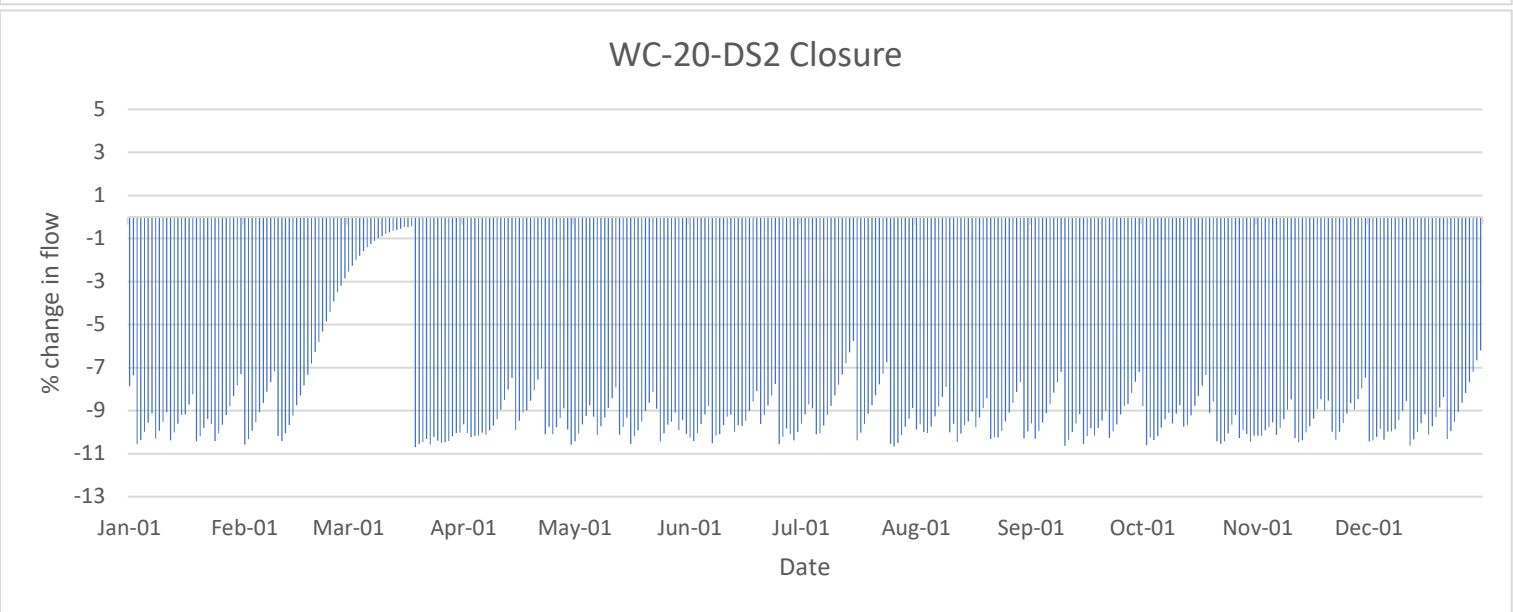
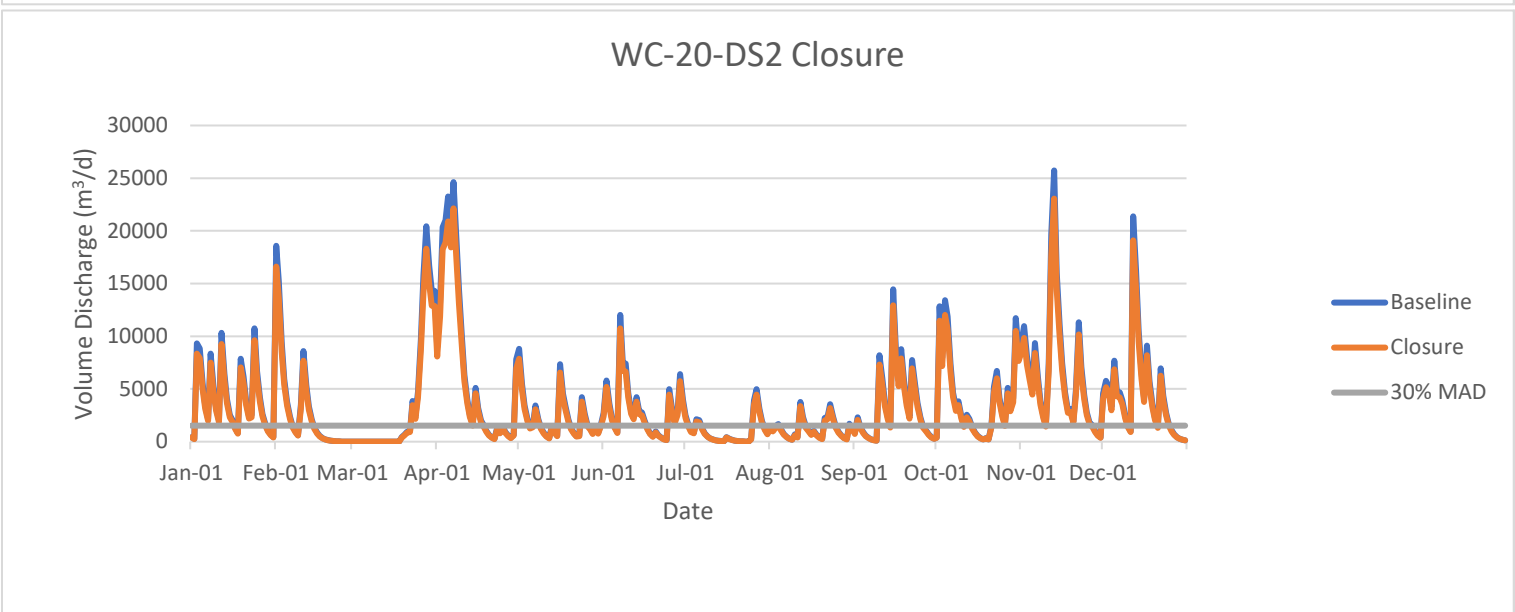
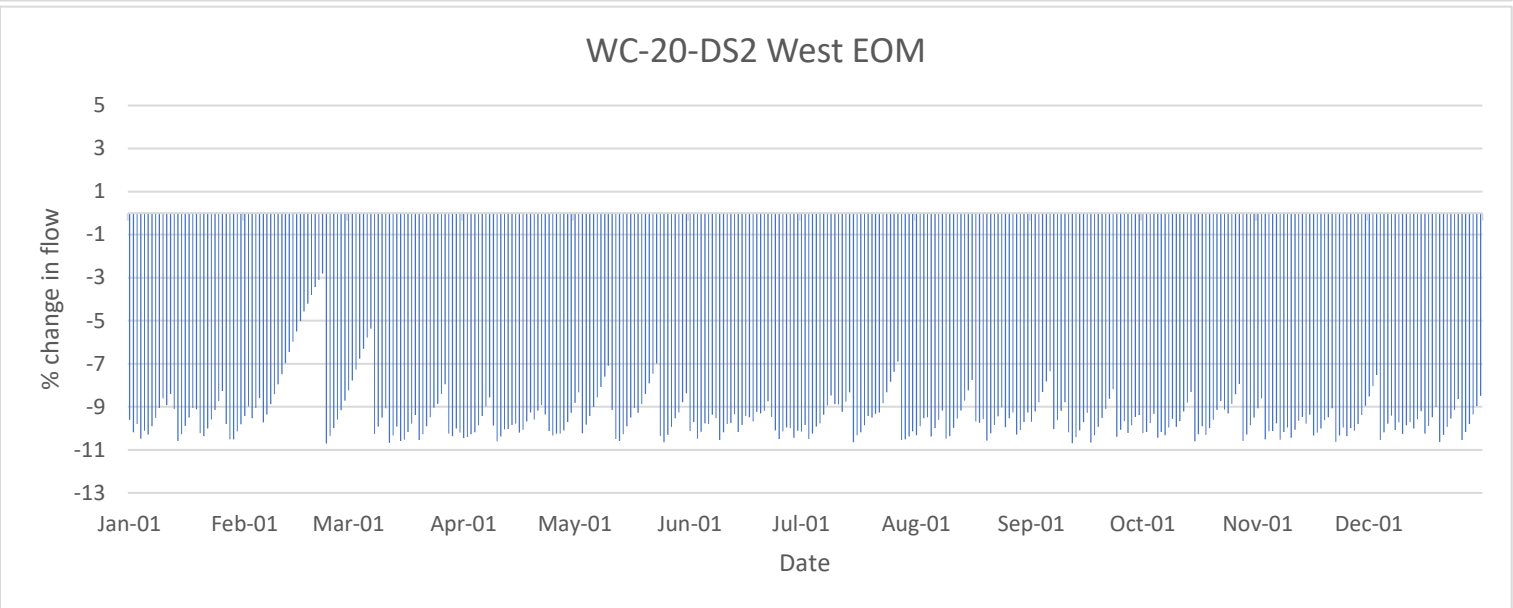
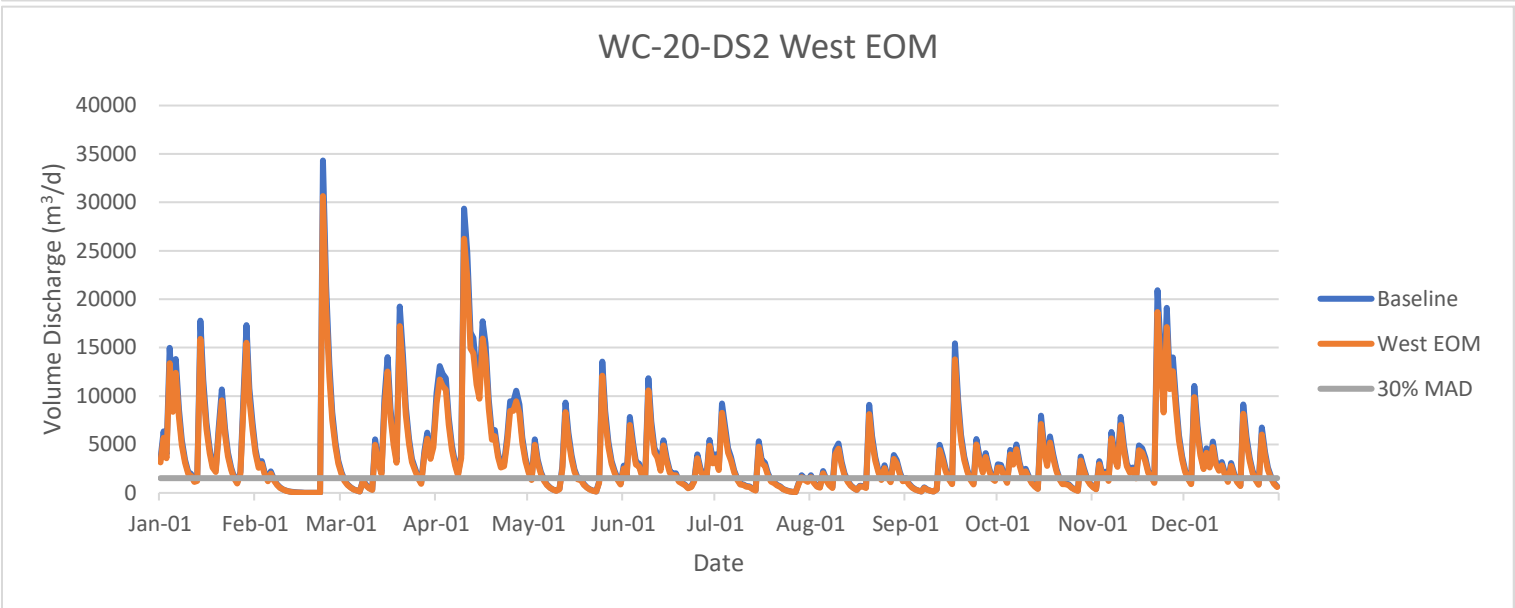
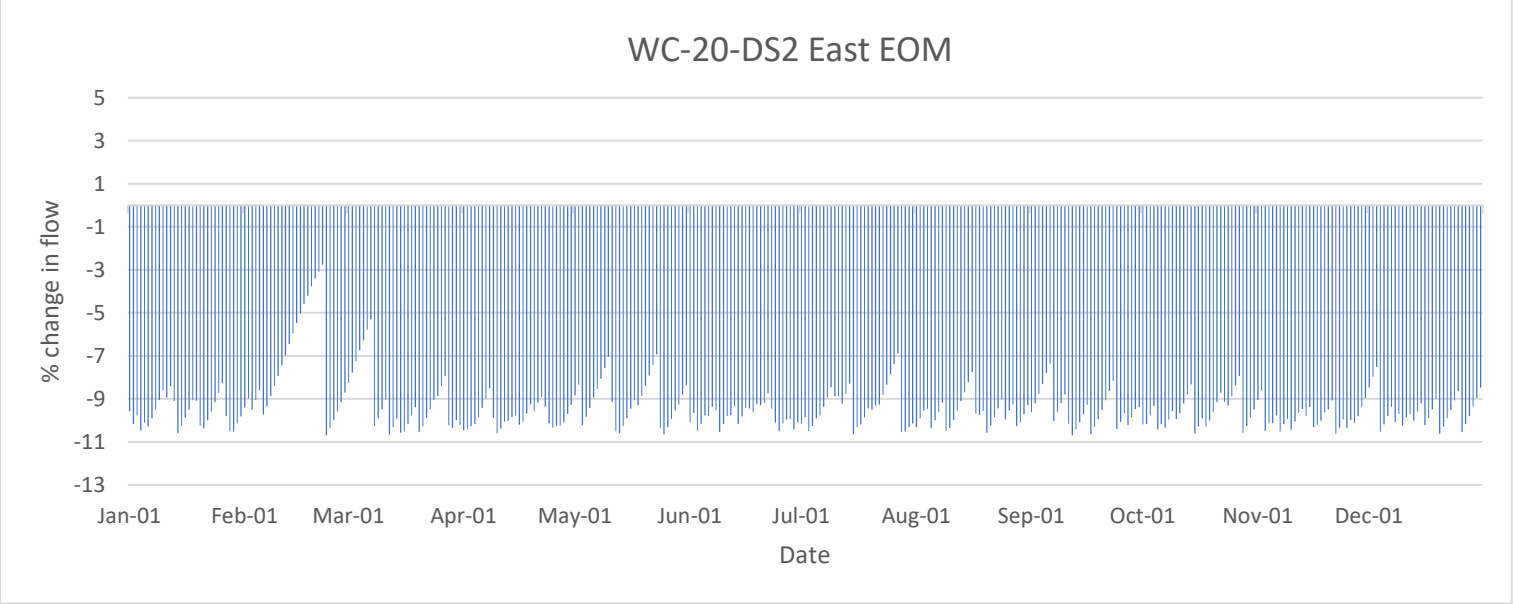
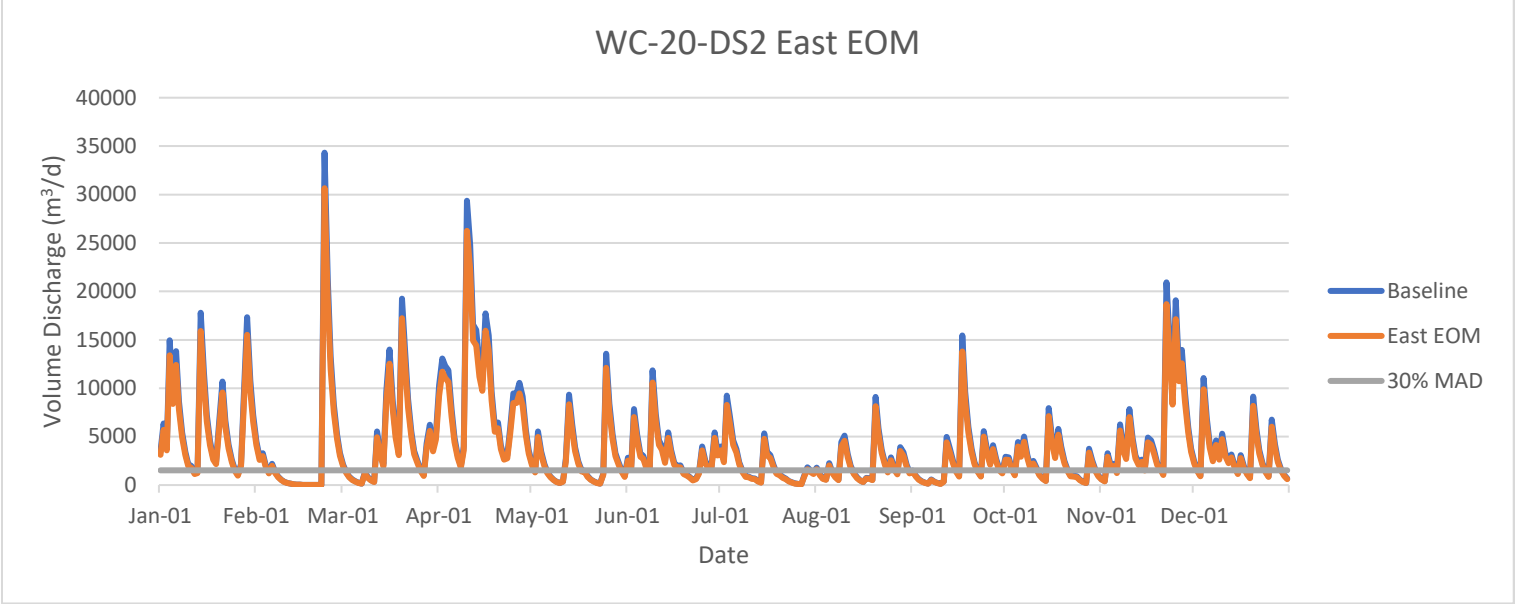
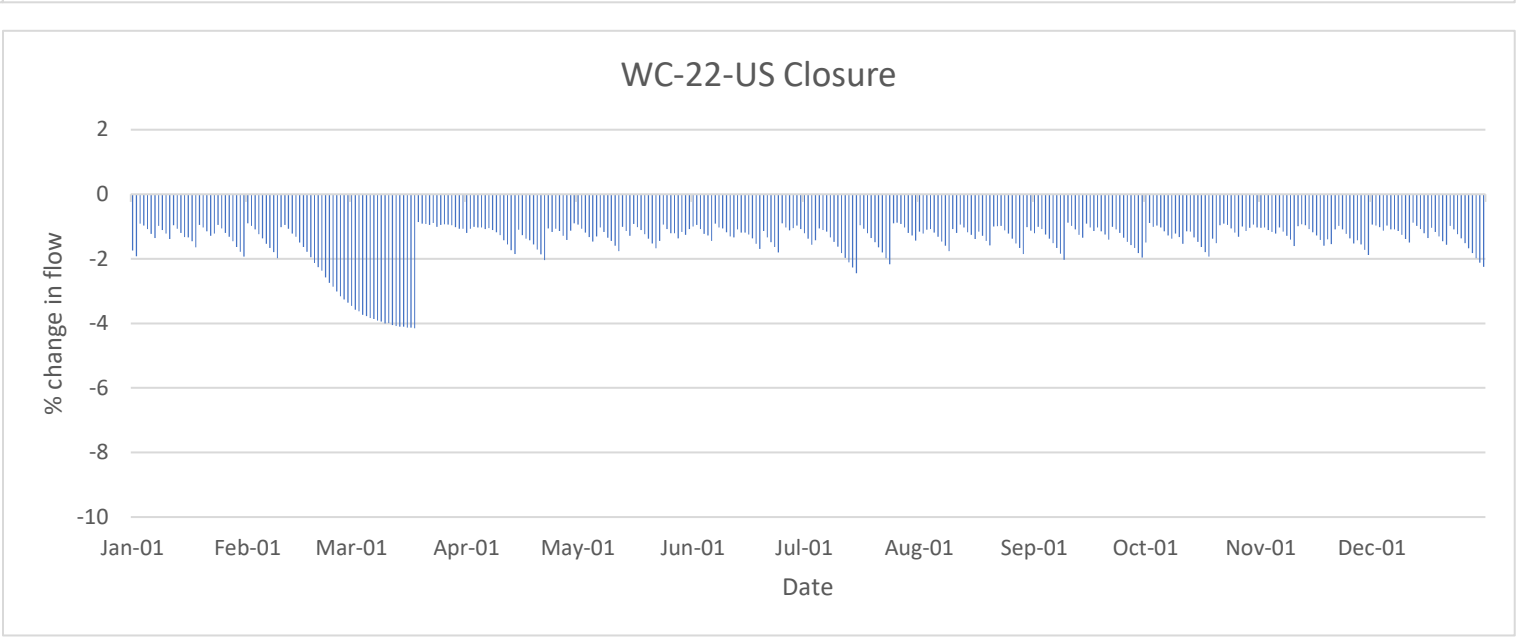
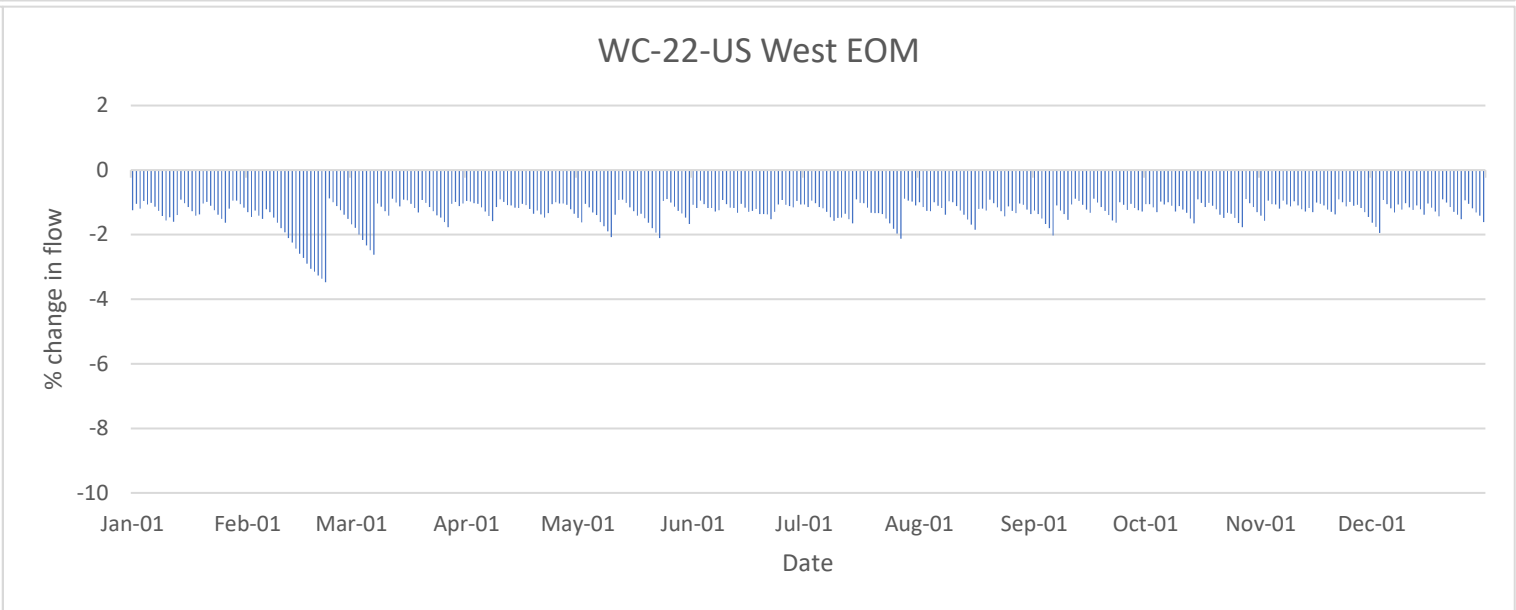
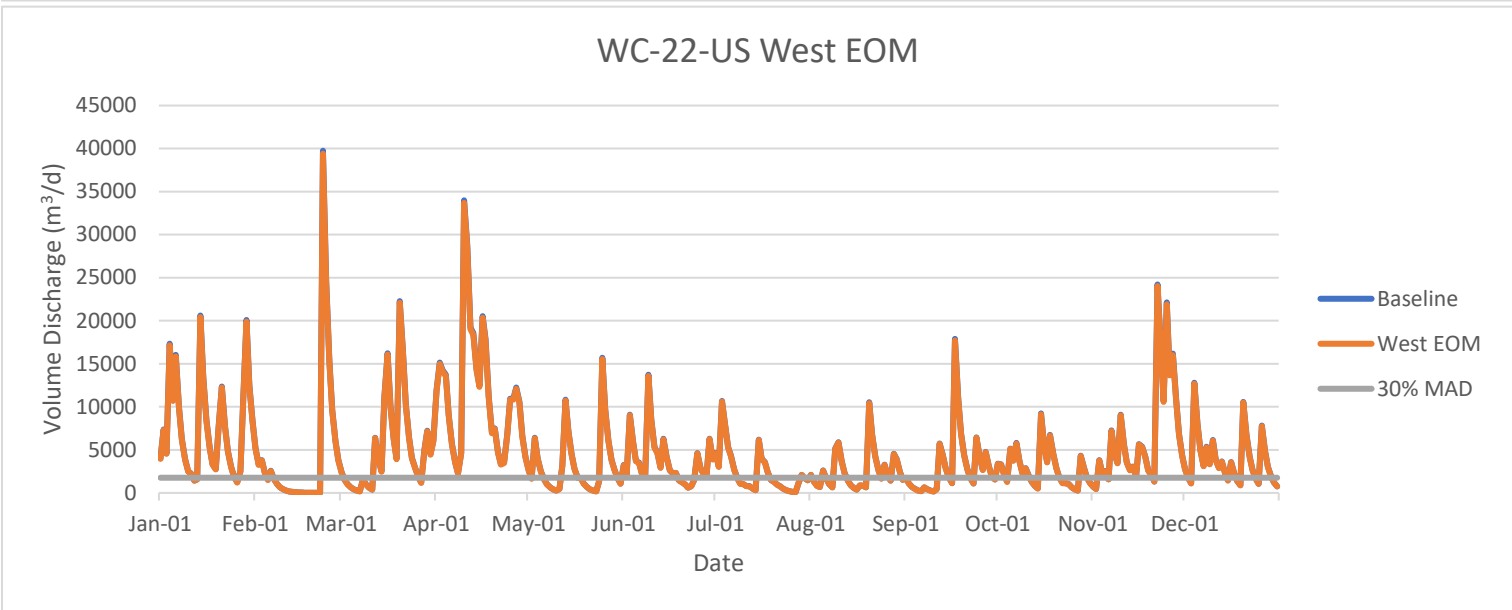
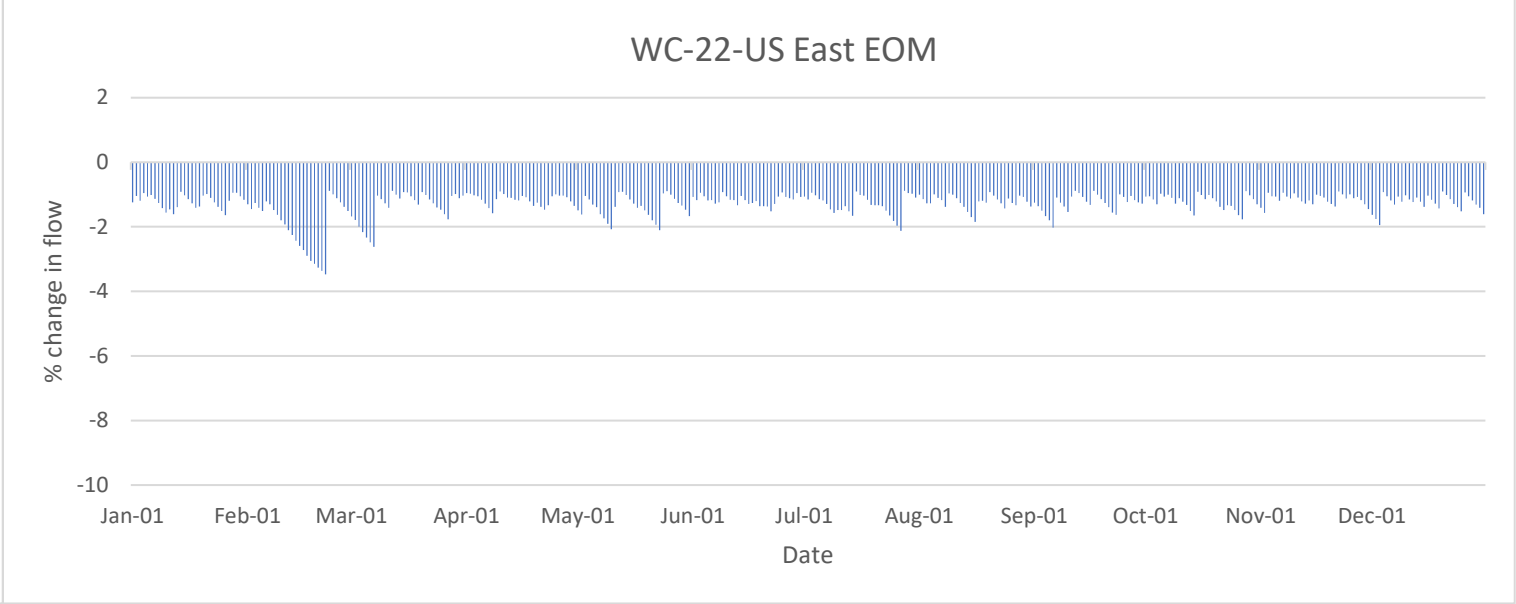
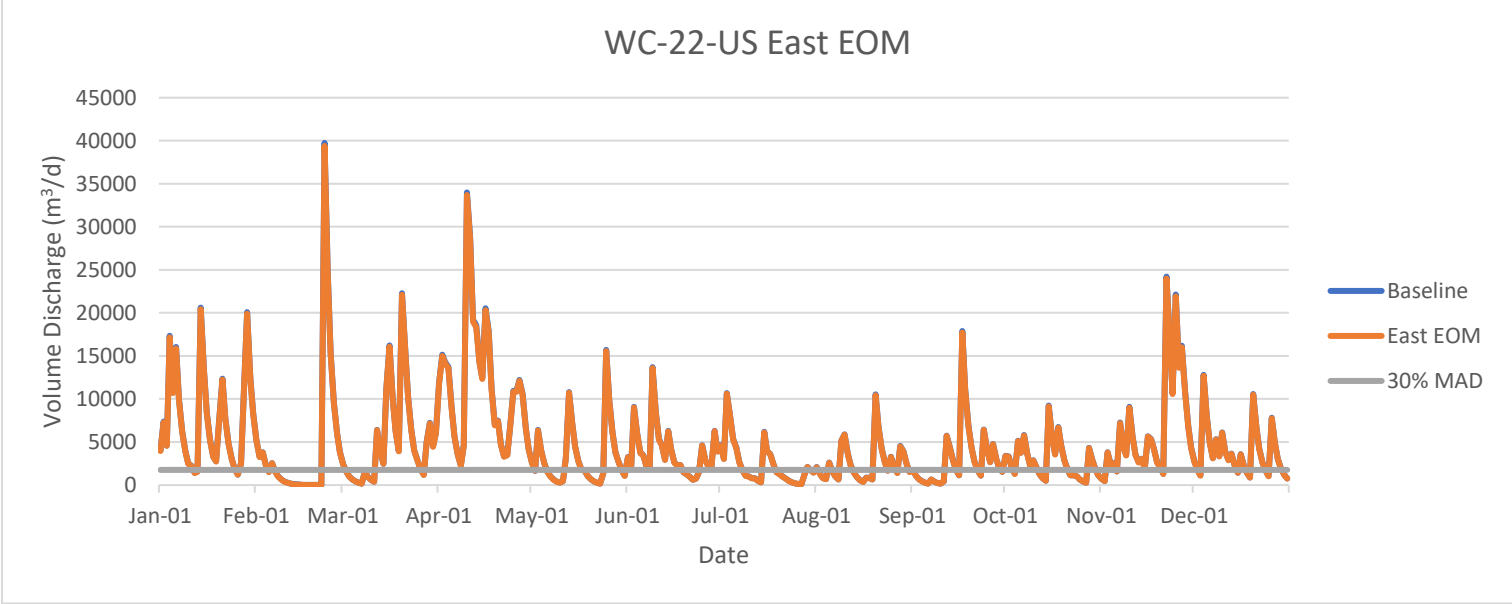


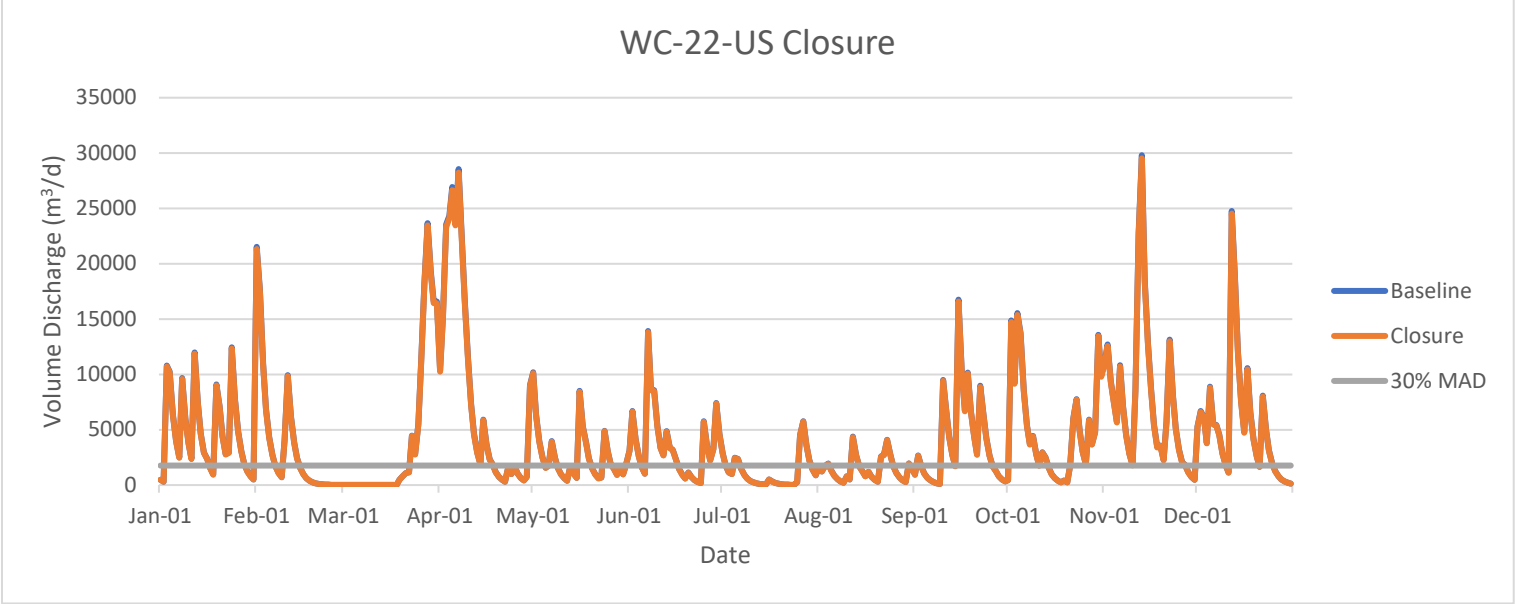
Table 1. Summary of Daily Flow Data Derived from Hydrographs; ‘Normal Year’ Scenario. Western Tributary System (WC51 and WC20).

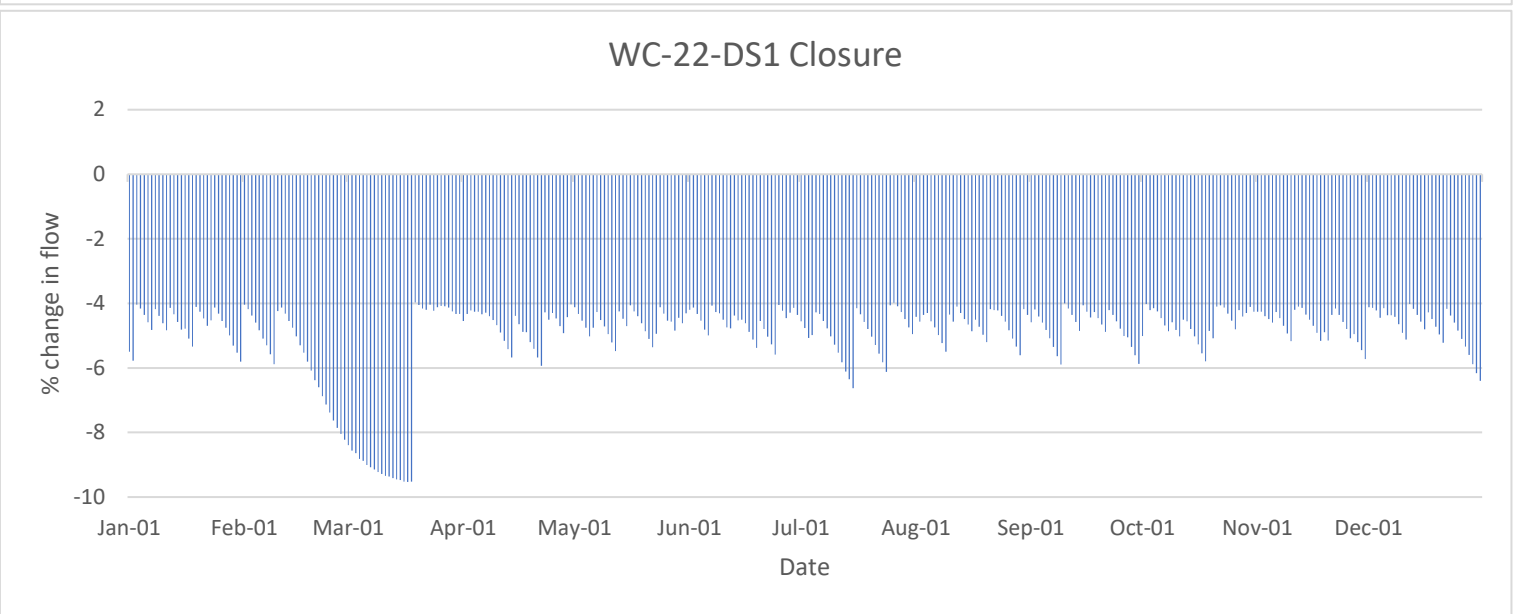
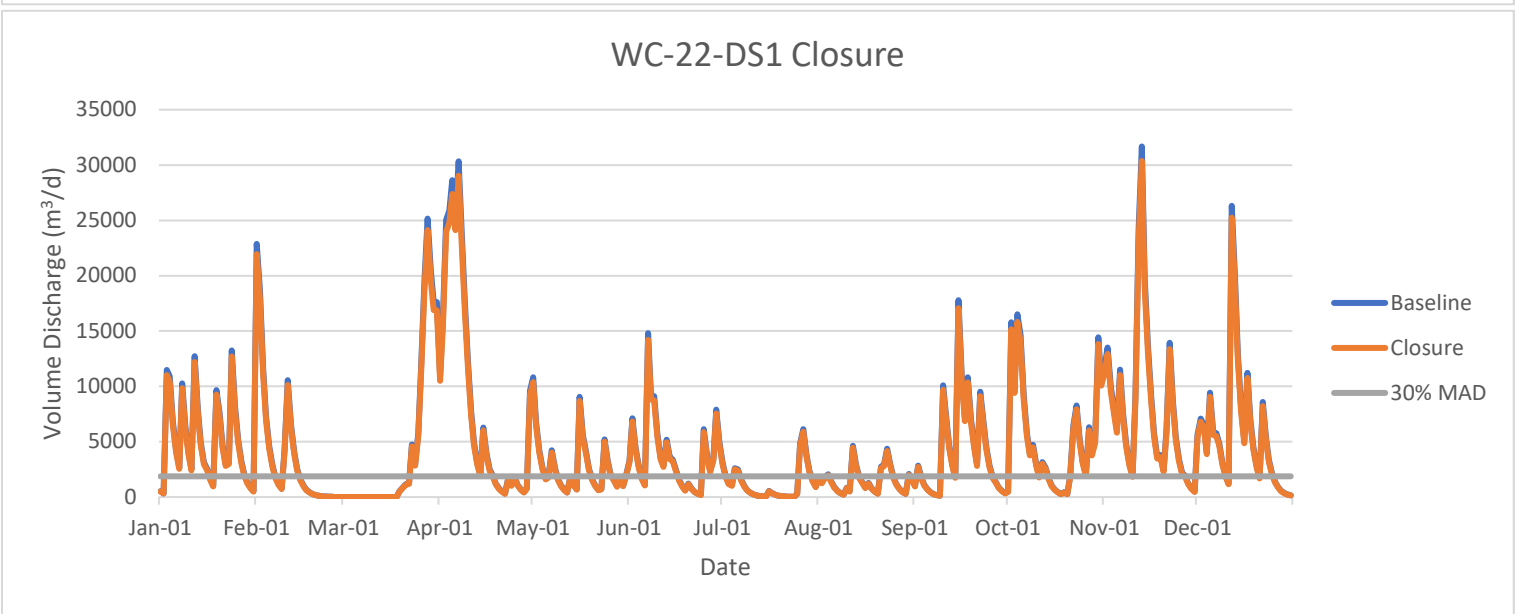
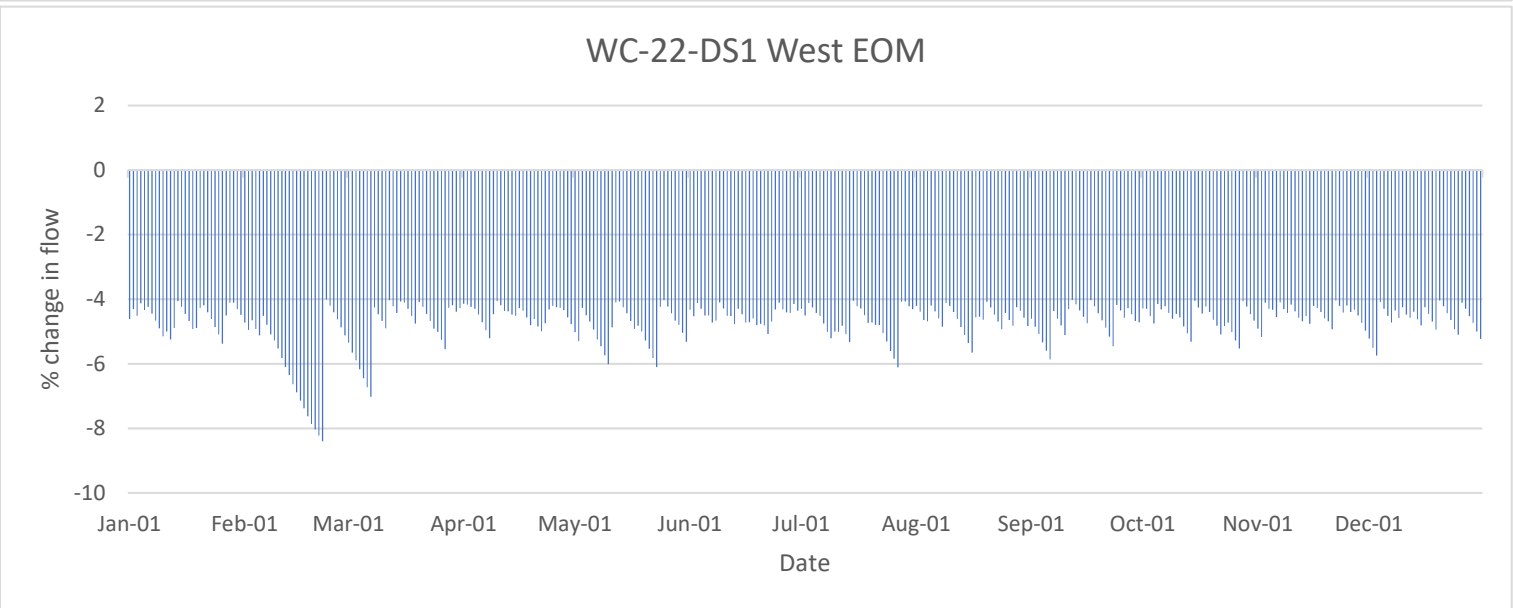
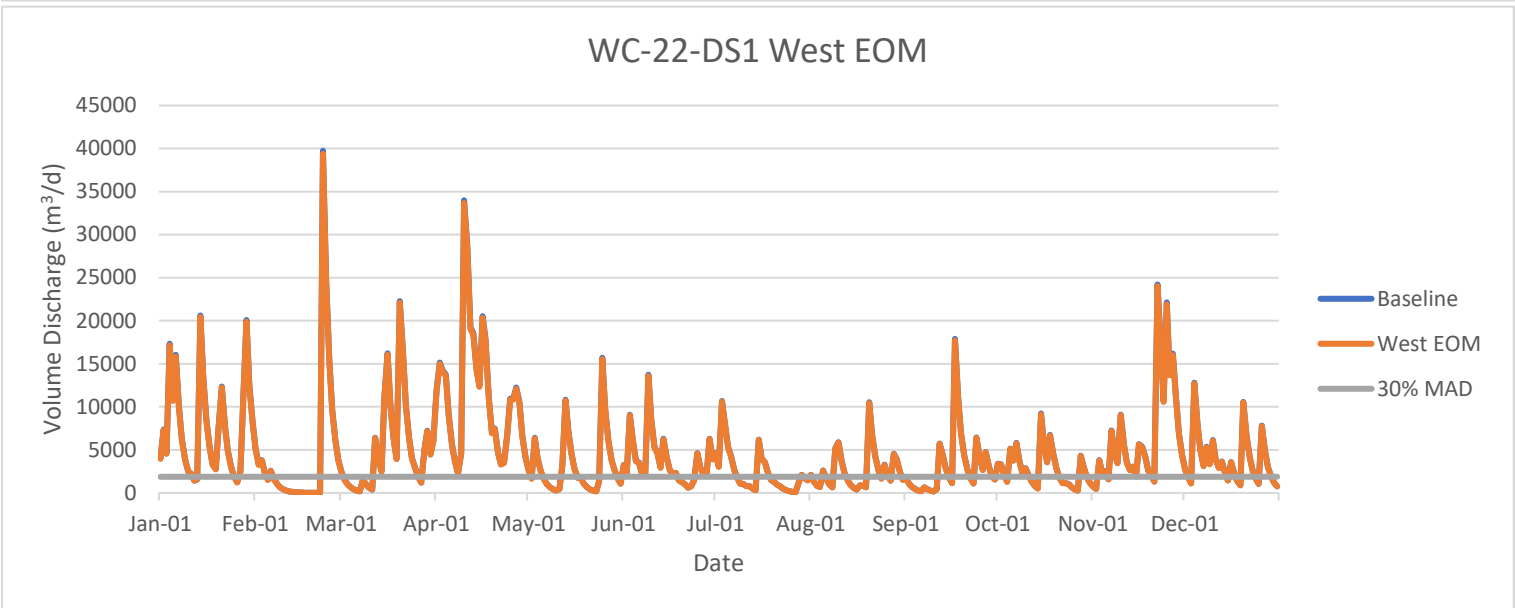
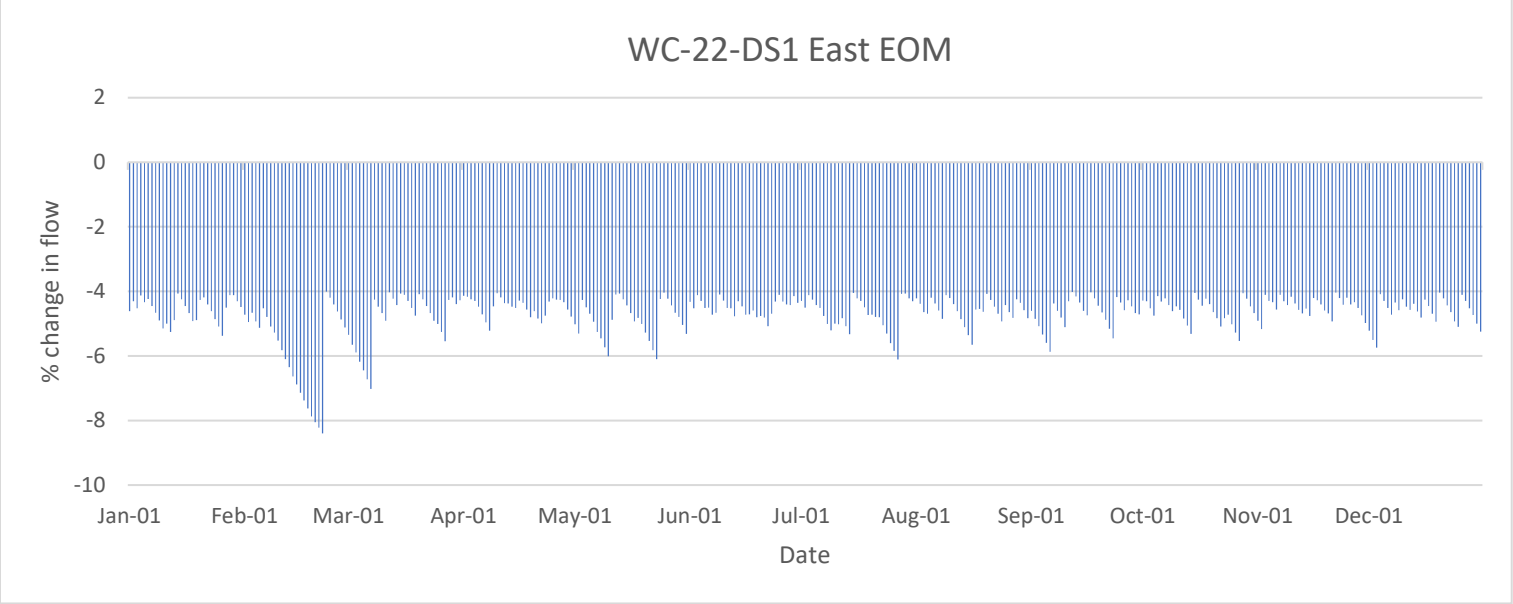
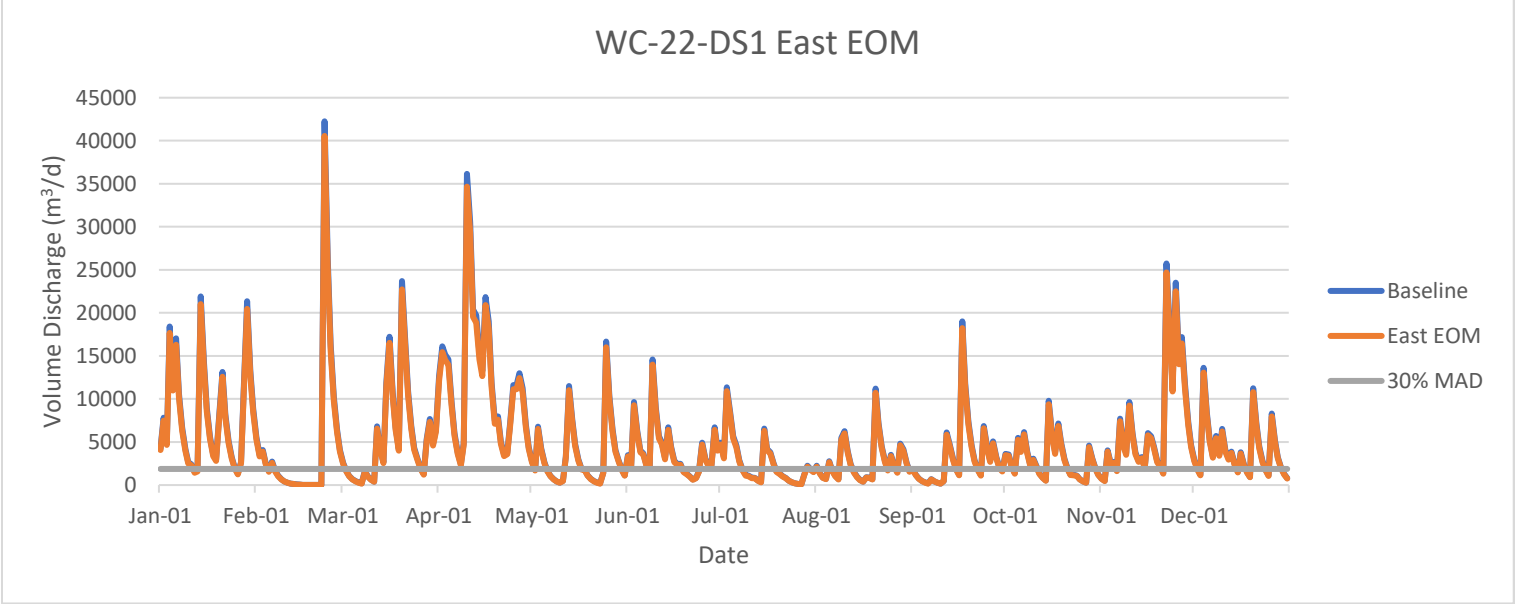
		WC-51-US	WC-20-DS	WC-20-DS1	WC-20-DS2
East EOM	Range in flow change	0	-7	-2	-3
		0	-30	-6	-11
	# days with > 10% reduction	0	362	0	119
	# baseline days below 30% MAD	127	127	127	127
	# of East EOM below 30% MAD	127	157	131	136
	# additional days below 30% MAD	0	30	4	9
West EOM	Range in flow change	0	-7	-2	-3
		0	-30	-6	-11
	# days with > 10% reduction	0	362	0	121
	# baseline days below 30% MAD	127	127	127	127
	# of West EOM below 30% MAD	127	157	131	136
	# additional days below 30% MAD	0	30	4	9
Closure	Range in flow change	0	-1	0	0
		0	-30	-6	-11
	# days with > 10% reduction	0	344	0	106
	# baseline days below 30% MAD	163	163	163	163
	# of Closure below 30% MAD	164	186	170	177
	# additional days below 30% MAD	1	23	7	14

May 2022 – Goldboro Gold Project. – Daily Hydrographs
Figures 25-48. Northern Tributary System (WC69 and WC22) Hydrographs showing Normal Year baseline and predicted daily flows during each Project Phase; and associated percent change in flow from baseline to each corresponding Project project phase.









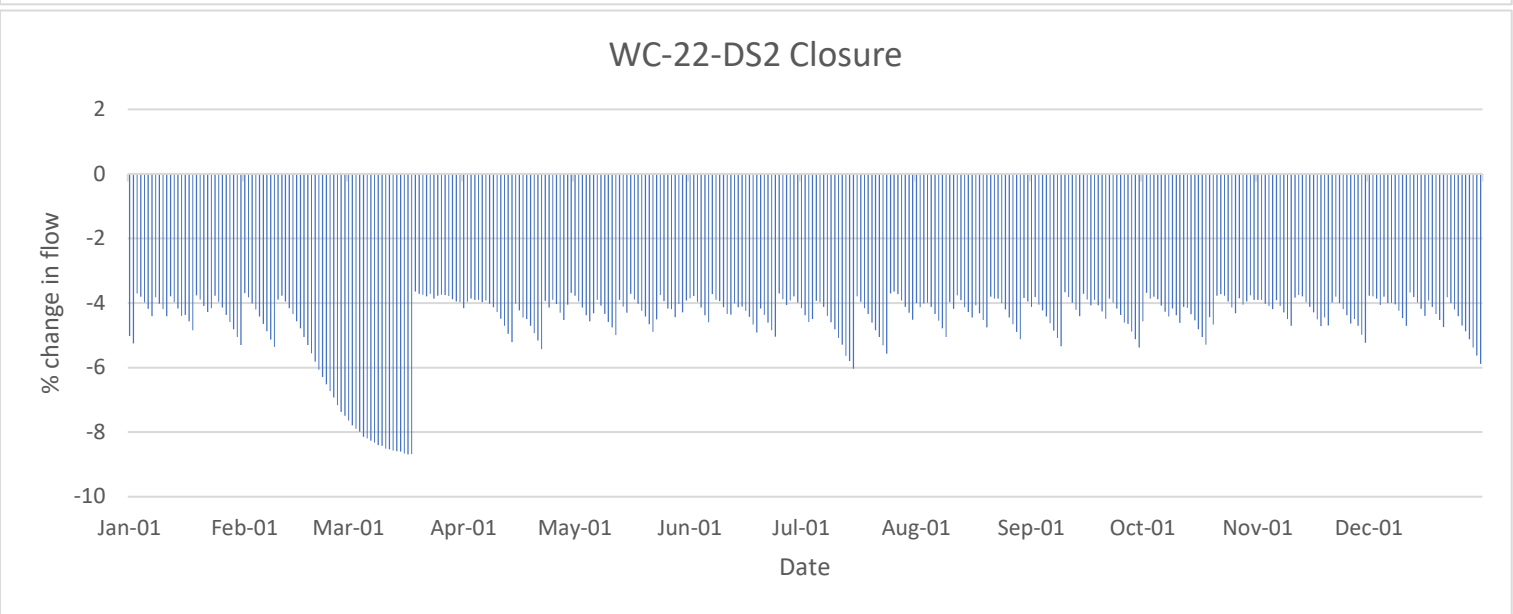
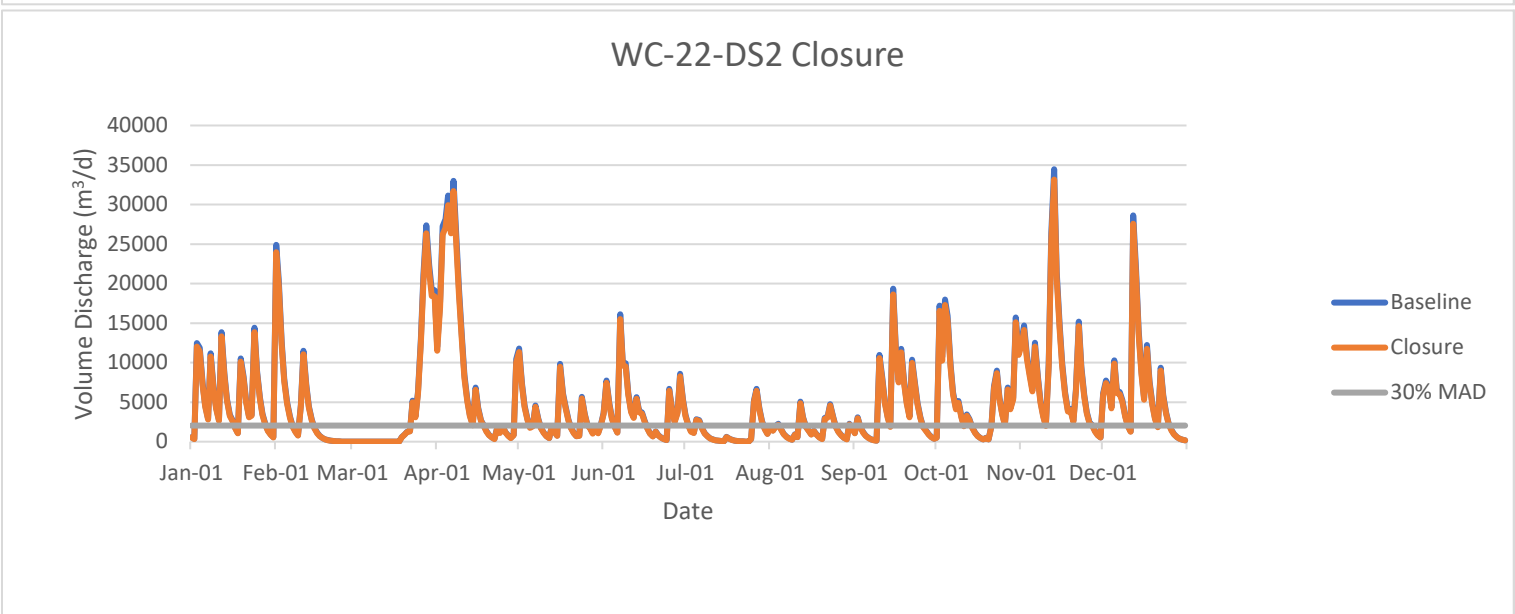
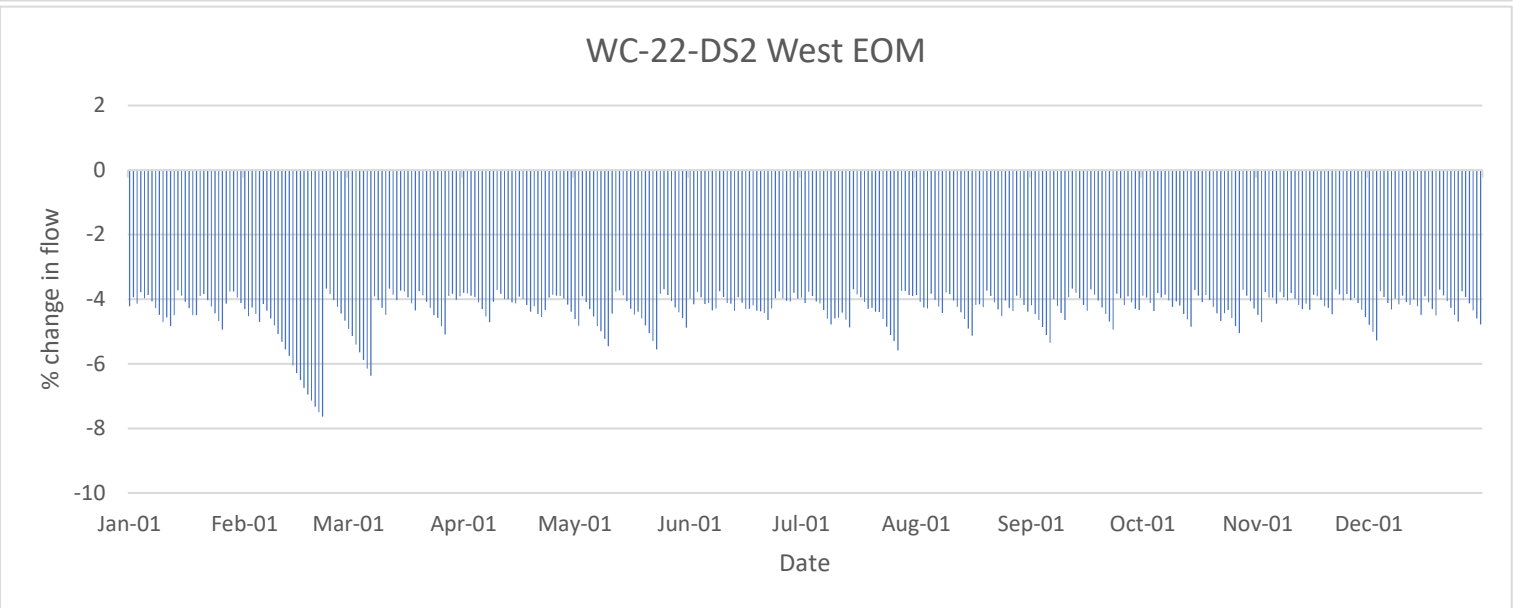
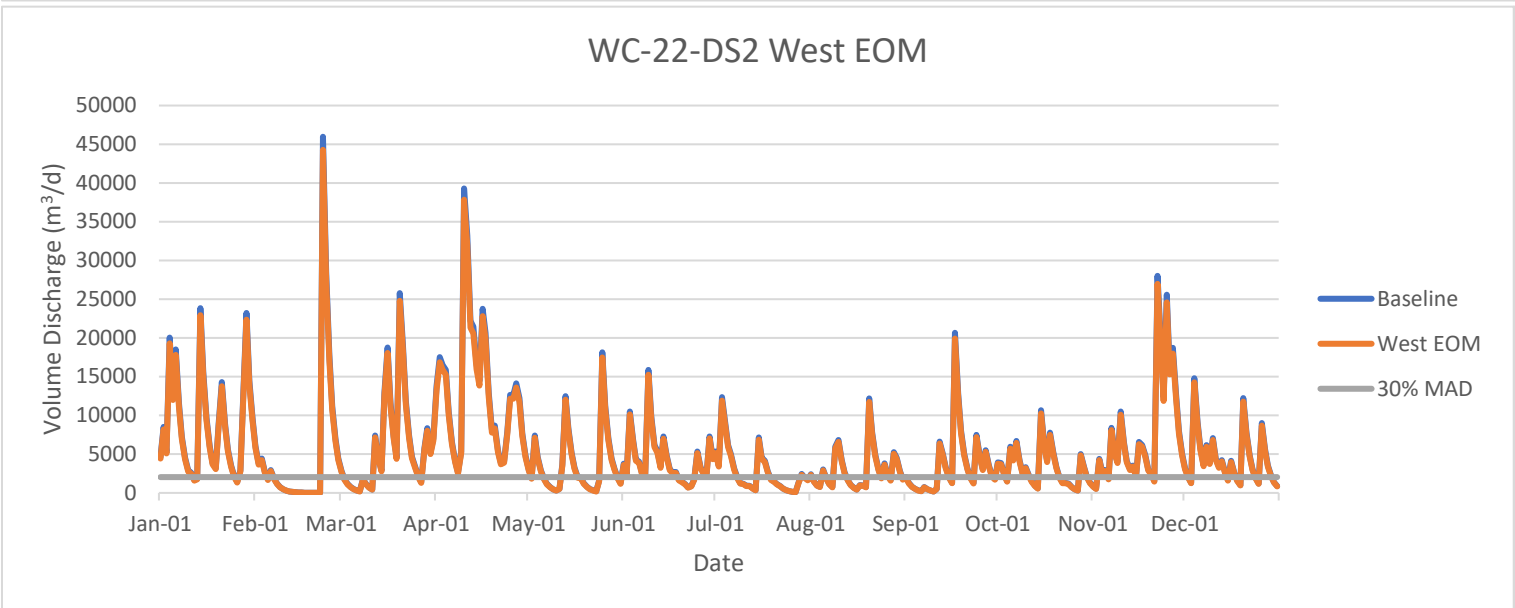
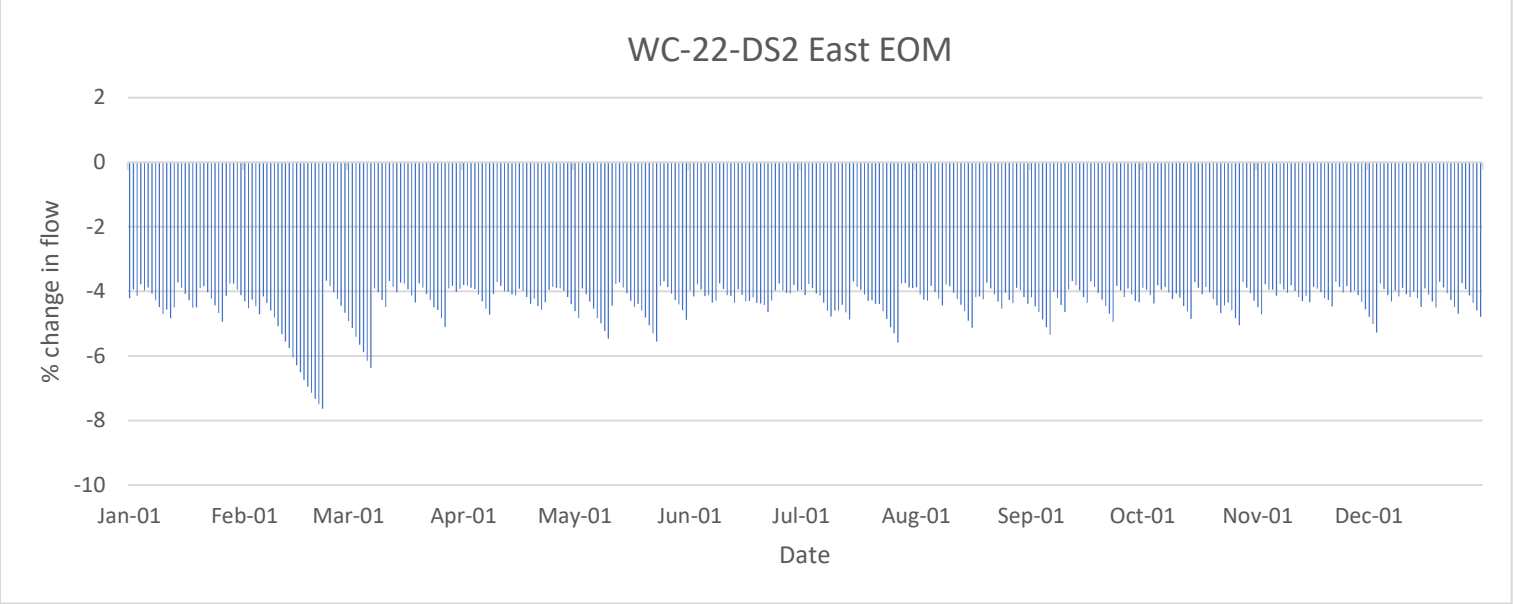
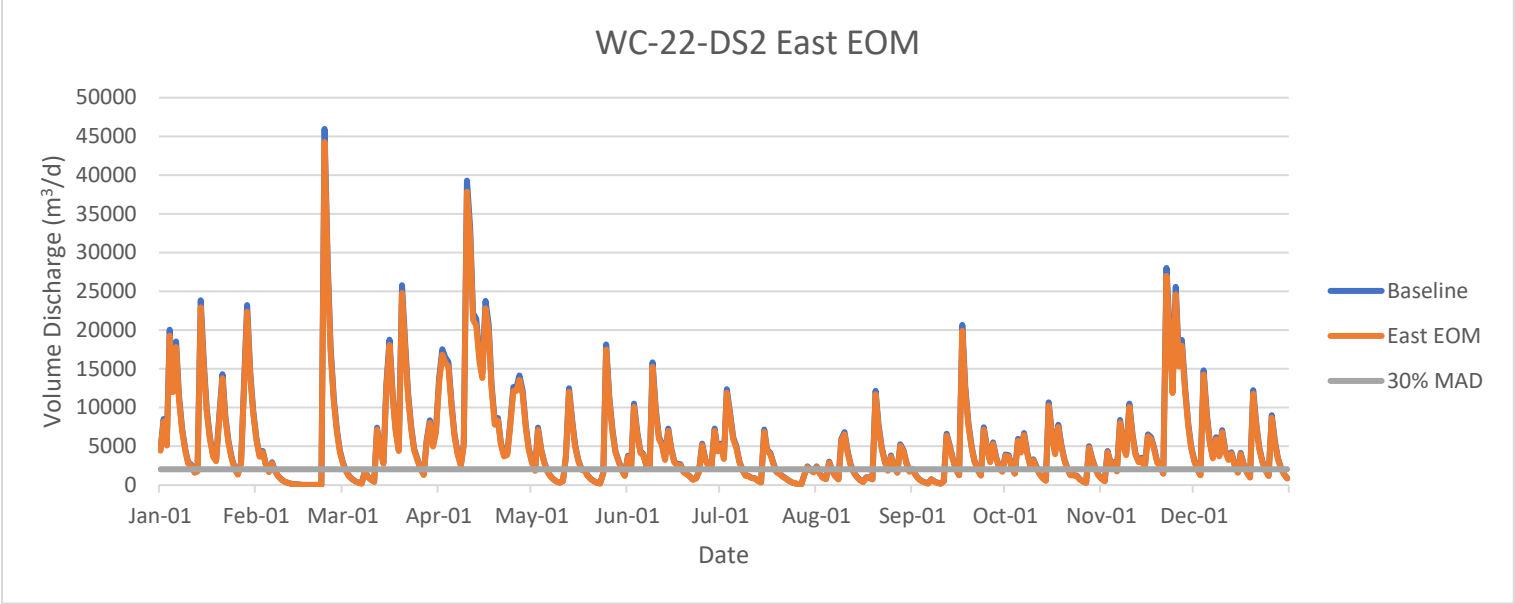
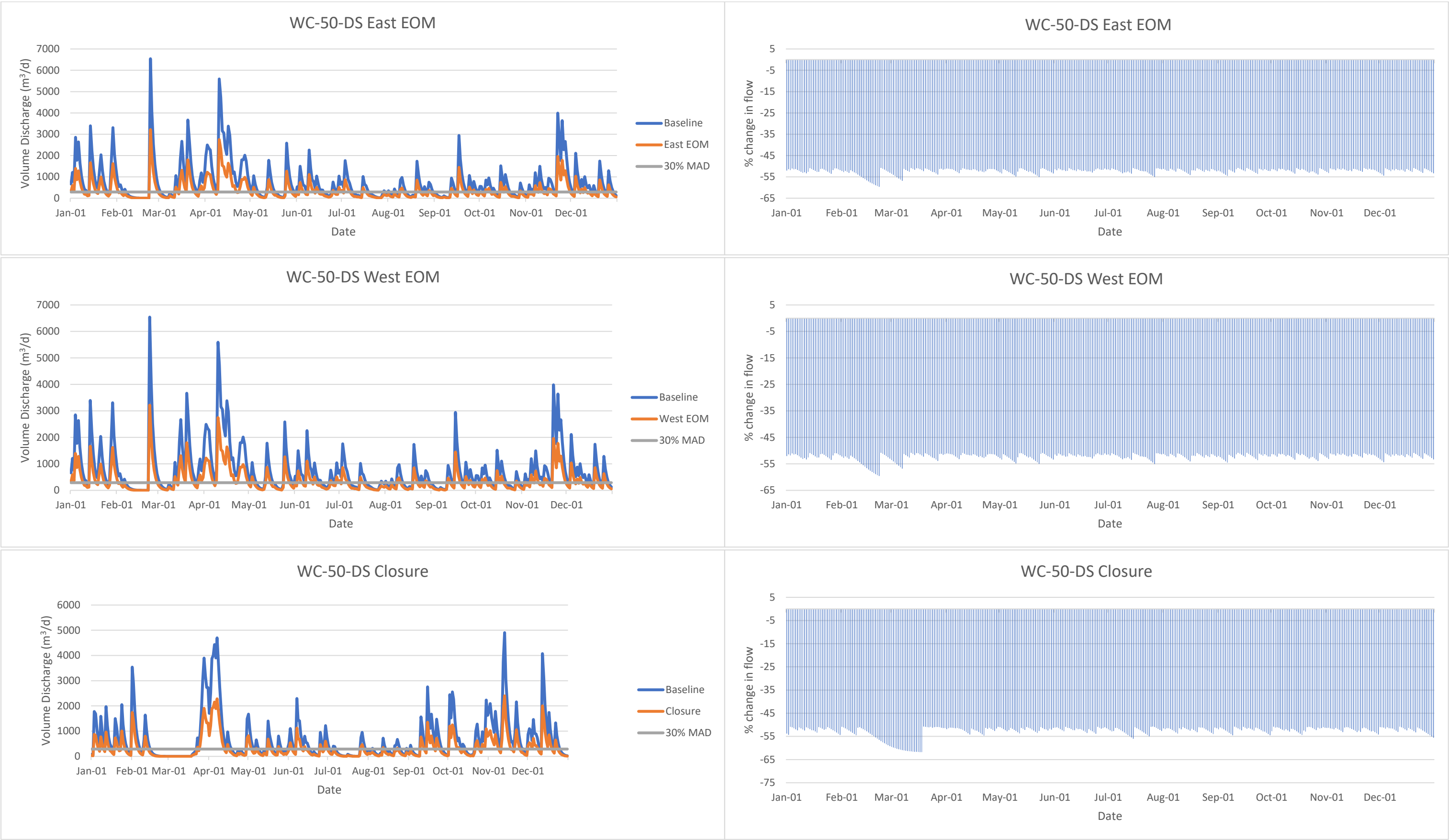
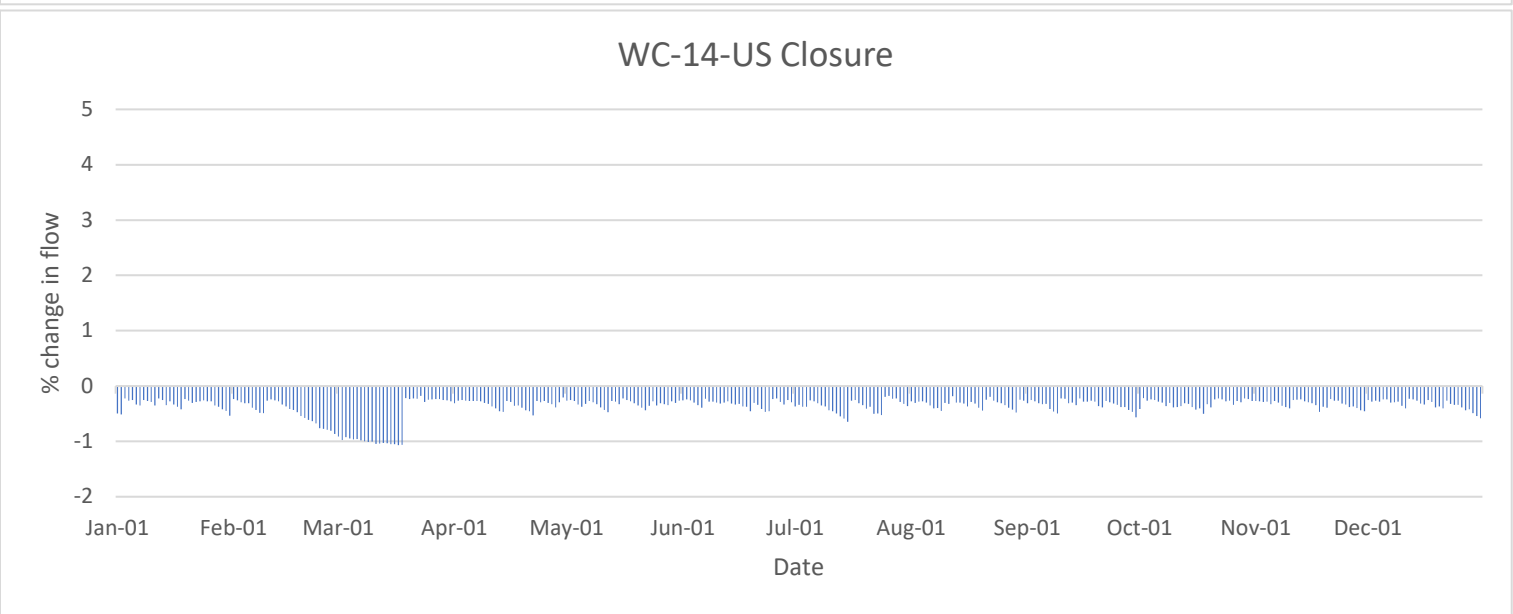
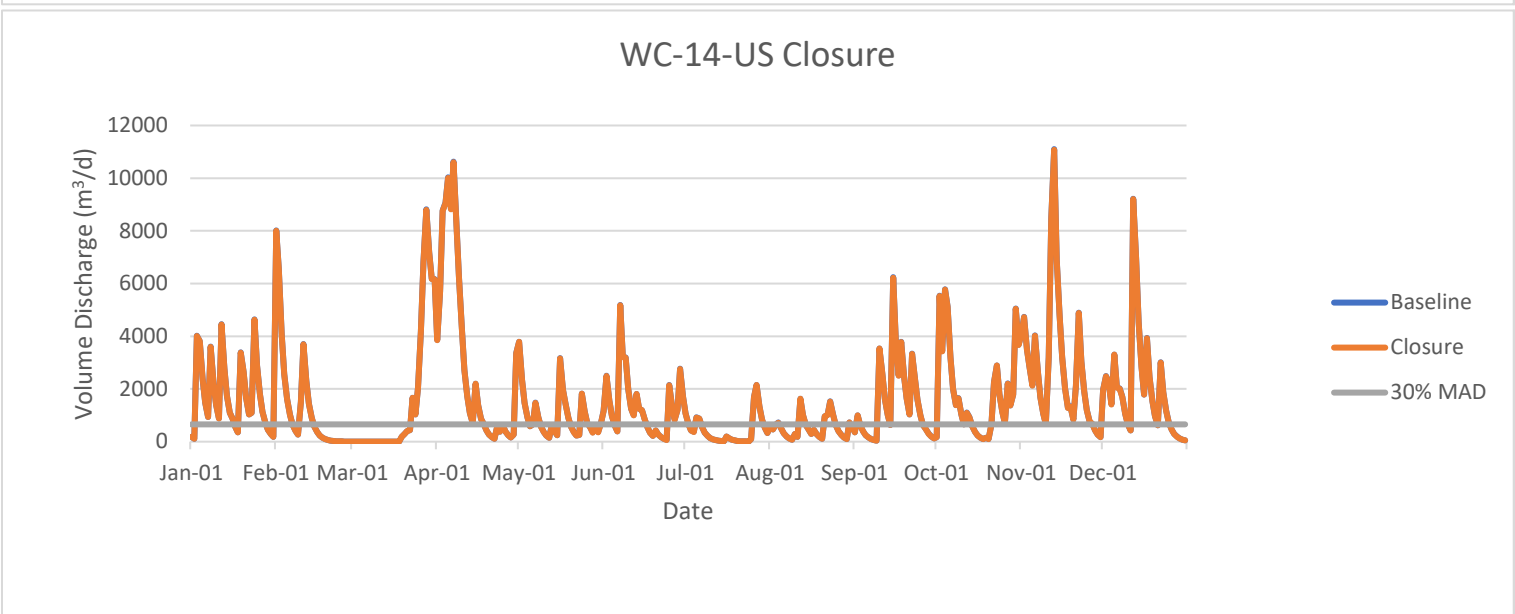
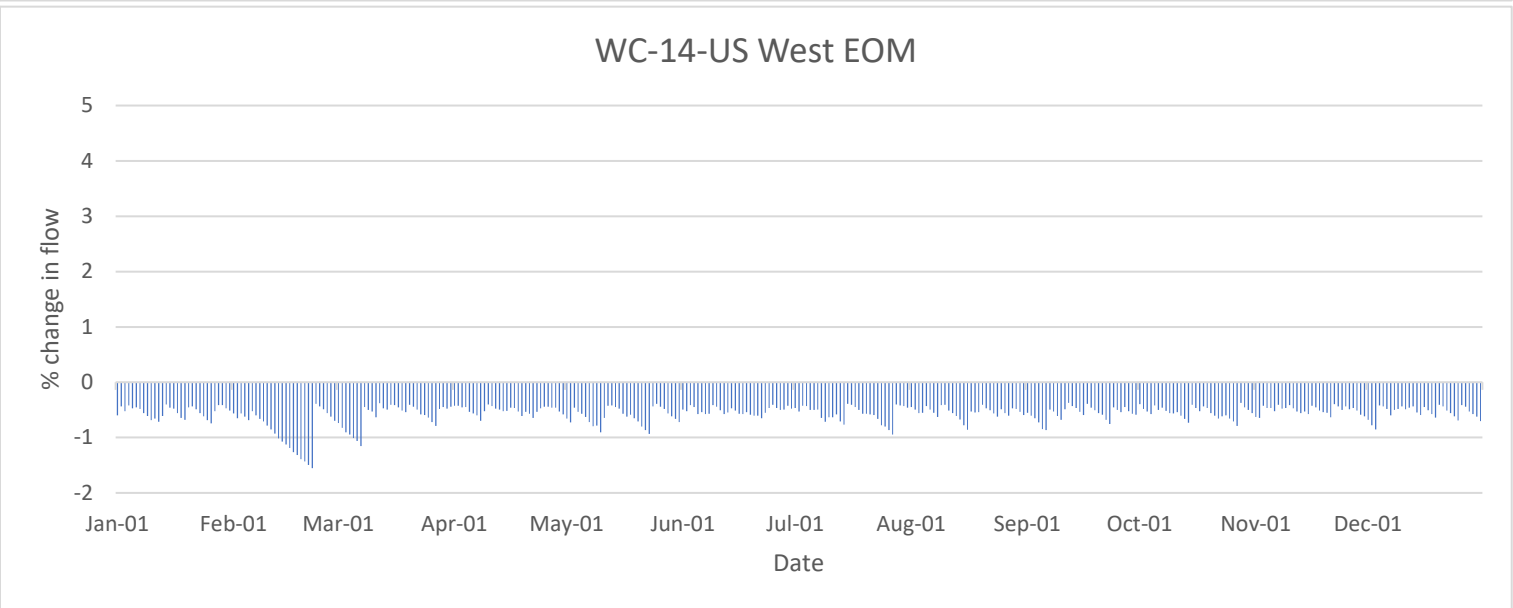
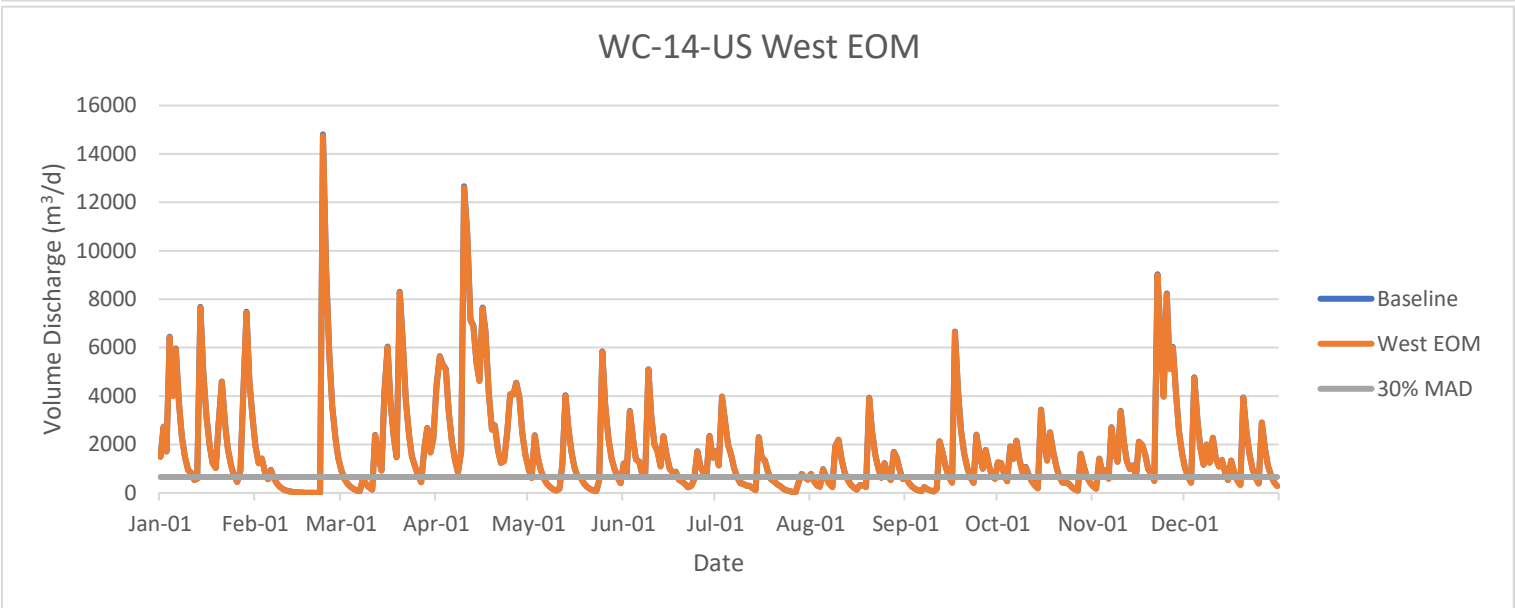
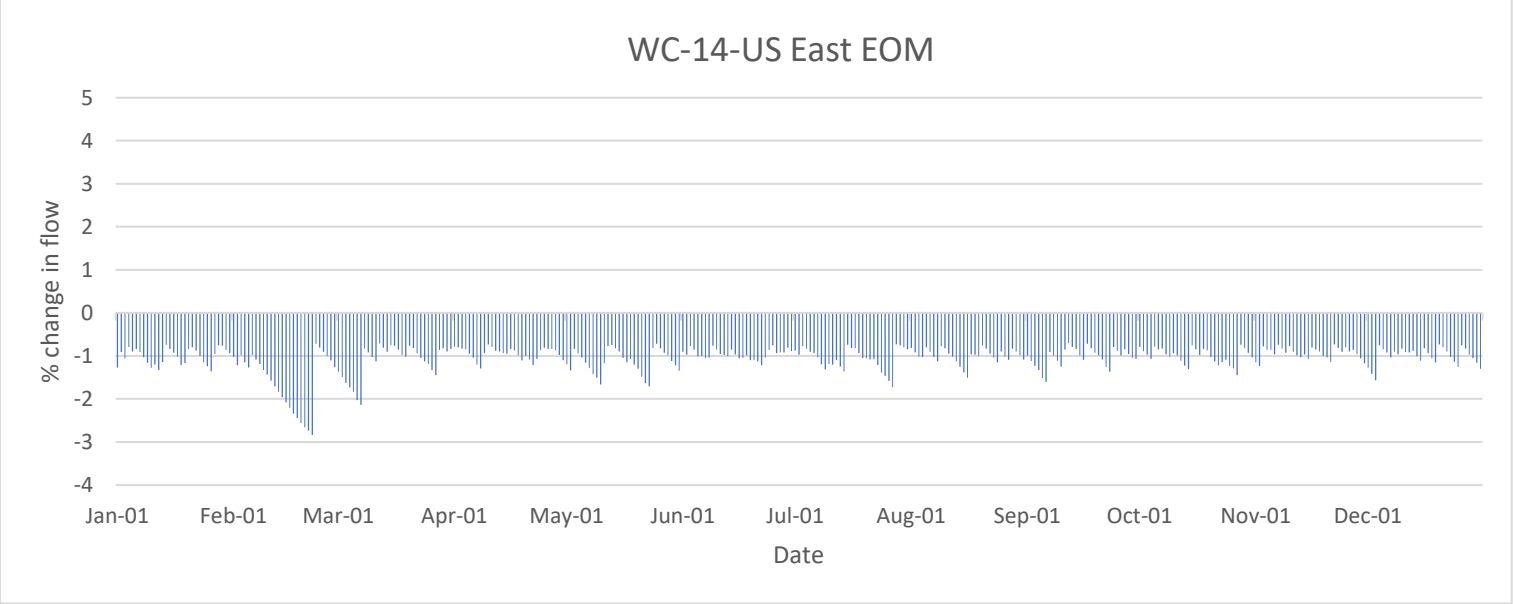
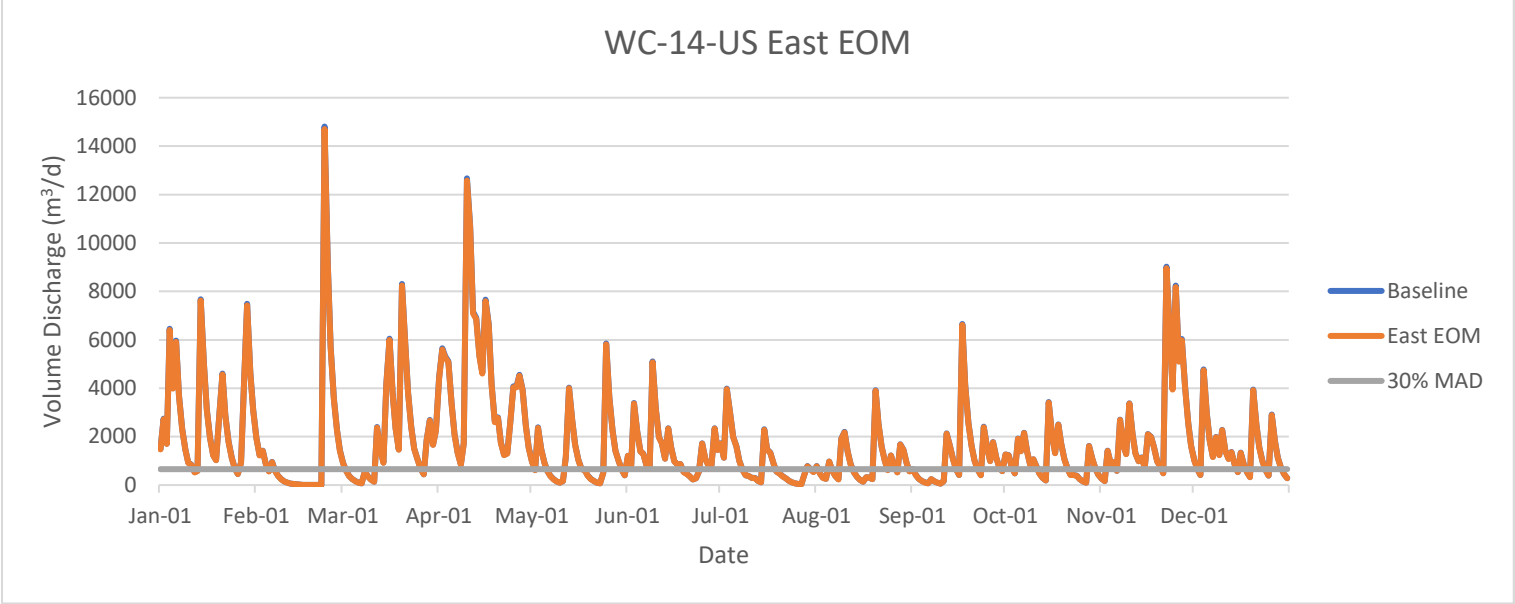


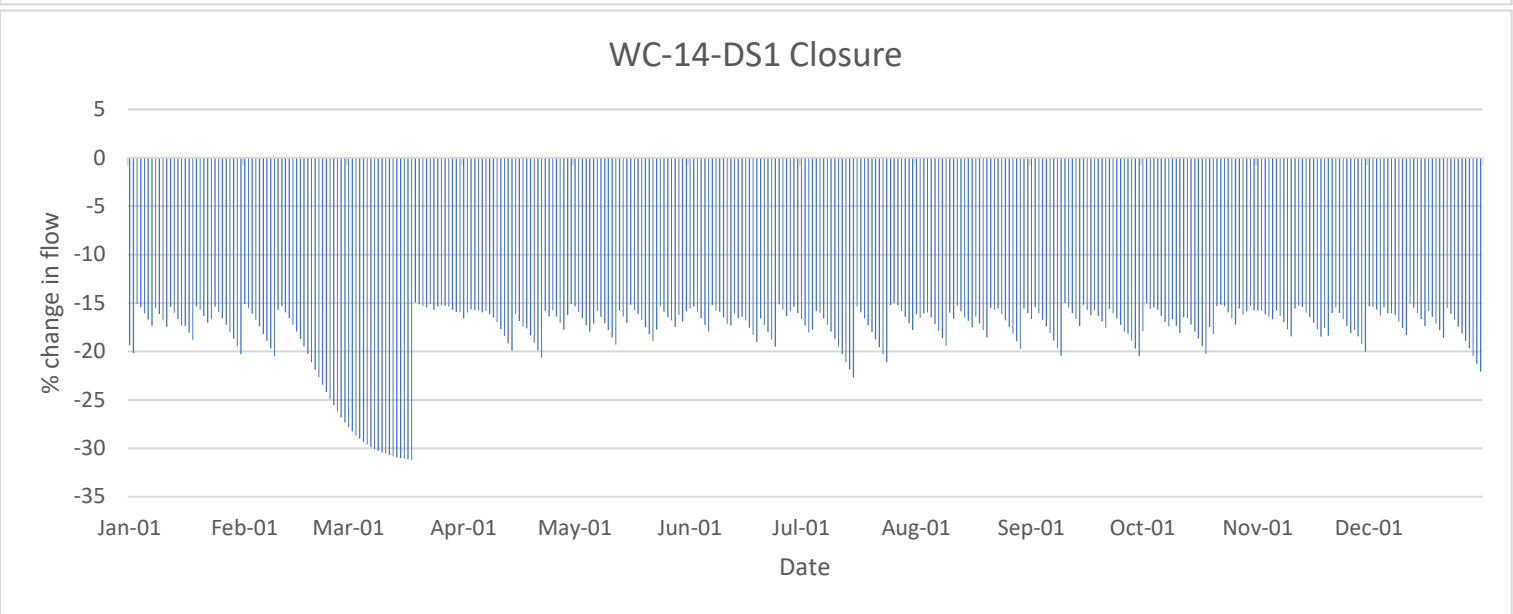
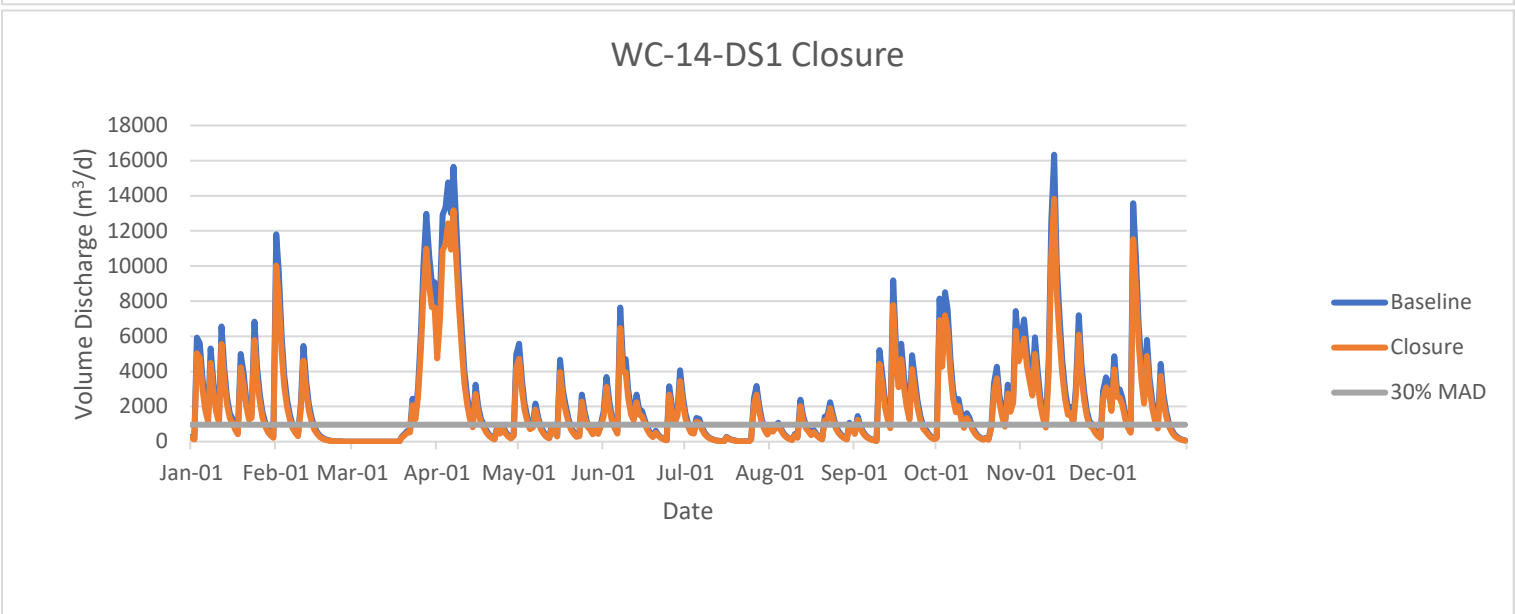
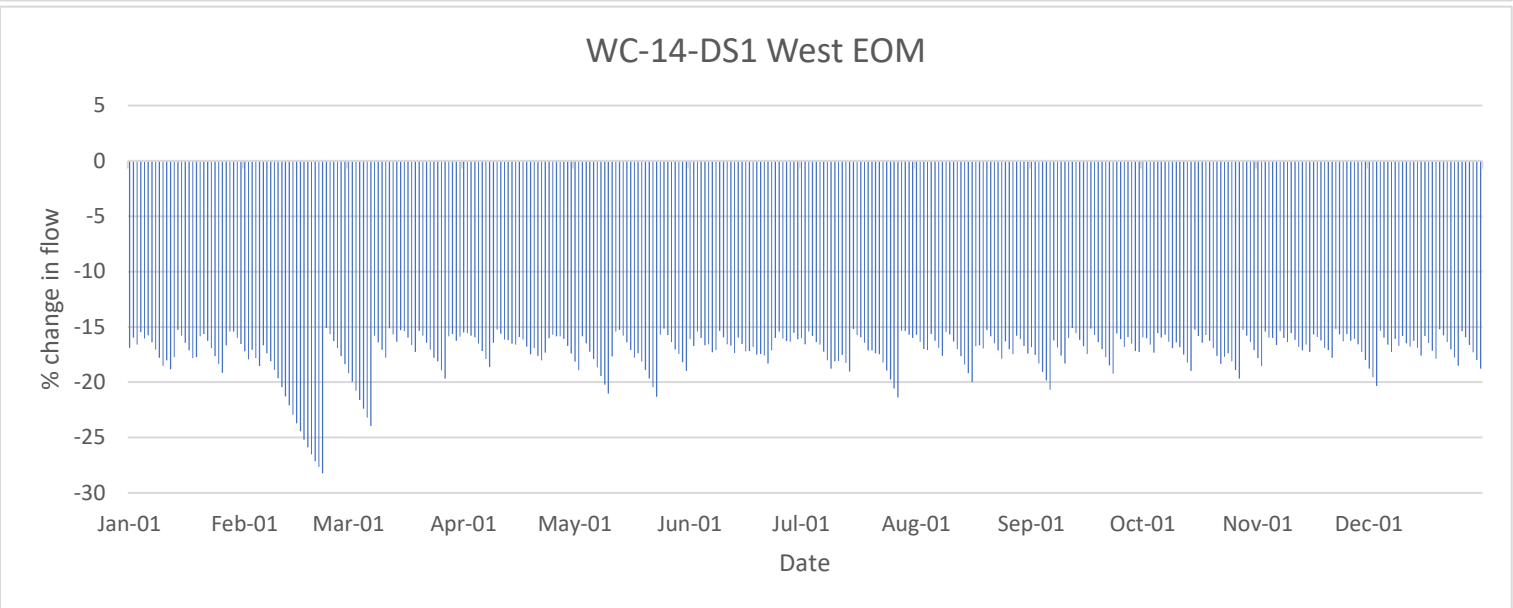
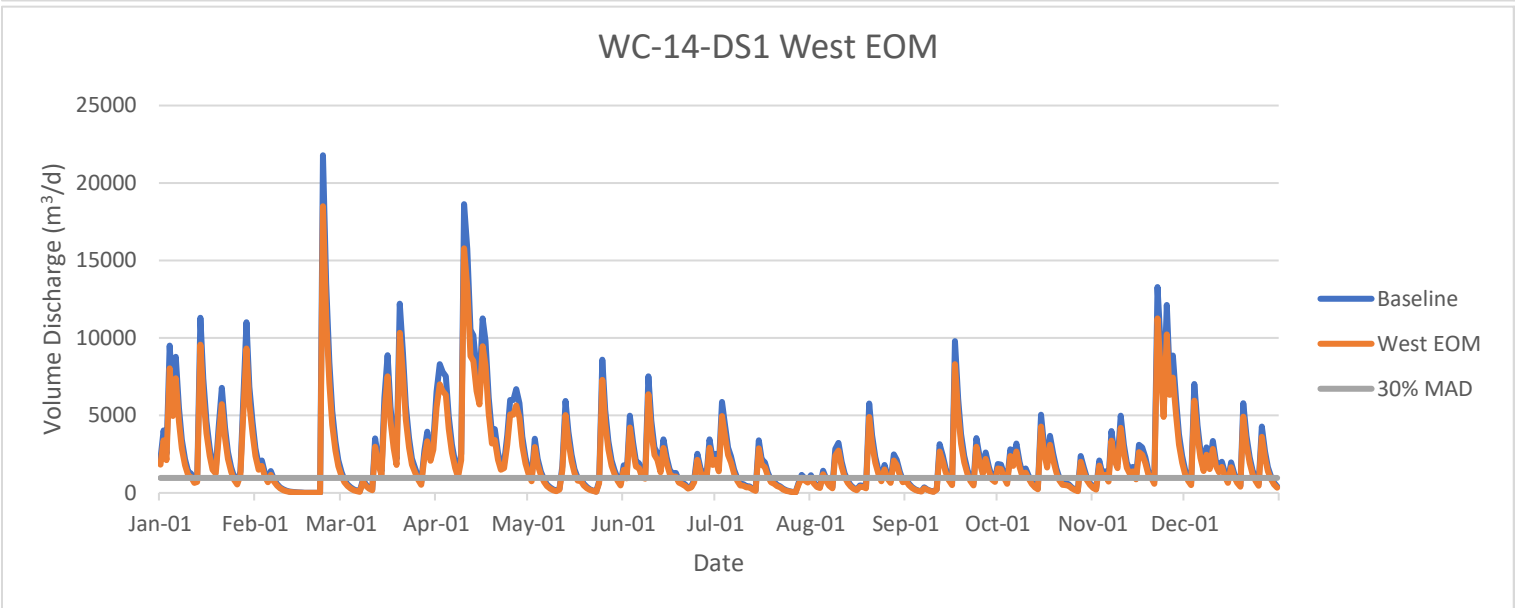
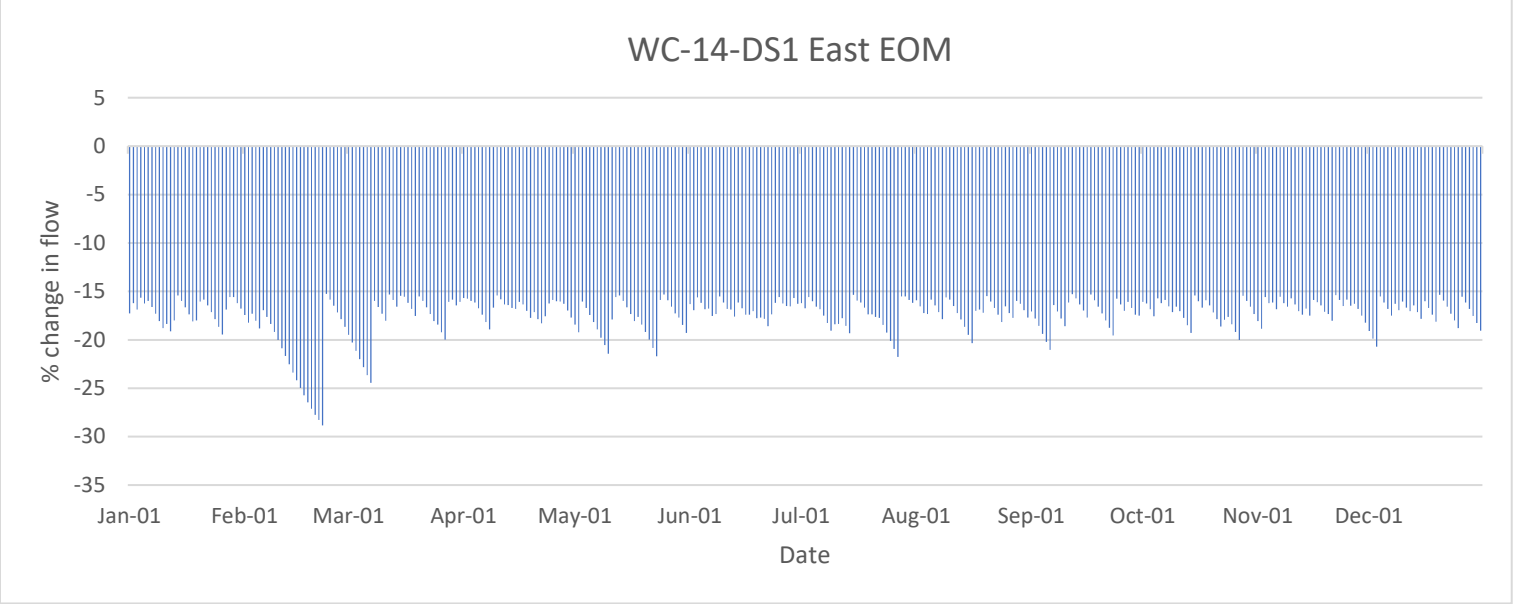
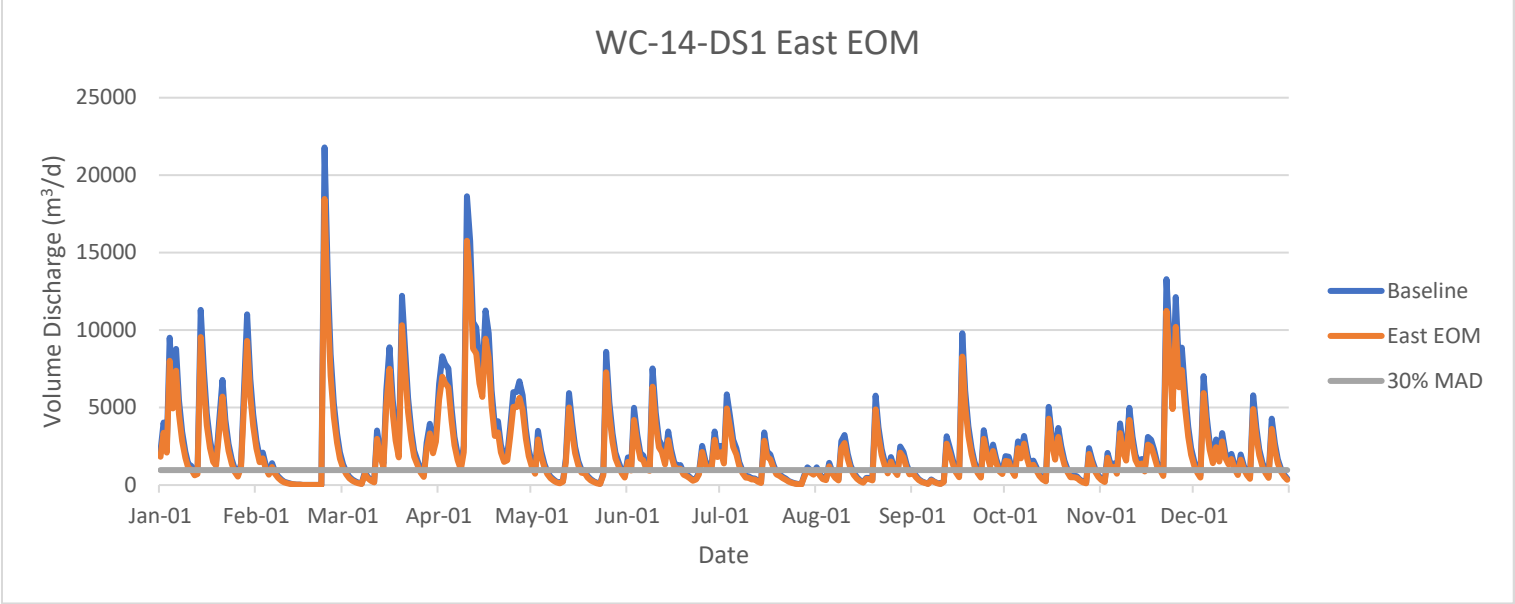
Table 2. Summary of Daily Flow Data Derived from Hydrographs; ‘Normal Year’ Scenario. Northern Tributary System (WC69 and WC22).

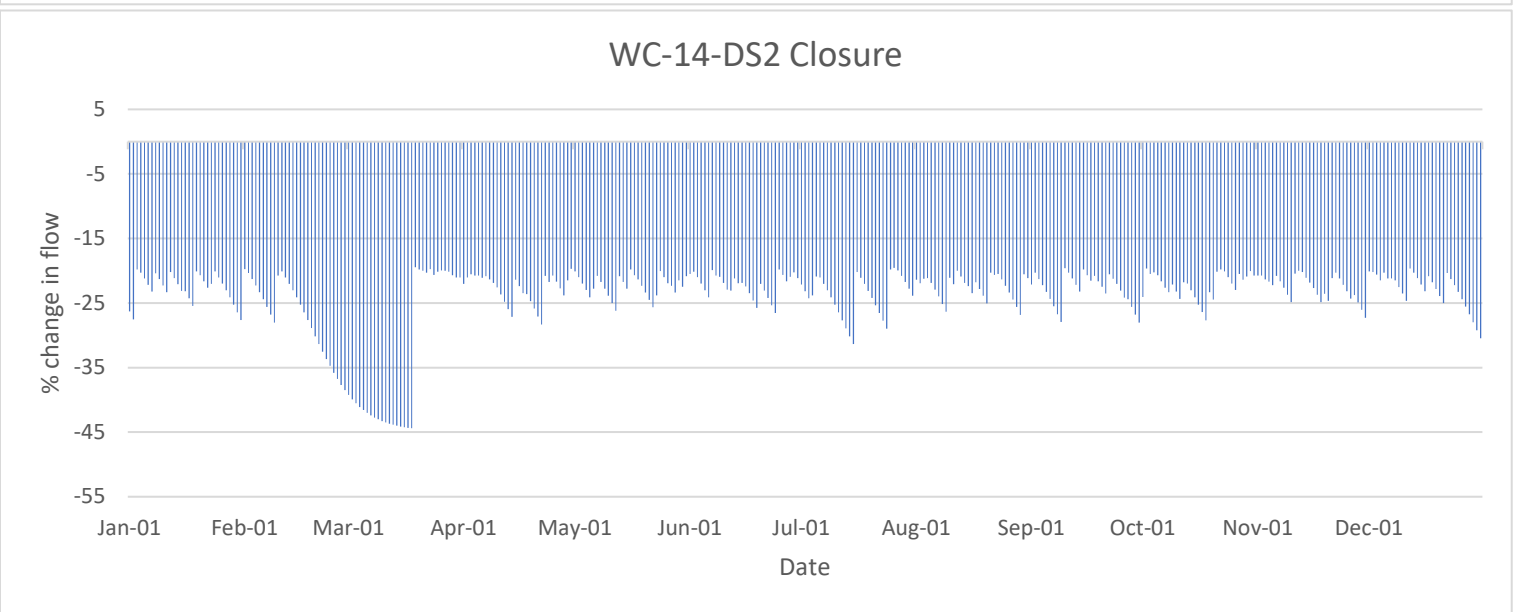
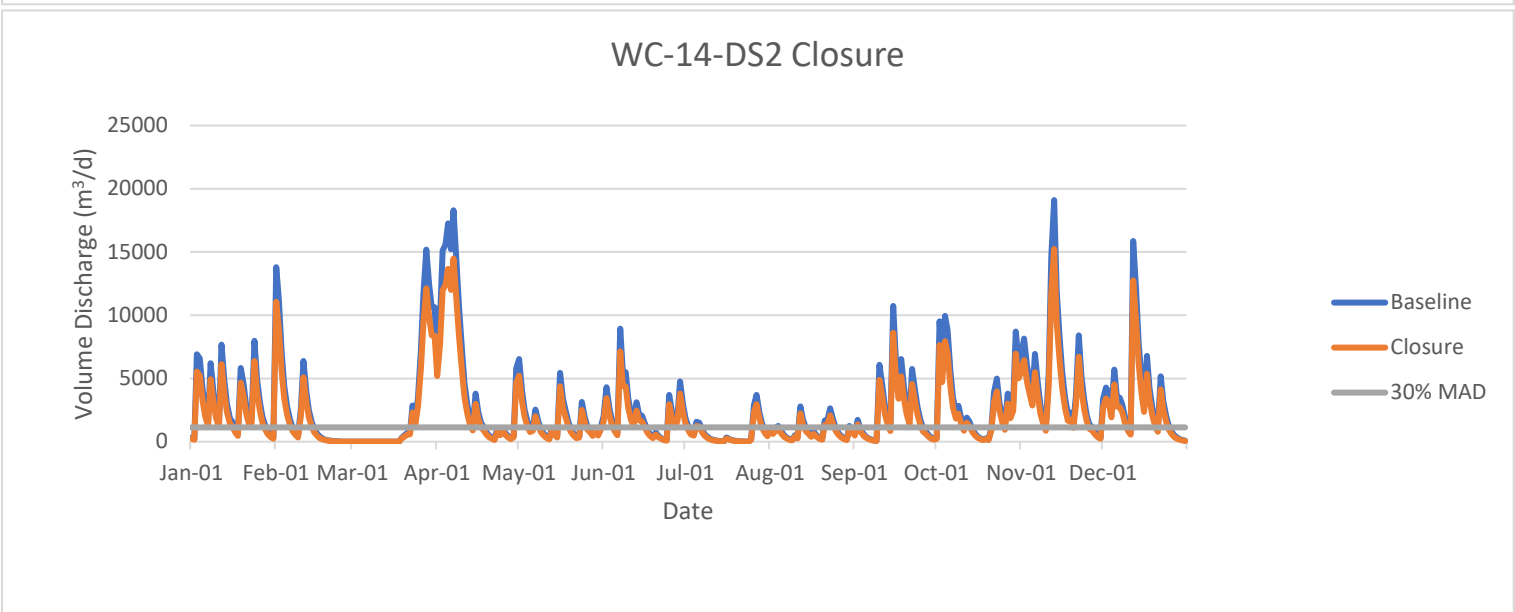
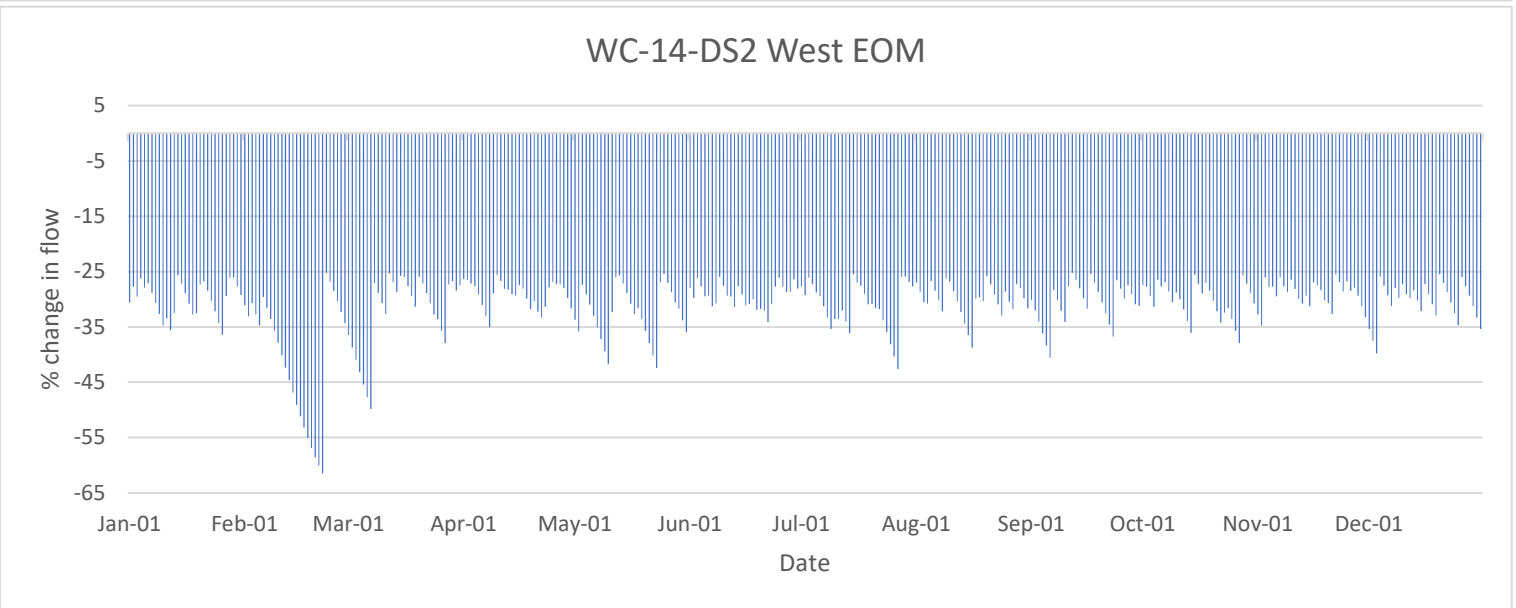
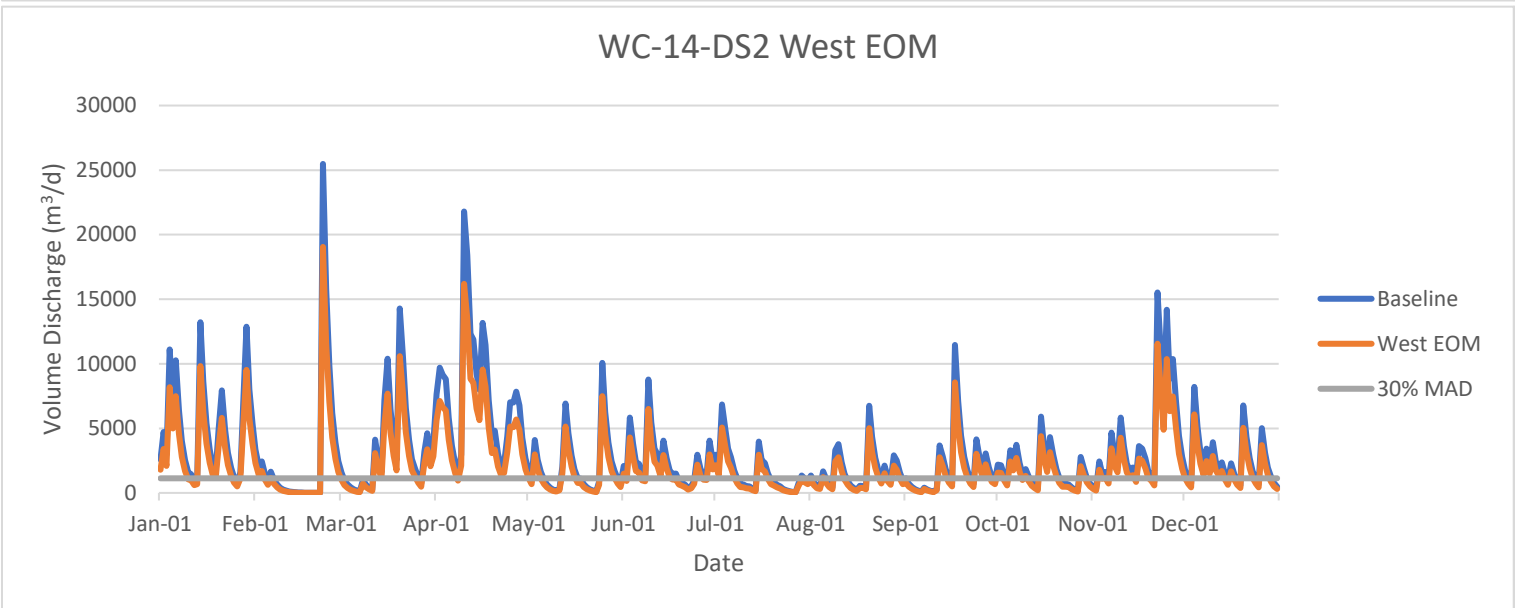
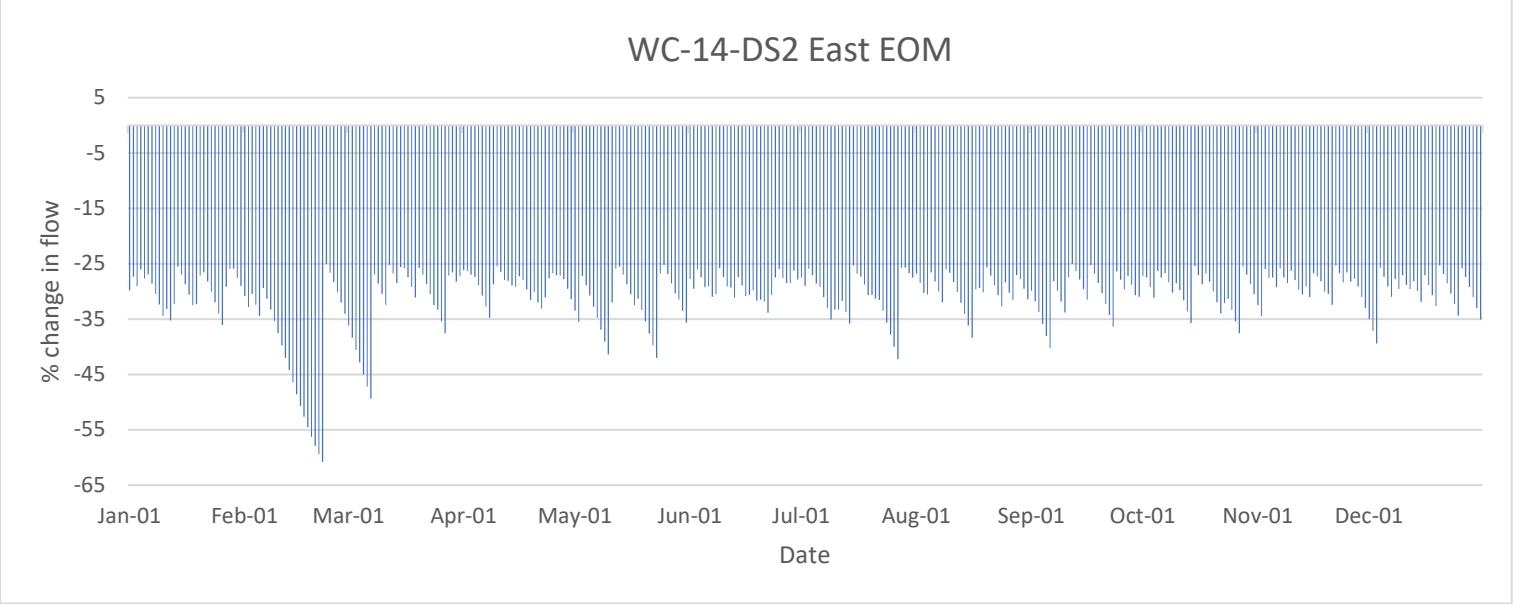
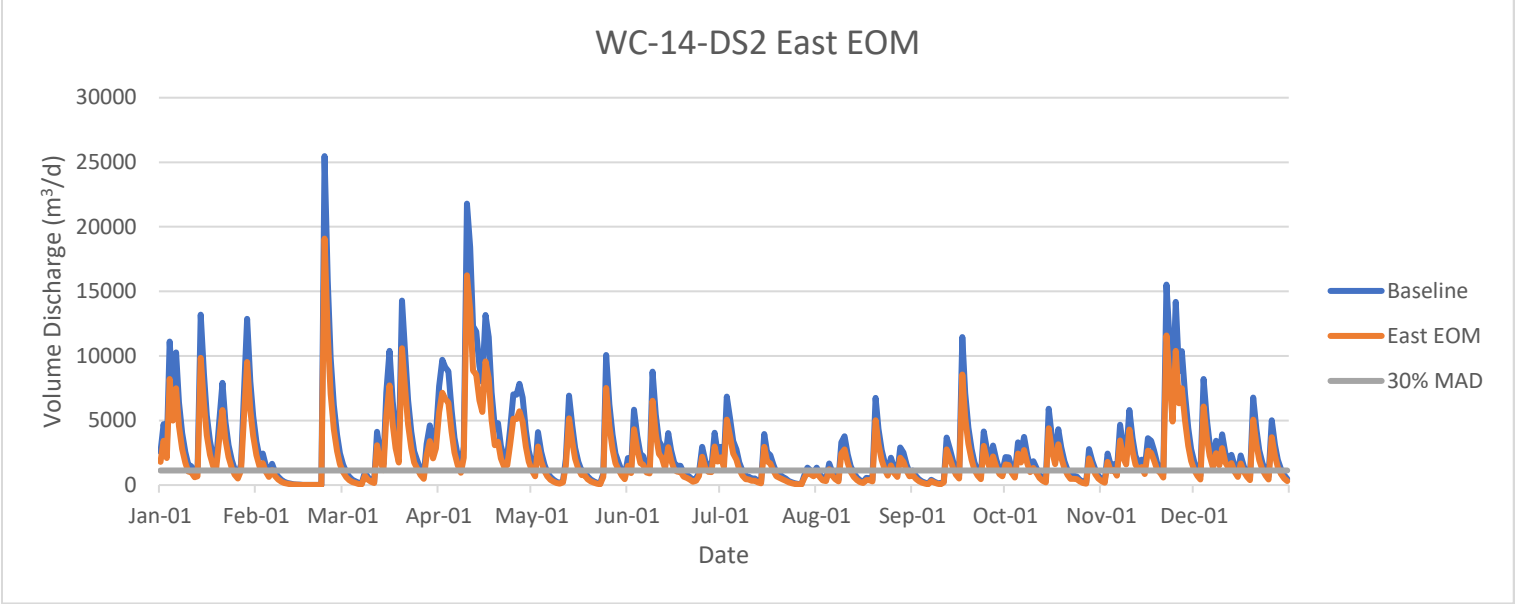
		WC-69-US	WC-22-US	WC-22-DS1	WC-22-DS2
East EOM	Range in flow change	0	-1	-1	-4
		0	-3	-3	-8
	# days with > 10% reduction	0	0	0	0
	# baseline days below 30% MAD	127	127	127	127
	# of East EOM below 30% MAD	127	128	128	131
	# additional days below 30% MAD	0	1	1	4
West EOM	Range in flow change	0	-1	-1	-4
		0	-3	-3	-8
	# days with > 10% reduction	0	0	0	0
	# baseline days below 30% MAD	127	127	127	127
	# of West EOM below 30% MAD	127	128	128	131
	# additional days below 30% MAD	0	1	1	4
Closure	Range in flow change	0	-1	-1	-4
		0	-4	-4	-9
	# days with > 10% reduction	0	0	0	0
	# baseline days below 30% MAD	163	163	163	163
	# of Closure below 30% MAD	164	165	165	170
	# additional days below 30% MAD	1	2	2	7

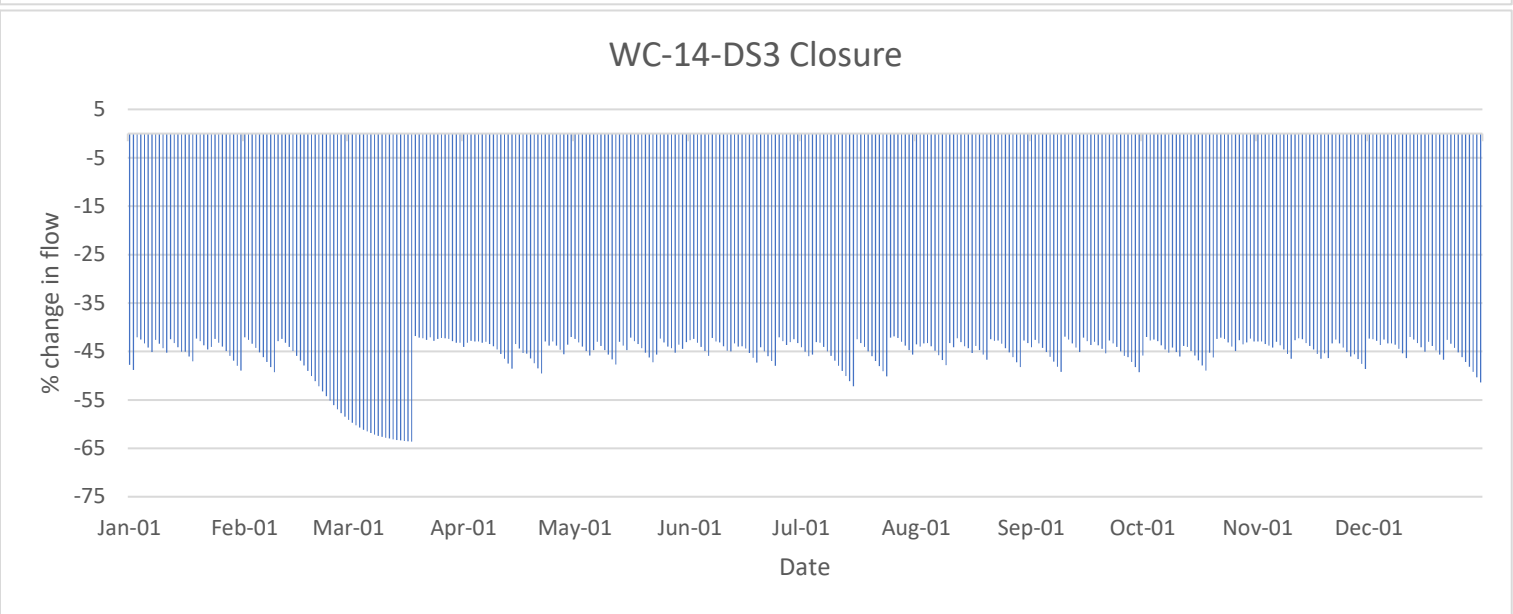
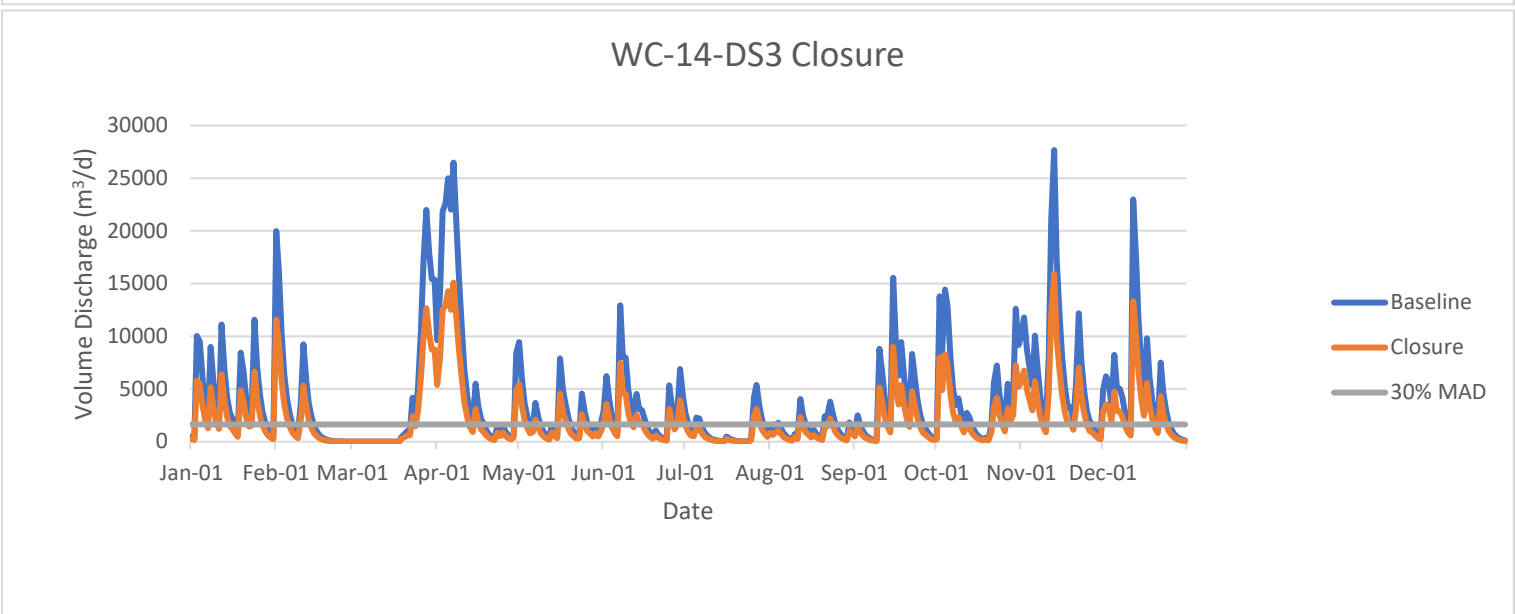
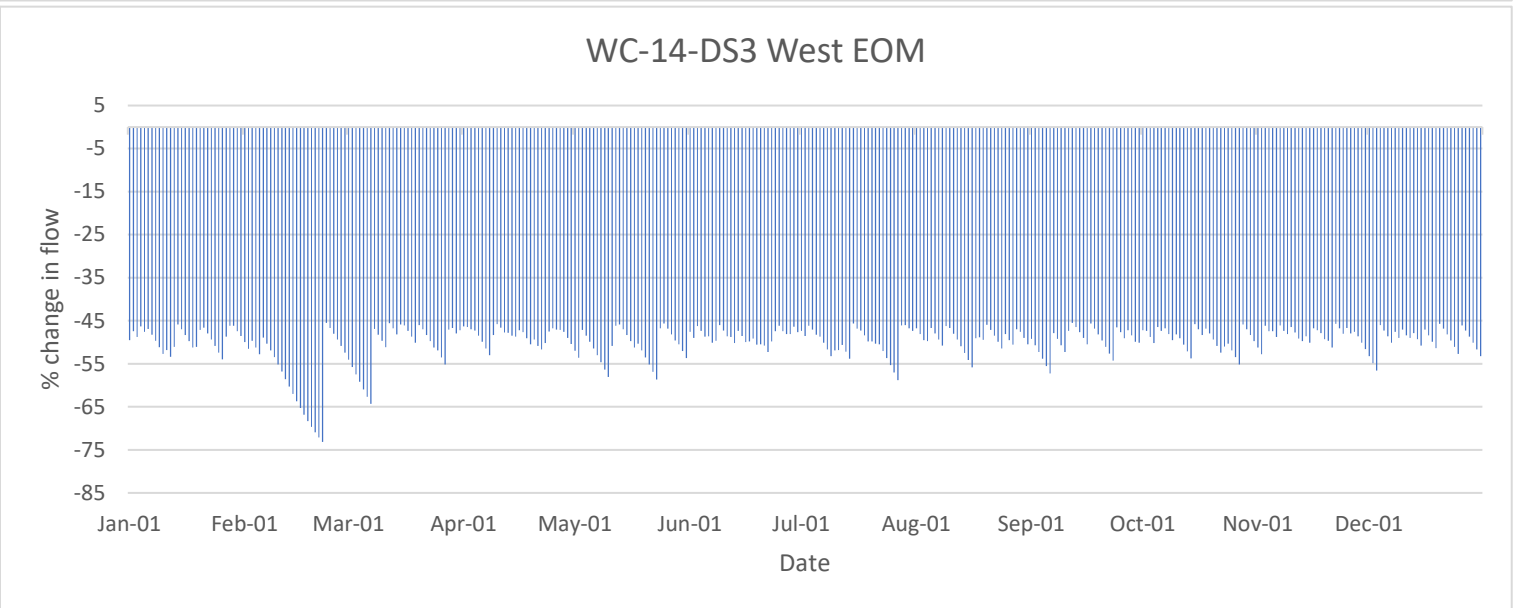
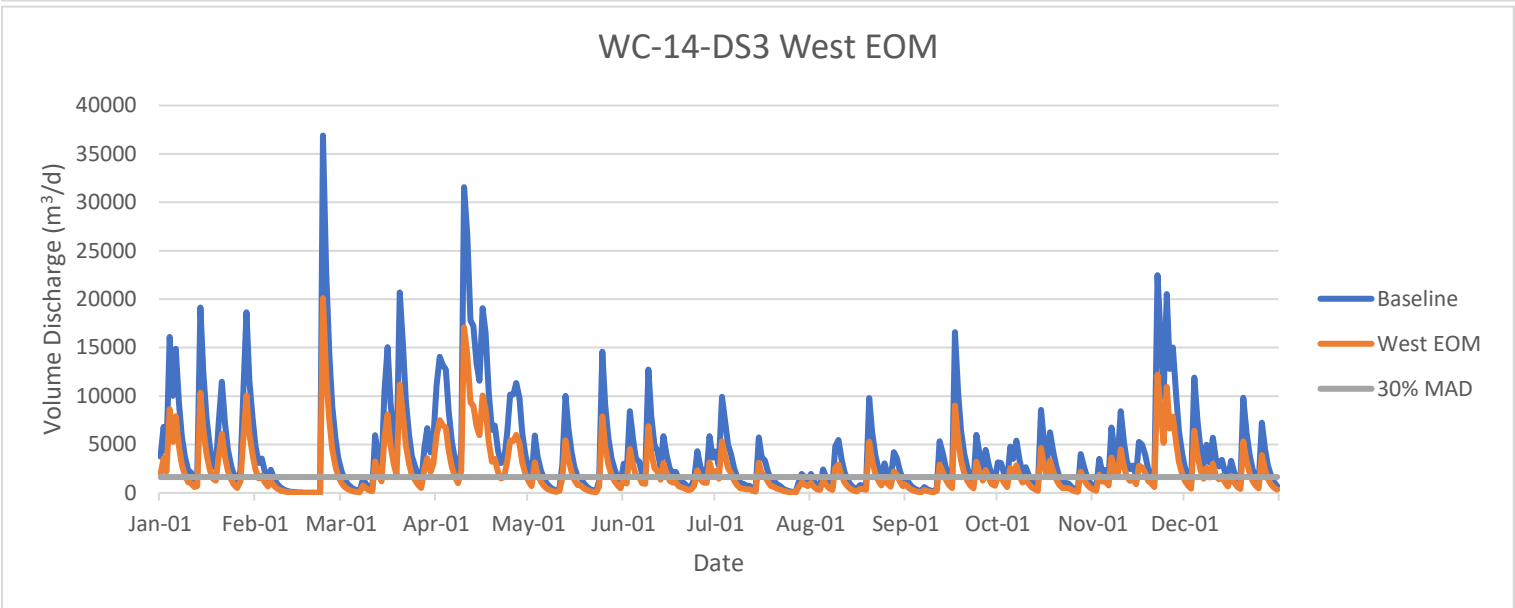
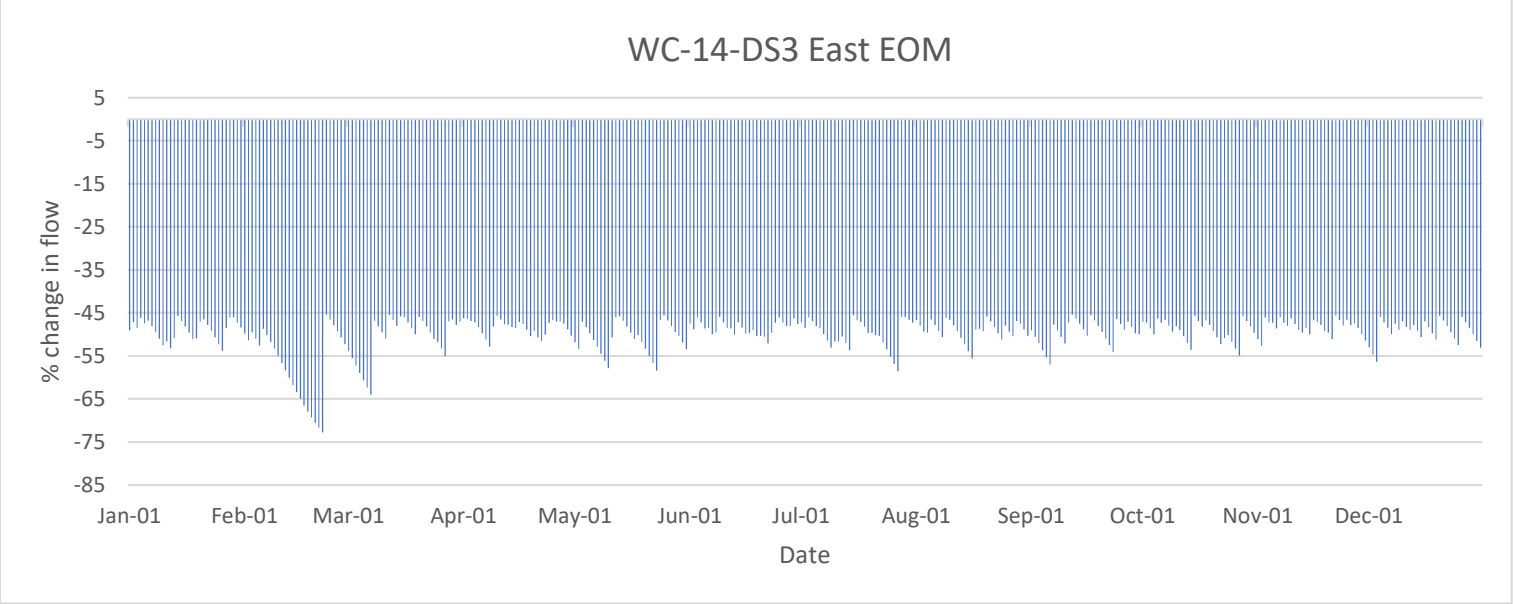
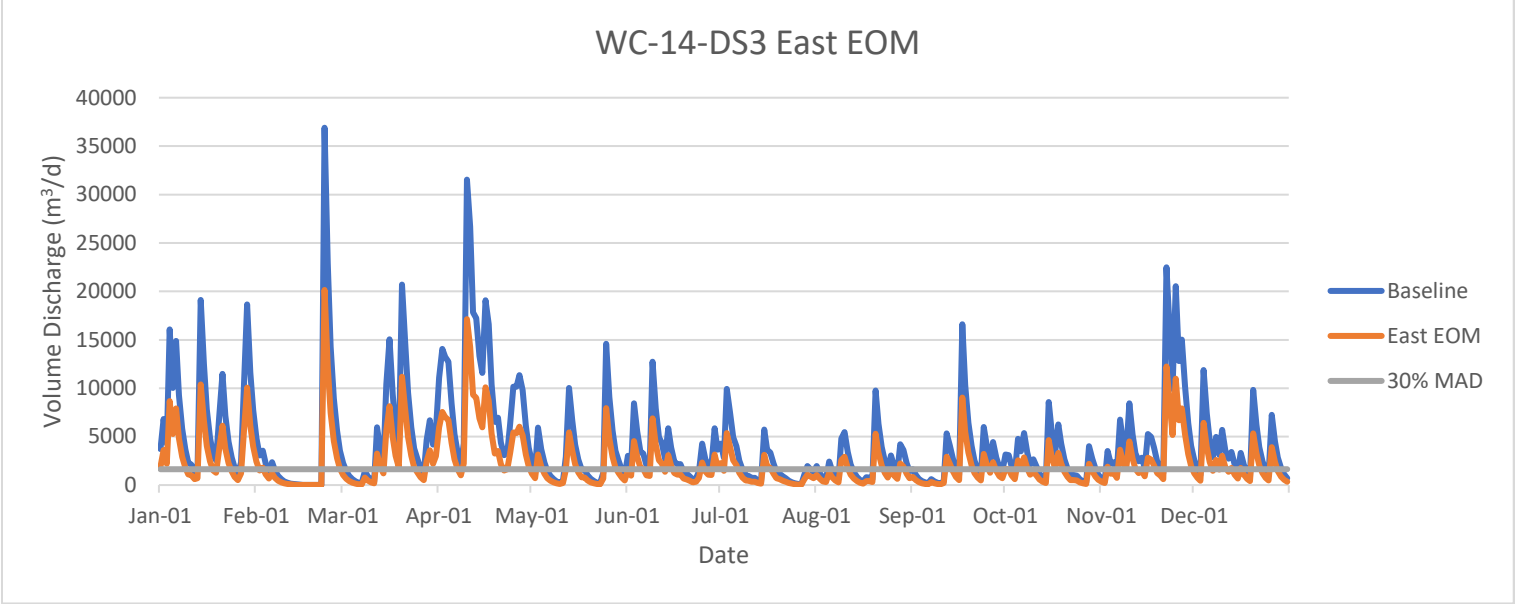
May 2022 – Goldboro Gold Project. – Daily Hydrographs
Figures 49-90. Eastern Tributary System (WC50, WC14 and WC16) Hydrographs showing Normal Year baseline and predicted daily flows during each Project Phase; and associated percent change in flow from baseline to each corresponding Project project phase.

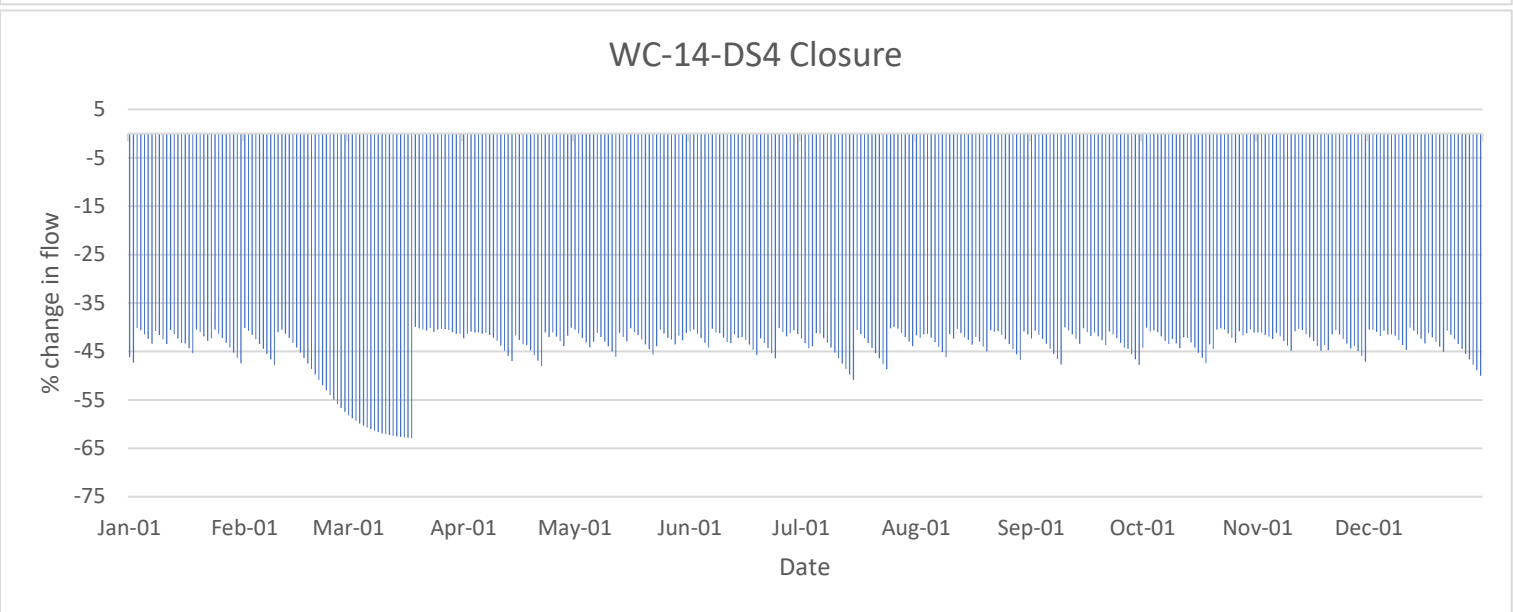
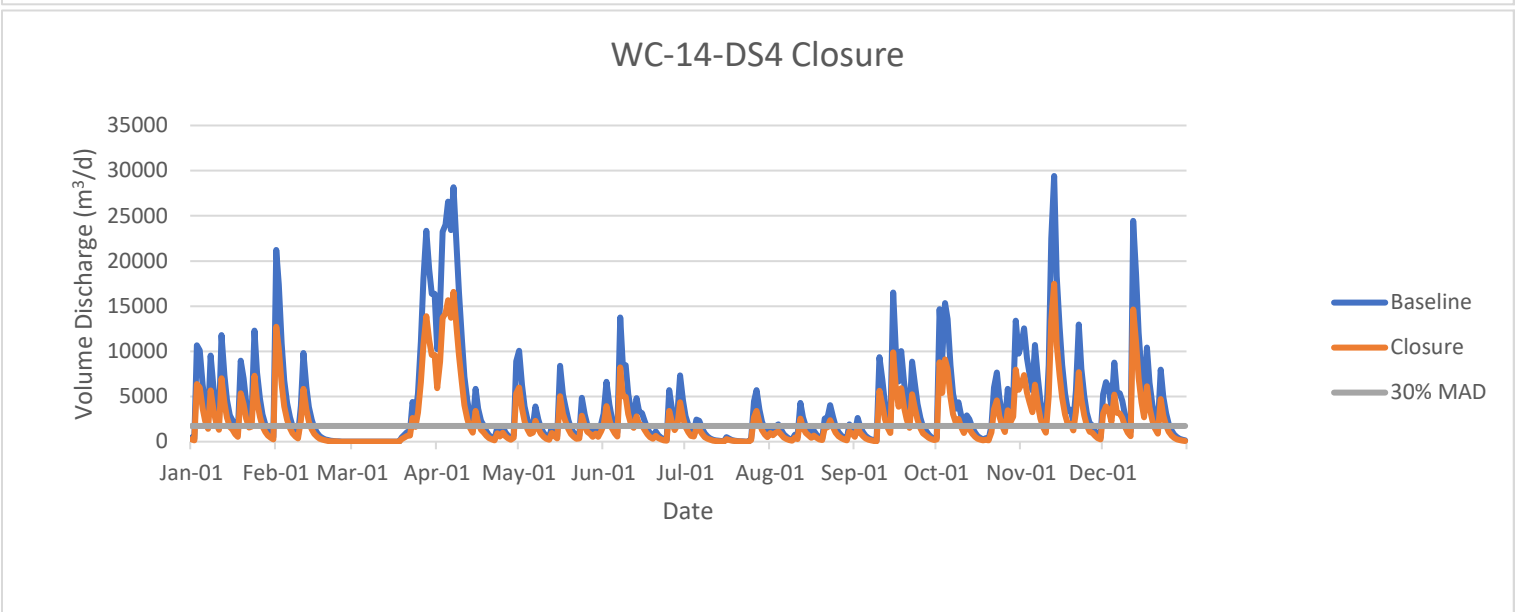
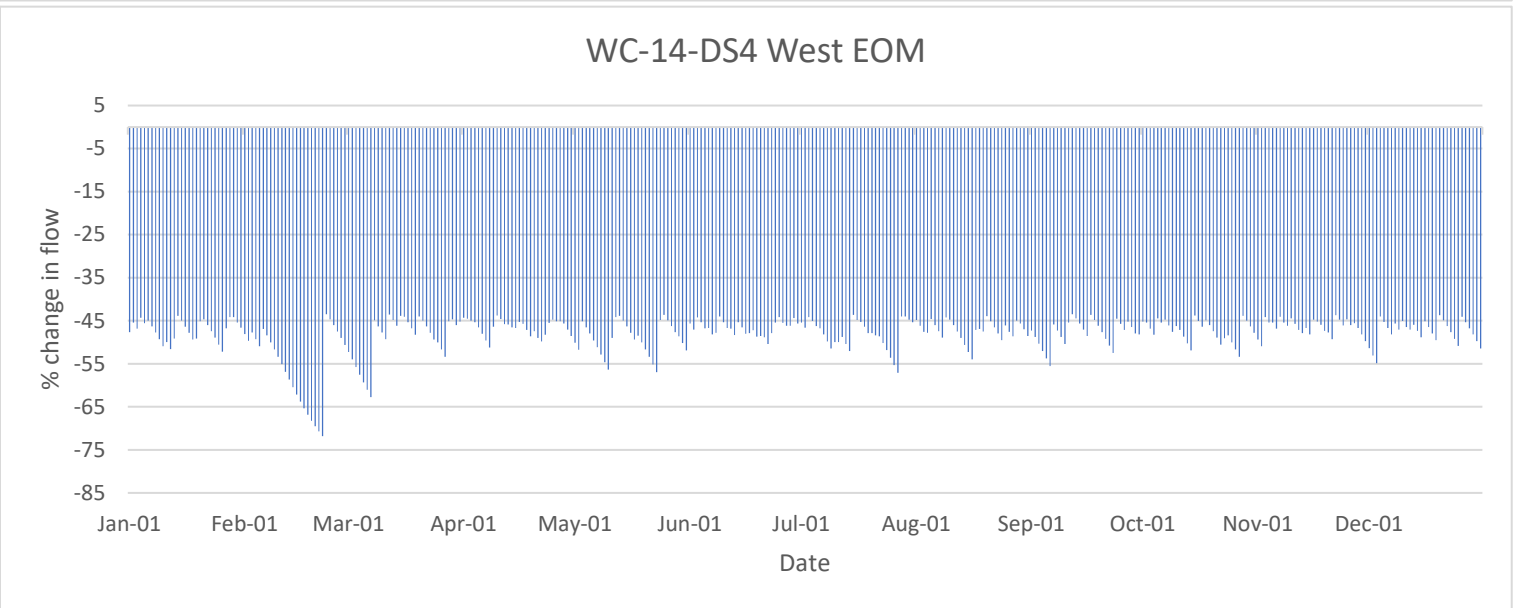
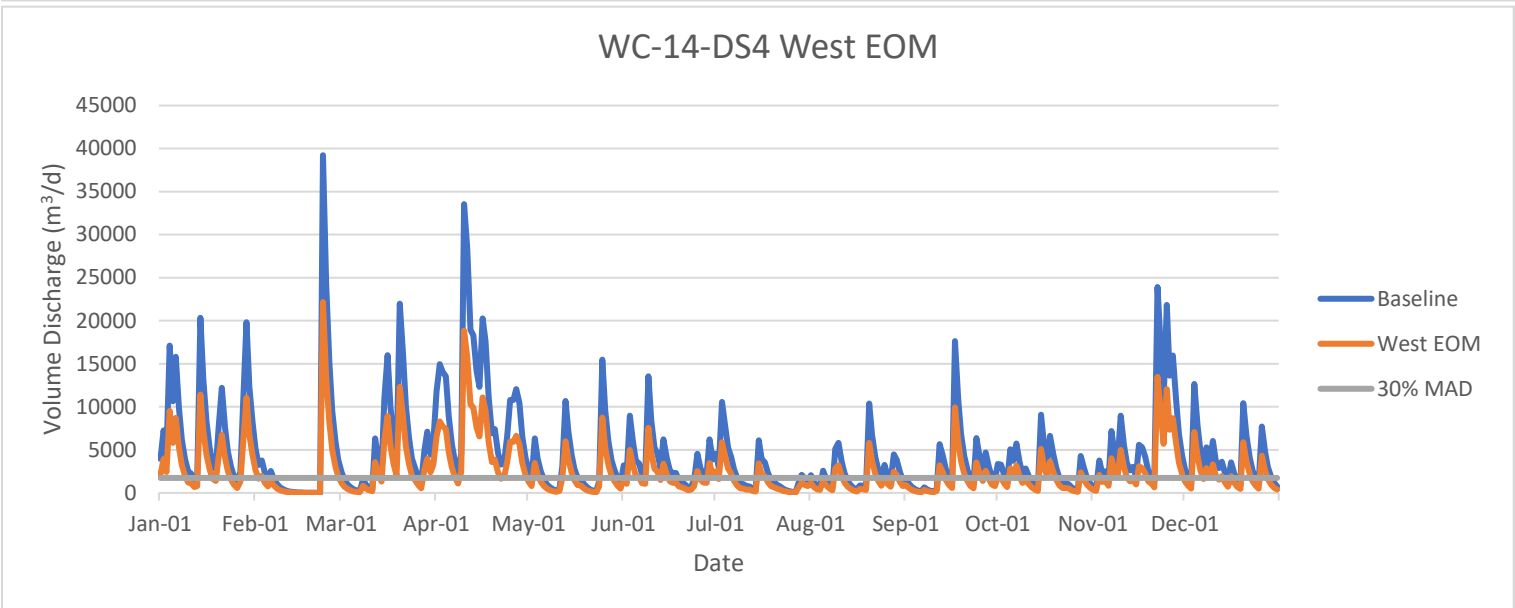
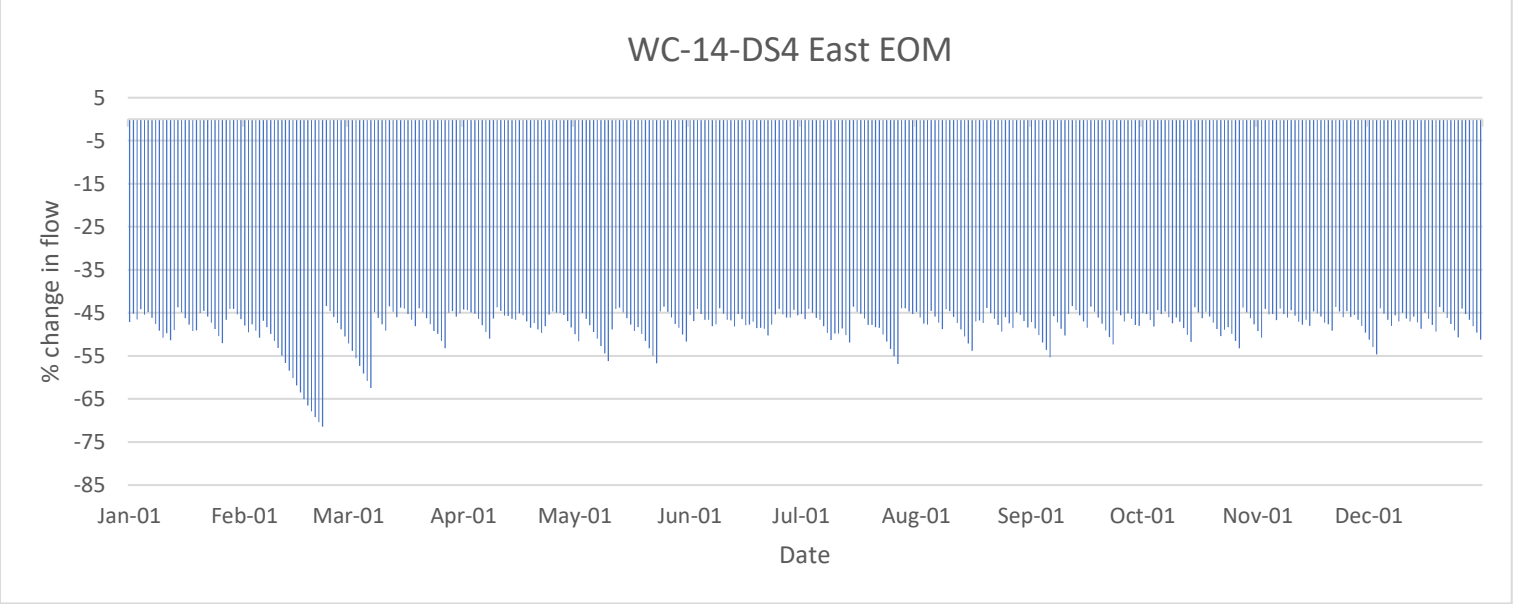
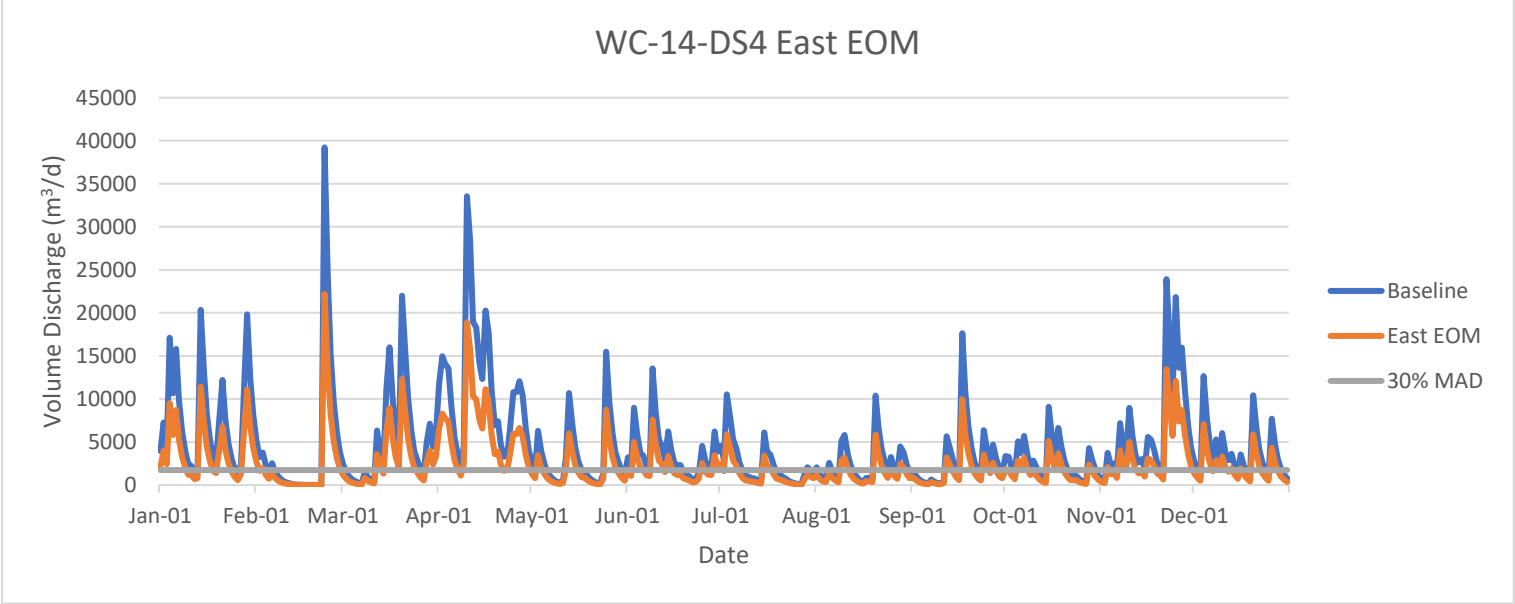


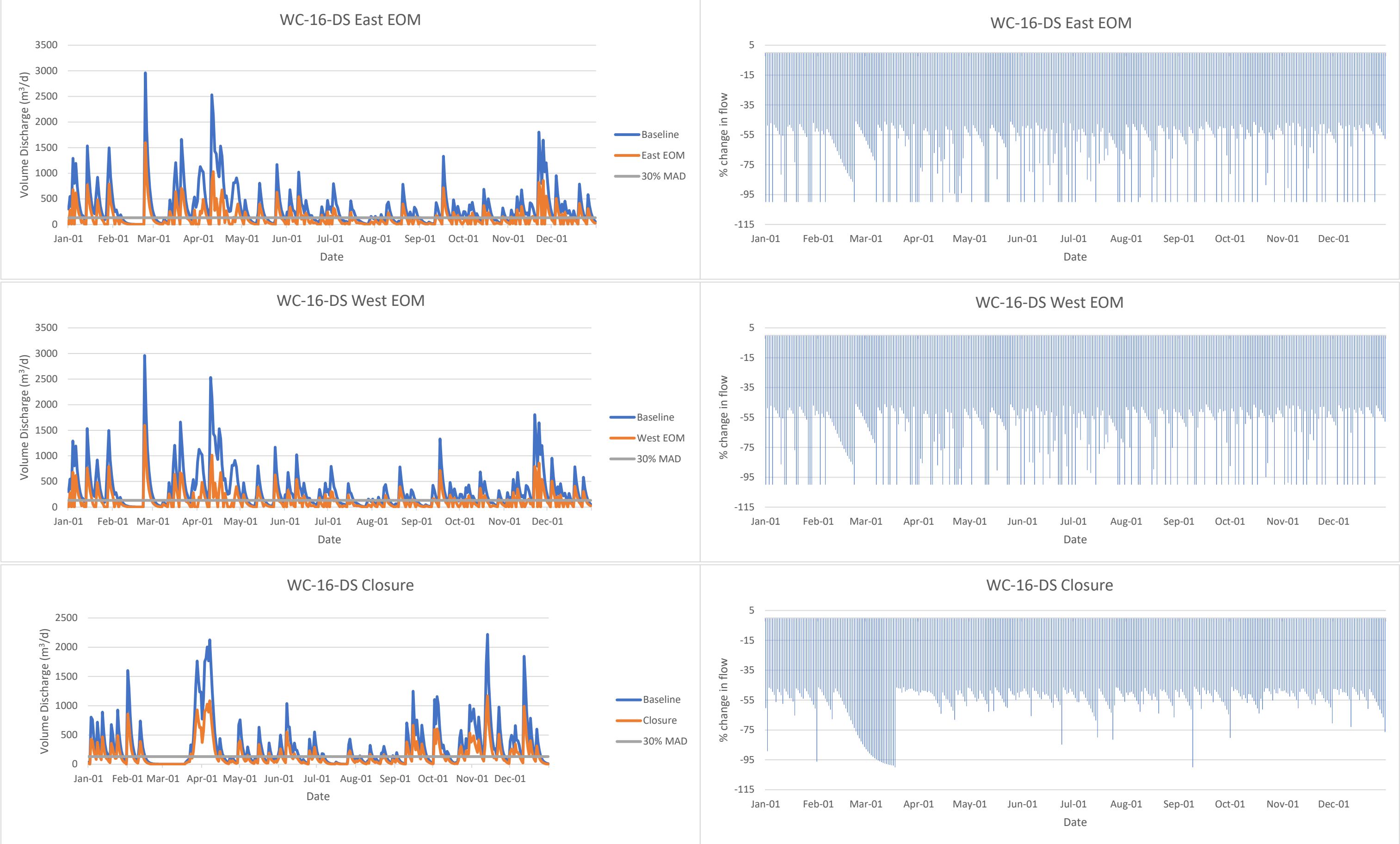








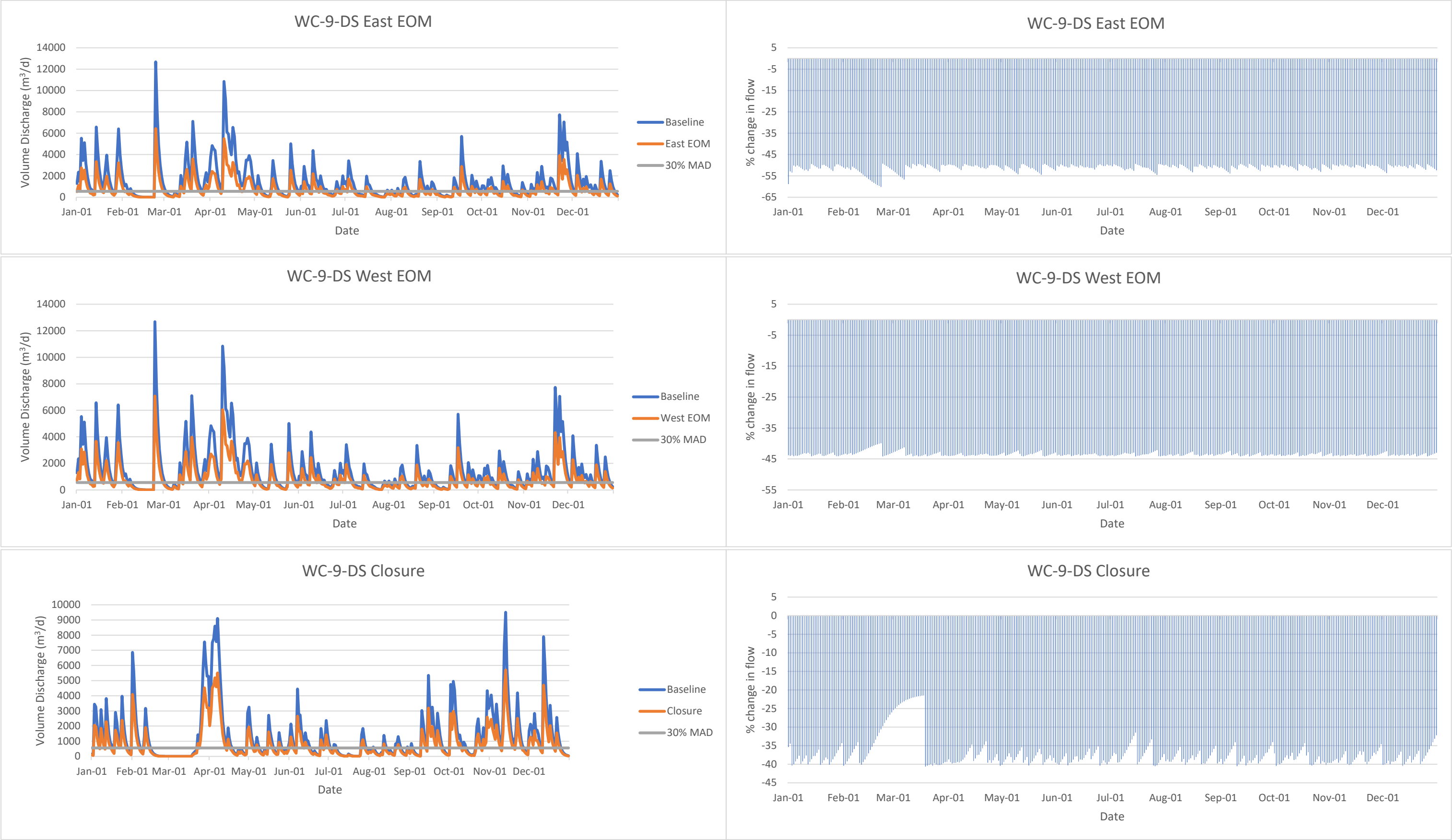




May 2022 – Goldboro Gold Project. – Daily Hydrographs
Table 3. Summary of Daily Flow Data Derived from Hydrographs; ‘Normal Year’ Scenario. Eastern Tributary System (WC50, WC14 and WC16).

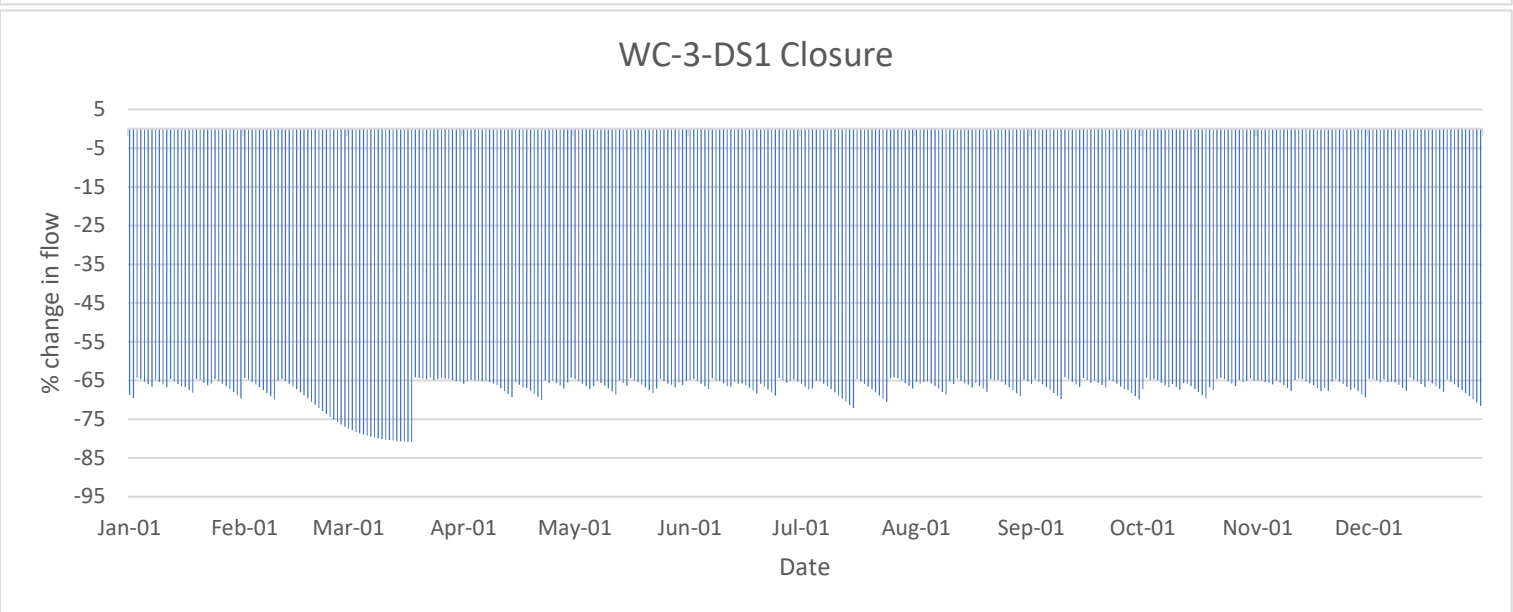
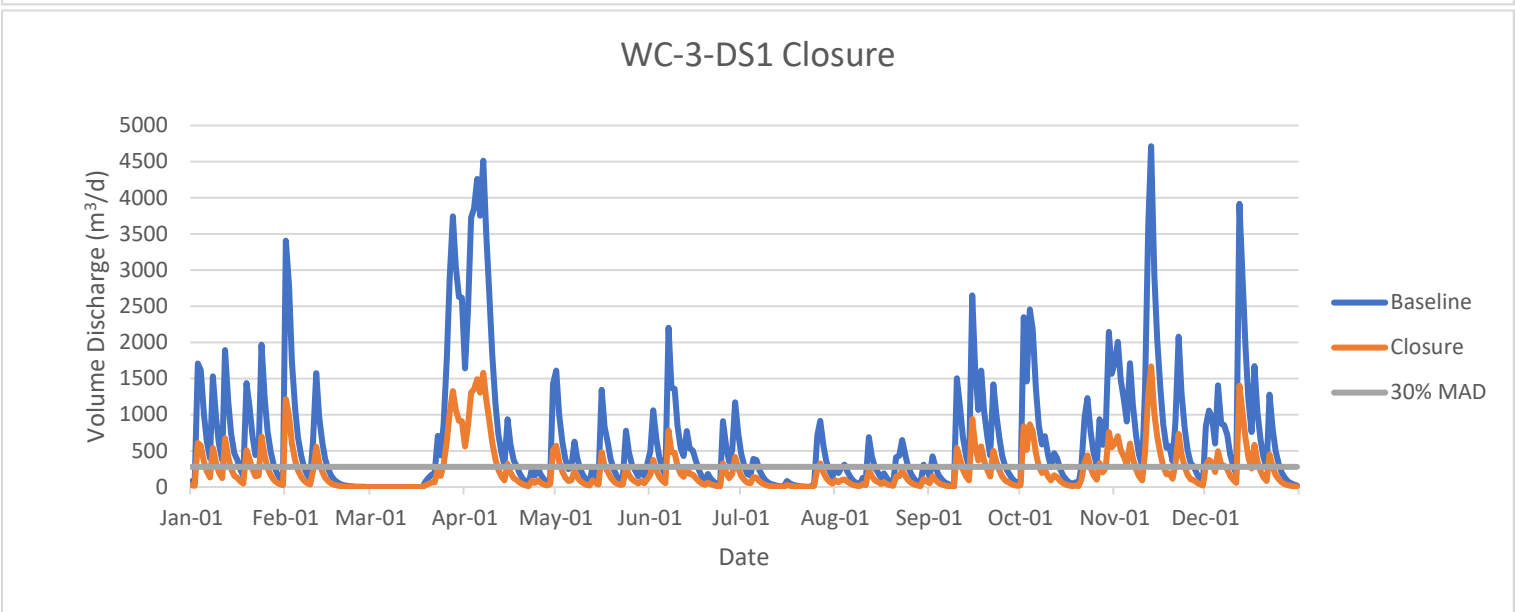
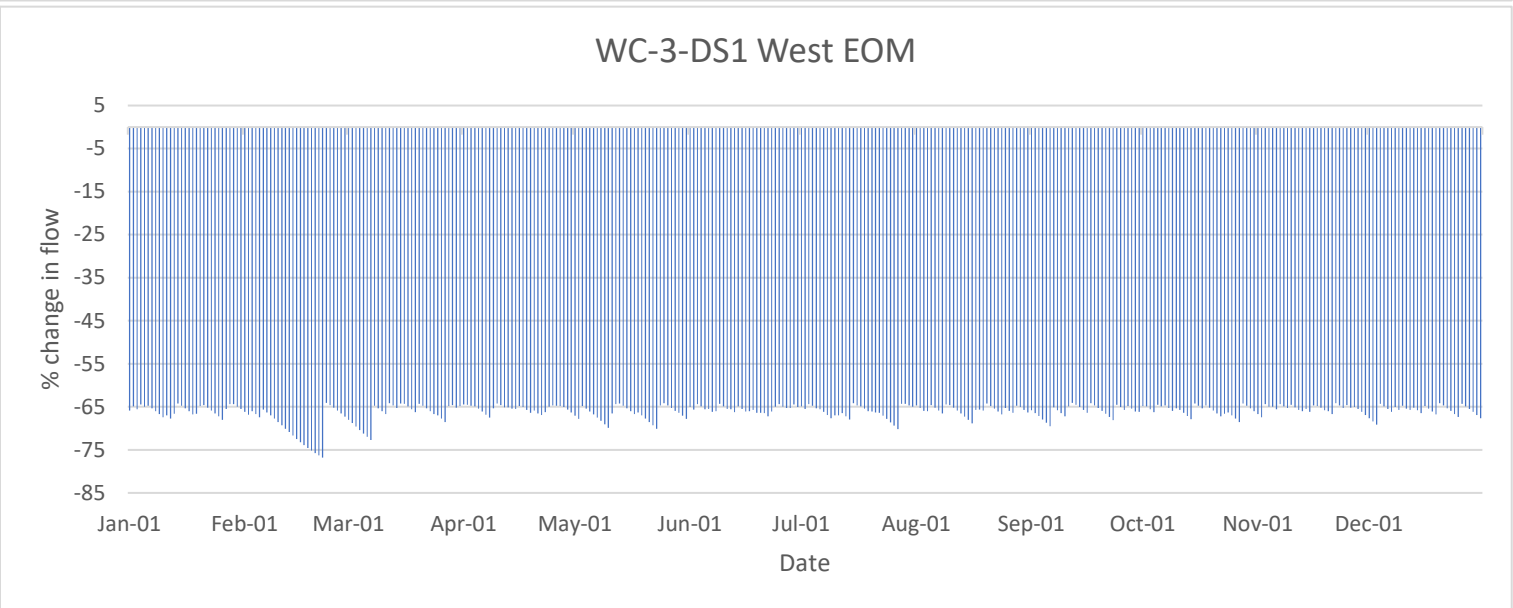
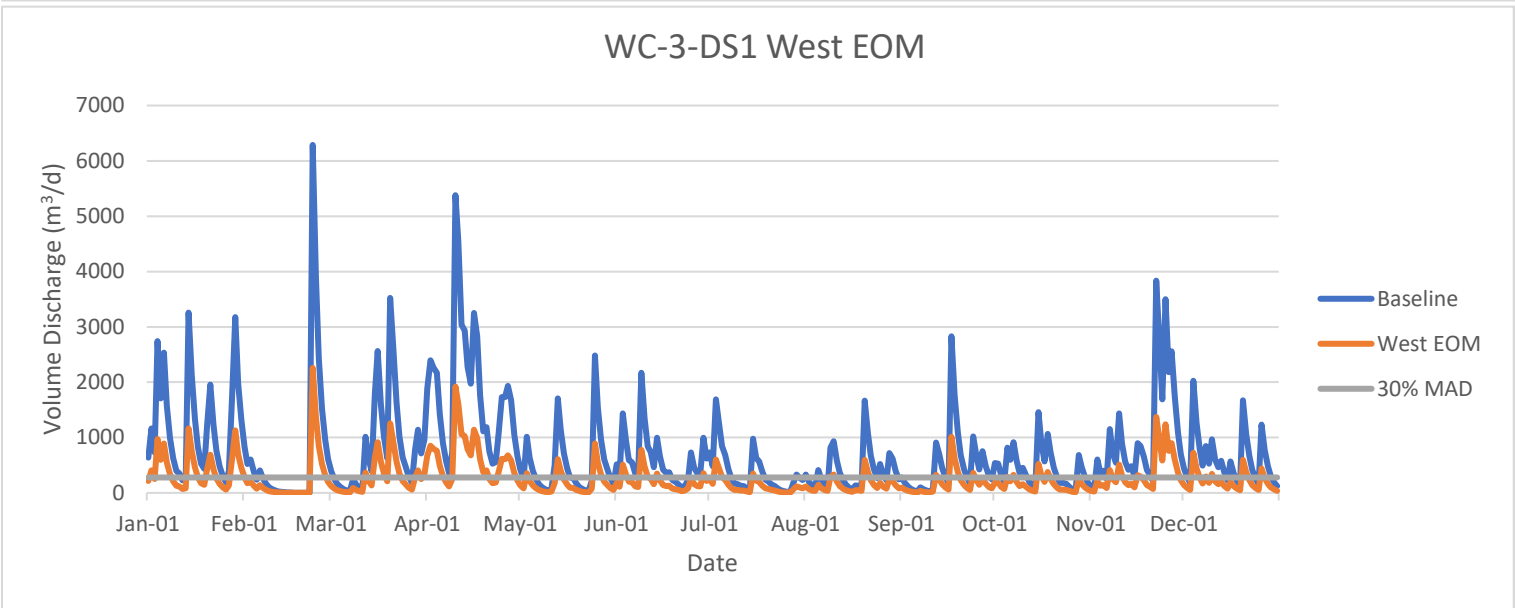
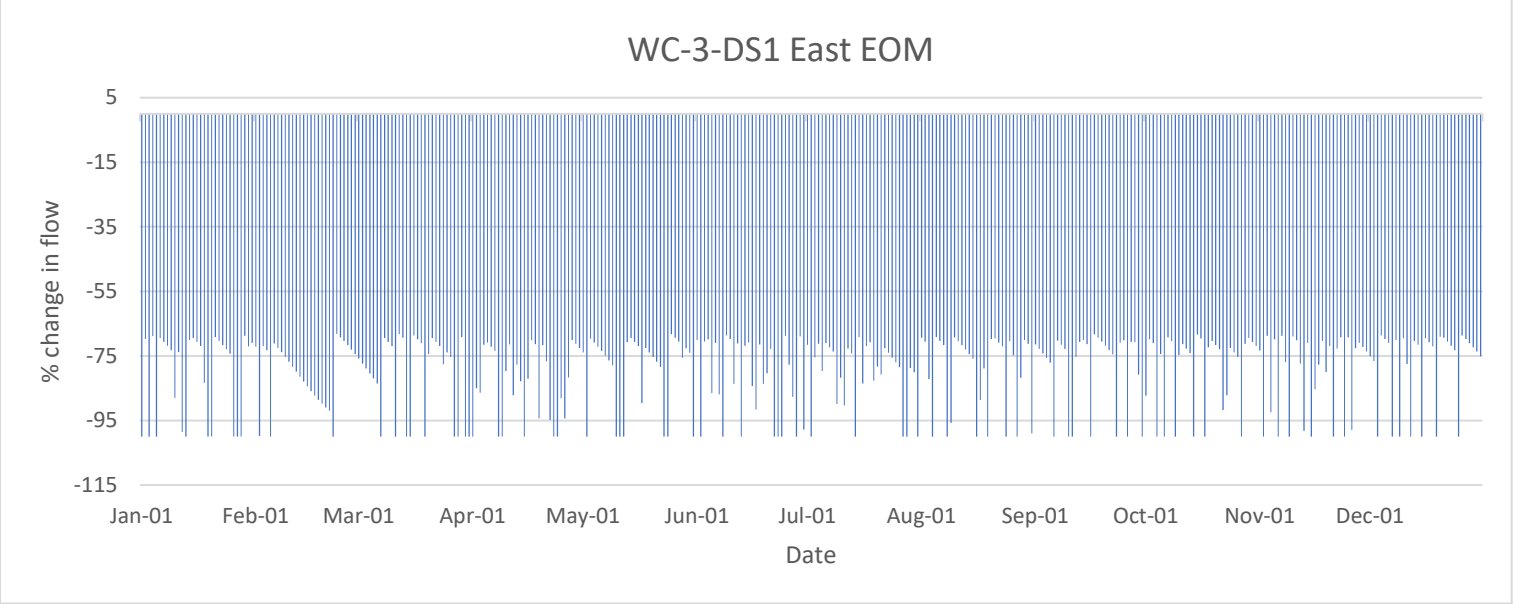
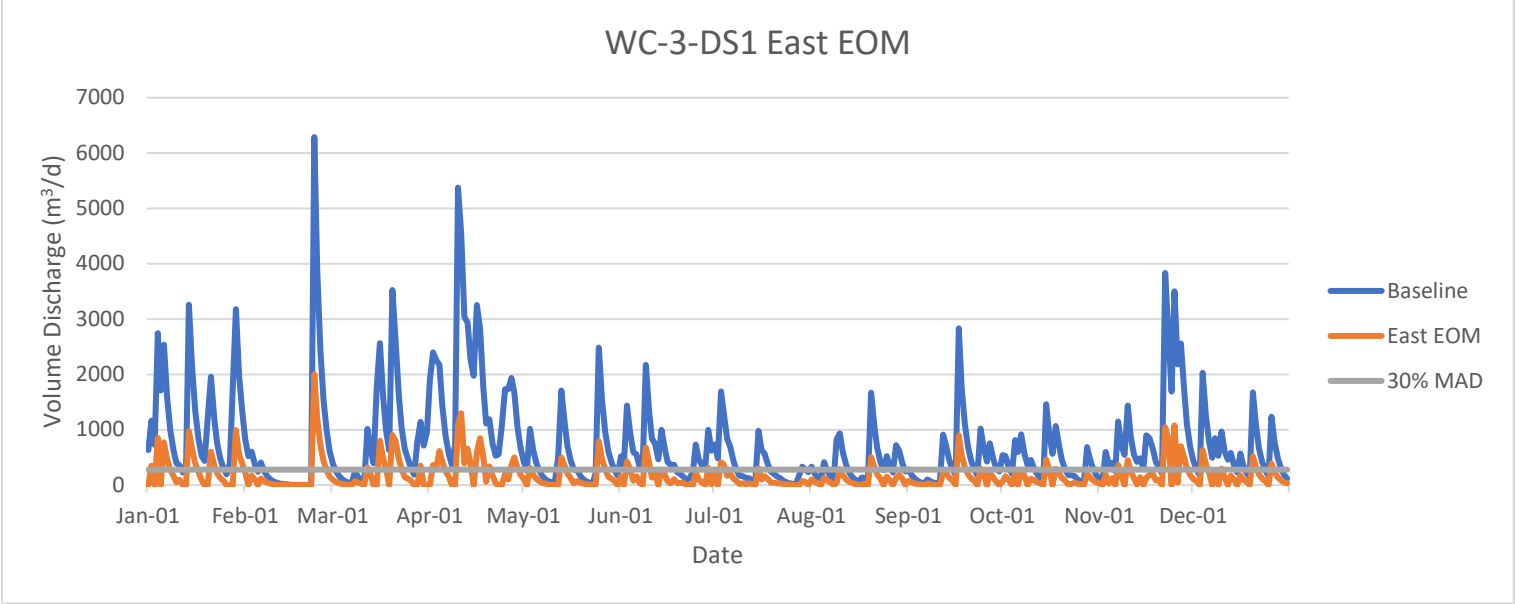
		WC-50-DS	WC-16-DS	WC-14-US	WC-14-DS1	WC-14-DS2	WC-14-DS3	WC-14-DS4
East EOM	Range in flow change	-51	-46	-1	-15	-25	-45	-43
		-60	-100	-3	-29	-61	-73	-71
	# days with > 10% reduction	365	365	0	365	365	365	365
	# baseline days below 30% MAD	127	127	127	127	127	127	127
	# of East EOM below 30% MAD	212	241	132	142	163	203	198
	# additional days below 30% MAD	85	114	5	15	36	76	71
West EOM	Range in flow change	-51	-46	0	-15	-25	-45	-43
		-60	-100	-2	-28	-61	-73	-72
	# days with > 10% reduction	365	365	0	365	365	365	365
	# baseline days below 30% MAD	127	127	127	127	127	127	127
	# of West EOM below 30% MAD	212	243	131	142	163	204	198
	# additional days below 30% MAD	85	116	4	15	36	77	71
Closure	Range in flow change	-51	-46	0	-15	-19	-42	-40
		-62	-100	-1	-31	-44	-64	-63
	# days with > 10% reduction	365	365	0	365	365	365	365
	# baseline days below 30% MAD	163	163	163	163	163	163	163
	# of Closure below 30% MAD	230	229	170	179	182	220	218
	# additional days below 30% MAD	67	66	7	16	19	57	55

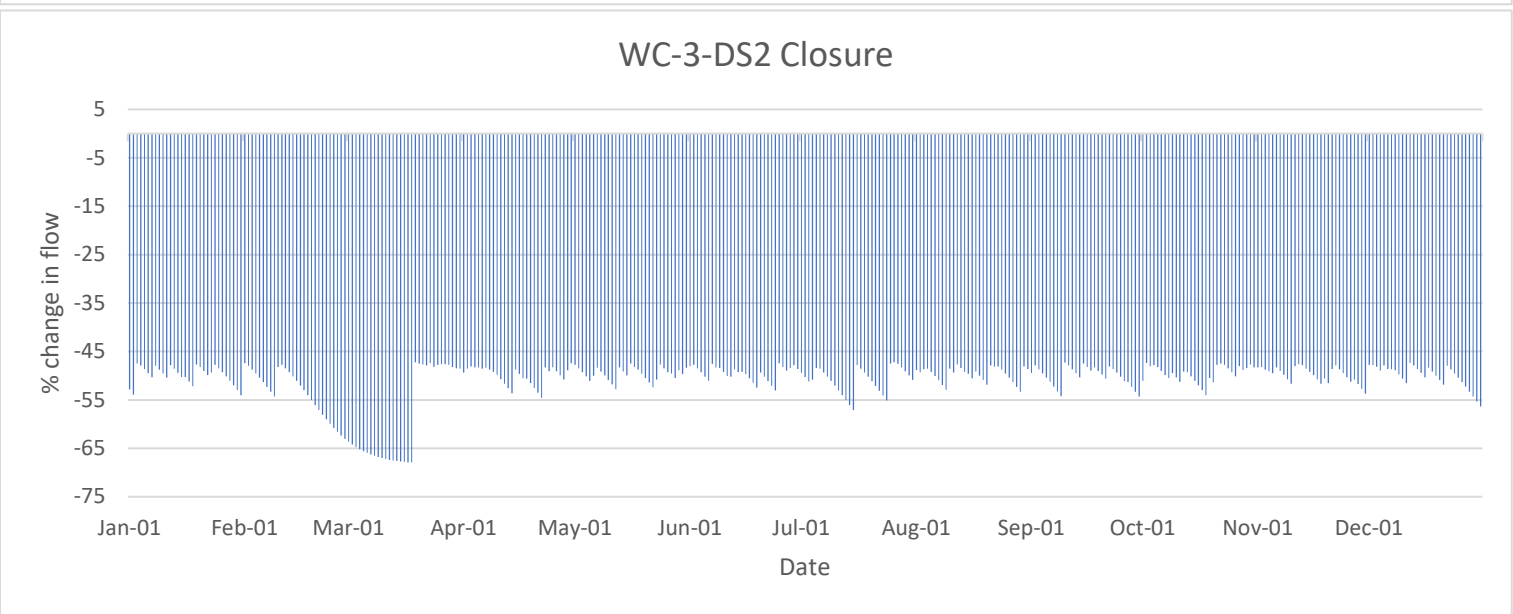
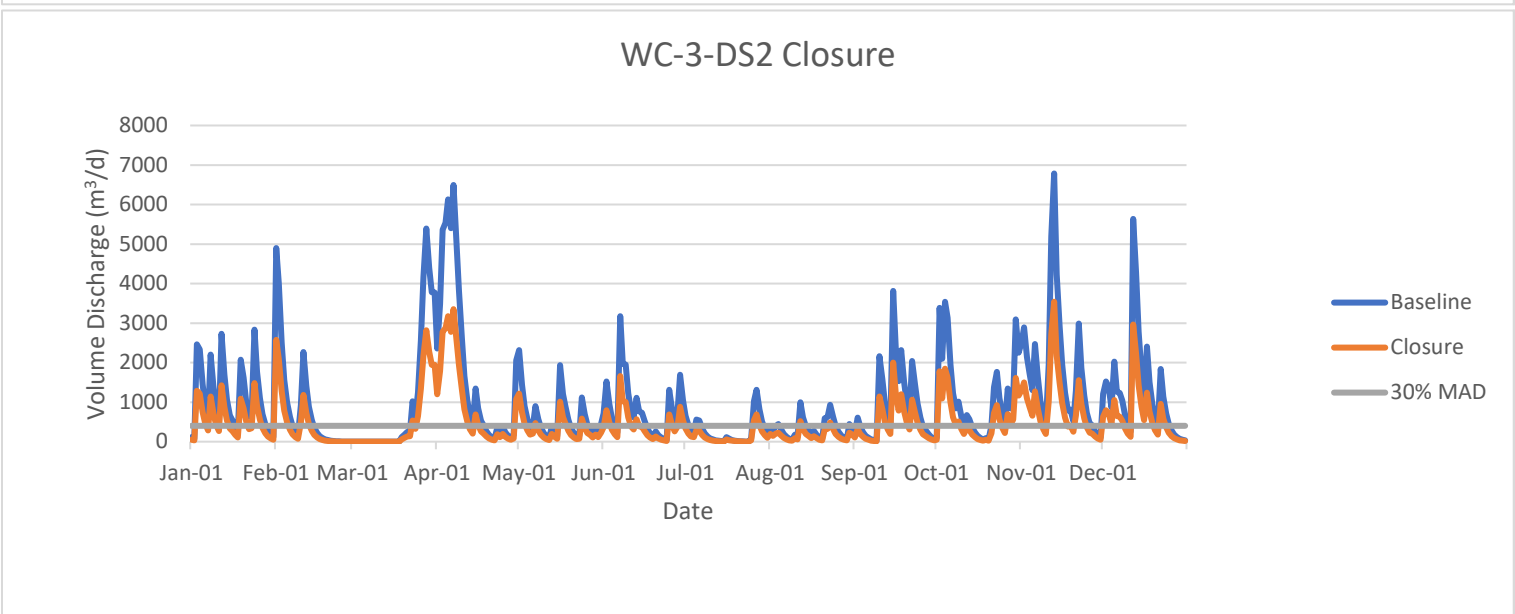
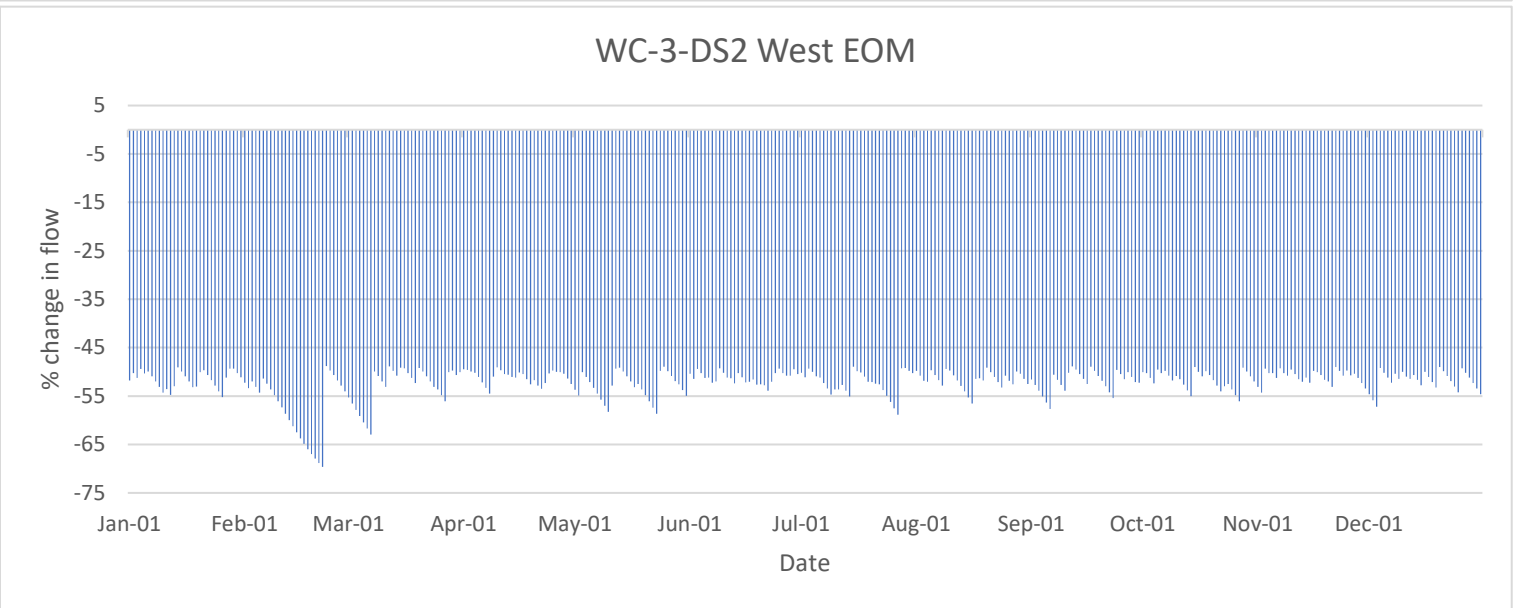
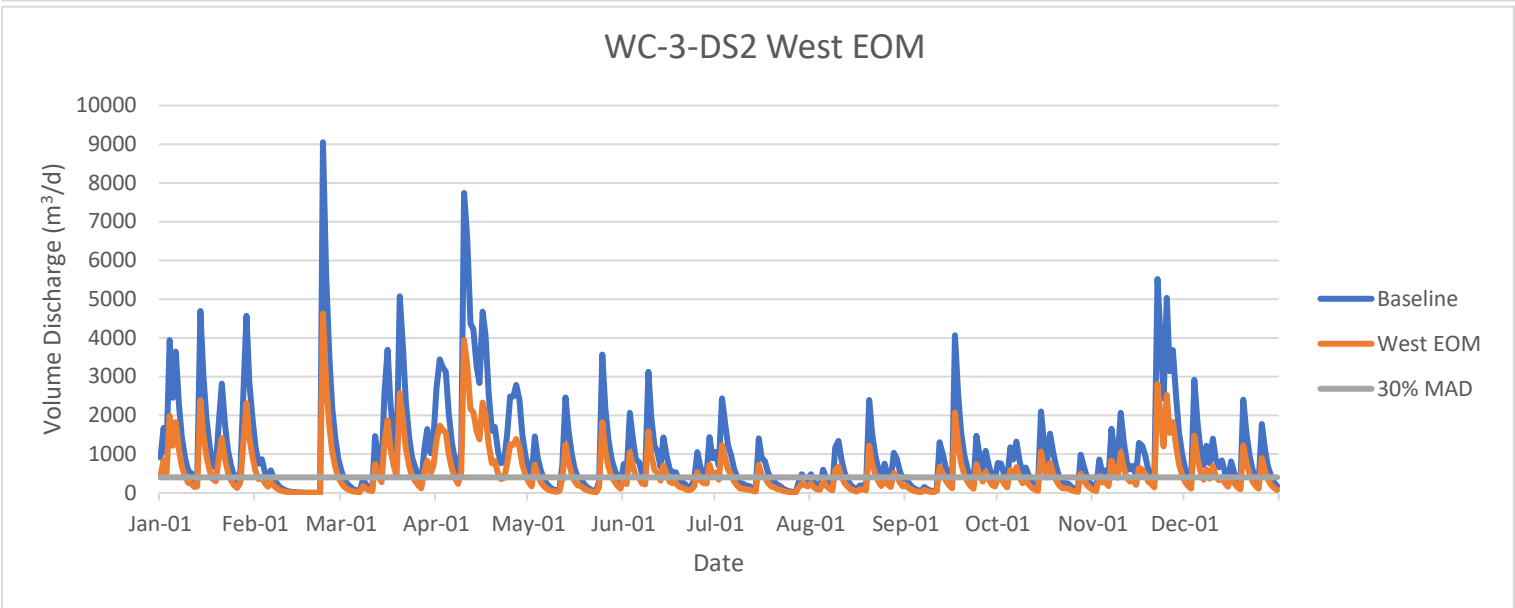
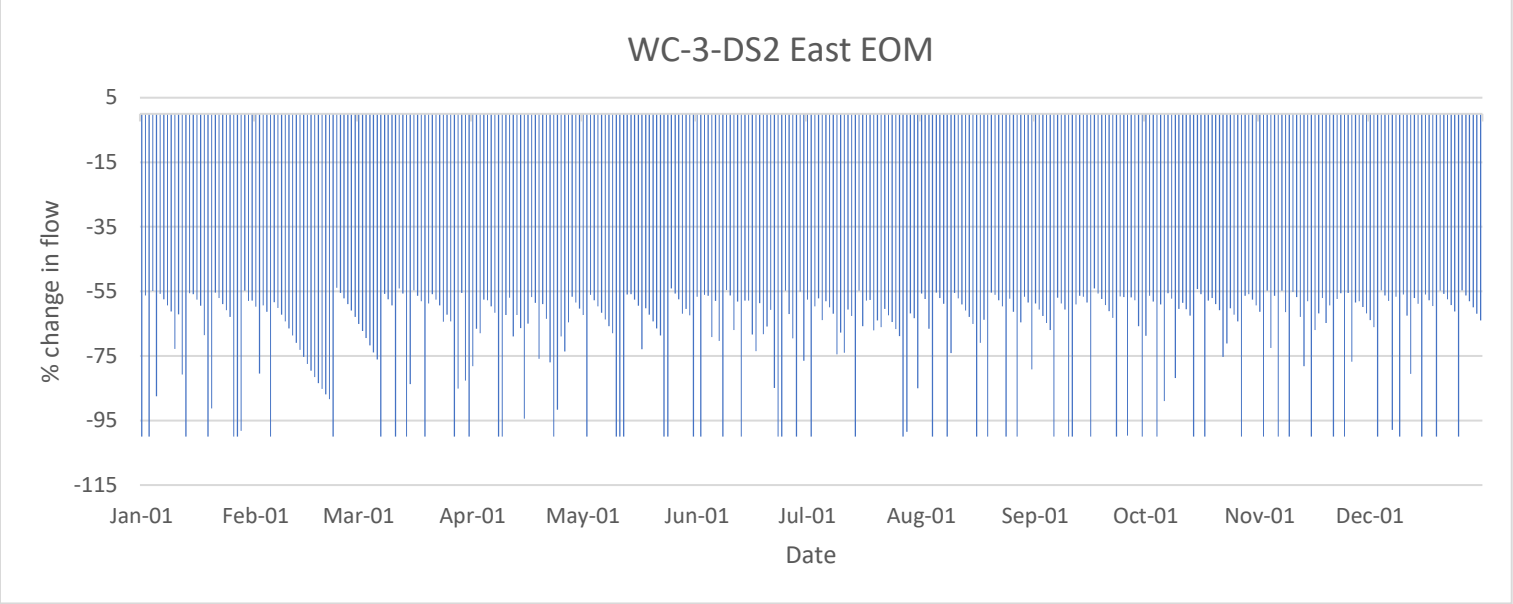
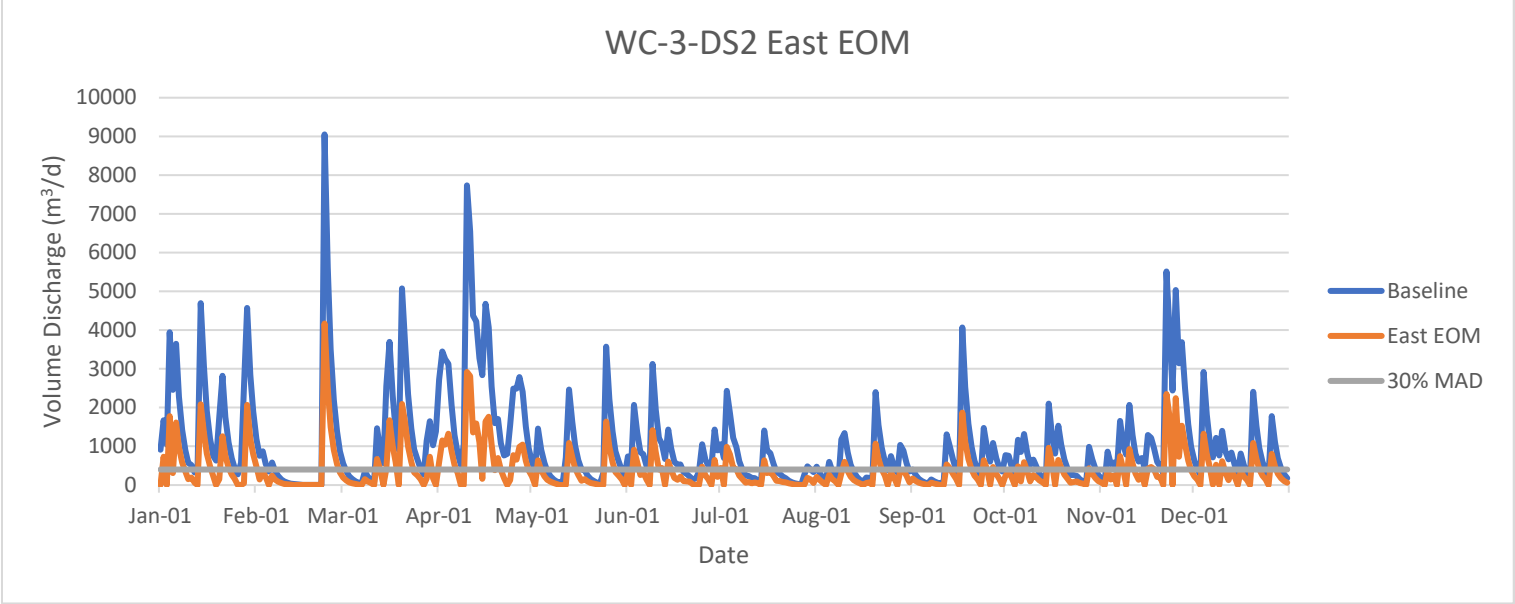
May 2022 – Goldboro Gold Project. – Daily Hydrographs
Figures 91-96. WC9 Hydrographs showing Normal Year baseline and predicted daily flows during each Project Phase; and associated percent change in flow from baseline to each corresponding Project project phase.

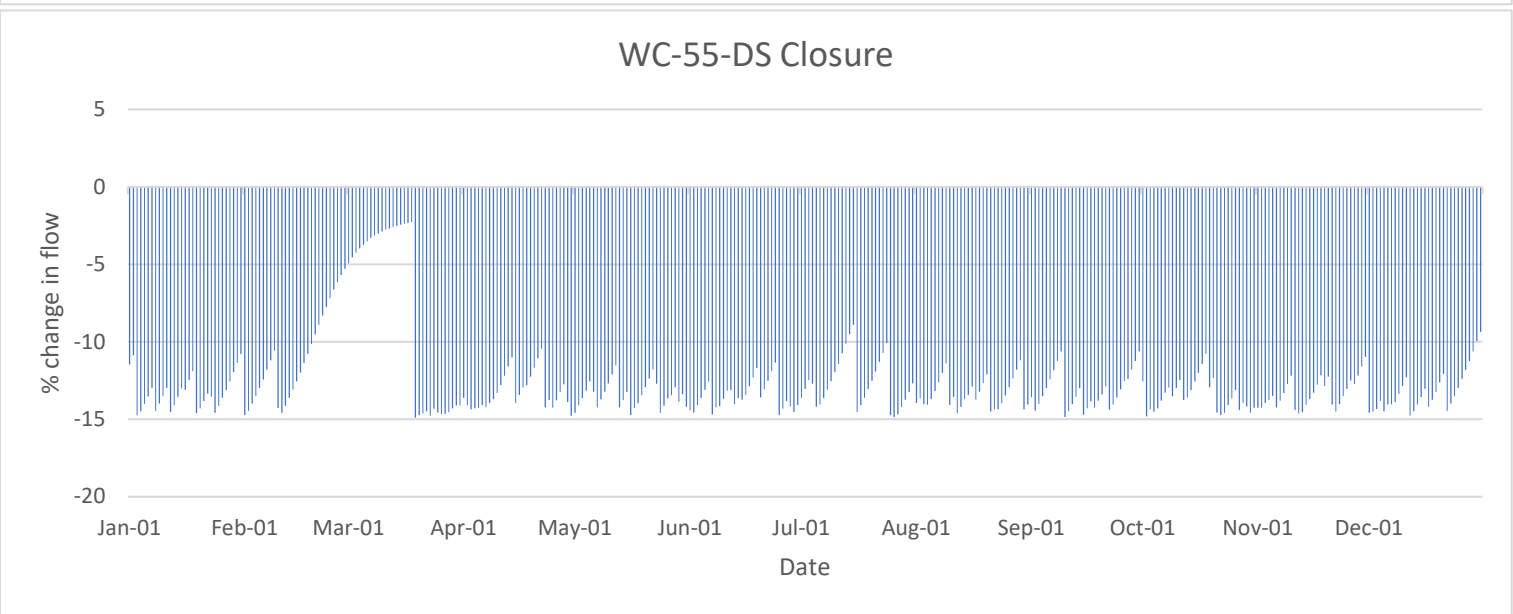
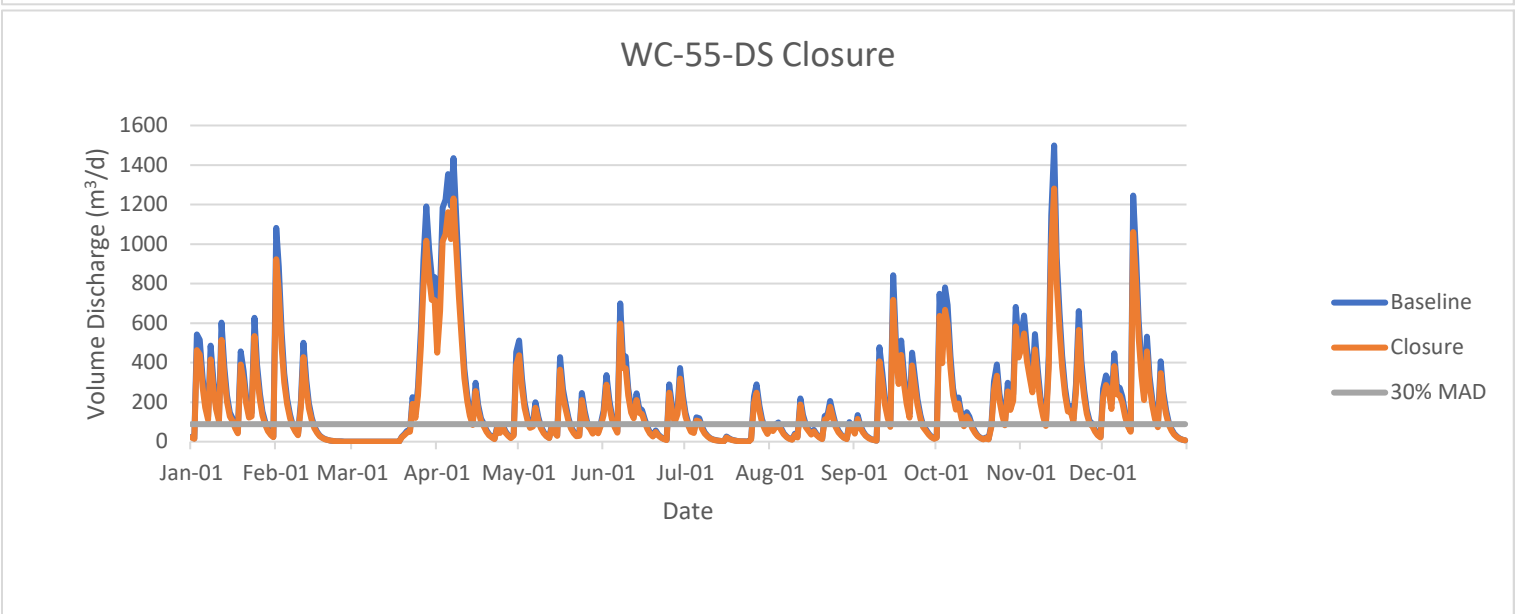
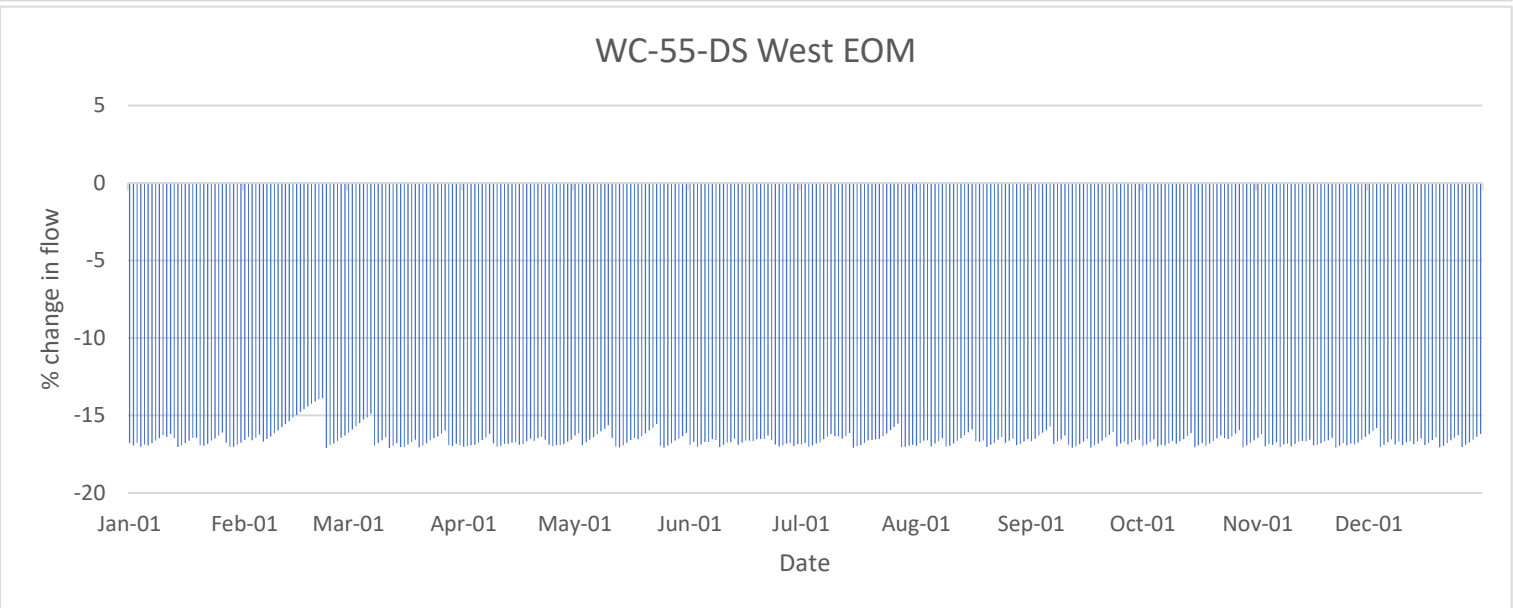
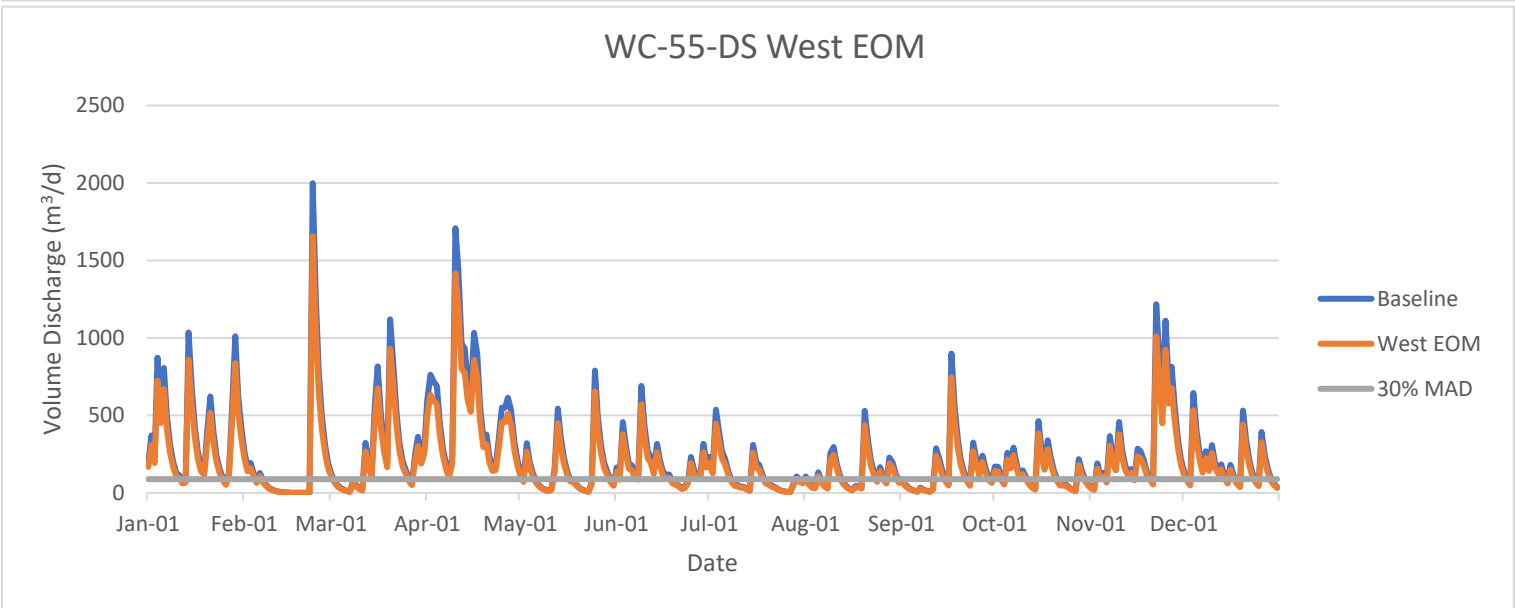
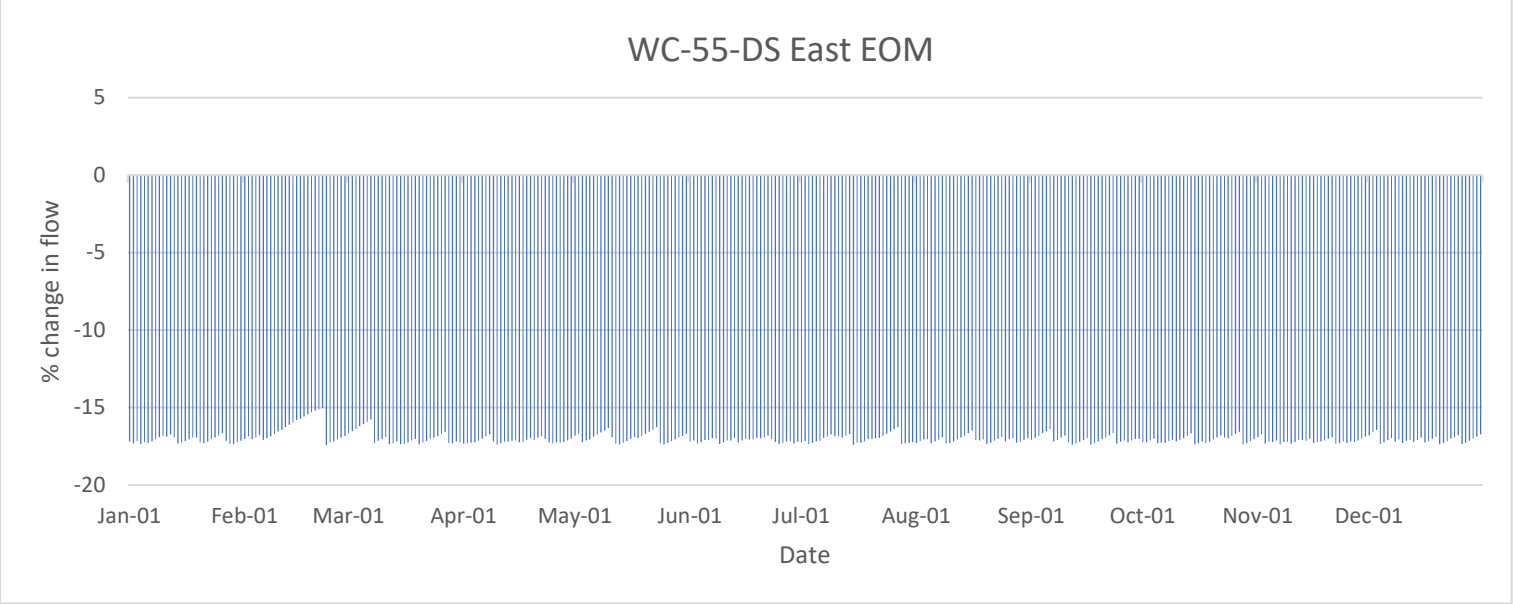
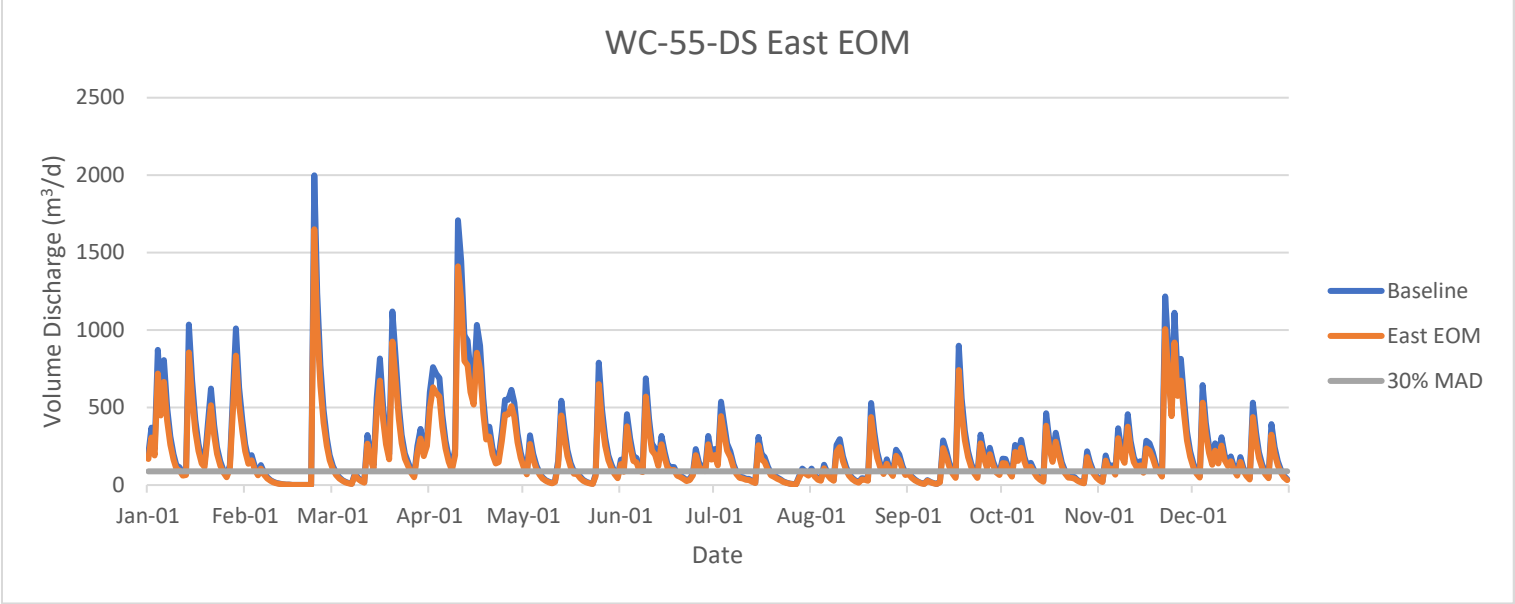


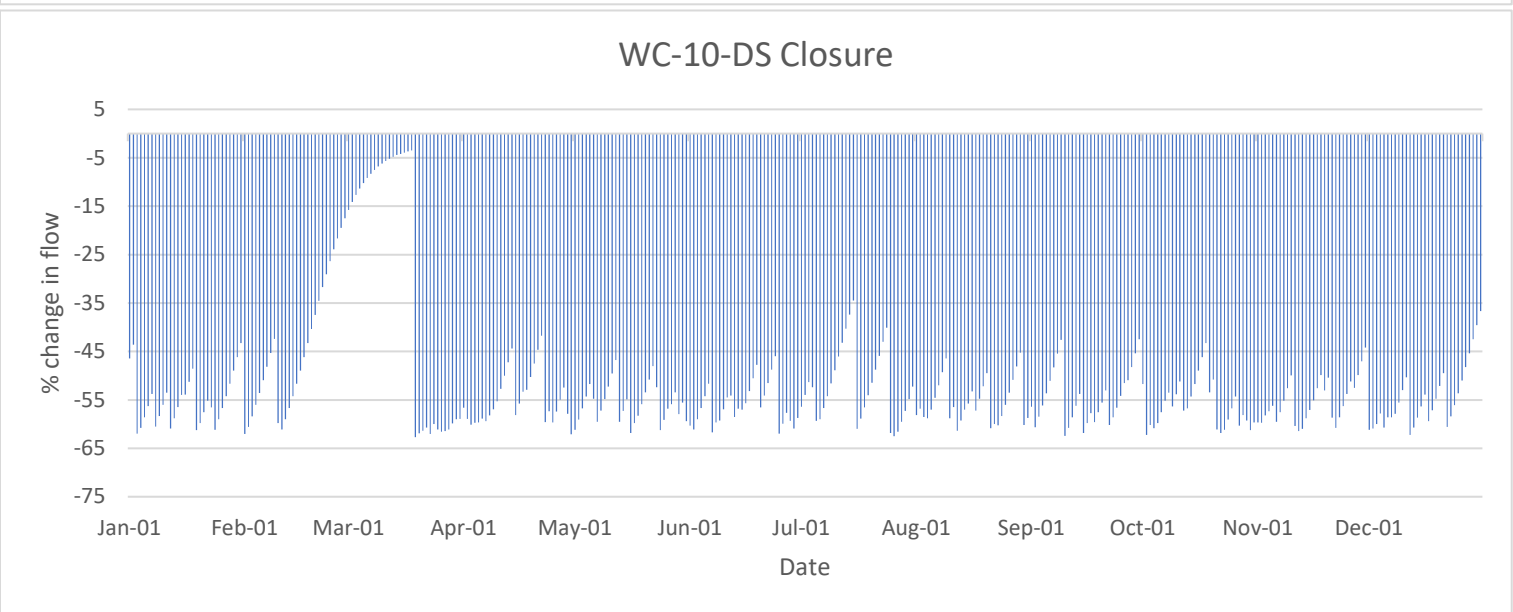
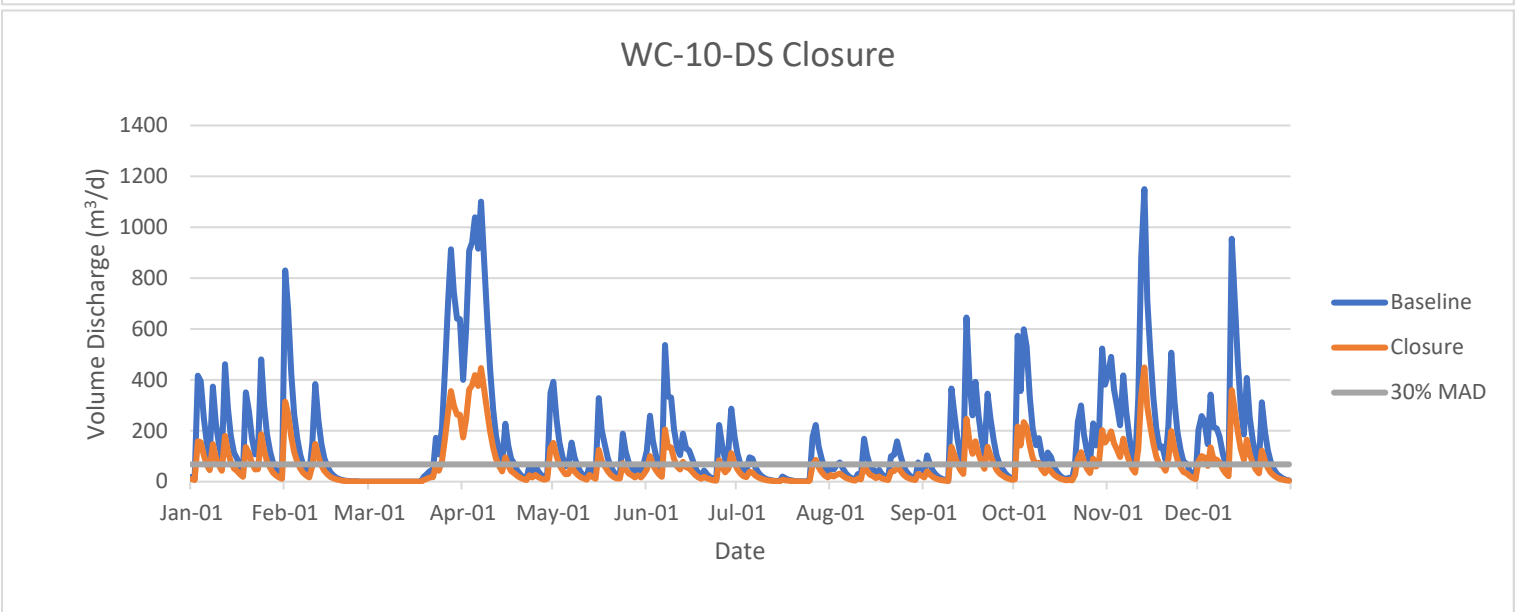
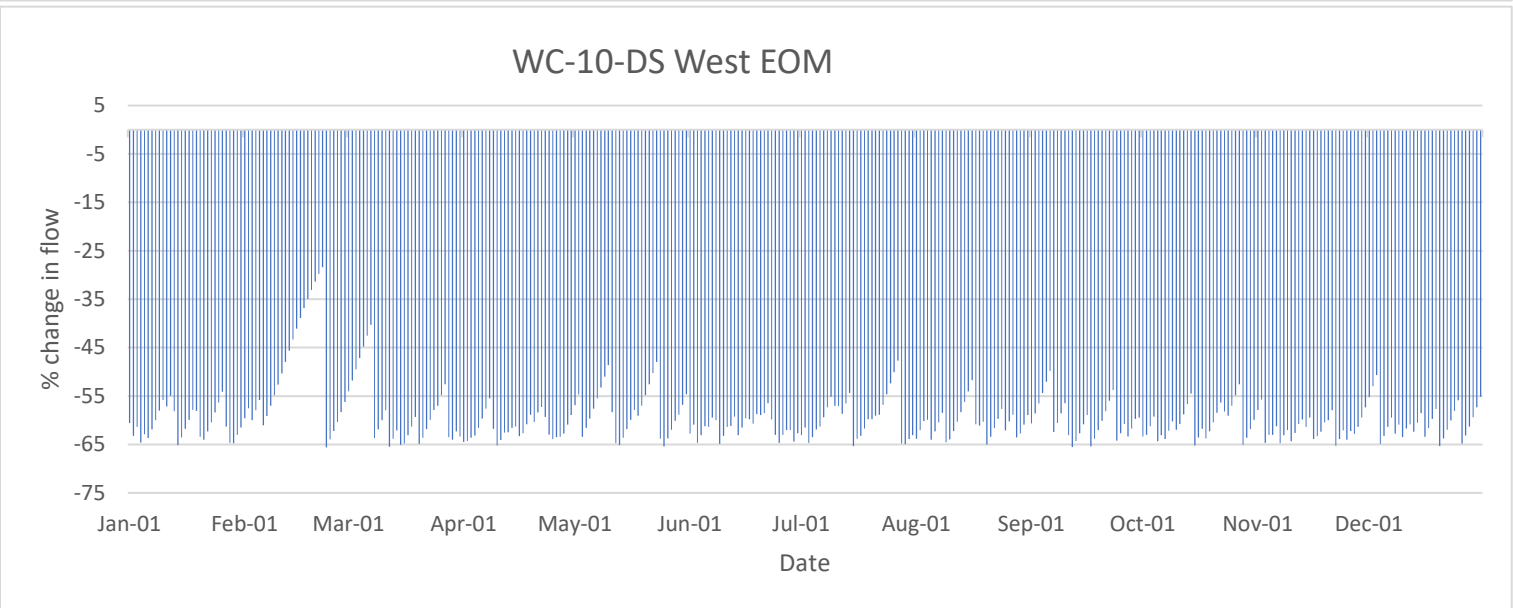
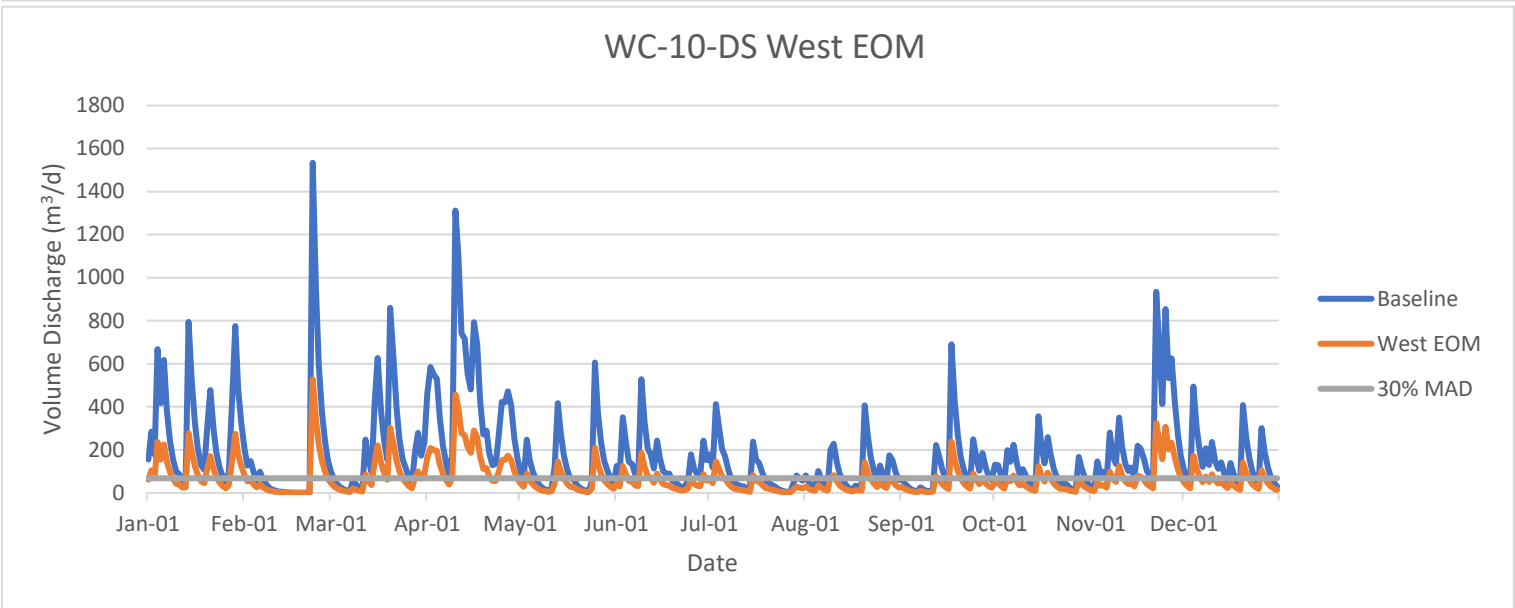
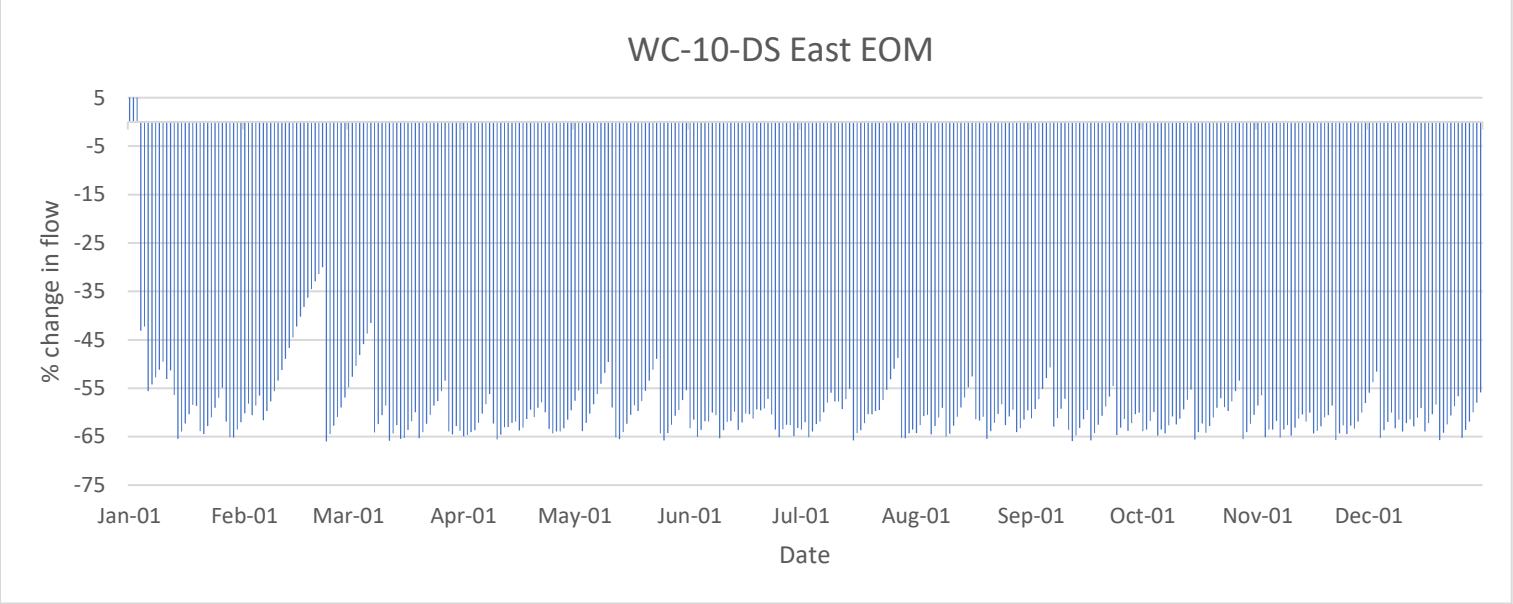
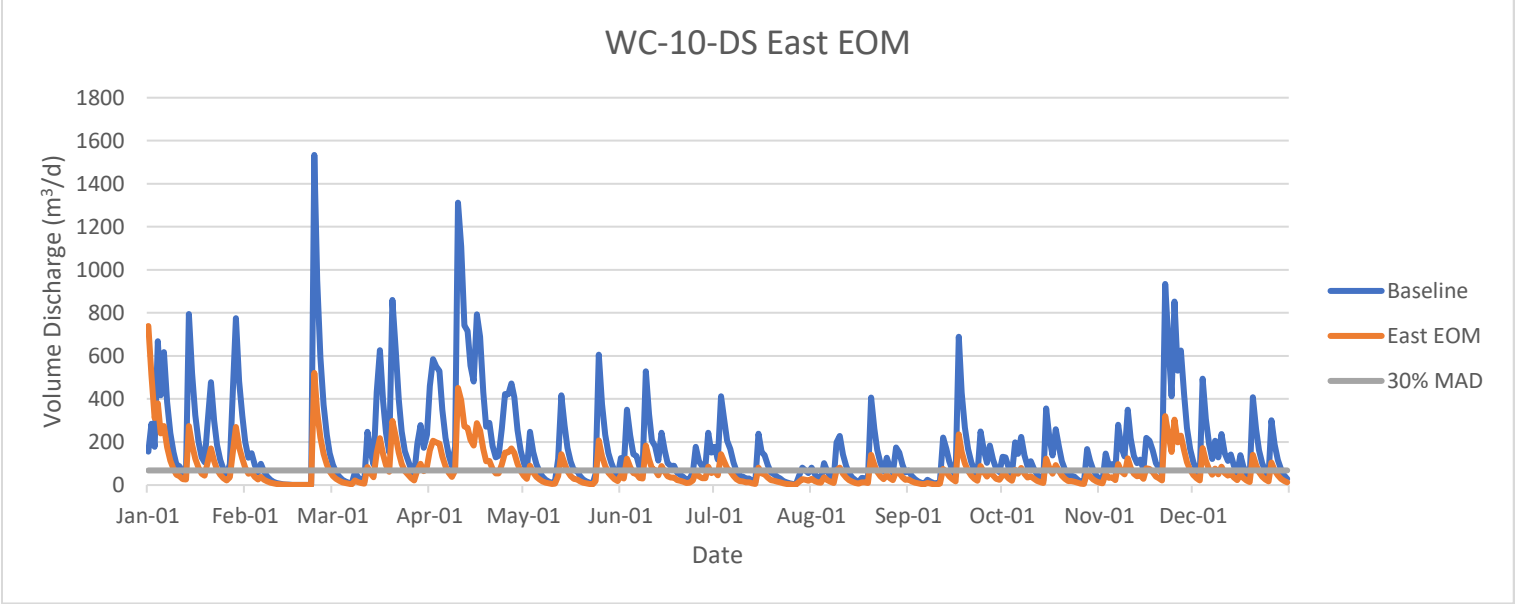
May 2022 – Goldboro Gold Project. – Daily Hydrographs
Table 4. Summary of Daily Flow Data Derived from Hydrographs; ‘Normal Year’ Scenario for WC9.

		WC-9-DS
East EOM	Range in flow change	-49
		-60
	# days with > 10% reduction	365
	# baseline days below 30% MAD	127
	# of East EOM below 30% MAD	209
	# additional days below 30% MAD	82
West EOM	Range in flow change	-40
		-44
	# days with > 10% reduction	365
	# baseline days below 30% MAD	127
	# of West EOM below 30% MAD	194
	# additional days below 30% MAD	67
Closure	Range in flow change	-21
		-41
	# days with > 10% reduction	365
	# baseline days below 30% MAD	163
	# of Closure below 30% MAD	209
	# additional days below 30% MAD	46









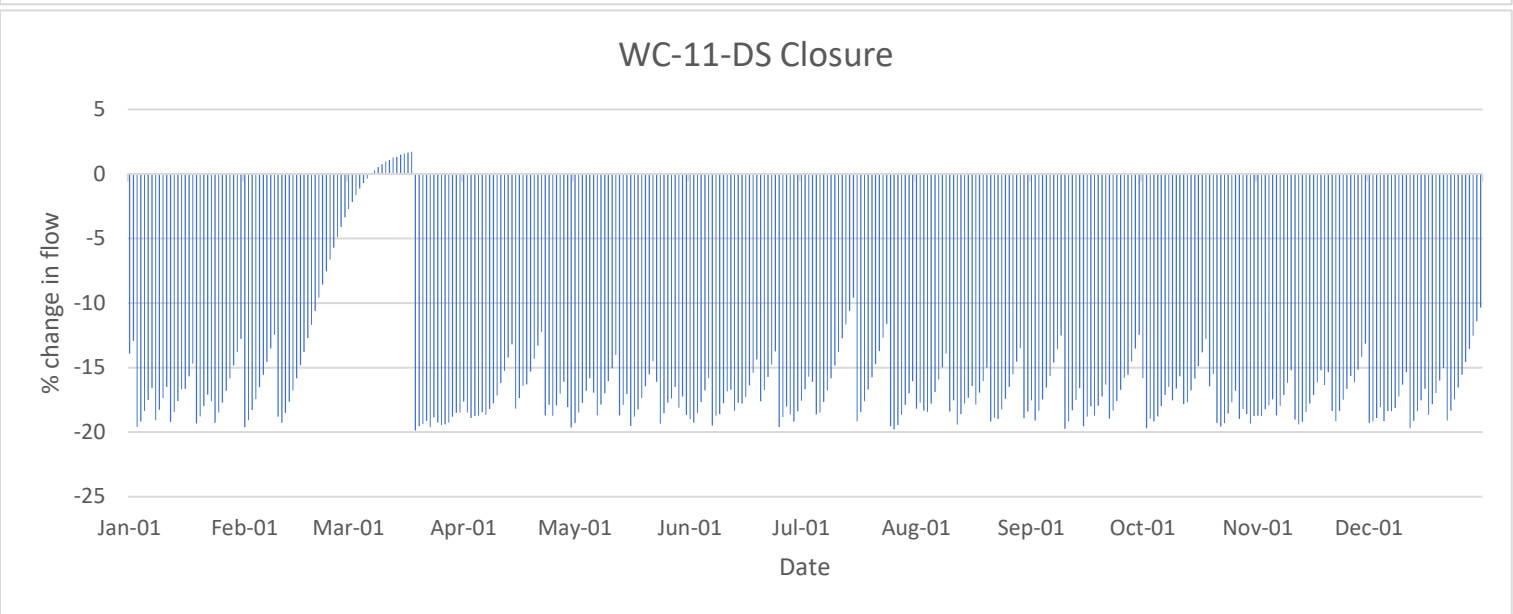
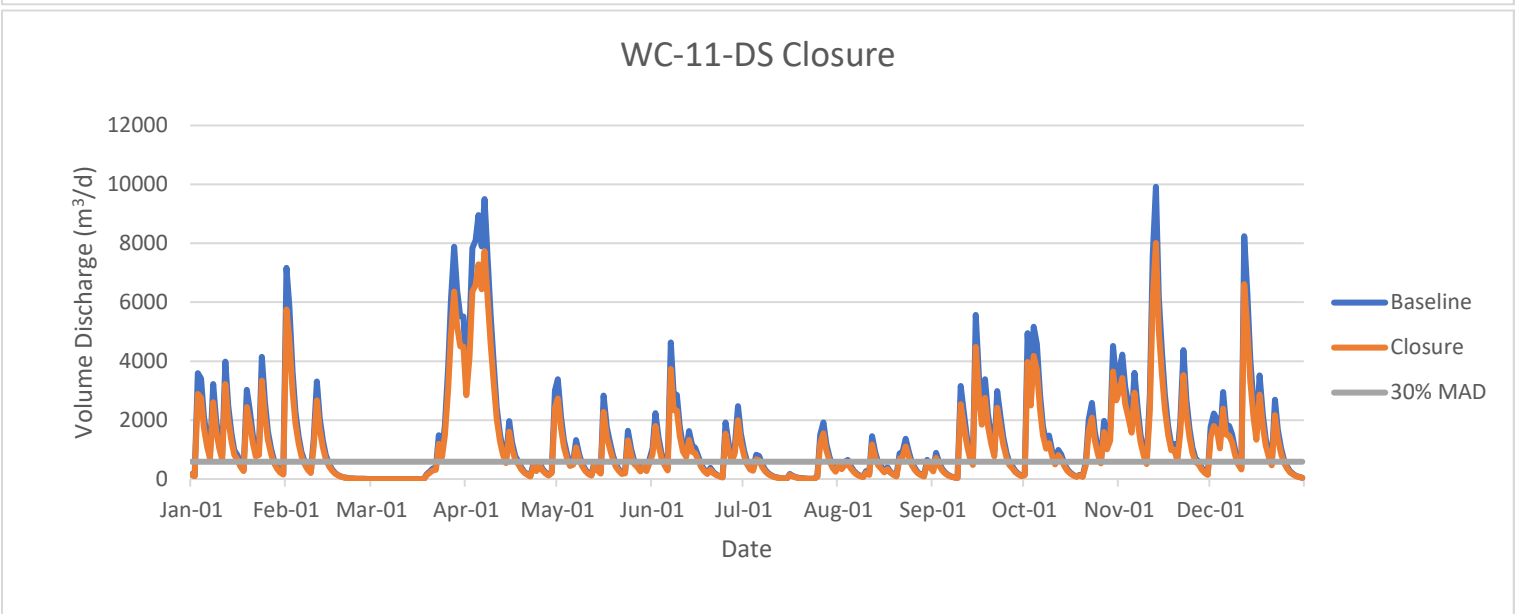
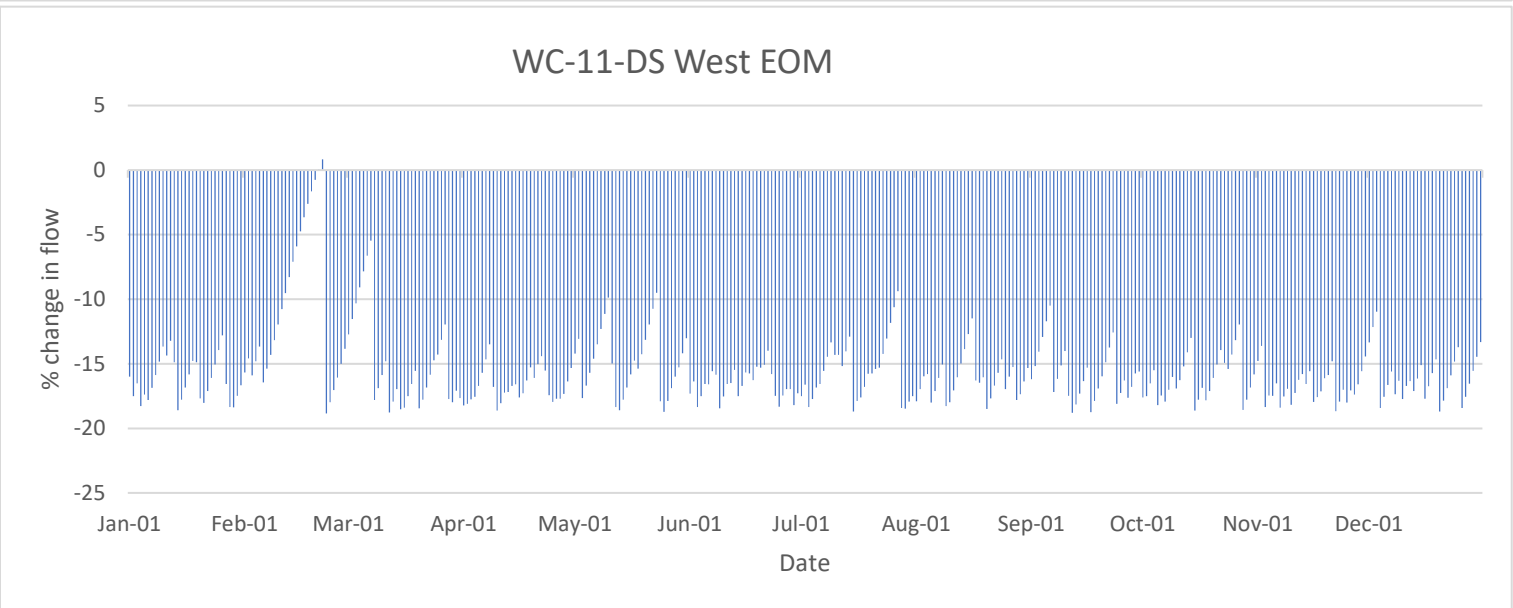
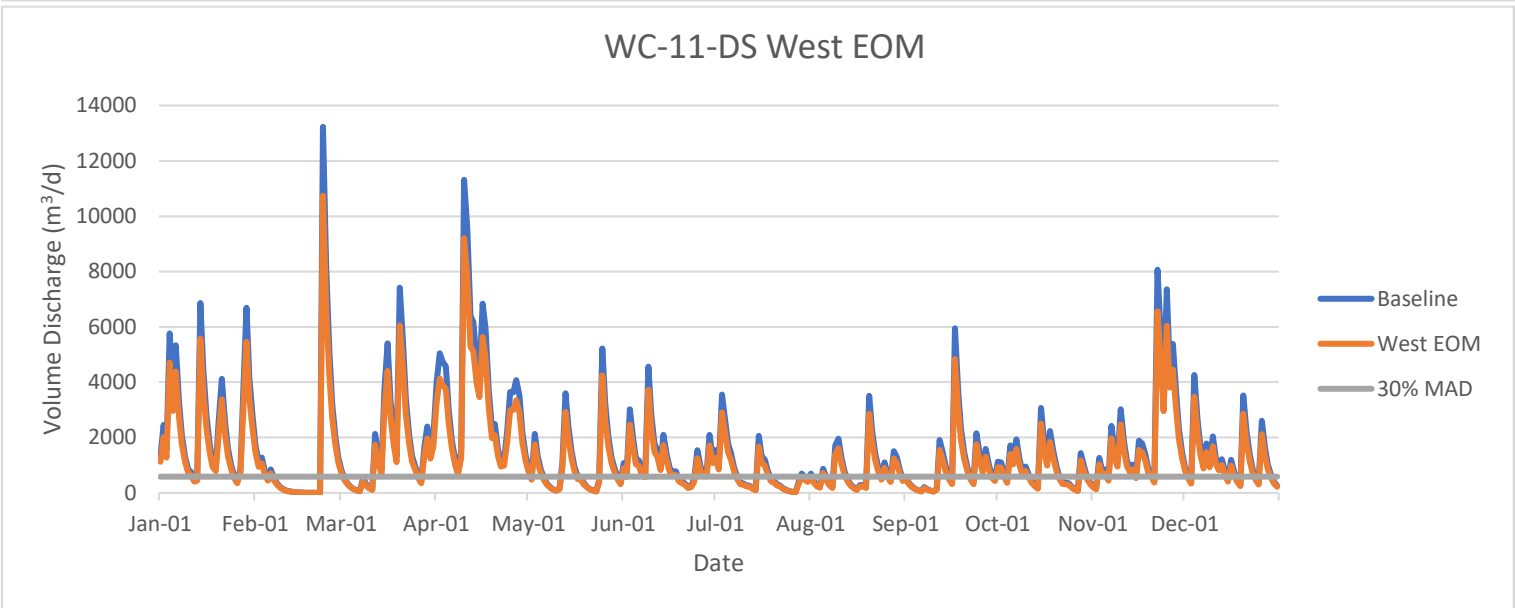
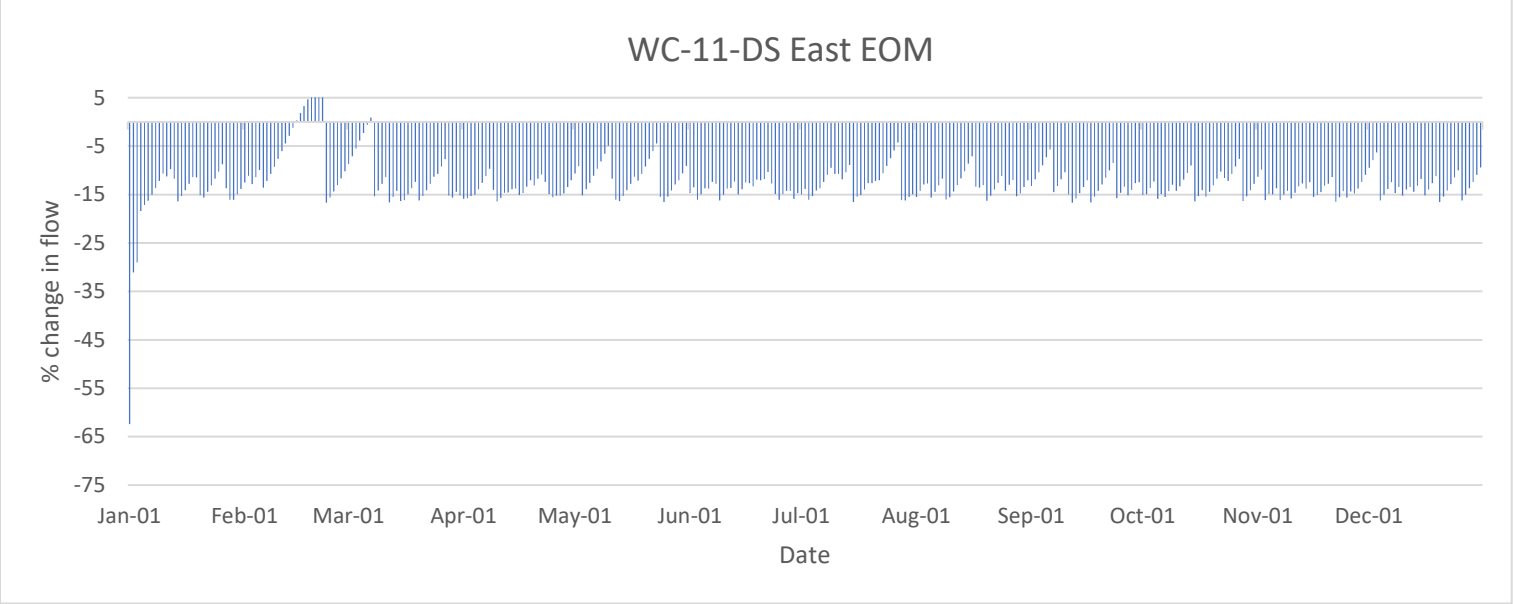
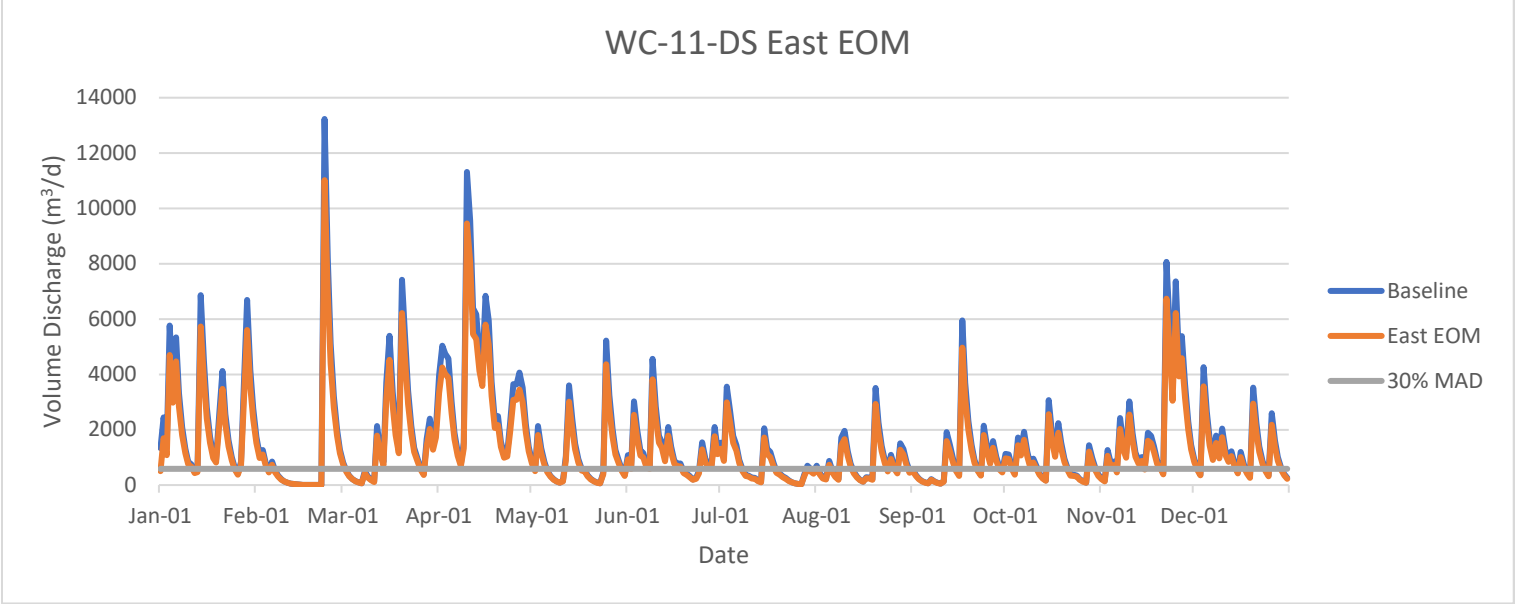
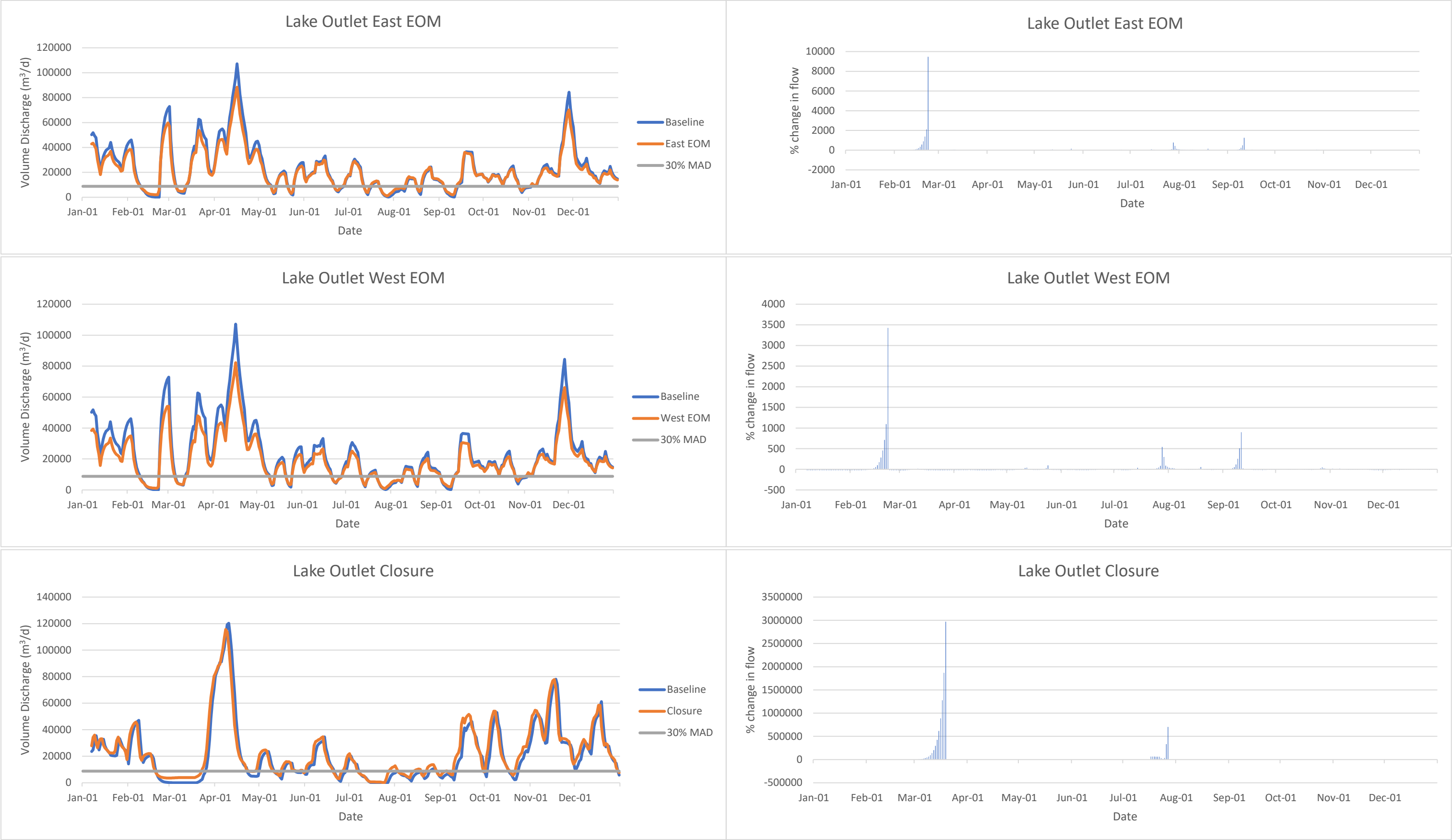
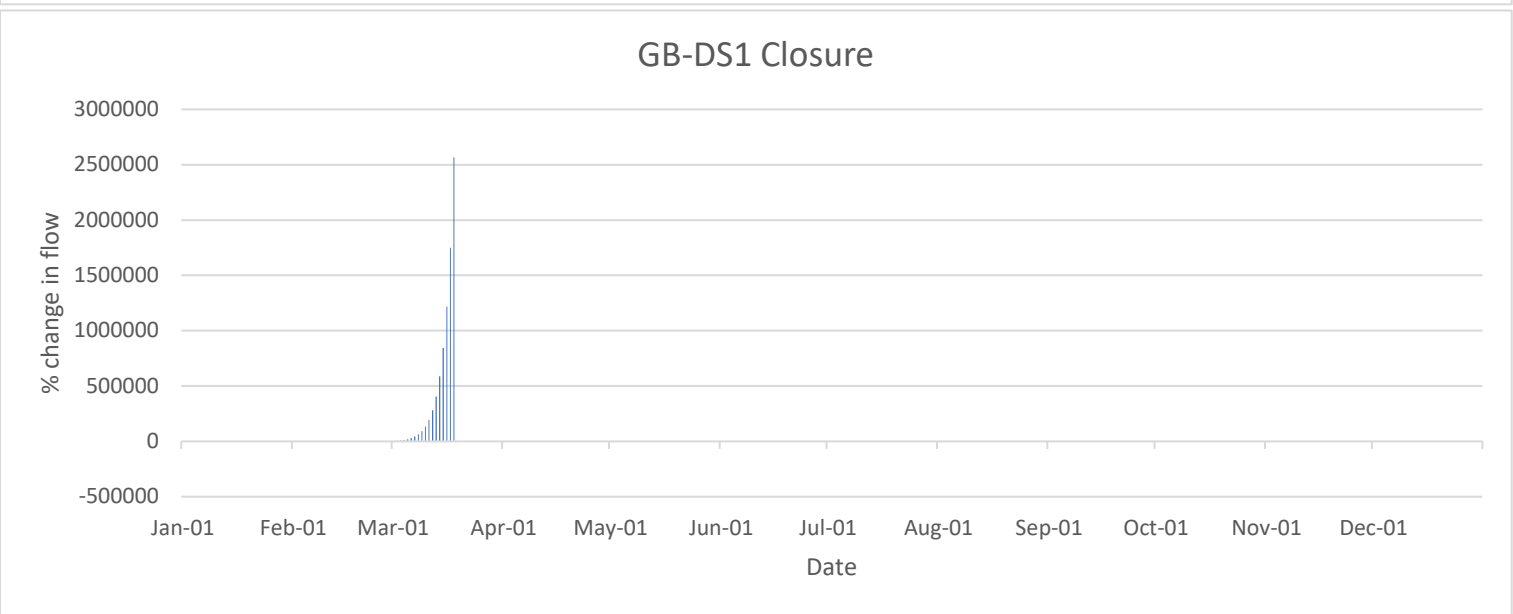
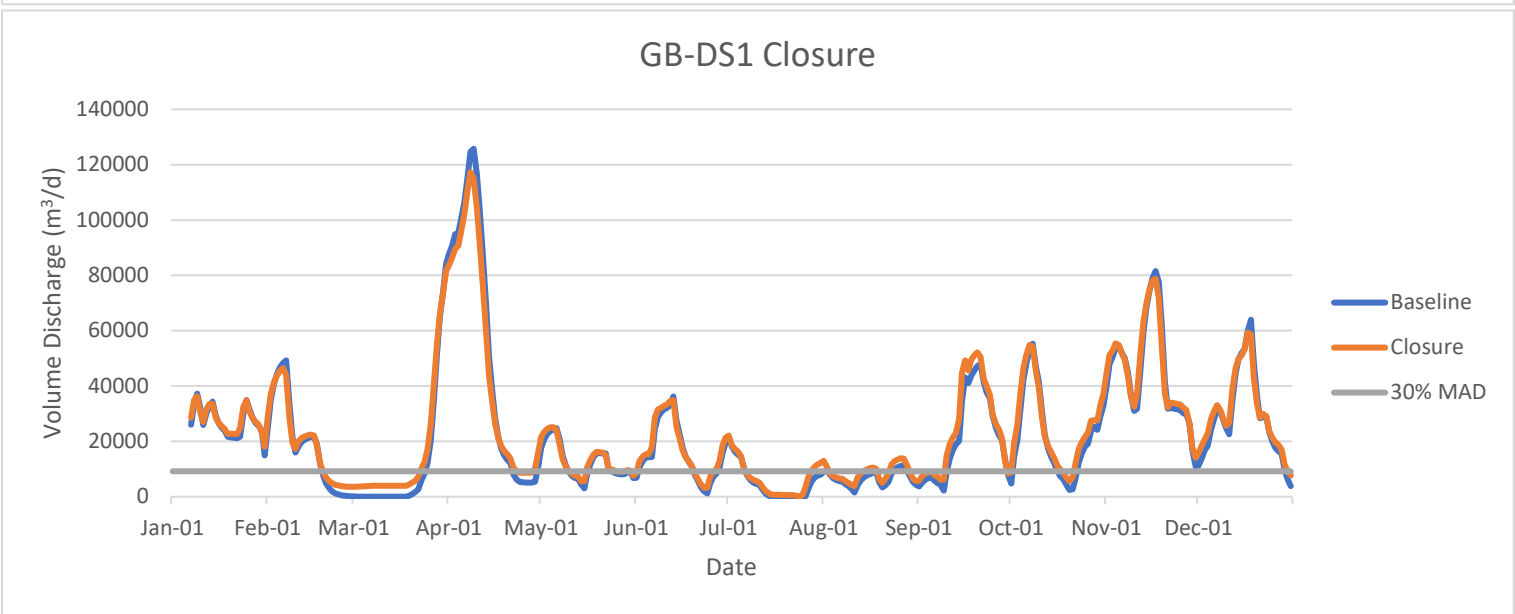
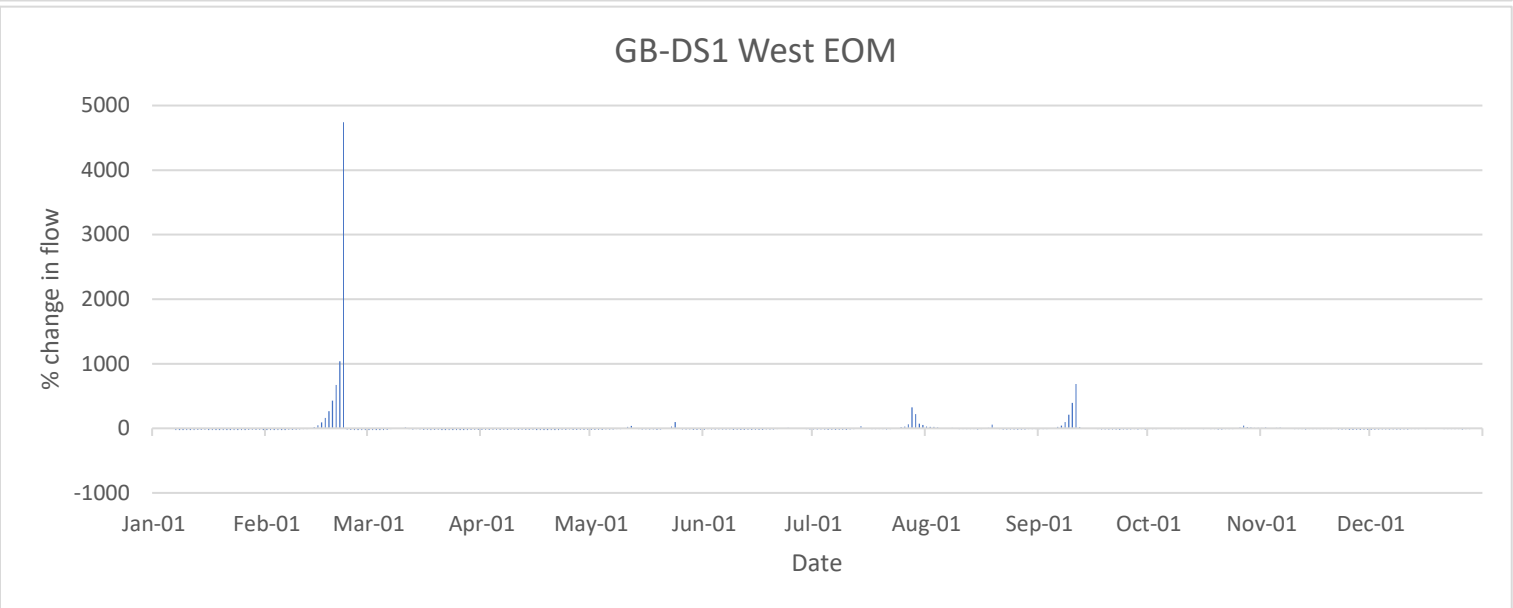
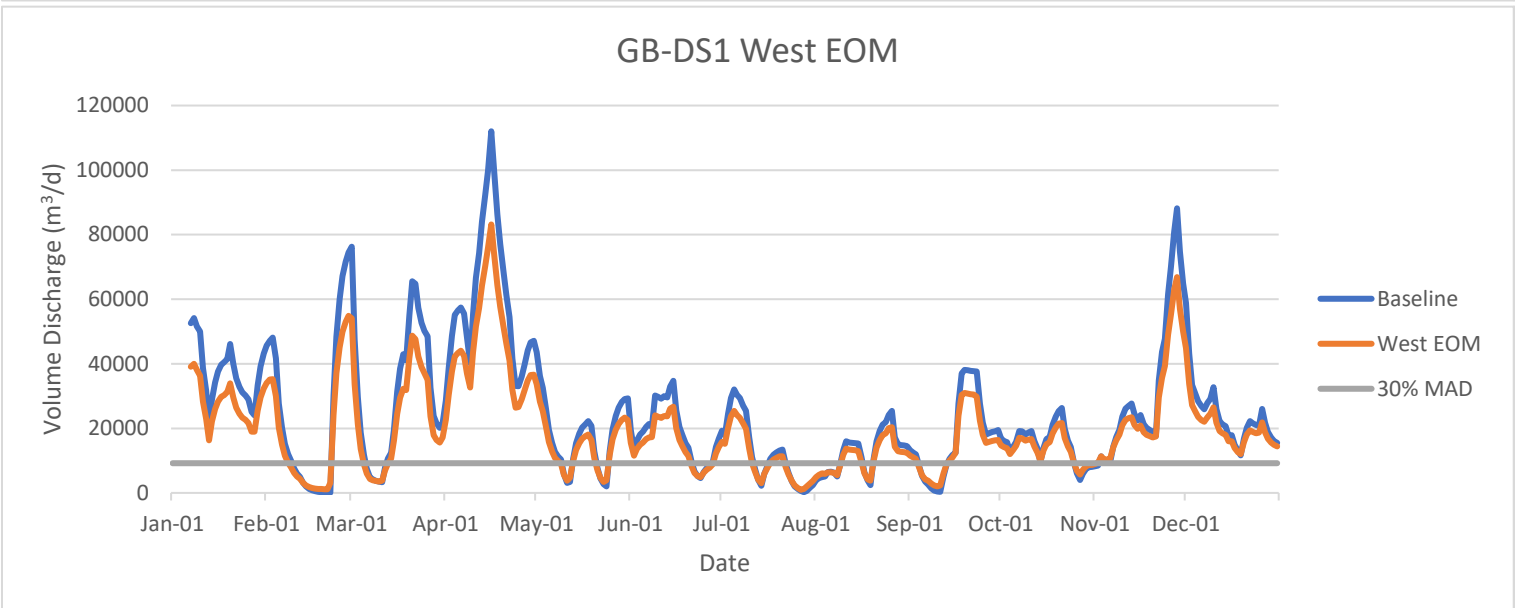
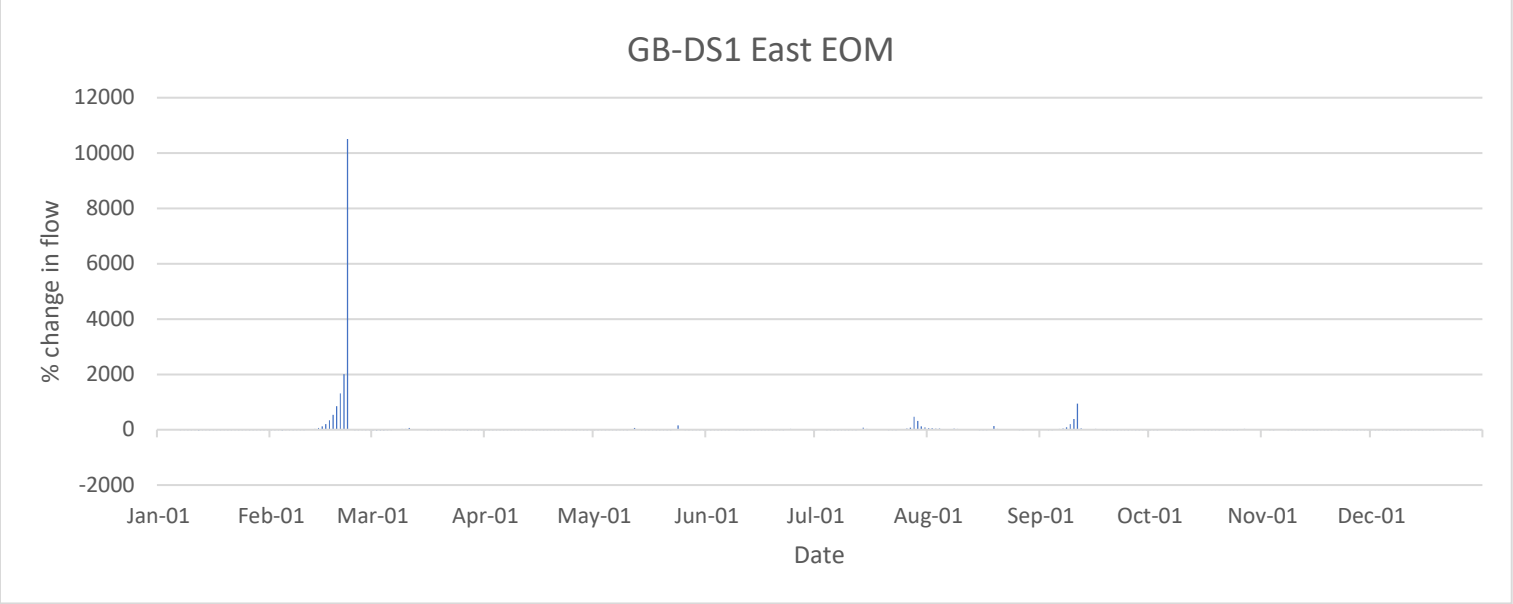
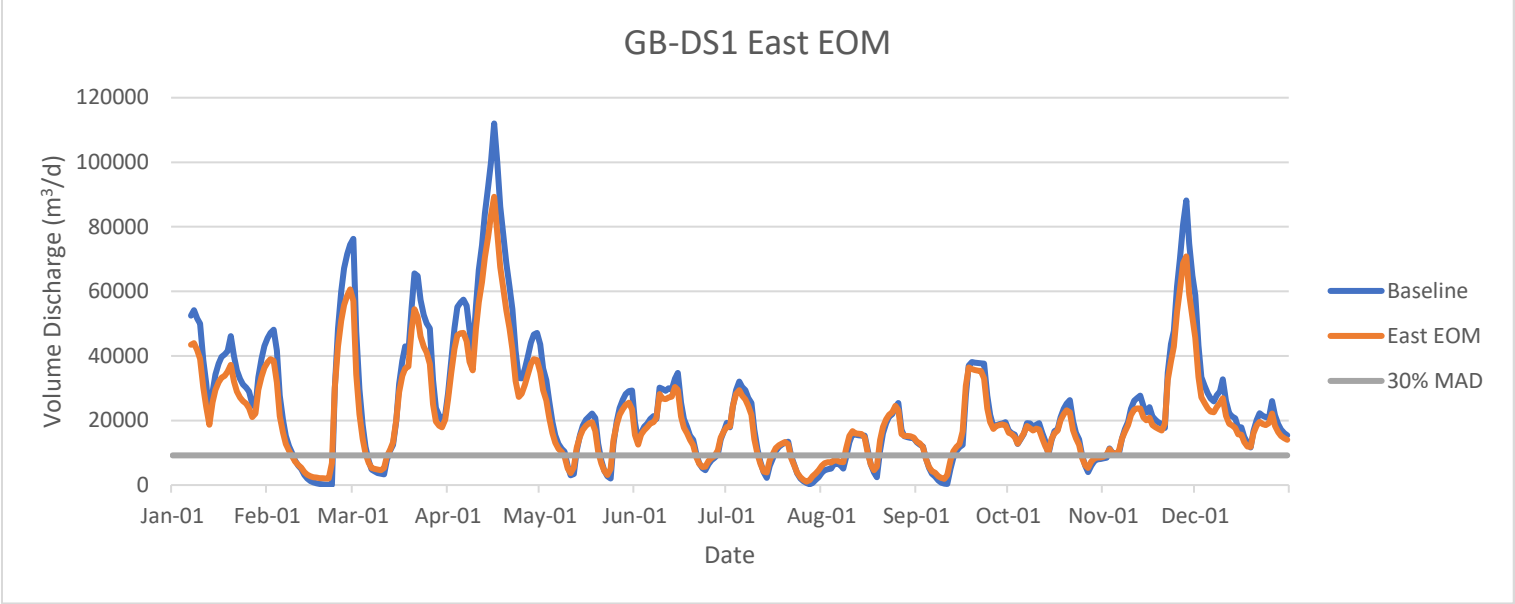


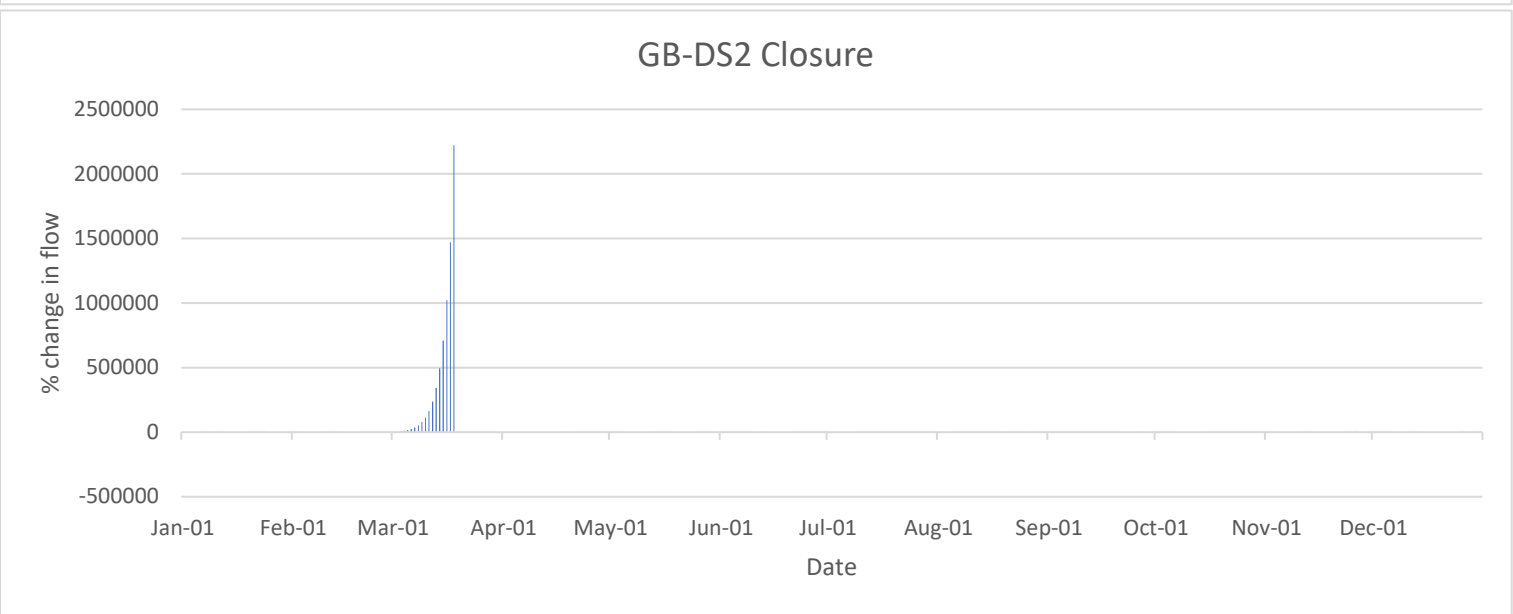
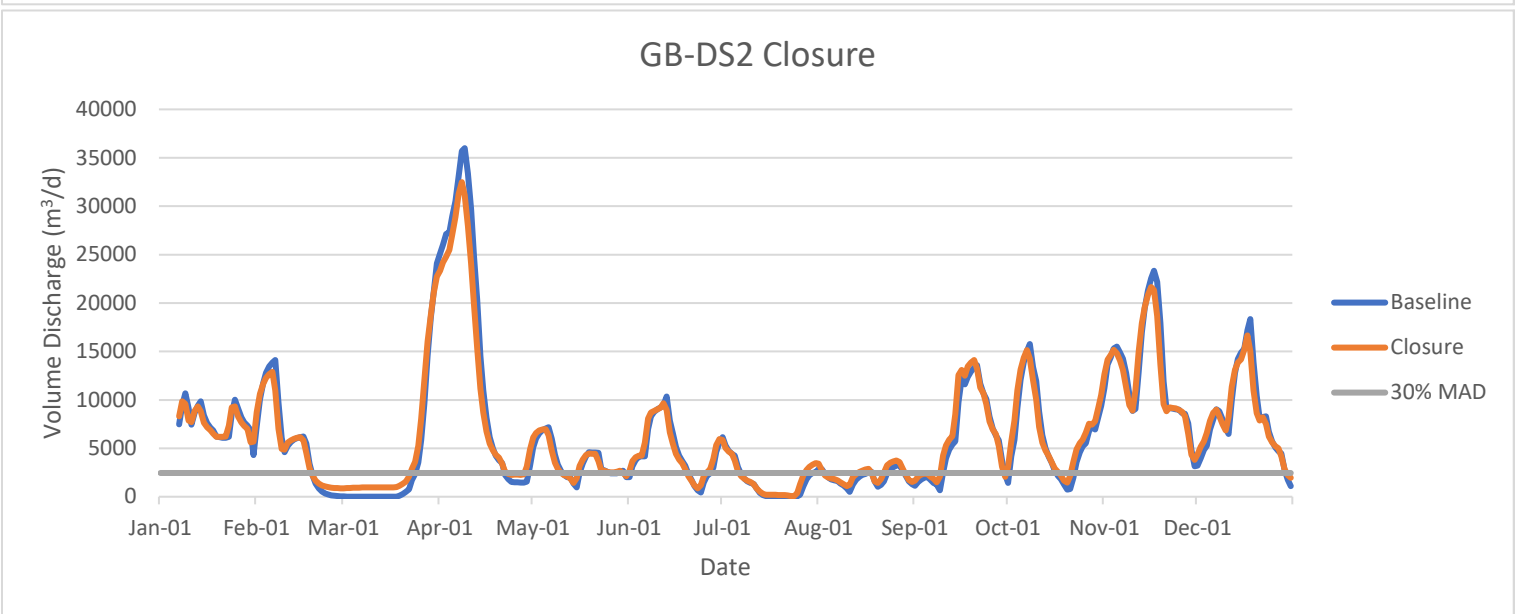
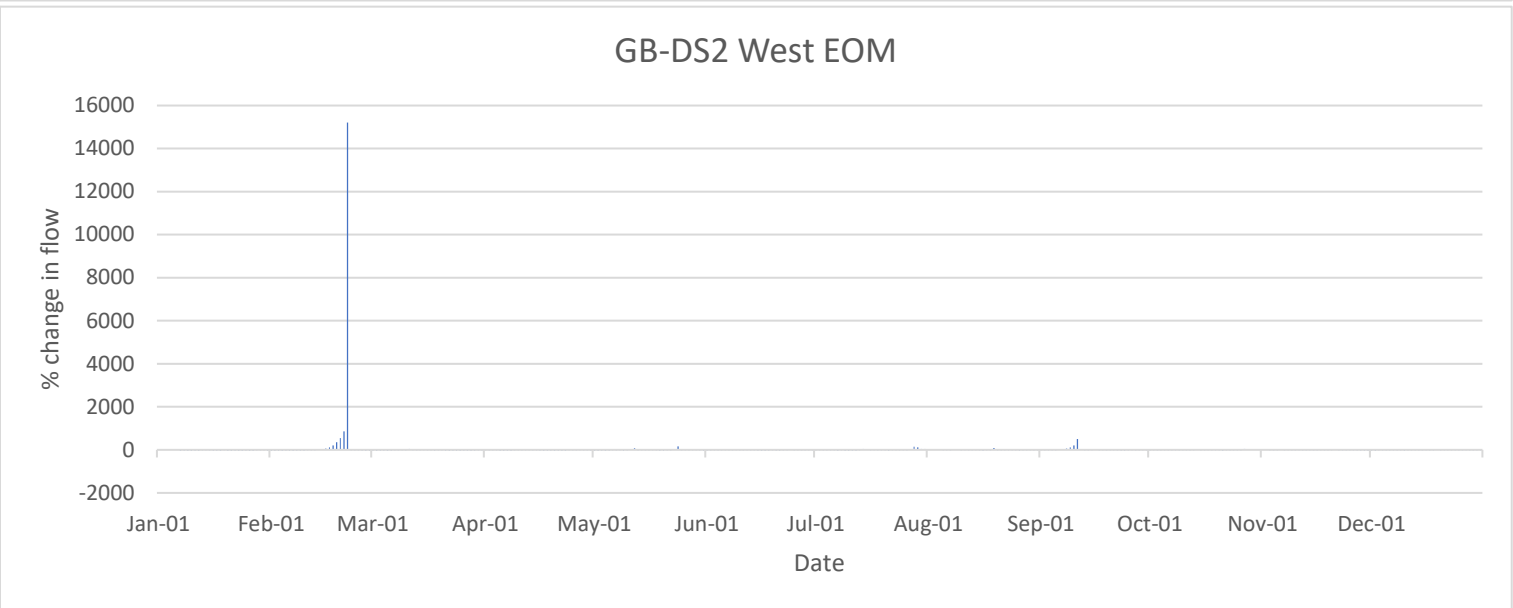
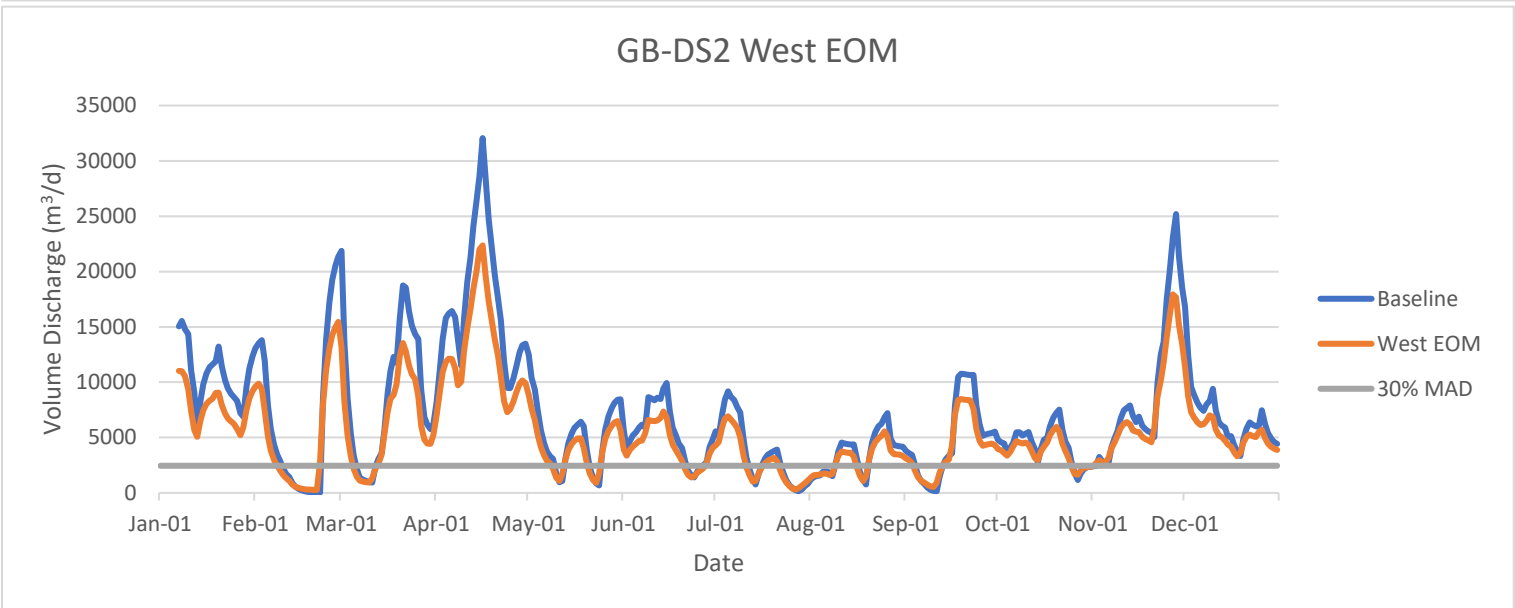
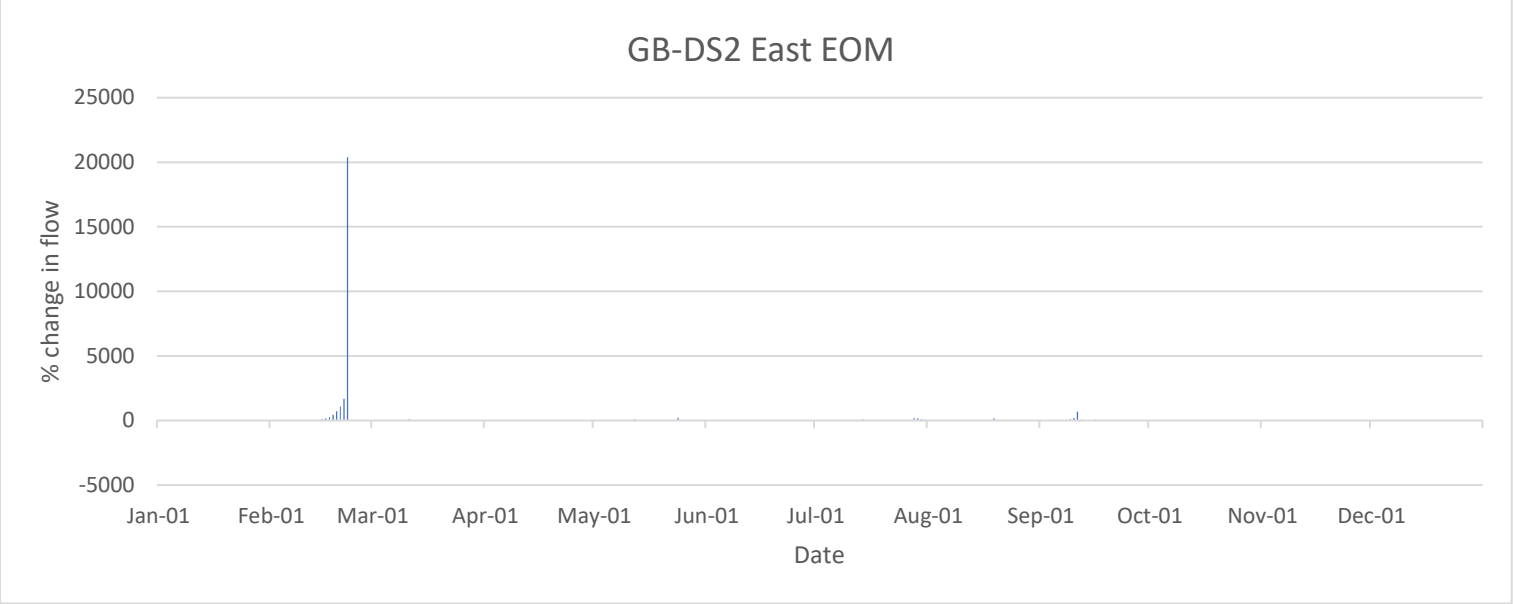
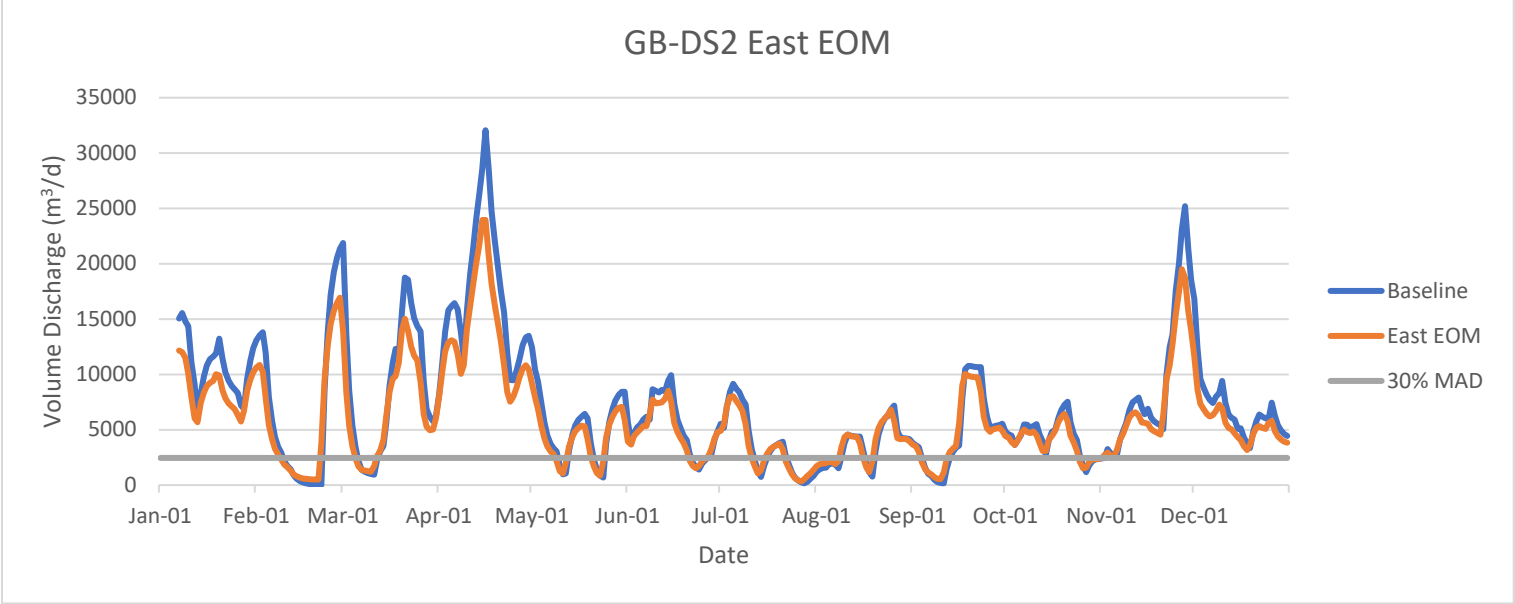
Table 5. Summary of Daily Flow Data Derived from Hydrographs; ‘Normal Year’ Scenario. Gold Brook Tributary System (WC3, WC55, WC10 and WC11).

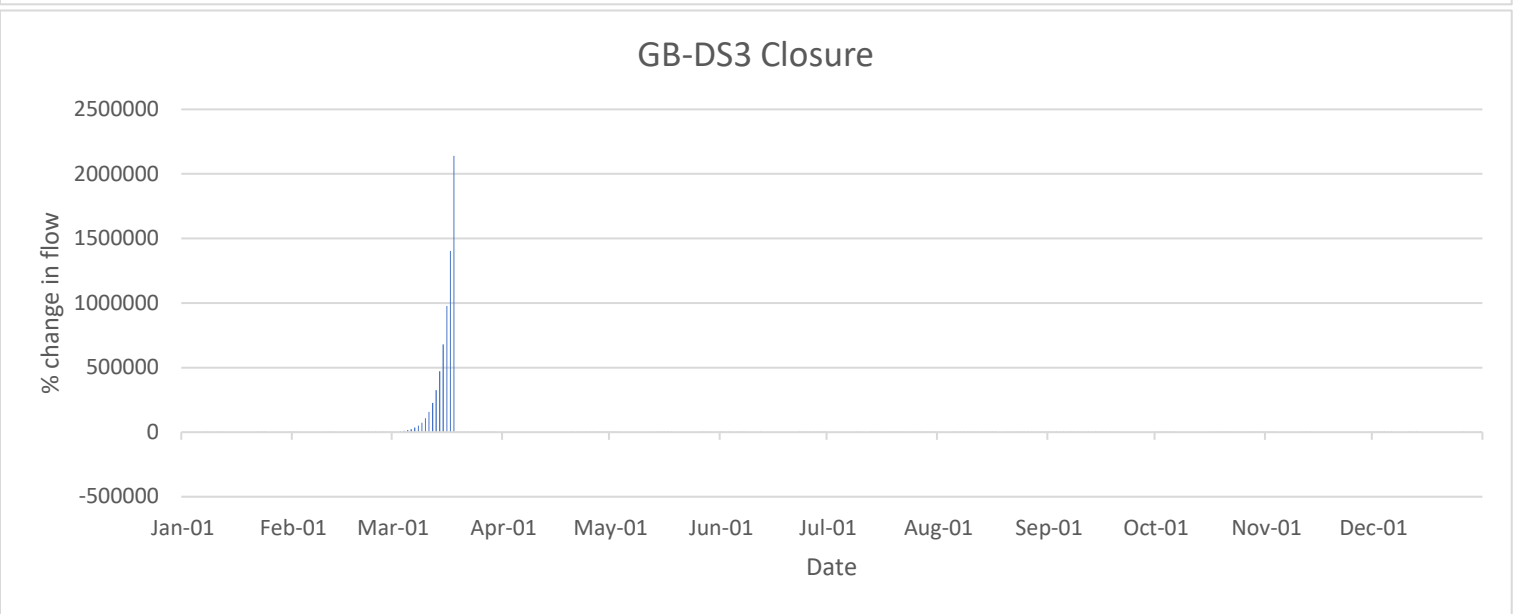
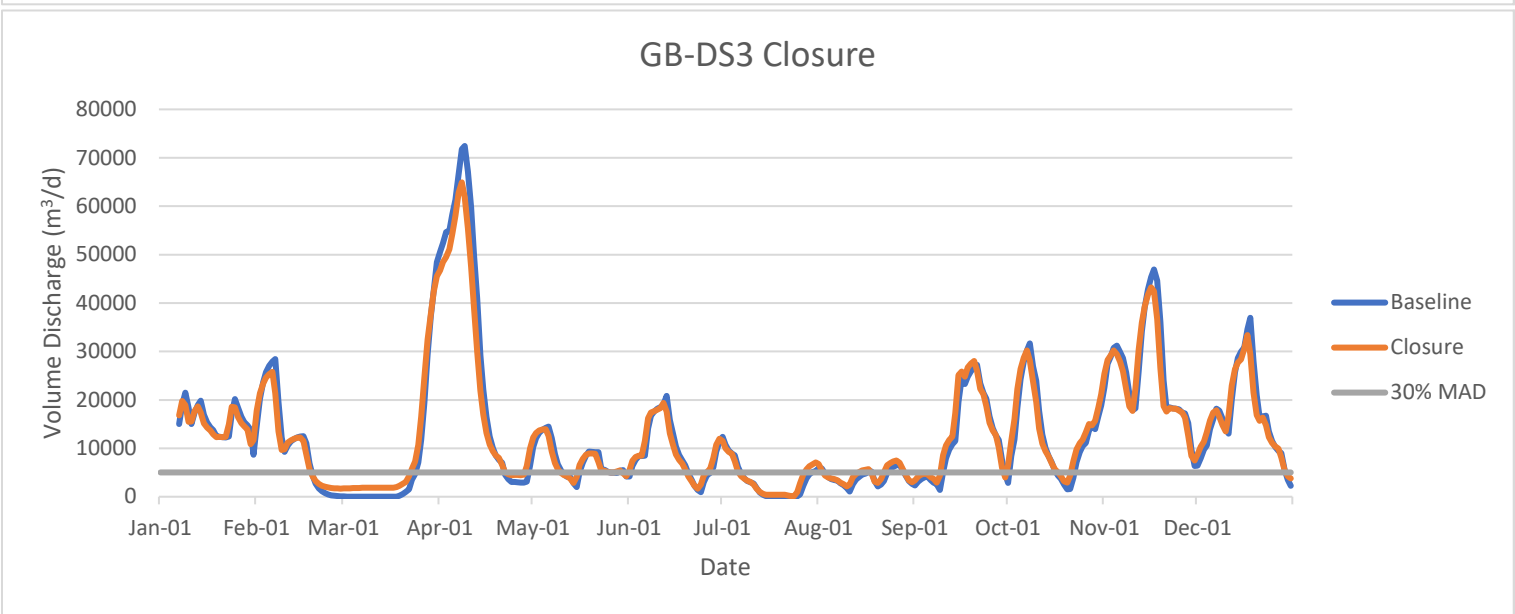
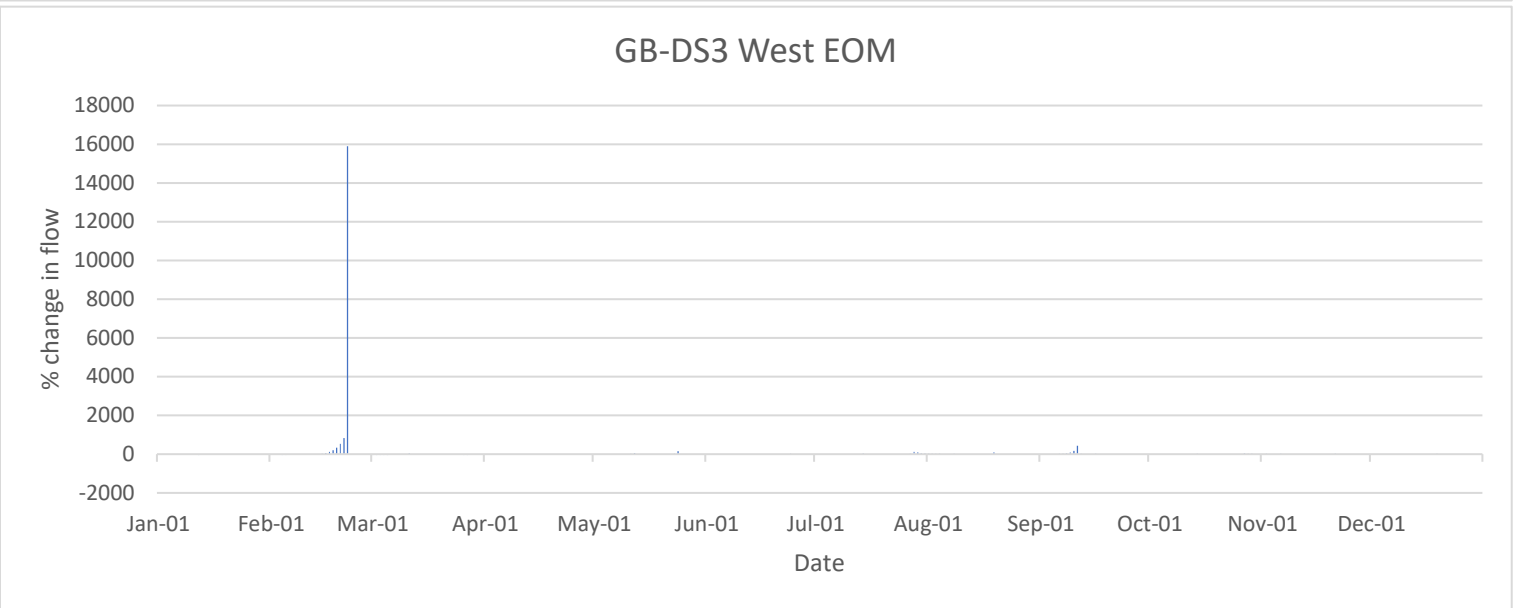
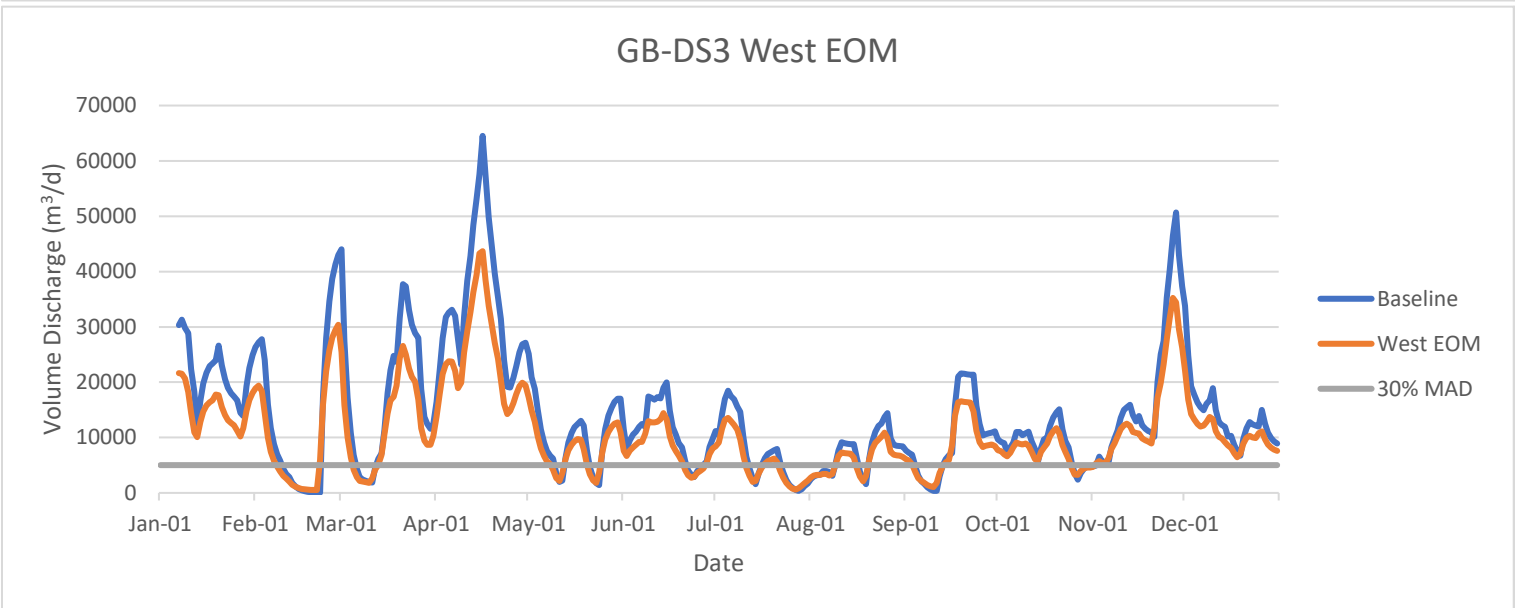
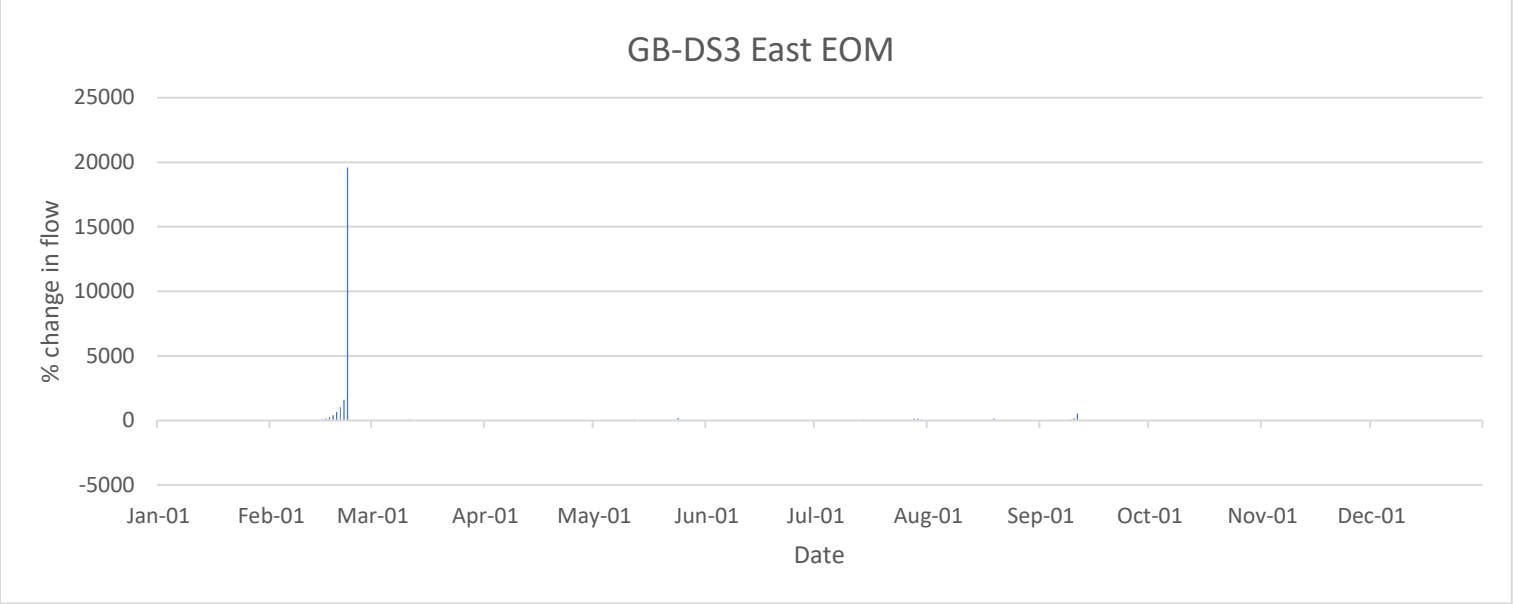
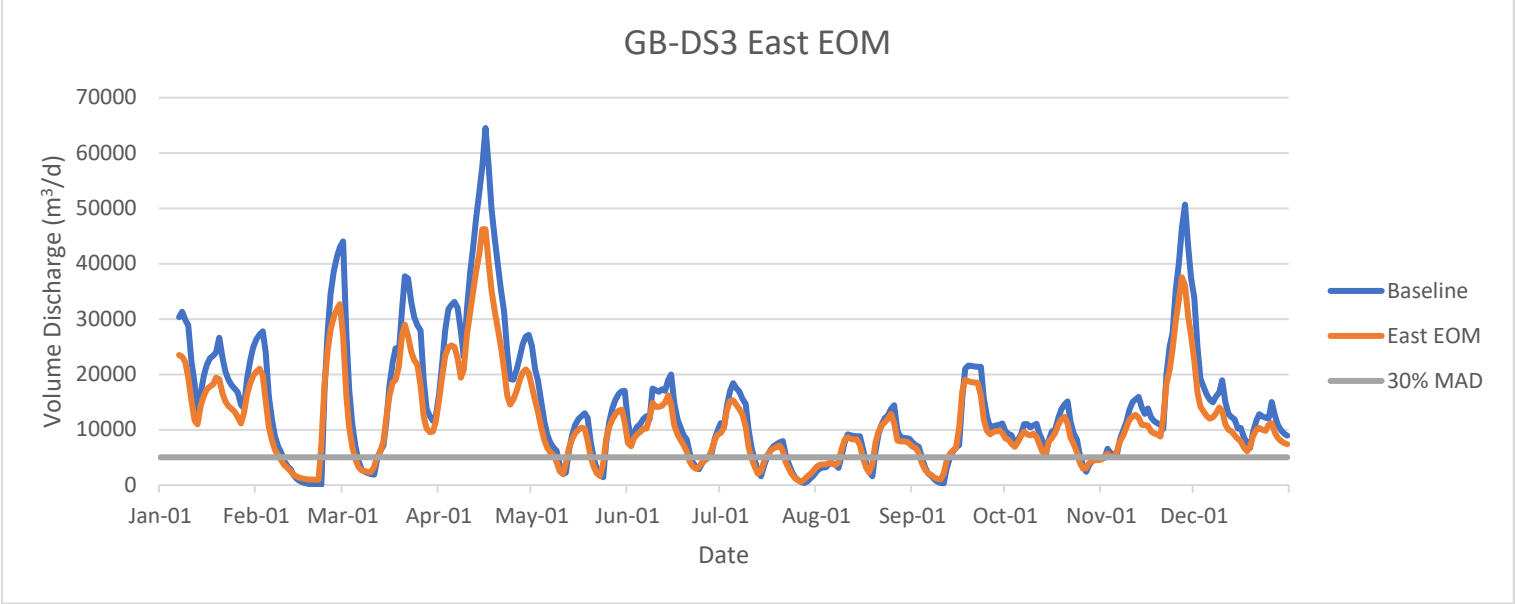
		WC-3-DS1	WC-3-DS2	WC-55-DS	WC-10-DS	WC-11-DS
East EOM	Range in flow change	-68	-54	-15	377	9
		-100	-100	-17	-66	-62
	# days with > 10% reduction	365	365	365	362	307
	# baseline days below 30% MAD	127	127	127	127	127
	# of East EOM below 30% MAD	284	248	144	247	138
	# additional days below 30% MAD	157	121	17	120	11
West EOM	Range in flow change	-64	-49	-14	-28	1
		-77	-70	-17	-66	-19
	# days with > 10% reduction	365	365	365	365	347
	# baseline days below 30% MAD	127	127	127	127	127
	# of West EOM below 30% MAD	257	209	144	248	144
	# additional days below 30% MAD	130	82	17	121	17
Closure	Range in flow change	-64	-47	-2	-3	2
		-81	-68	-15	-63	-20
	# days with > 10% reduction	365	365	334	352	338
	# baseline days below 30% MAD	163	163	163	163	163
	# of Closure below 30% MAD	266	227	178	246	179
	# additional days below 30% MAD	103	64	15	83	16

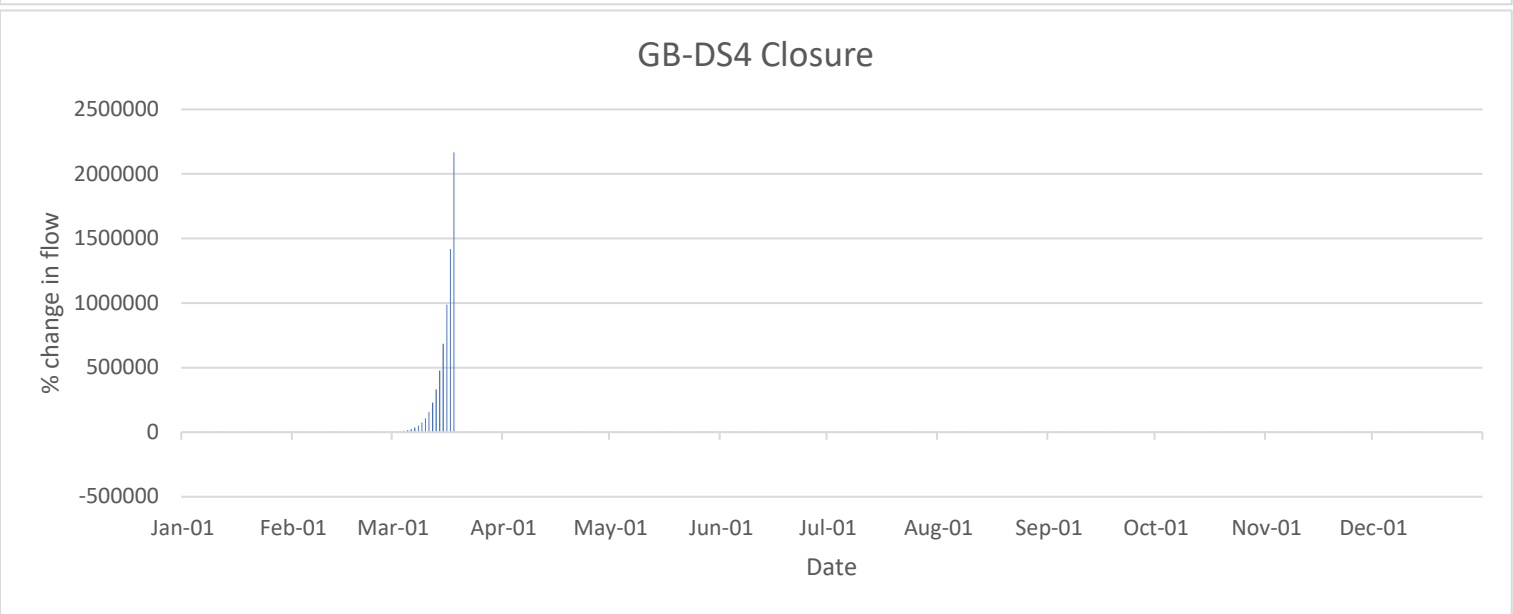
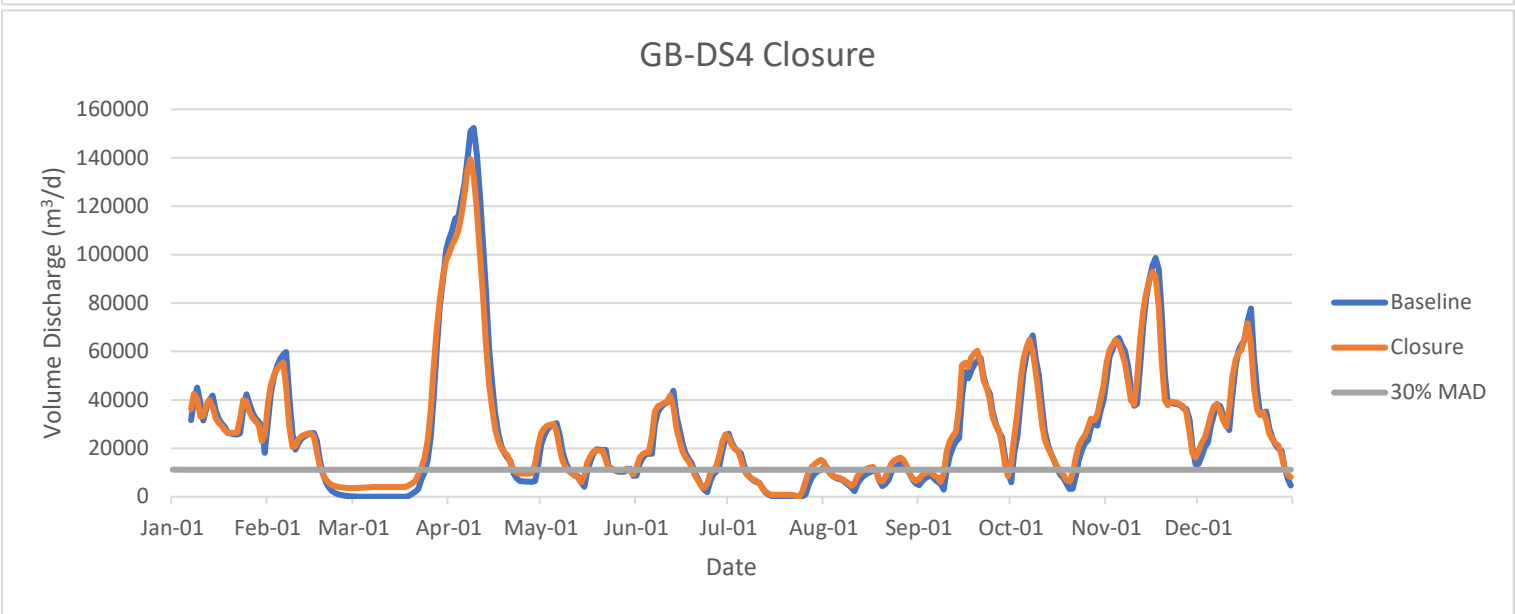
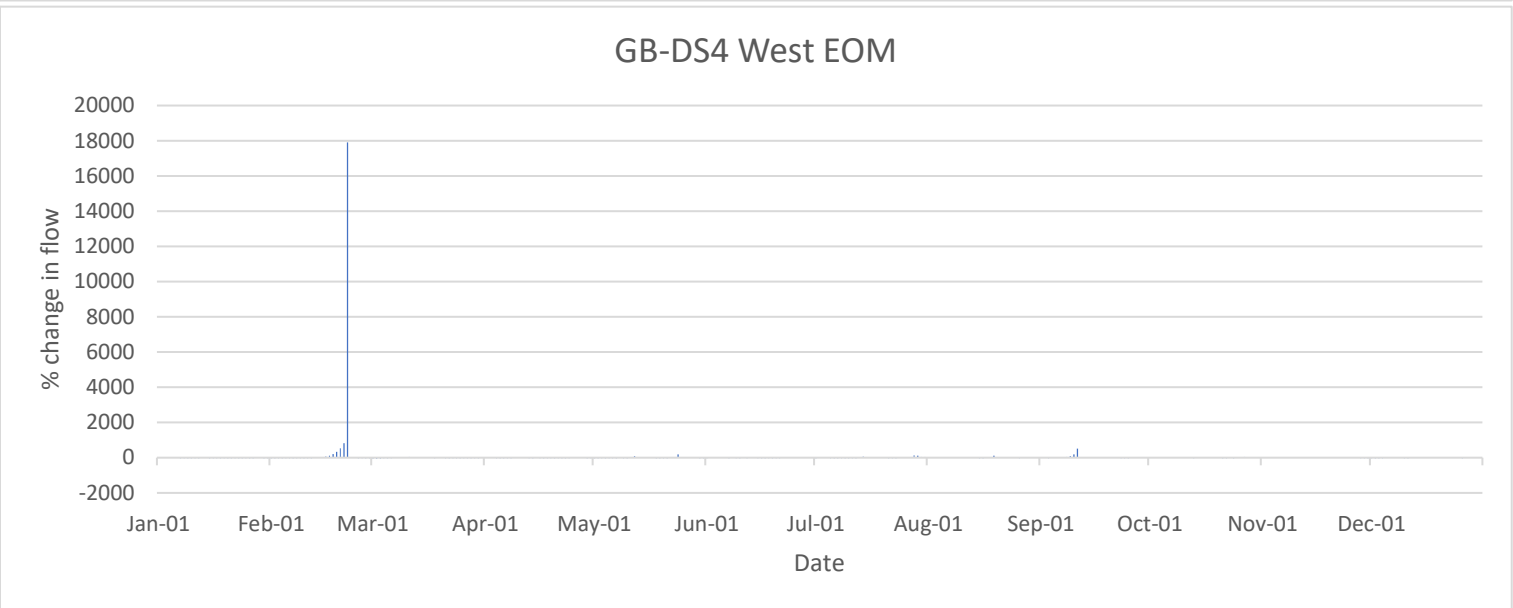
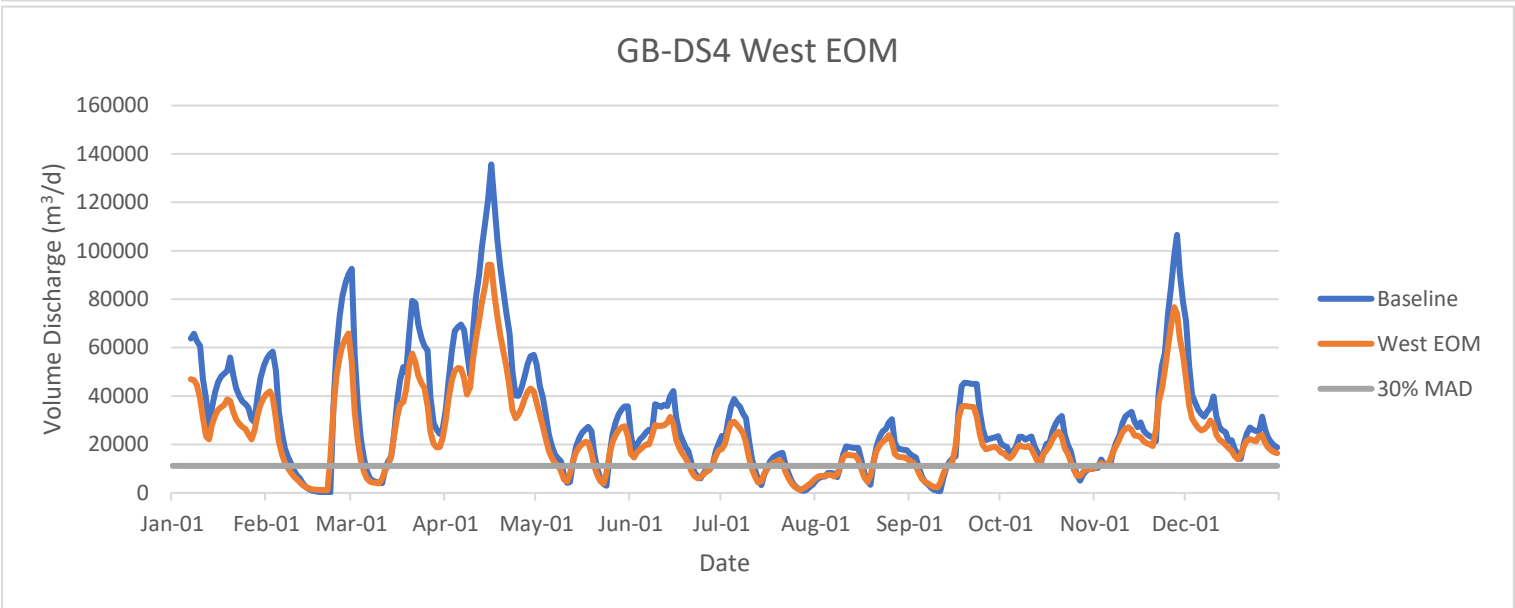
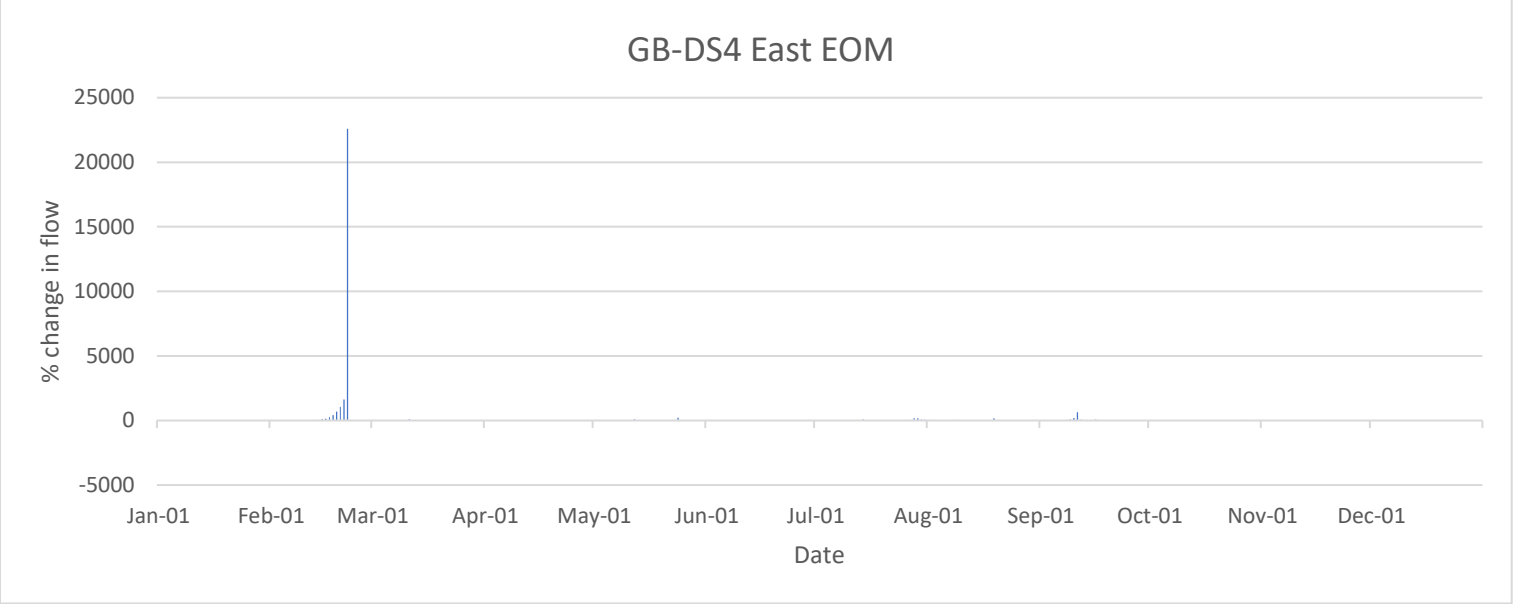
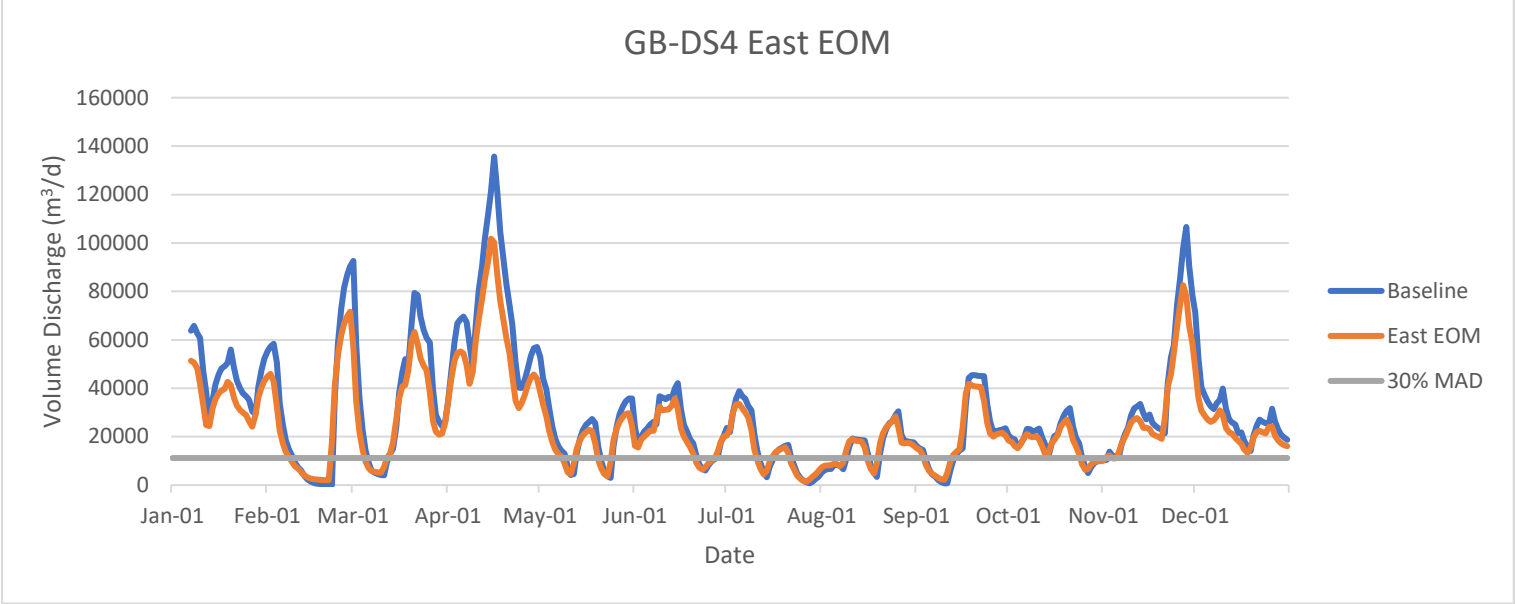
May 2022 – Goldboro Gold Project. – Daily Hydrographs
Figures 127-174. Gold Brook System Hydrographs showing Normal Year baseline and predicted daily flows during each Project Phase; and associated percent change in flow from baseline to each corresponding Project project phase.

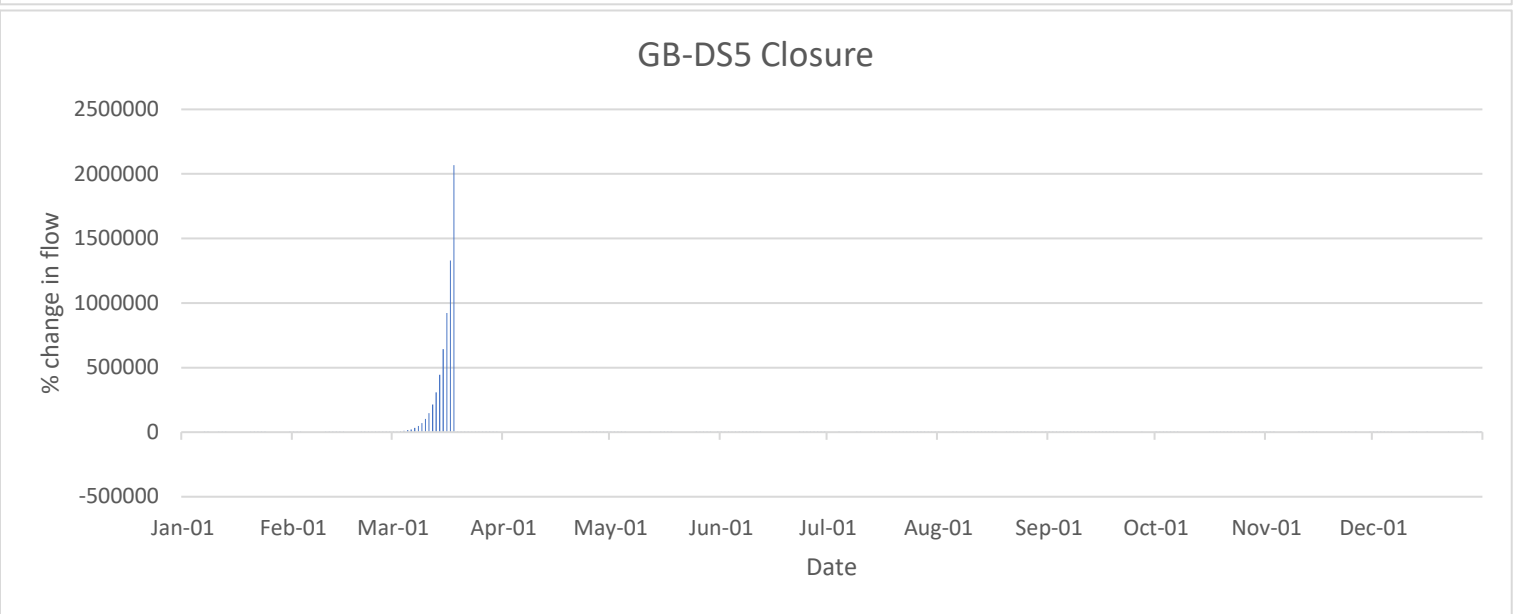
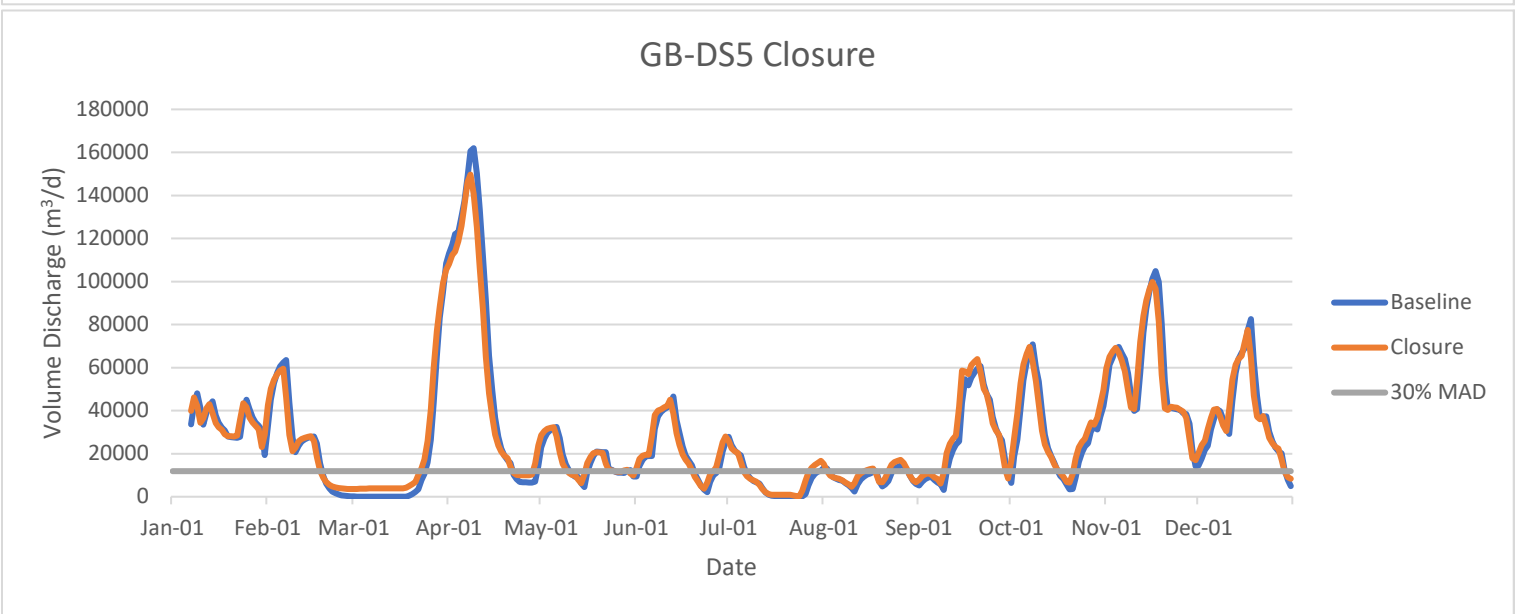
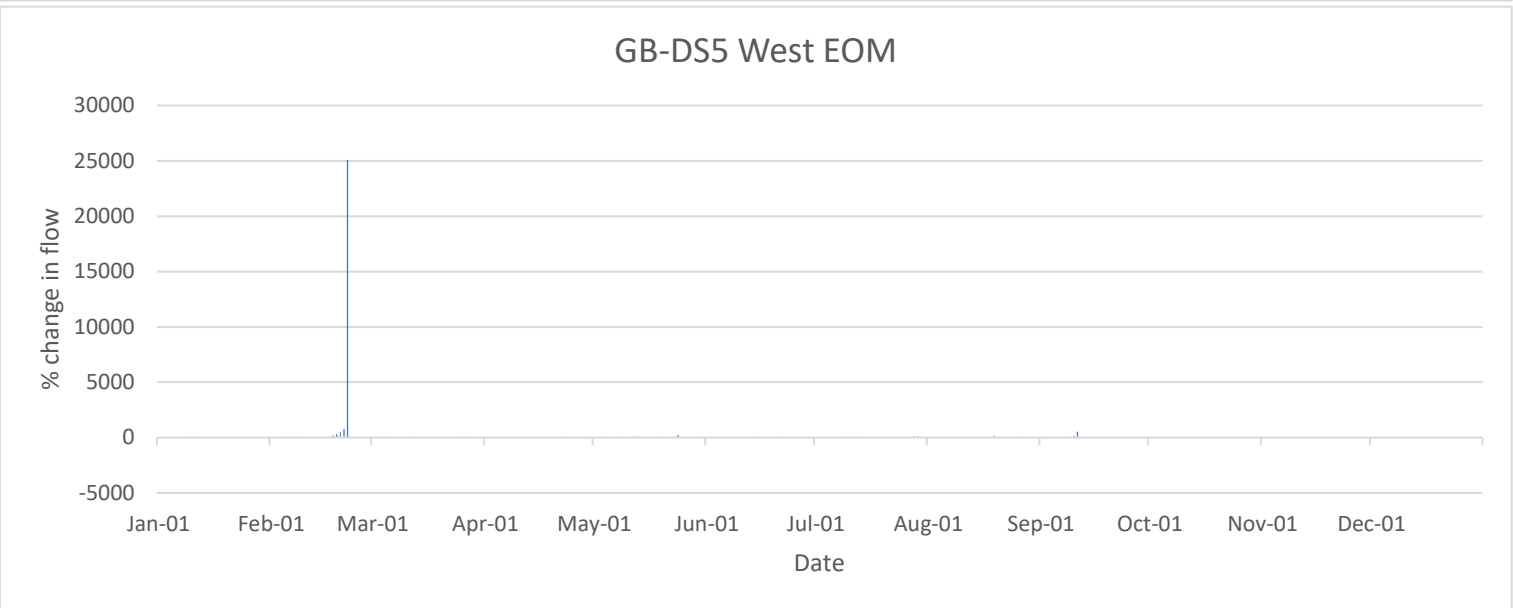
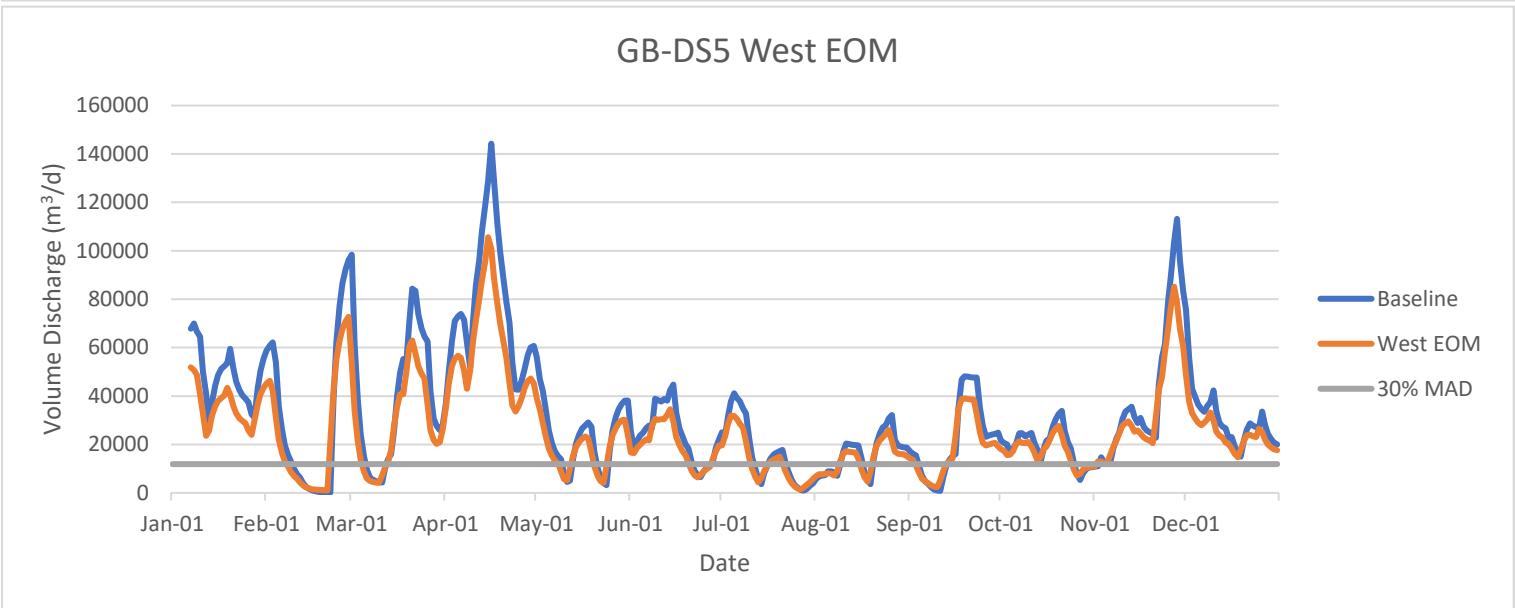
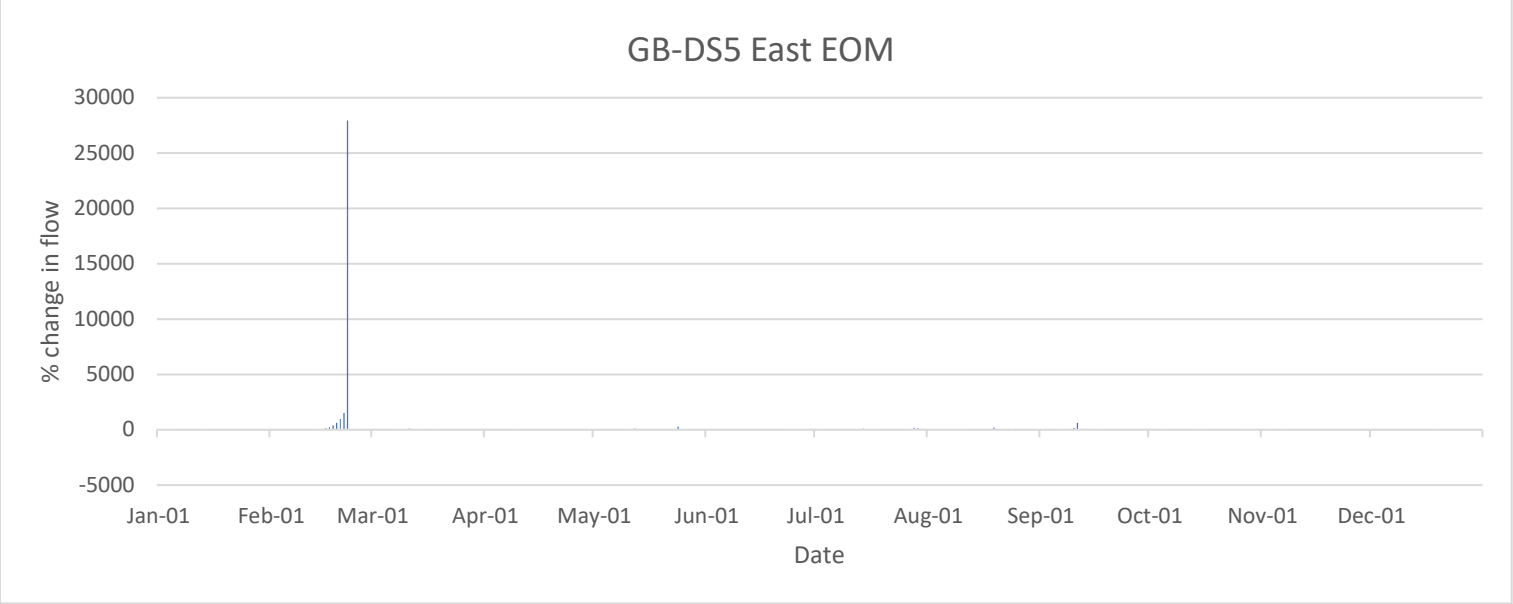
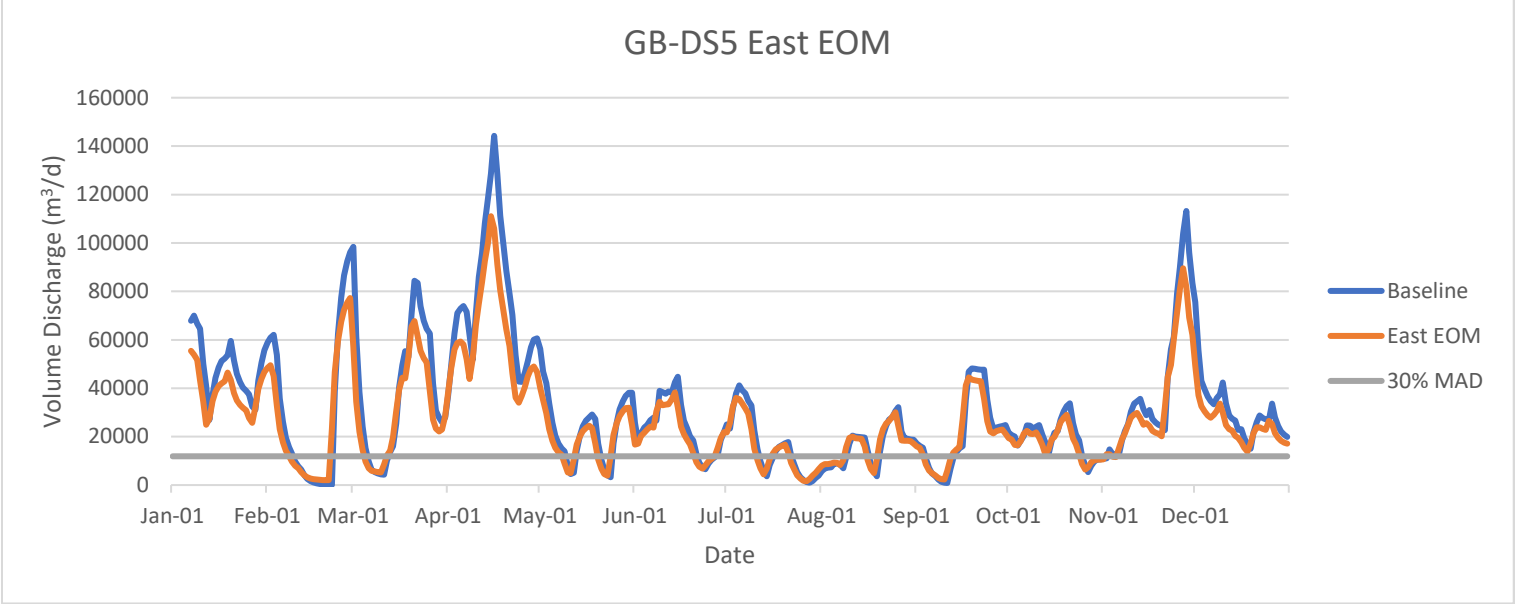


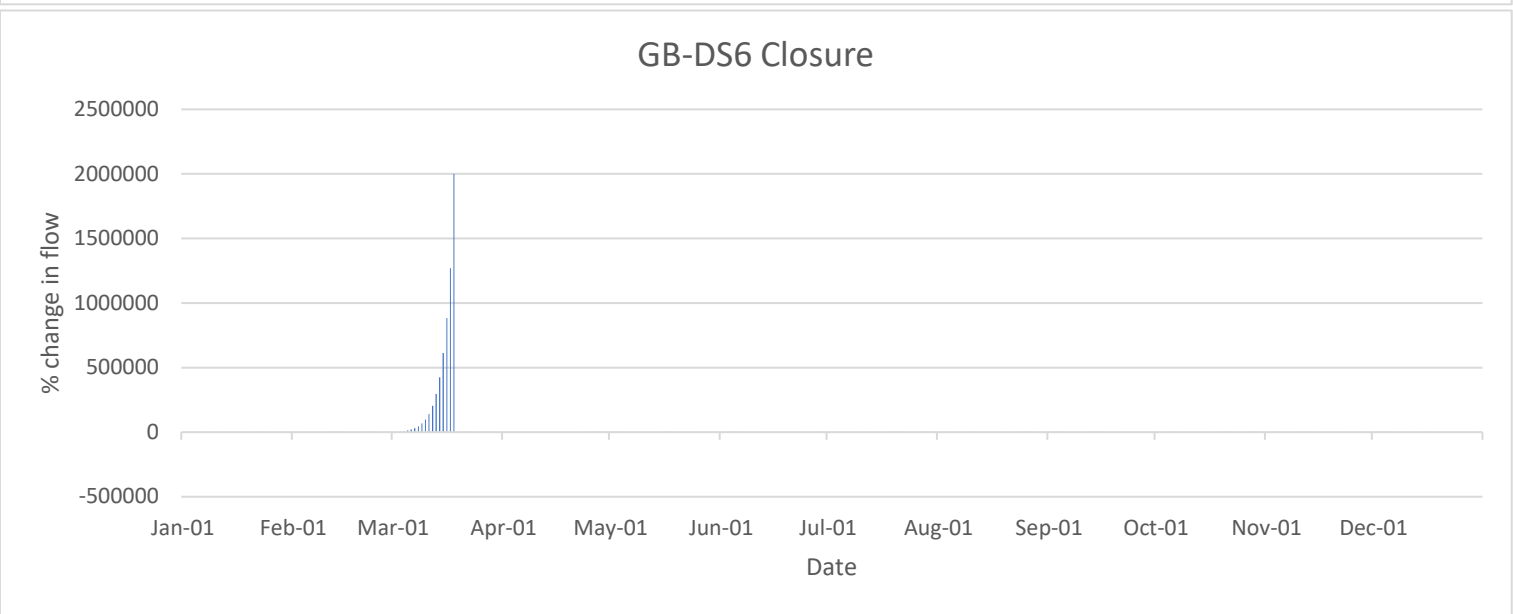
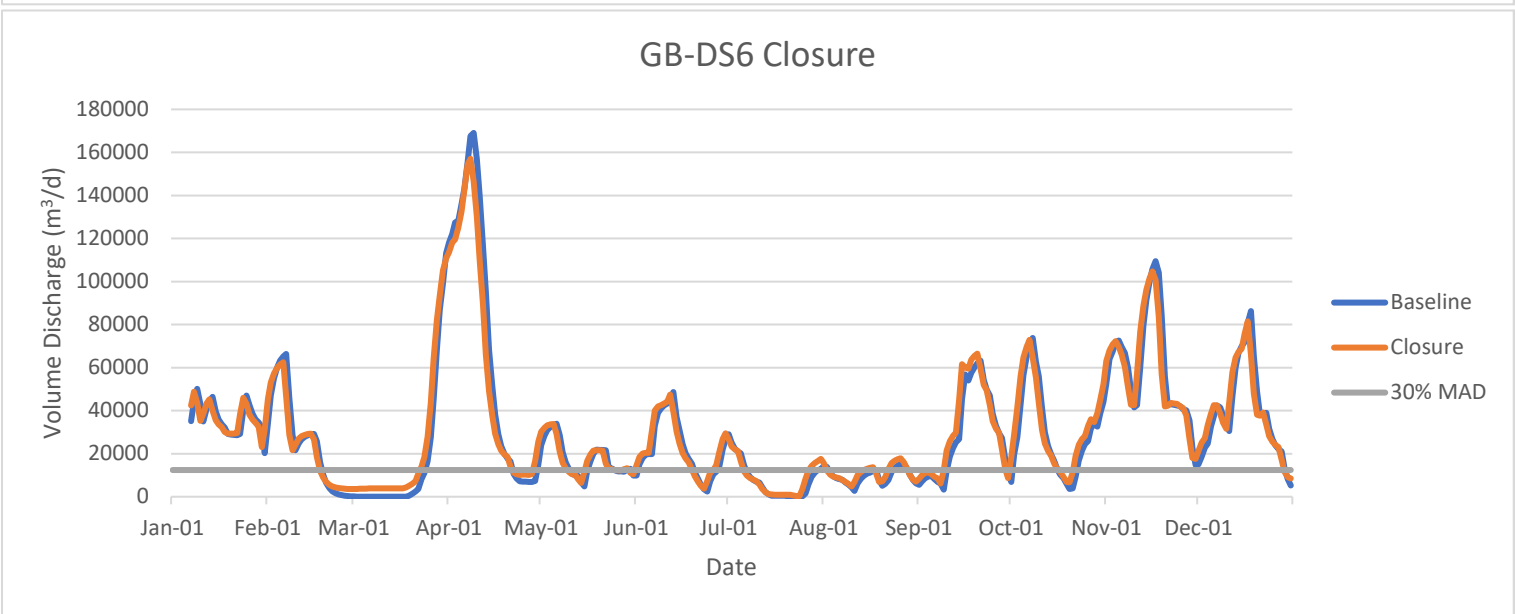
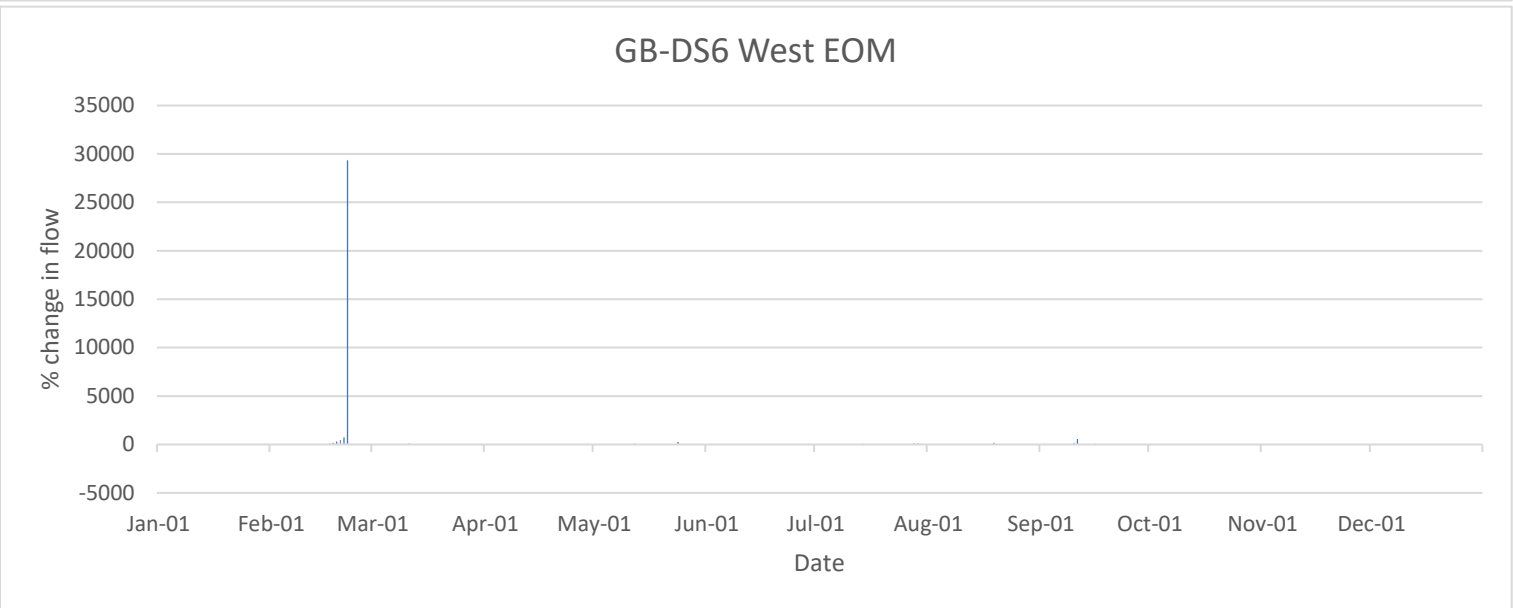
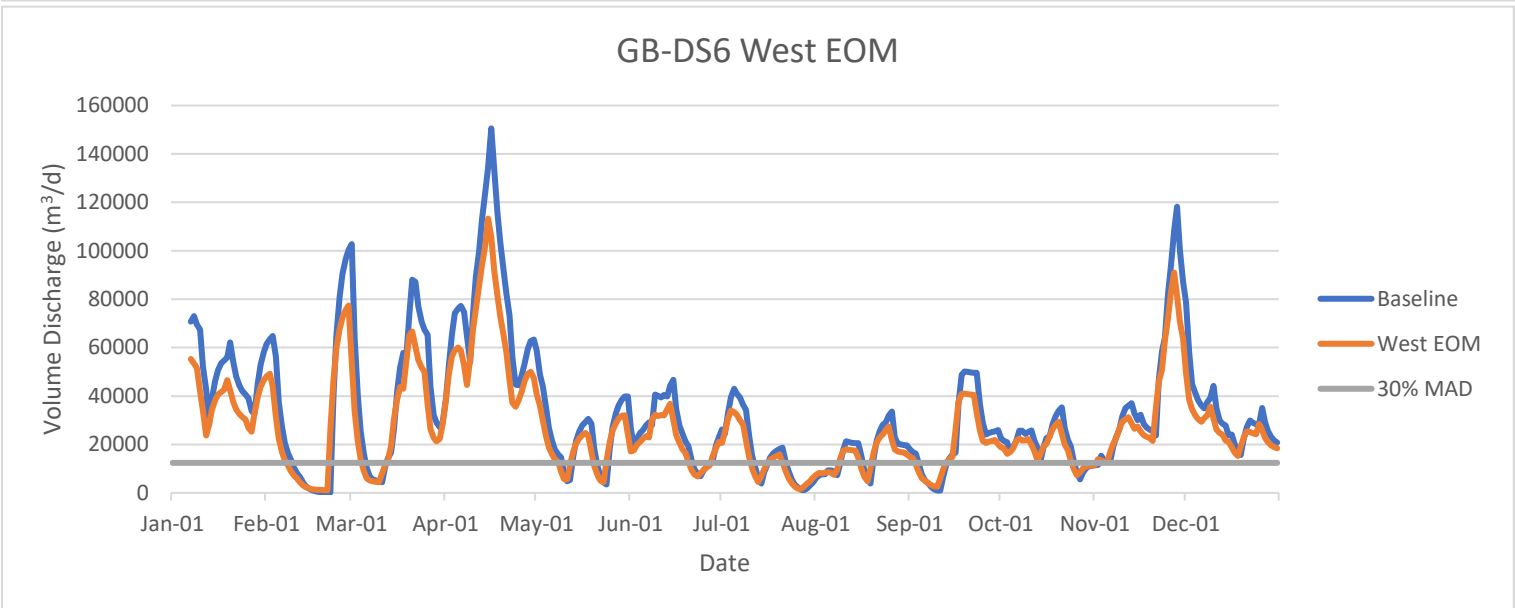
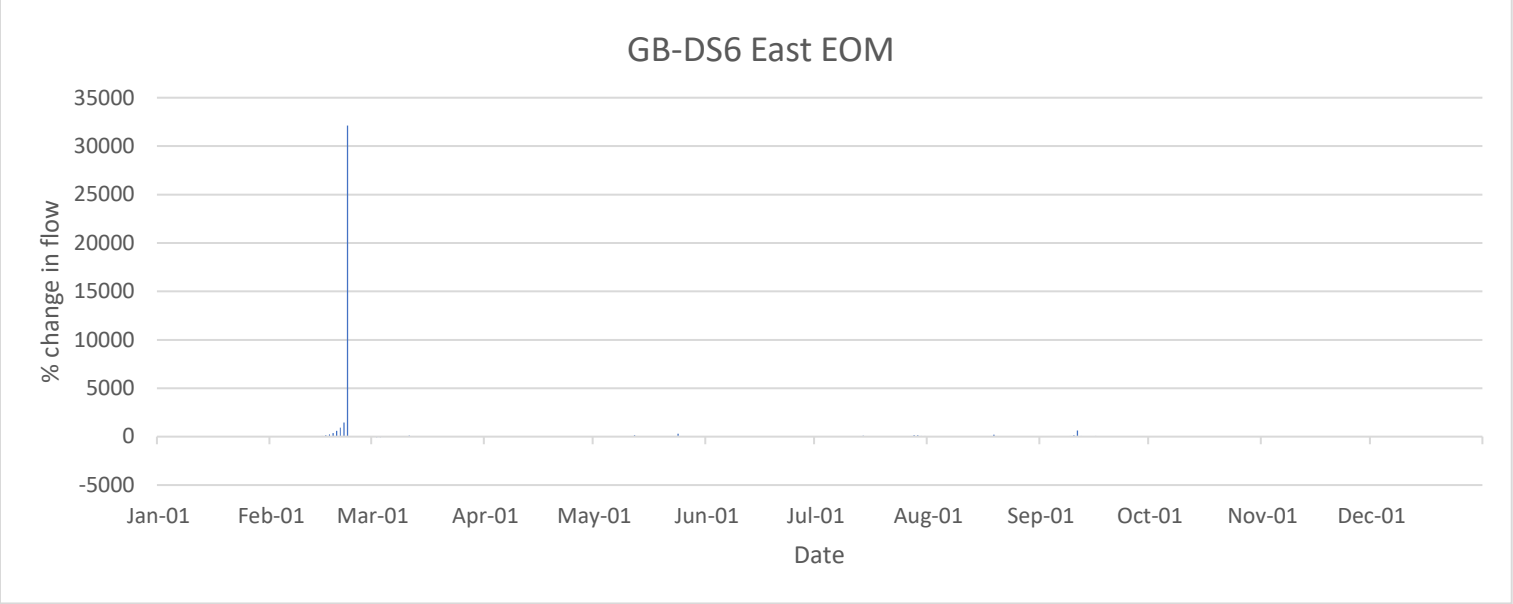
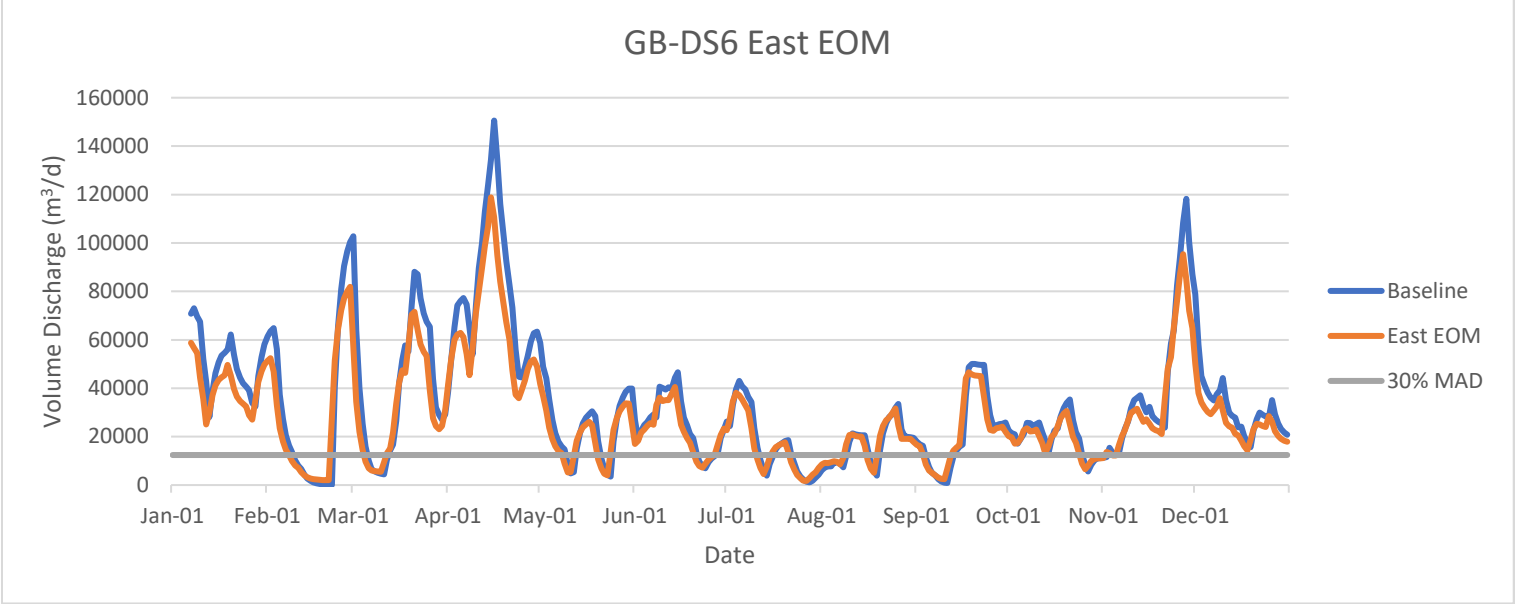












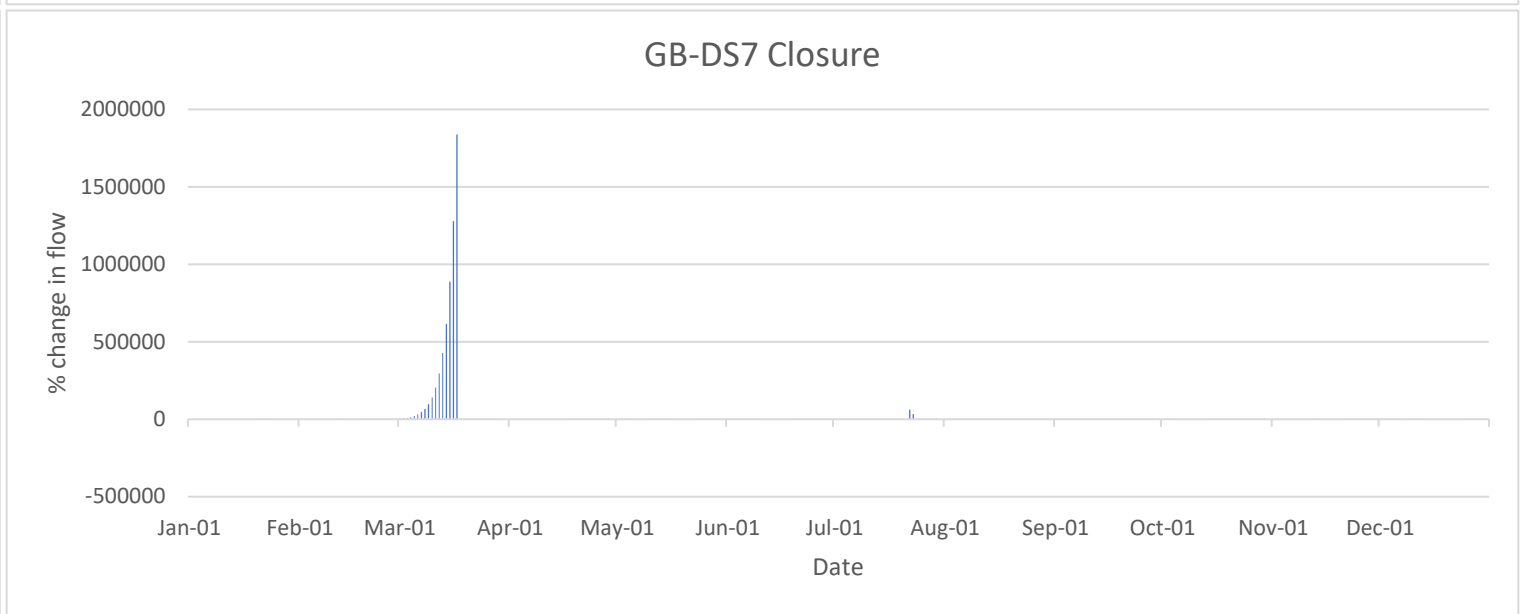
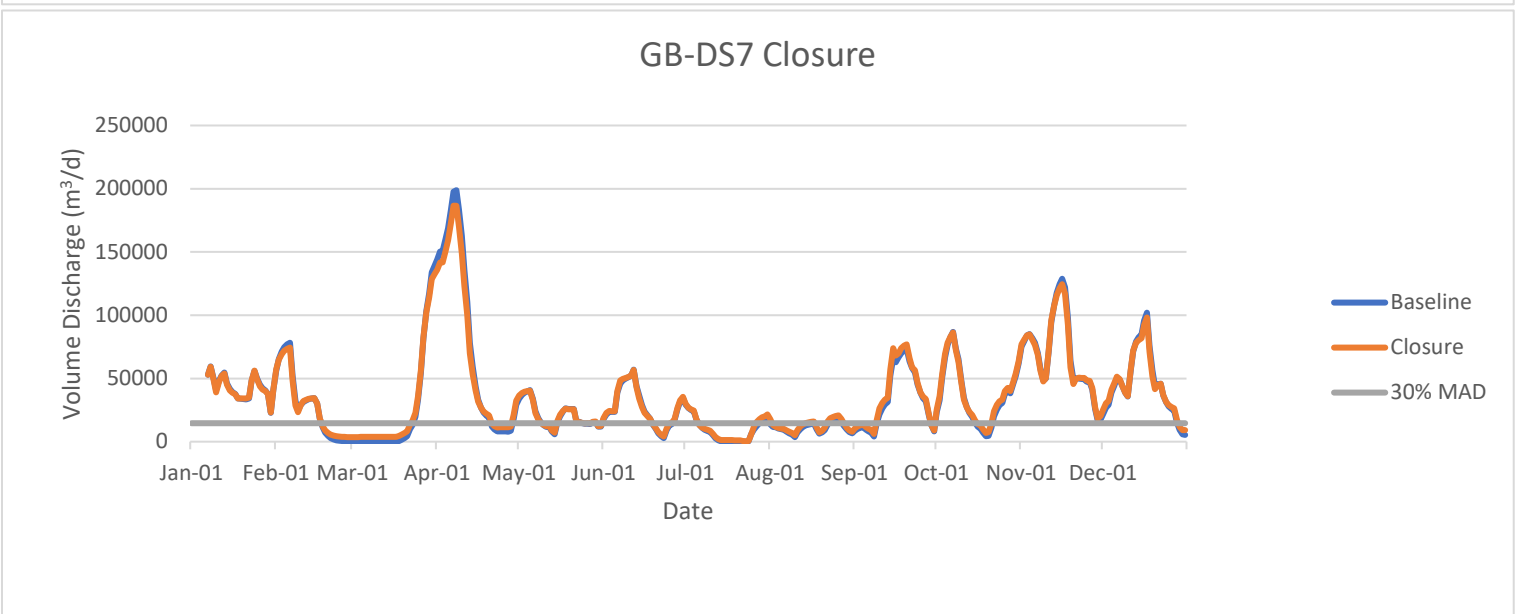
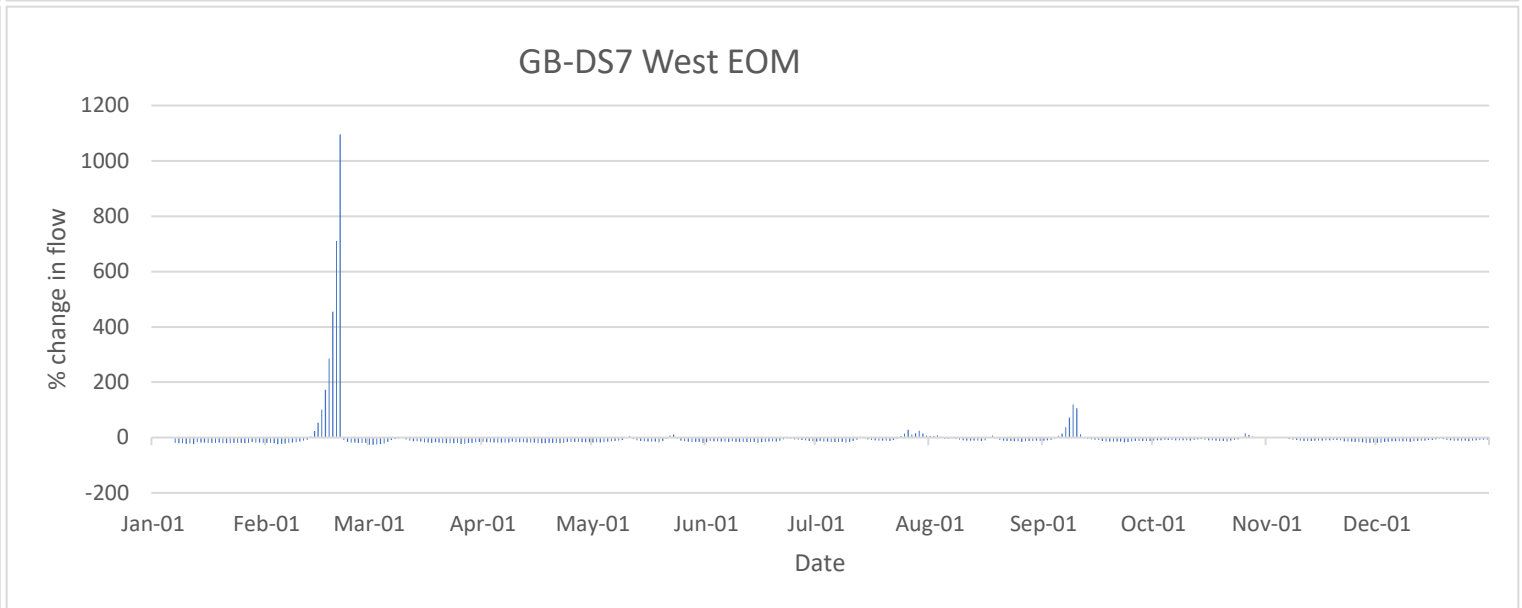
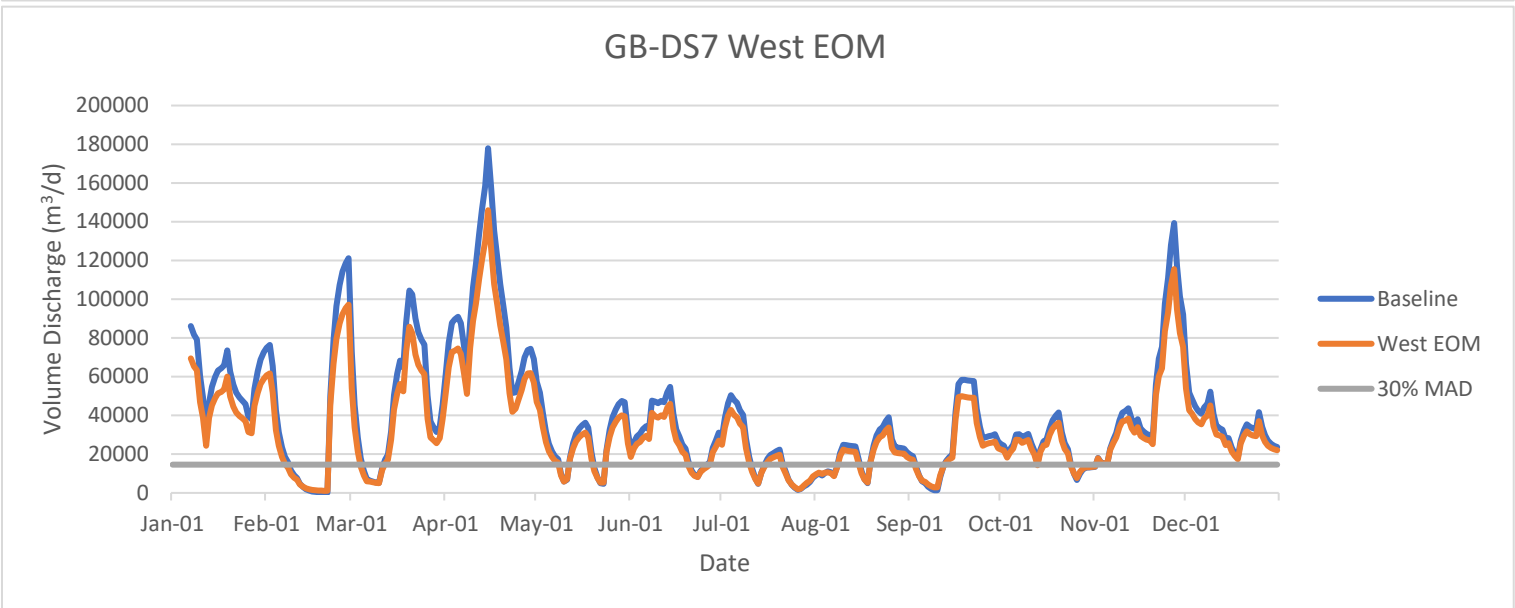
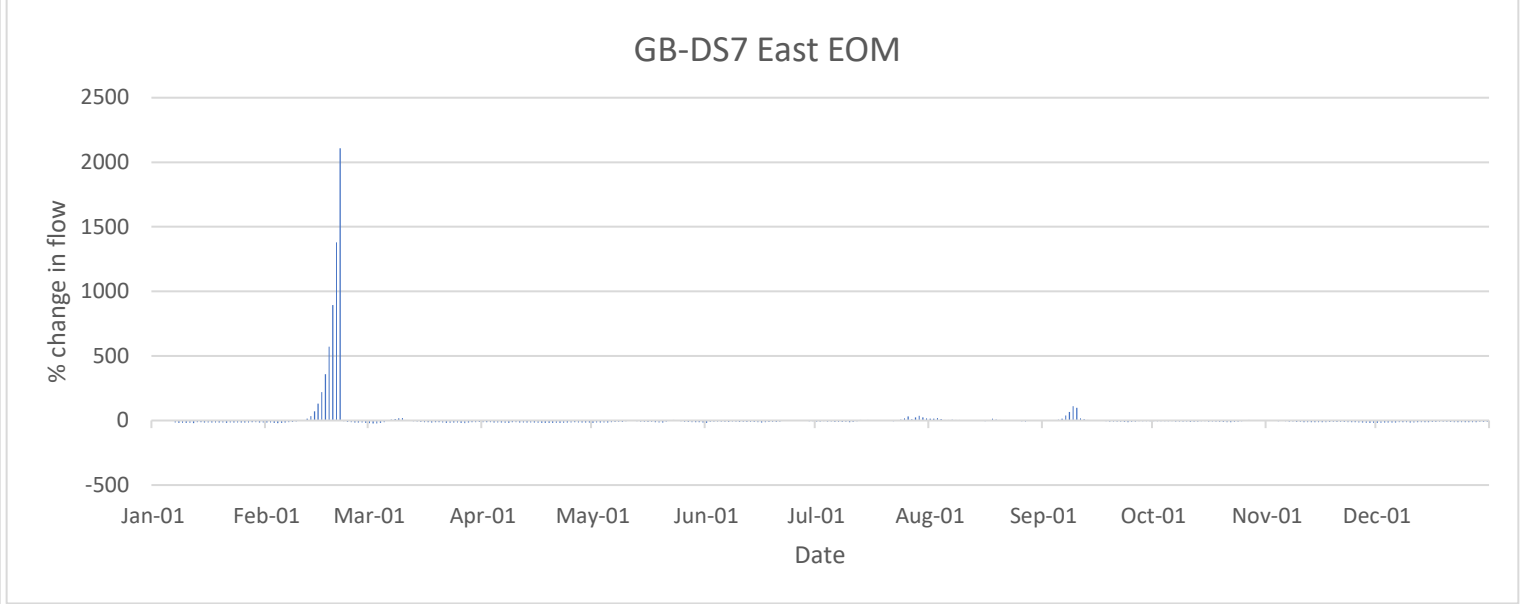
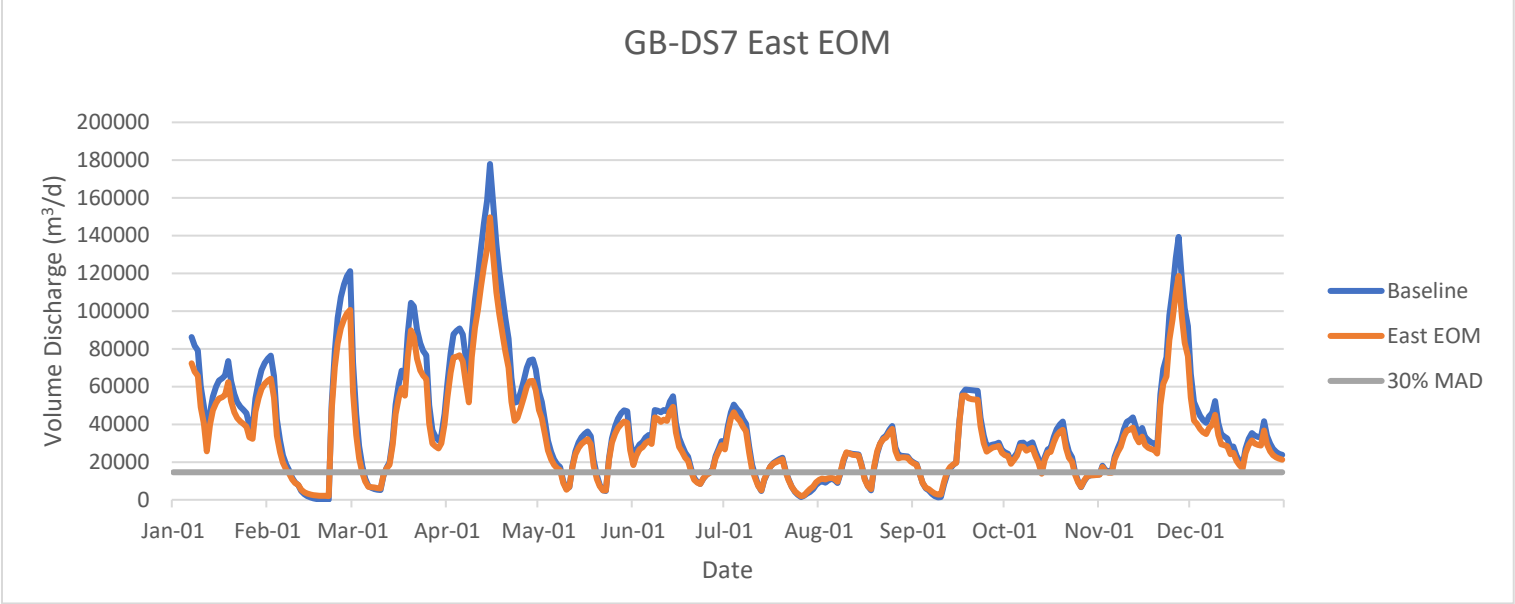
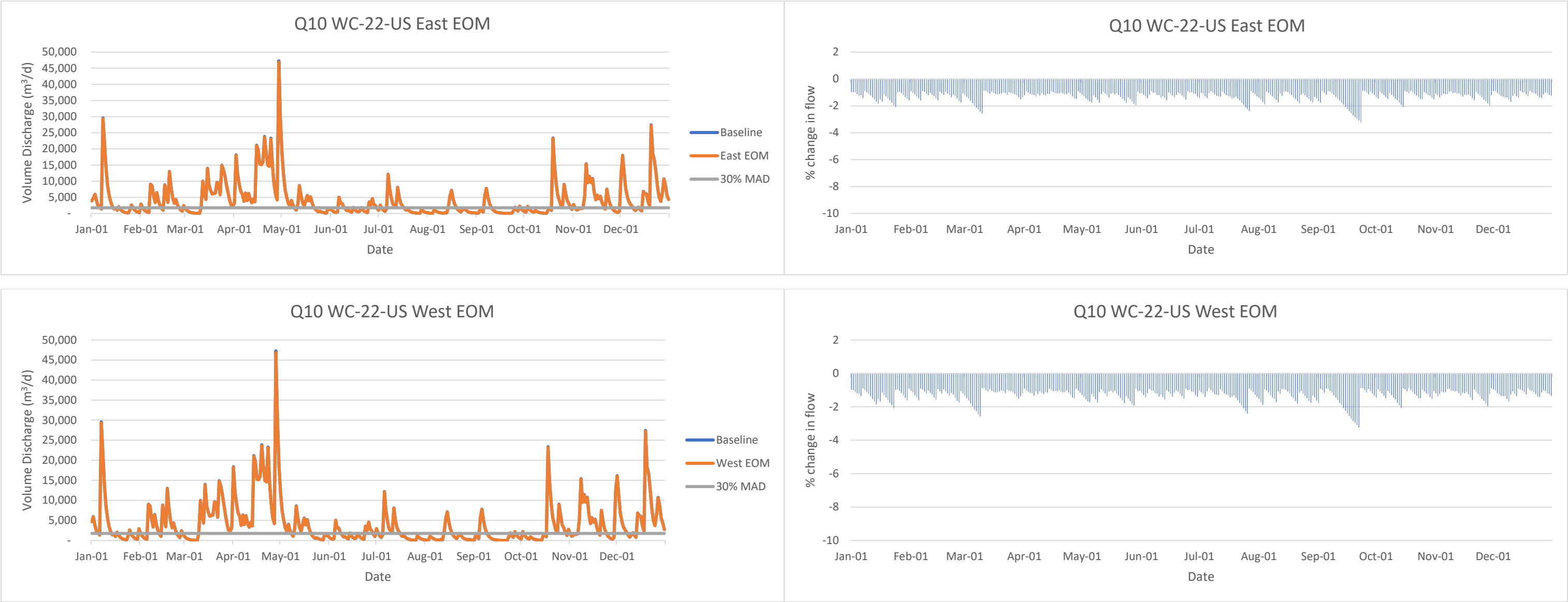
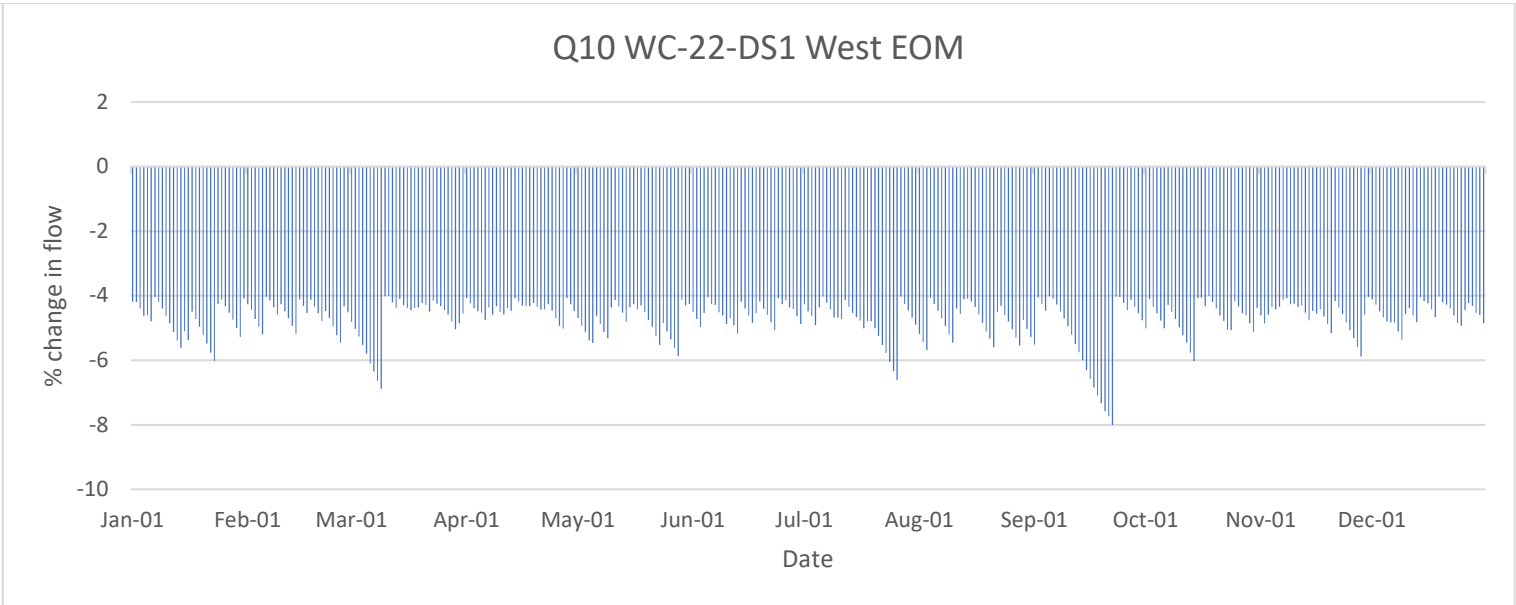
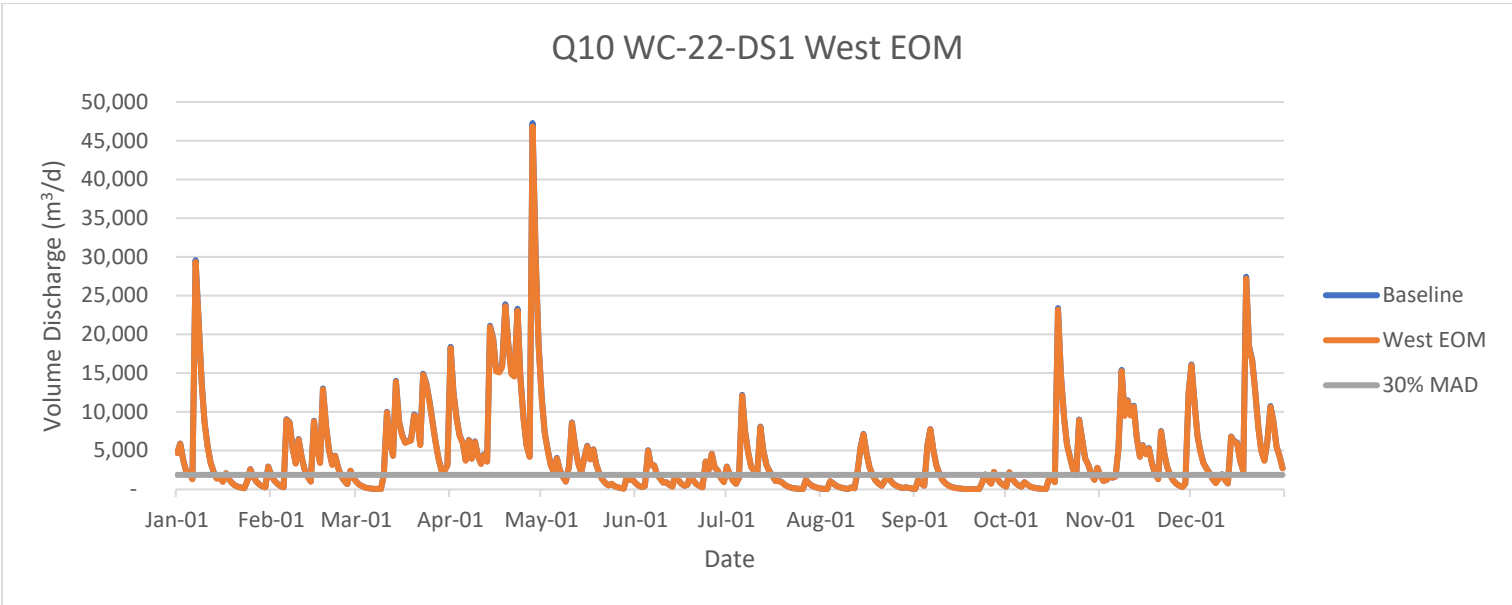
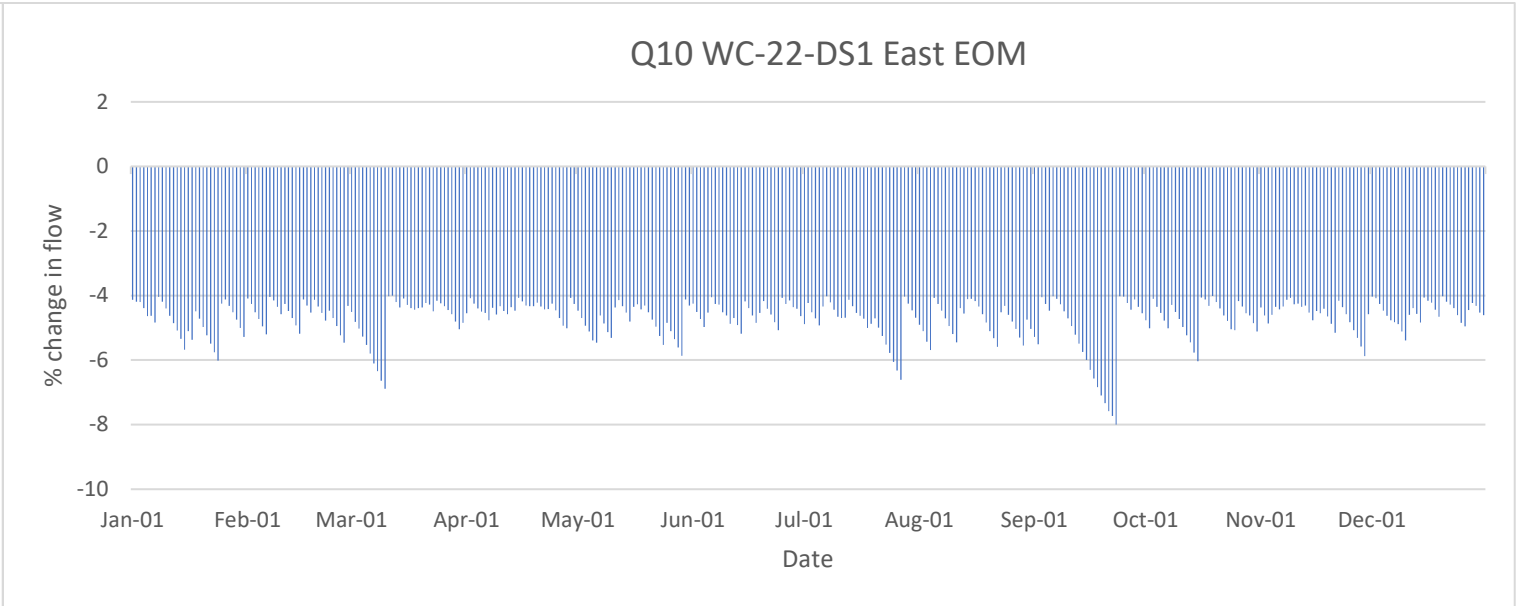
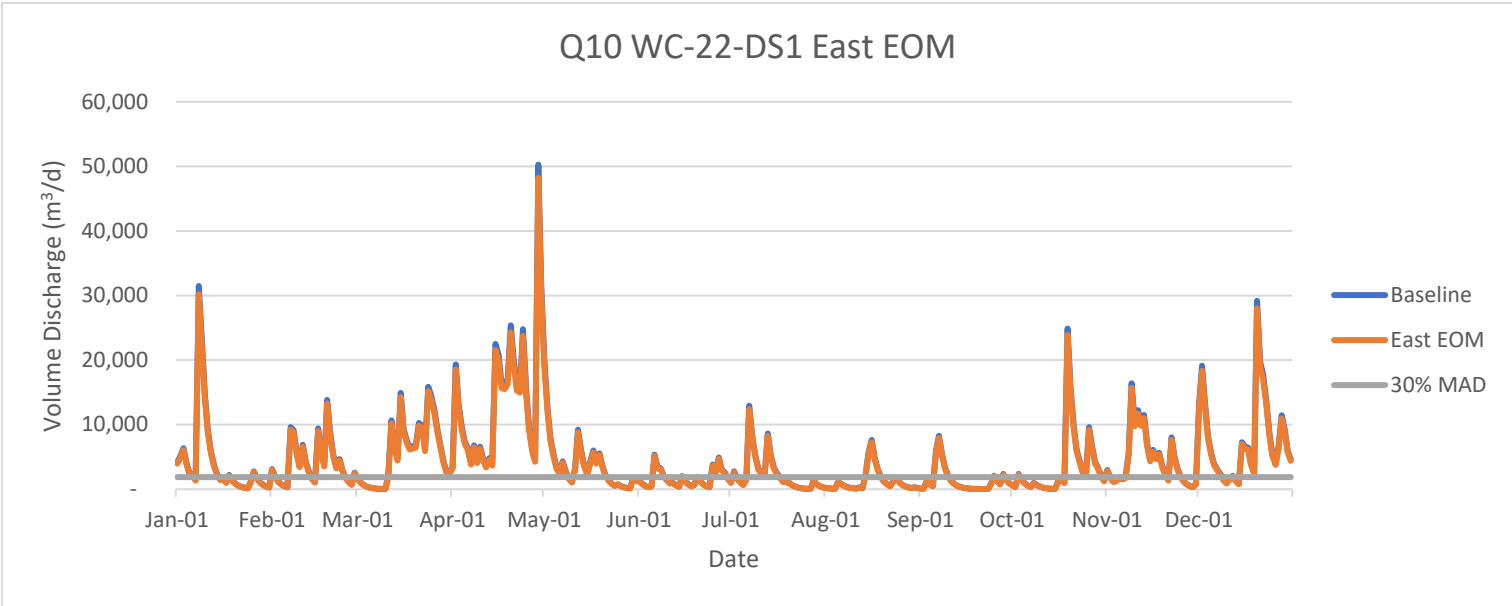
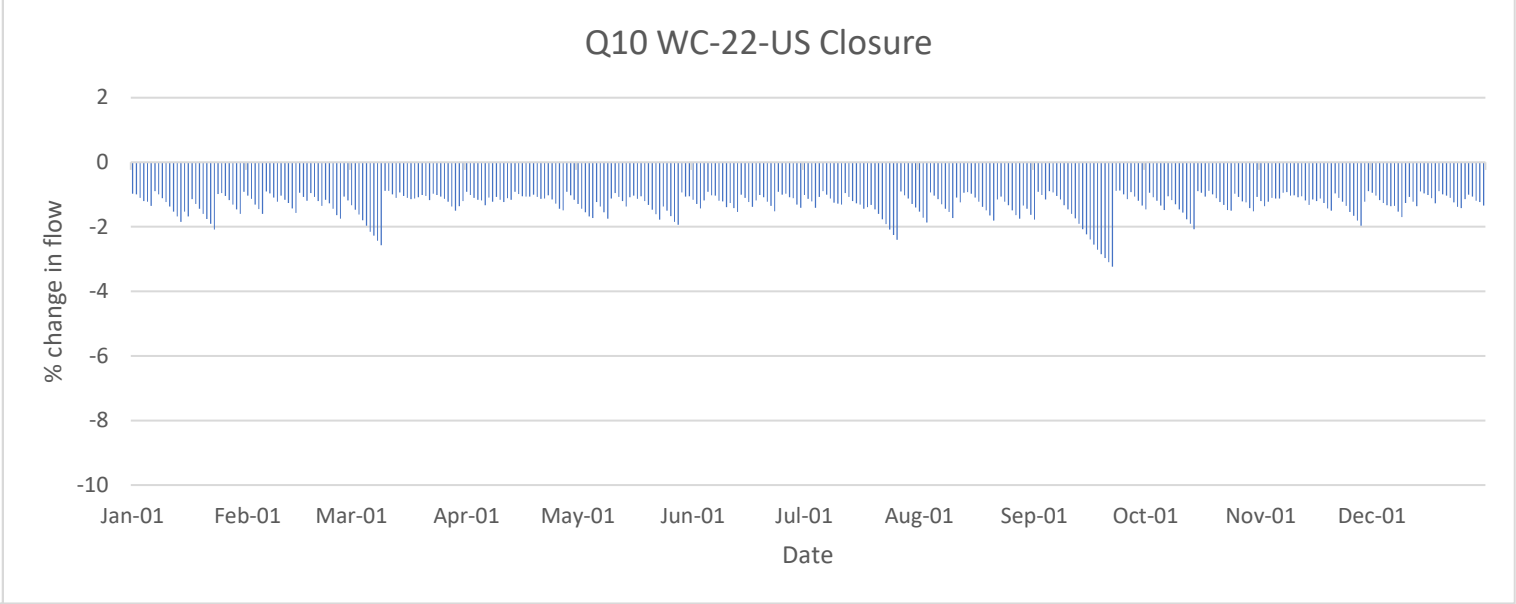
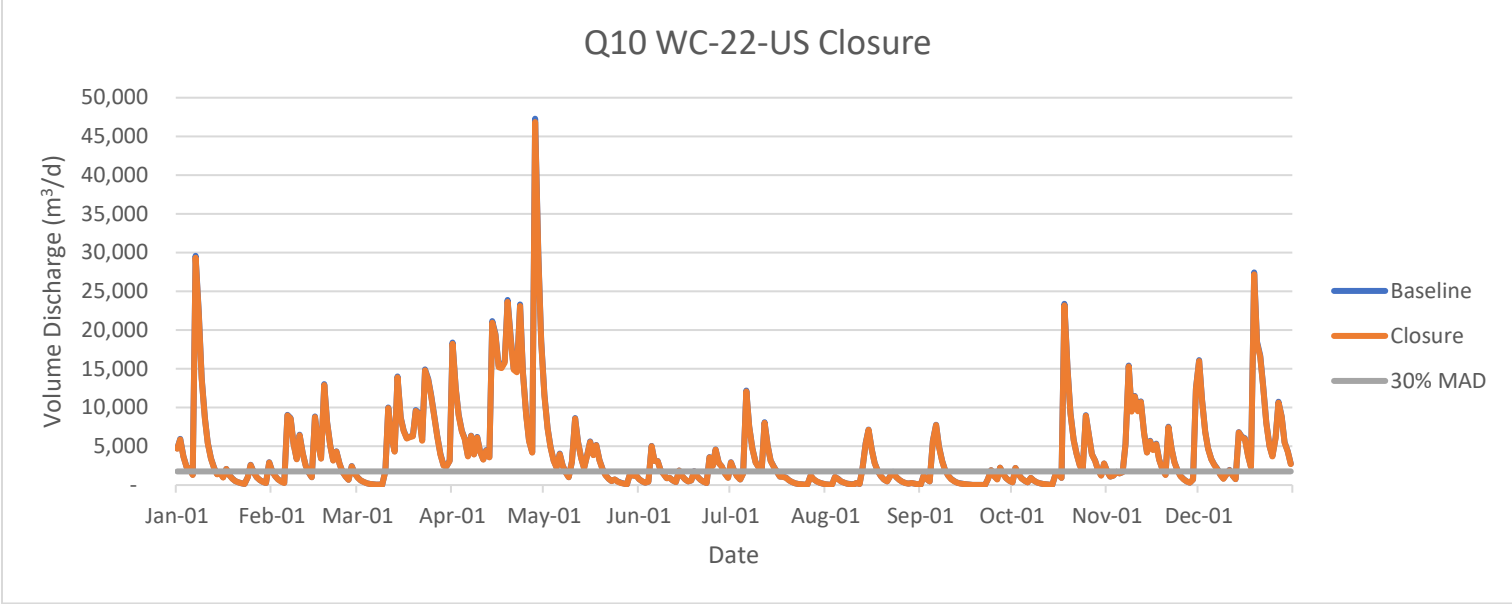


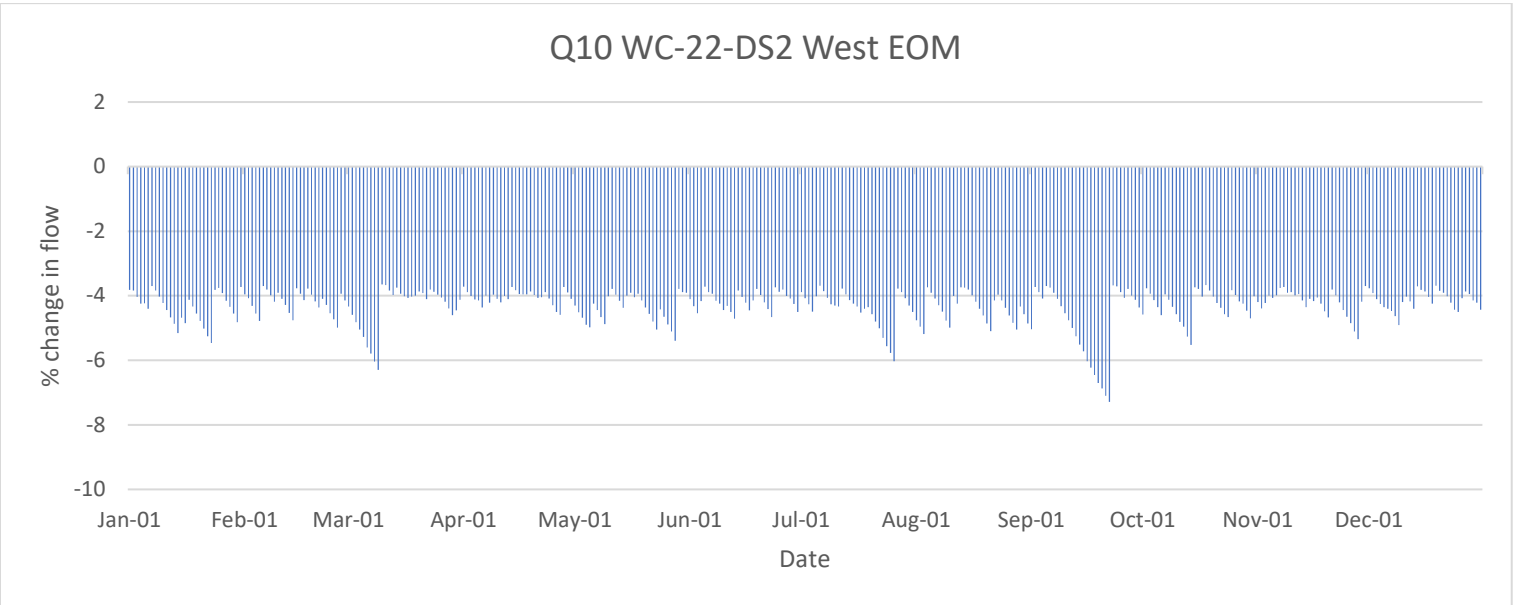
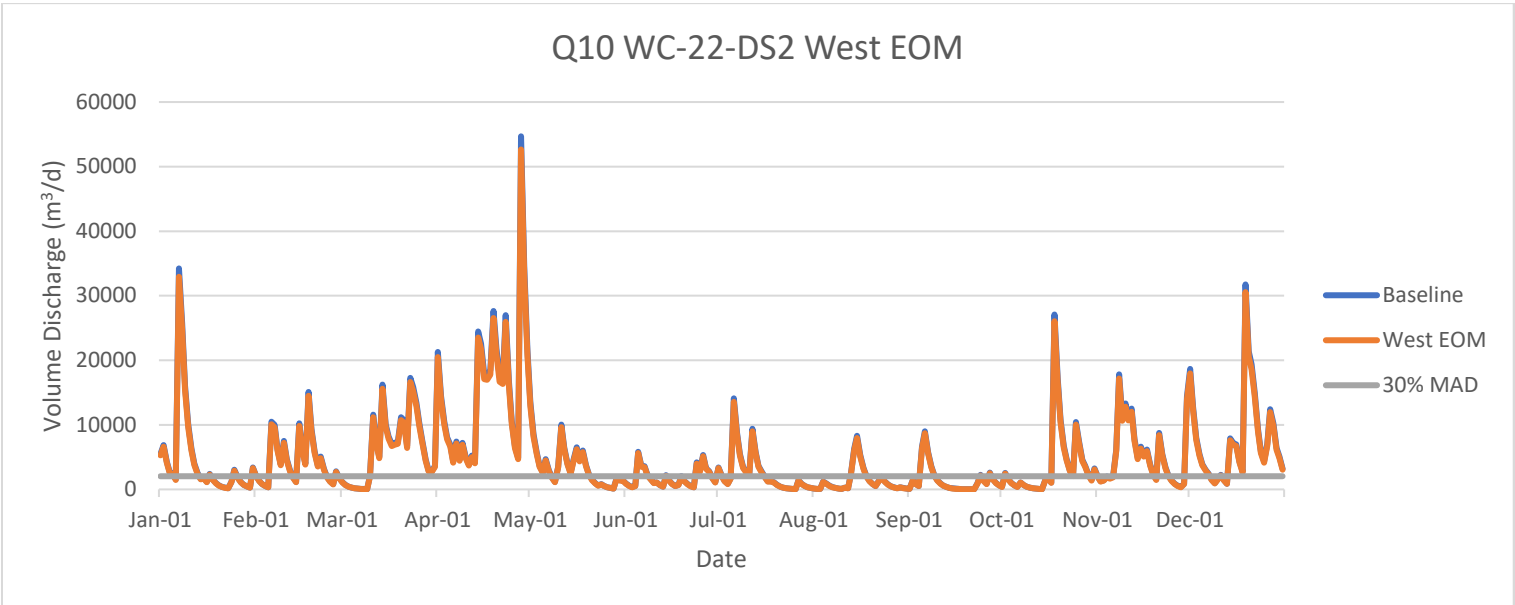
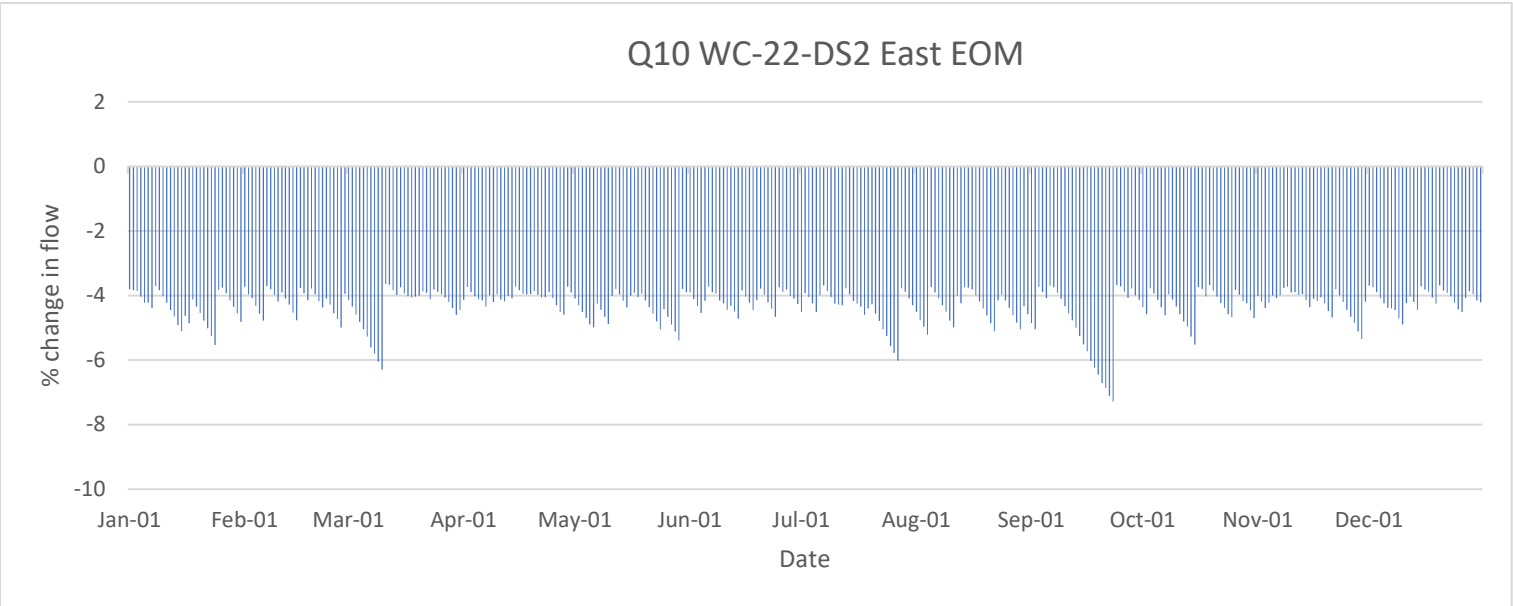
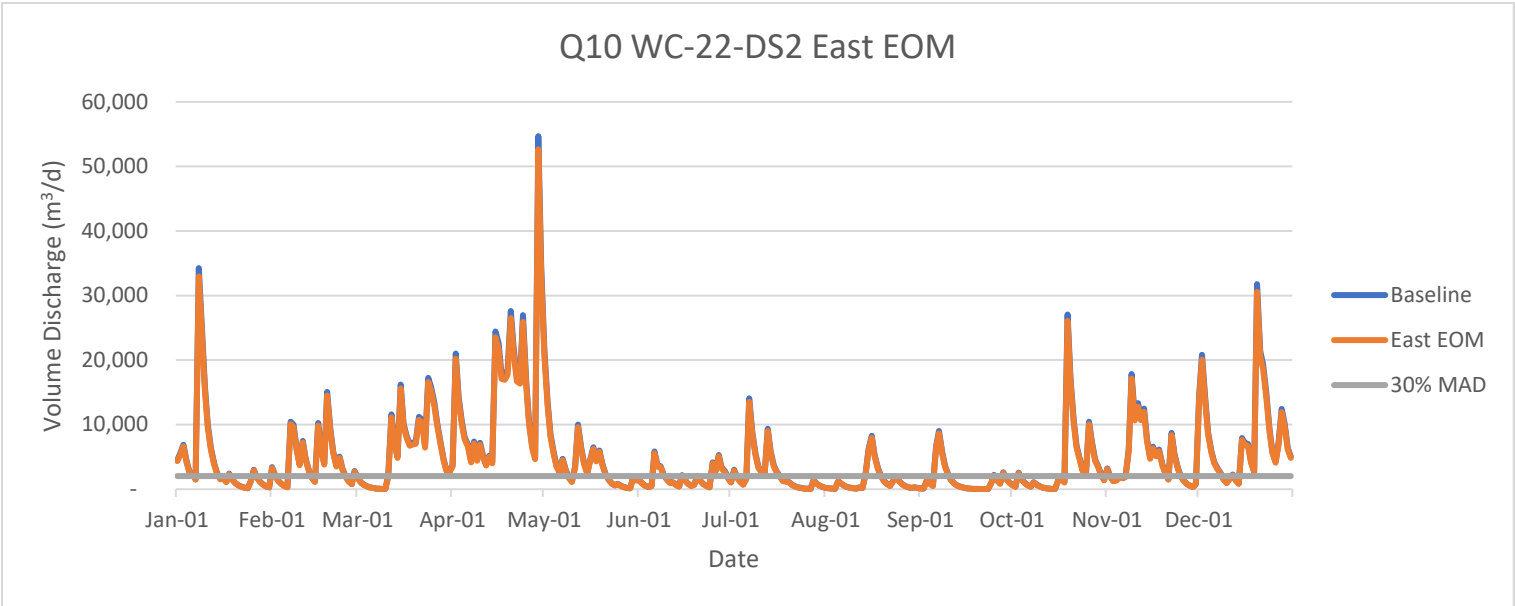
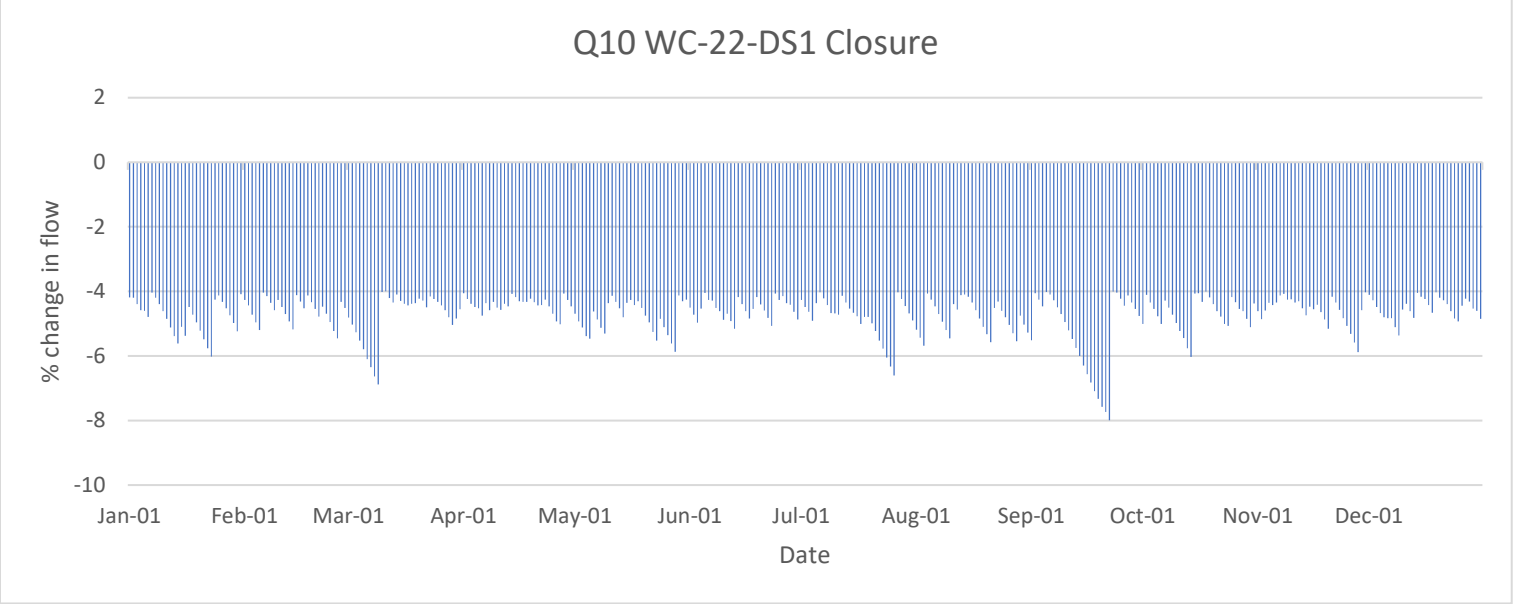
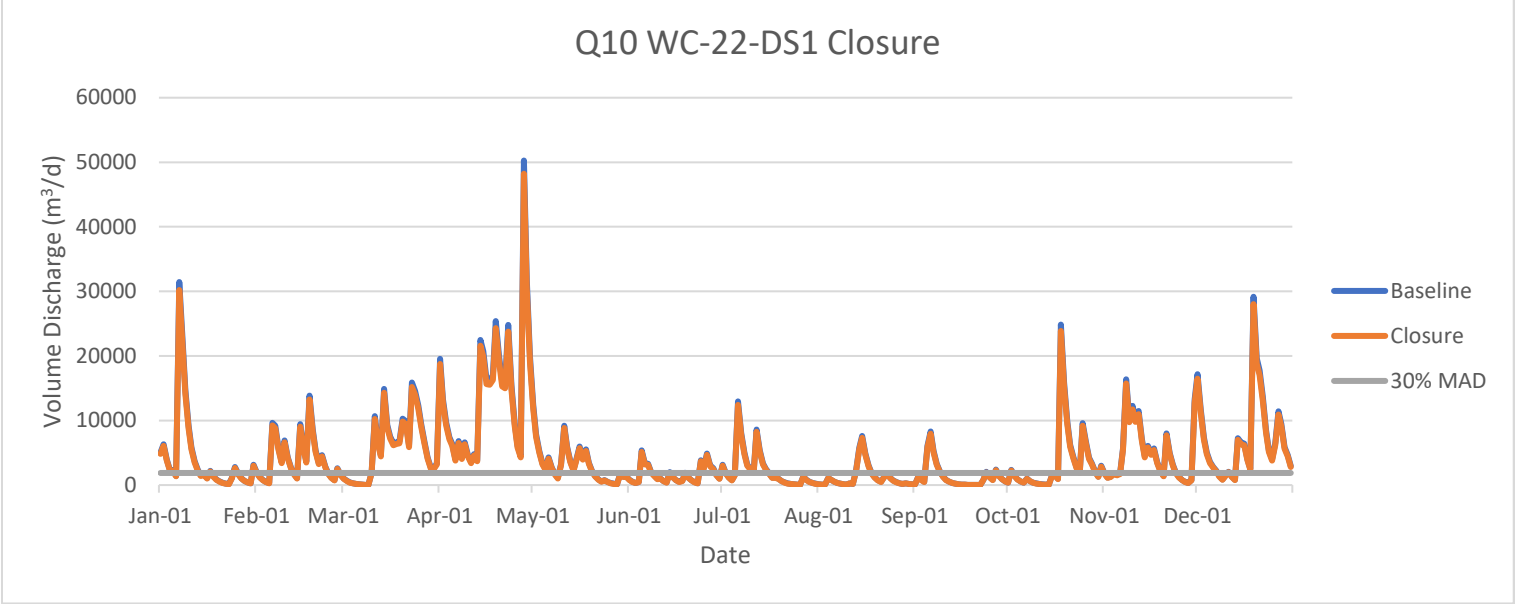
Table 6. Summary of Daily Flow Data Derived from Hydrographs; ‘Normal Year’ Scenario. Gold Brook System.

	Range in flow change	Lake Outlet	GB-DS1	GB-DS2	GB-DS3	GB-DS4	GB-DS5	GB-DS6	GB-DS7
East EOM	Range in flow change	9474	10510	20398	19605	22584	27951	32137	2109
		-24	-28	-38	-41	-40	-44	-46	-24
	# days with > 10% reduction	116	163	202	235	209	200	194	179
	# baseline days below 30% MAD	0	343	352	361	364	364	364	365
	# of East EOM below 30% MAD	78	78	73	75	77	77	77	77
	# additional days below 30% MAD	78	-265	-279	-286	-287	-287	-287	-288
West EOM	Range in flow change	3426	4743	15205	15897	17912	25070	29335	1095
		-26	-29	-40	-42	-42	-45	-47	-26
	# days with > 10% reduction	217	255	277	288	277	256	250	242
	# baseline days below 30% MAD	0	344	355	364	364	364	364	365
	# of West EOM below 30% MAD	78	78	73	75	77	77	77	77
	# additional days below 30% MAD	78	-266	-282	-289	-287	-287	-287	-288
Closure	Range in flow change	2968668	2564378	2220841	2138874	2167843	2067773	2000630	1838805
		-41	-15	-28	-31	-30	-34	-37	-11
	# days with > 10% reduction	59	11	47	55	49	58	68	3
	# baseline days below 30% MAD	0	316	333	343	346	346	346	365
	# of Closure below 30% MAD	135	135	125	124	131	130	130	128
	# additional days below 30% MAD	135	-181	-208	-219	-215	-216	-216	-237

Figures 175-192: Northern Tributary System Hydrographs showing Dry Year baseline and predicted daily flows during each Project Phase; and associated percent change in flow from baseline to each corresponding Project project phase.







		WC-22-US	WC-22-DS1	WC-22-DS2
East EOM	Range in flow change	-1	-4	-4
		-3	-8	-7
	# days with > 10% reduction	0	0	0
	# baseline days below 30% MAD	169	169	169
	# of East EOM below 30% MAD	169	174	173
	# additional days below 30% MAD	0	5	4
West EOM	Range in flow change	-1	-4	-4
		-3	-8	-7
	# days with > 10% reduction	0	0	0
	# baseline days below 30% MAD	168	168	168
	# of West EOM below 30% MAD	168	173	172
	# additional days below 30% MAD	0	5	4
Closure	Range in flow change	-1	-4	-4
		-3	-8	-7
	# days with > 10% reduction	0	0	0
	# baseline days below 30% MAD	168	168	168
	# of Closure below 30% MAD	168	173	172
	# additional days below 30% MAD	0	5	4

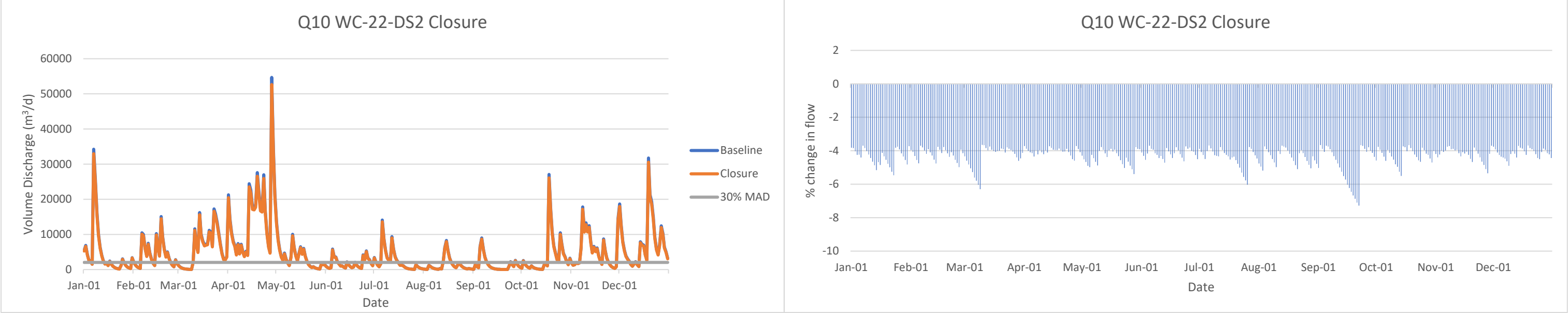
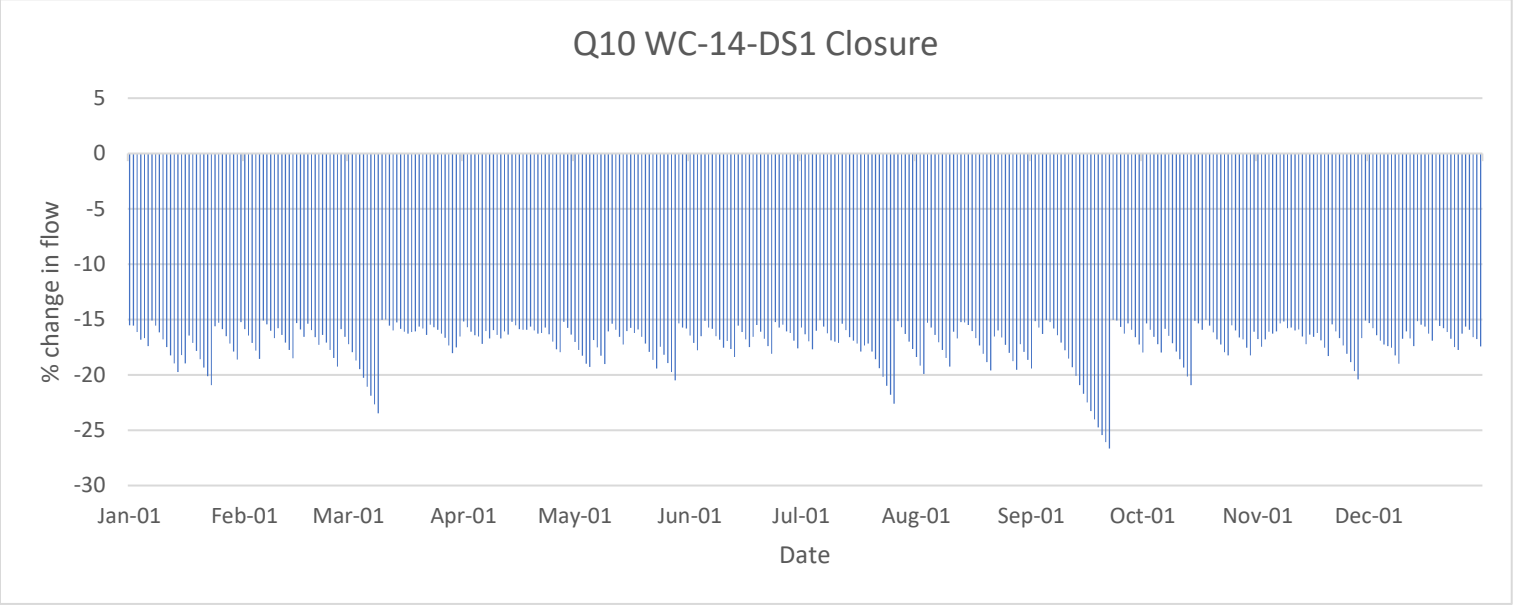
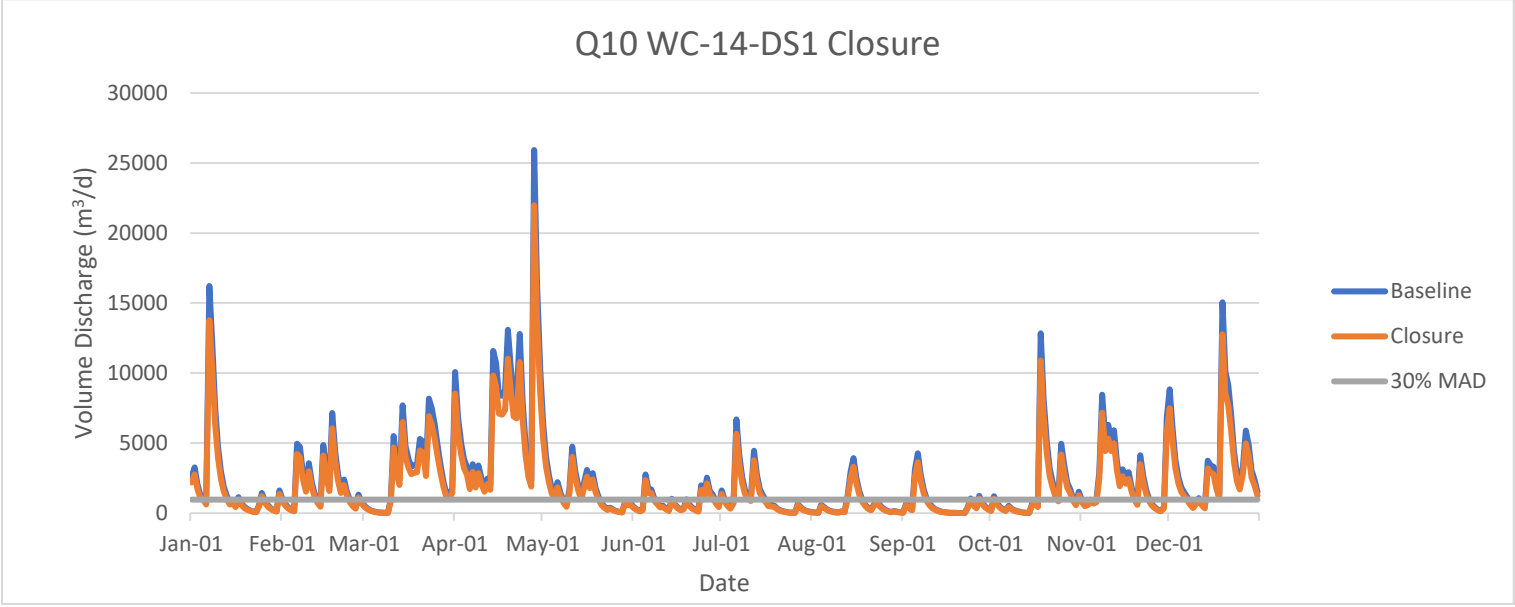
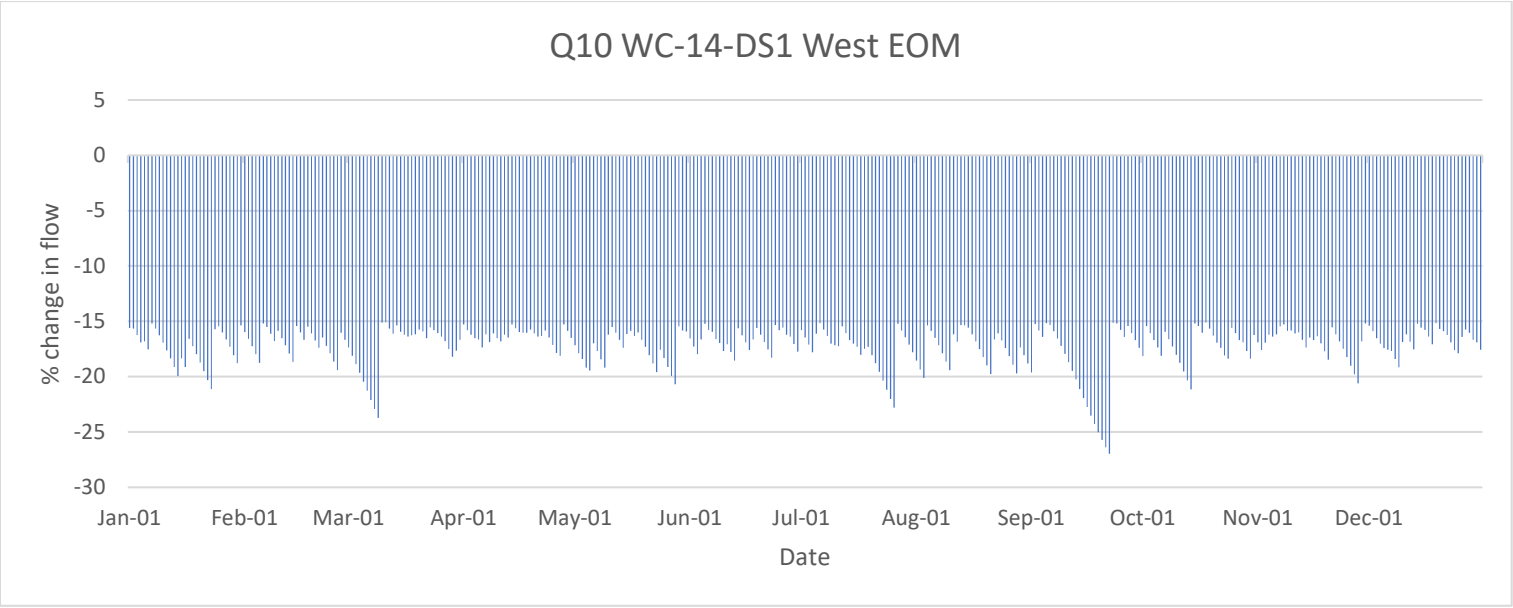
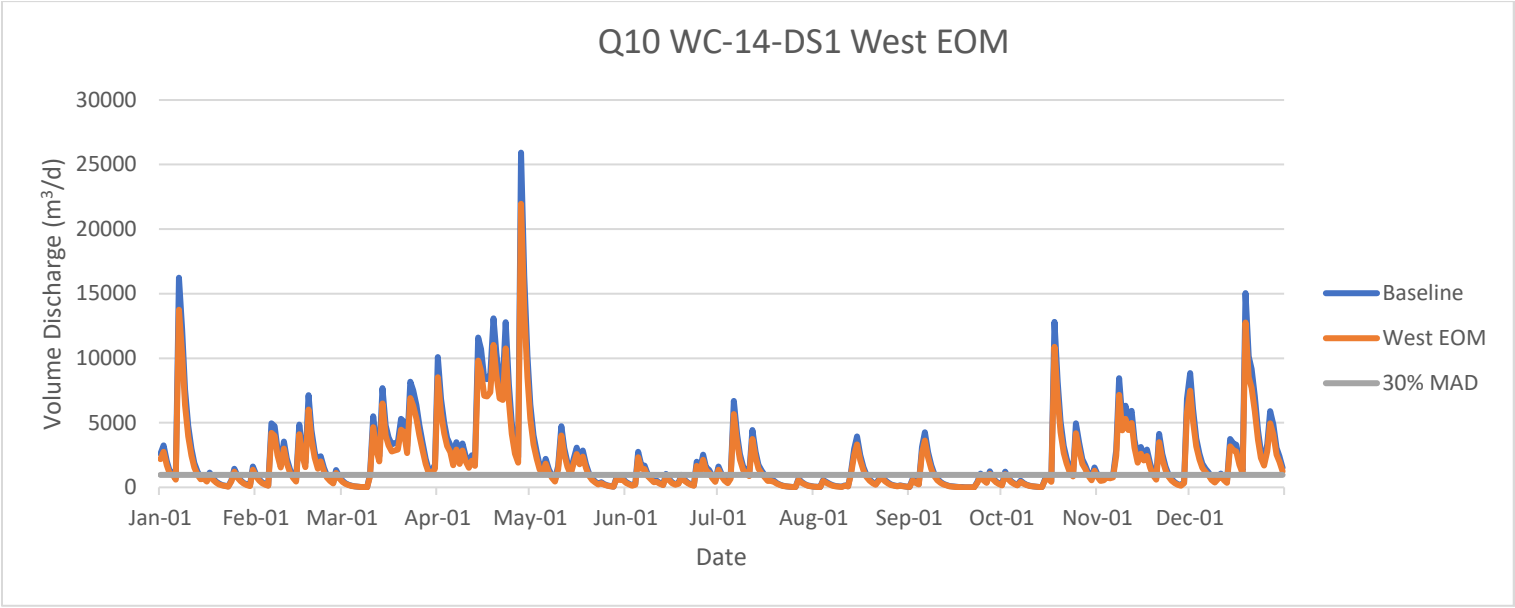
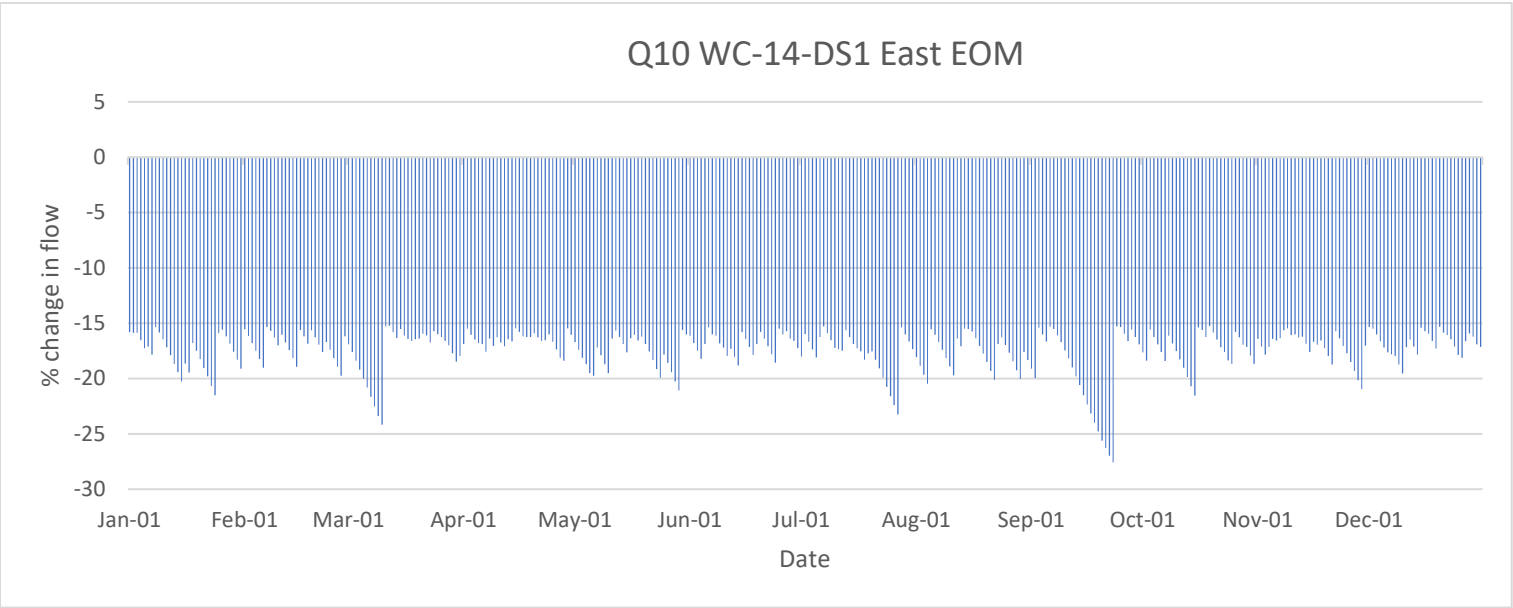
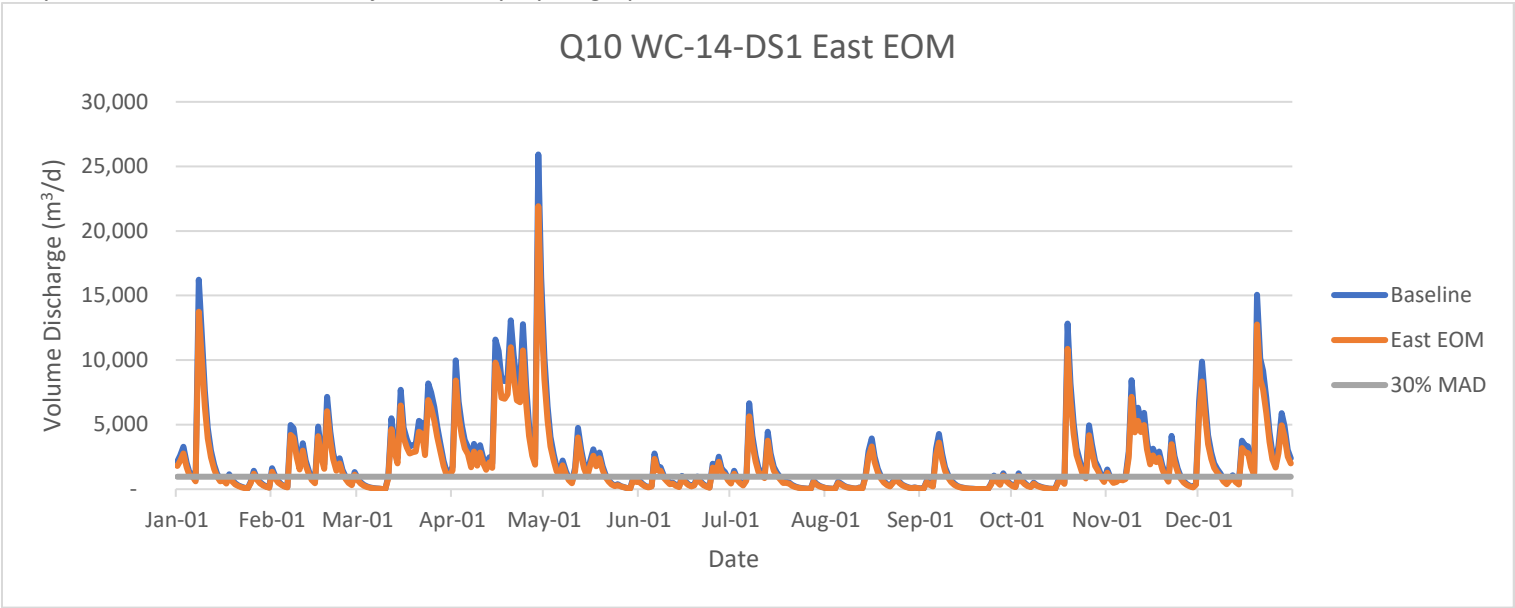
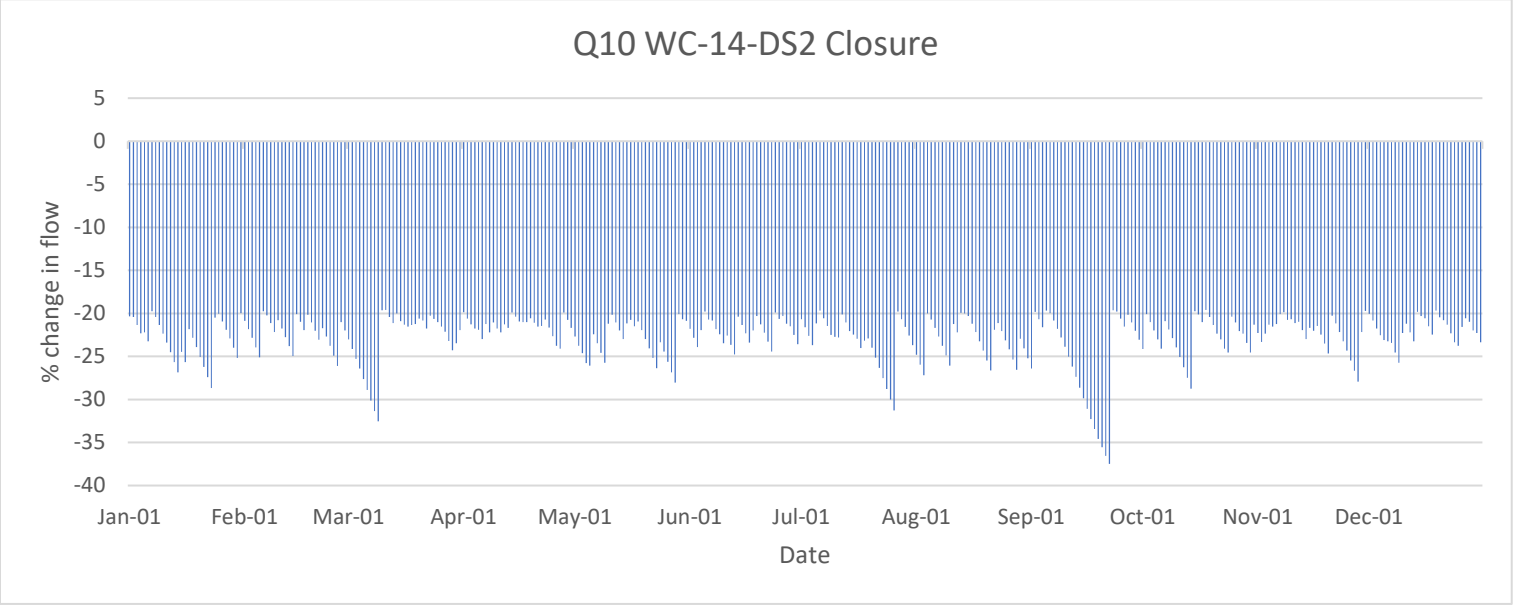
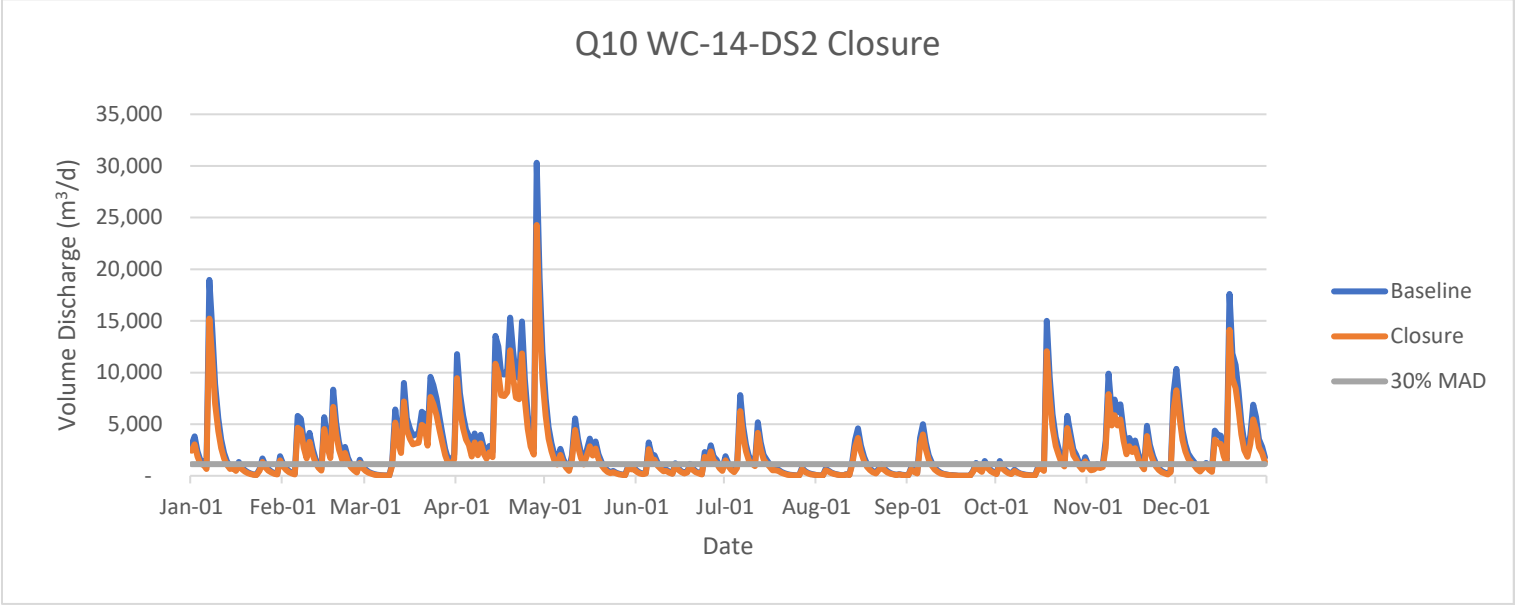
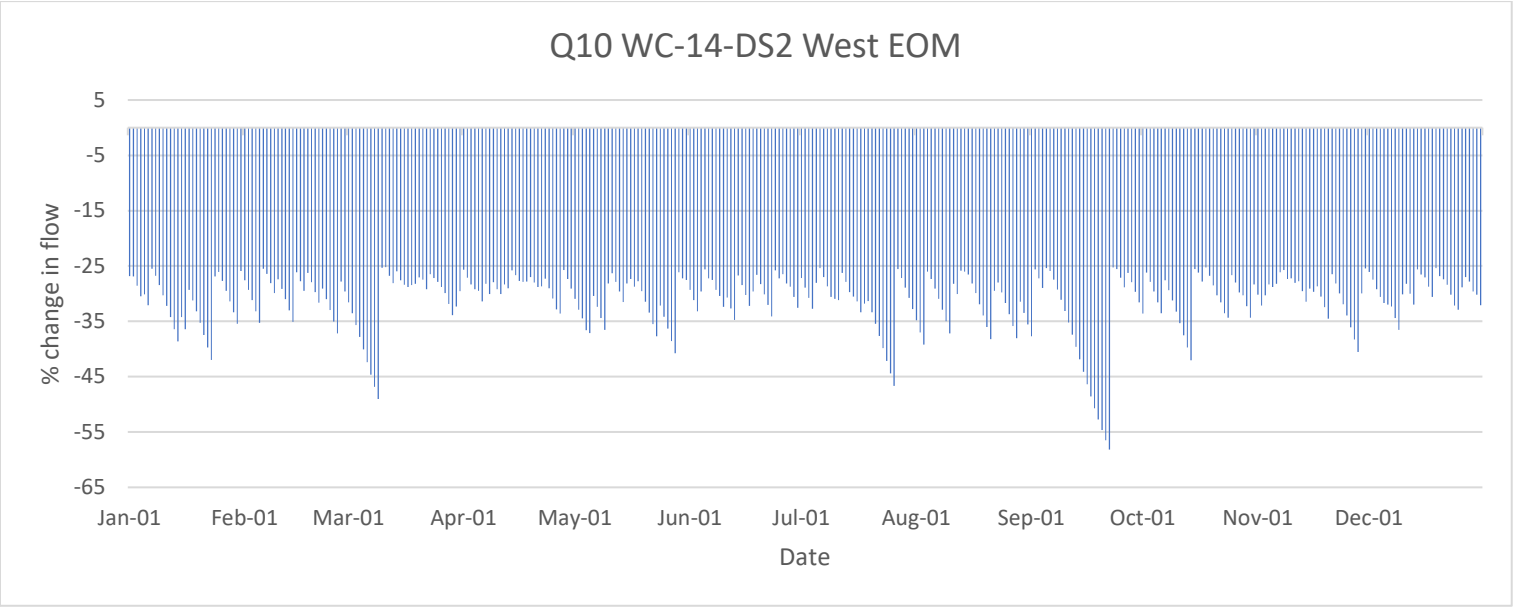
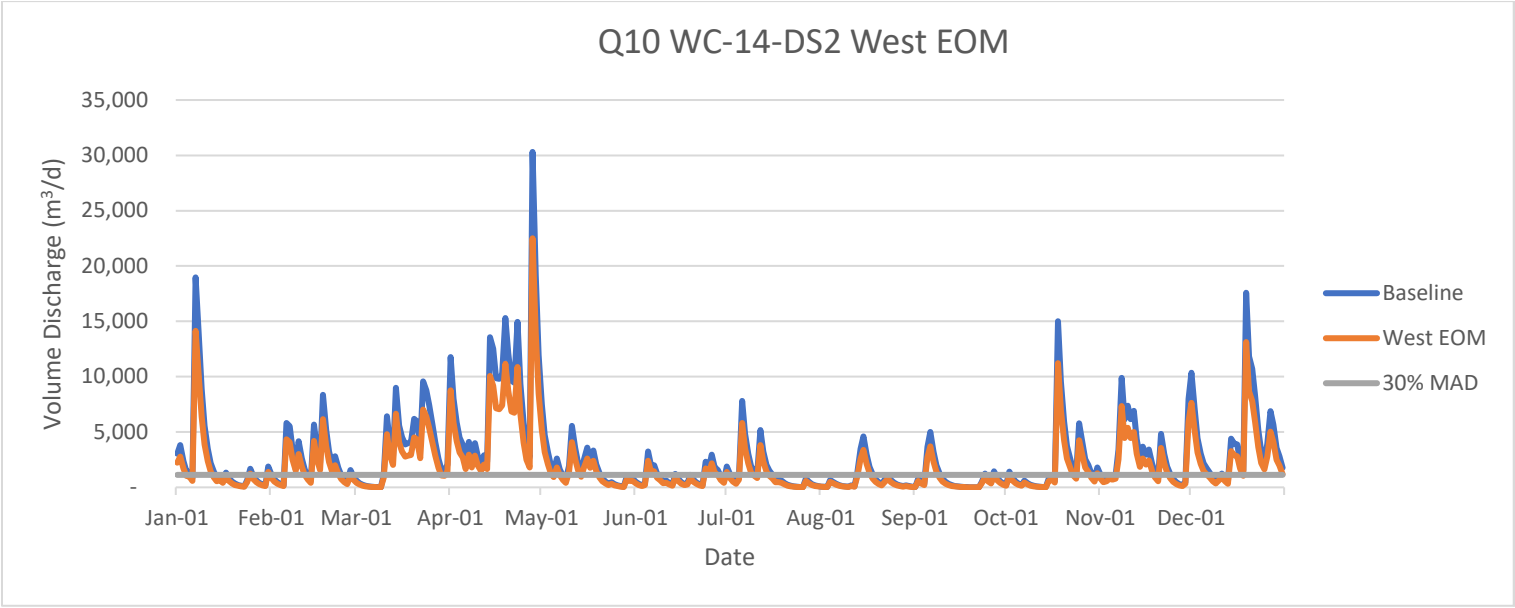
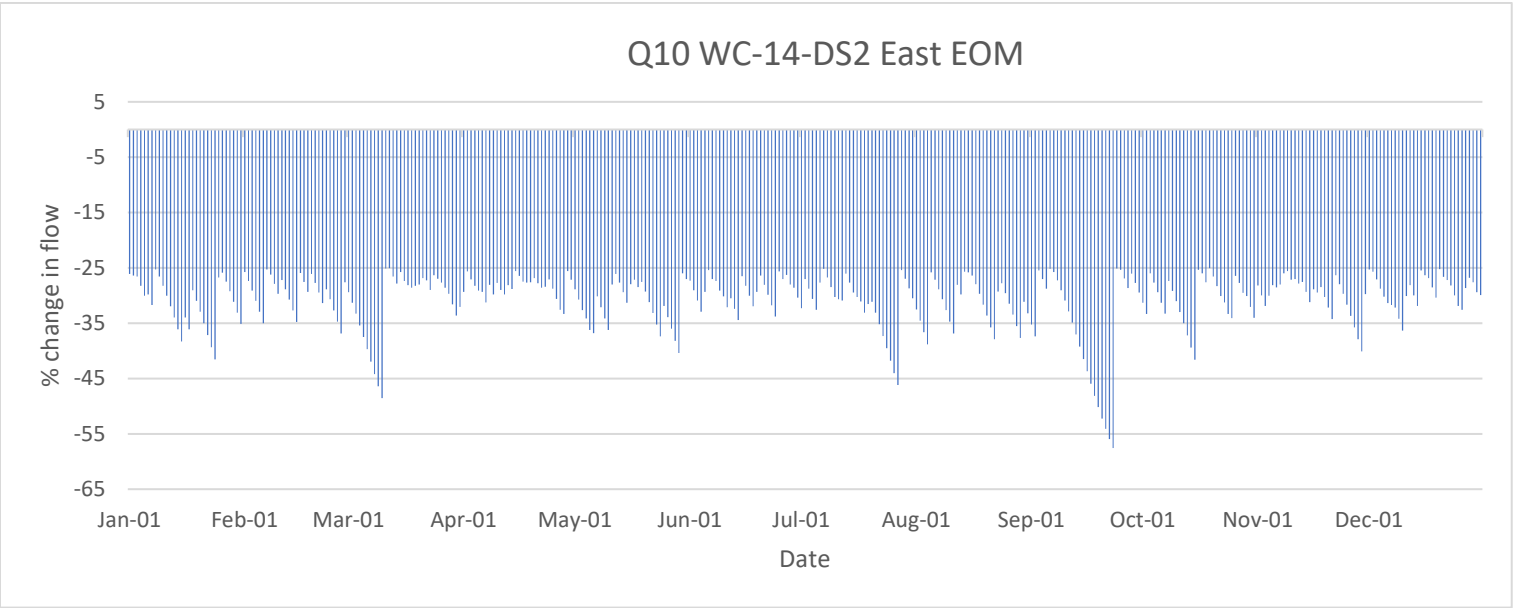
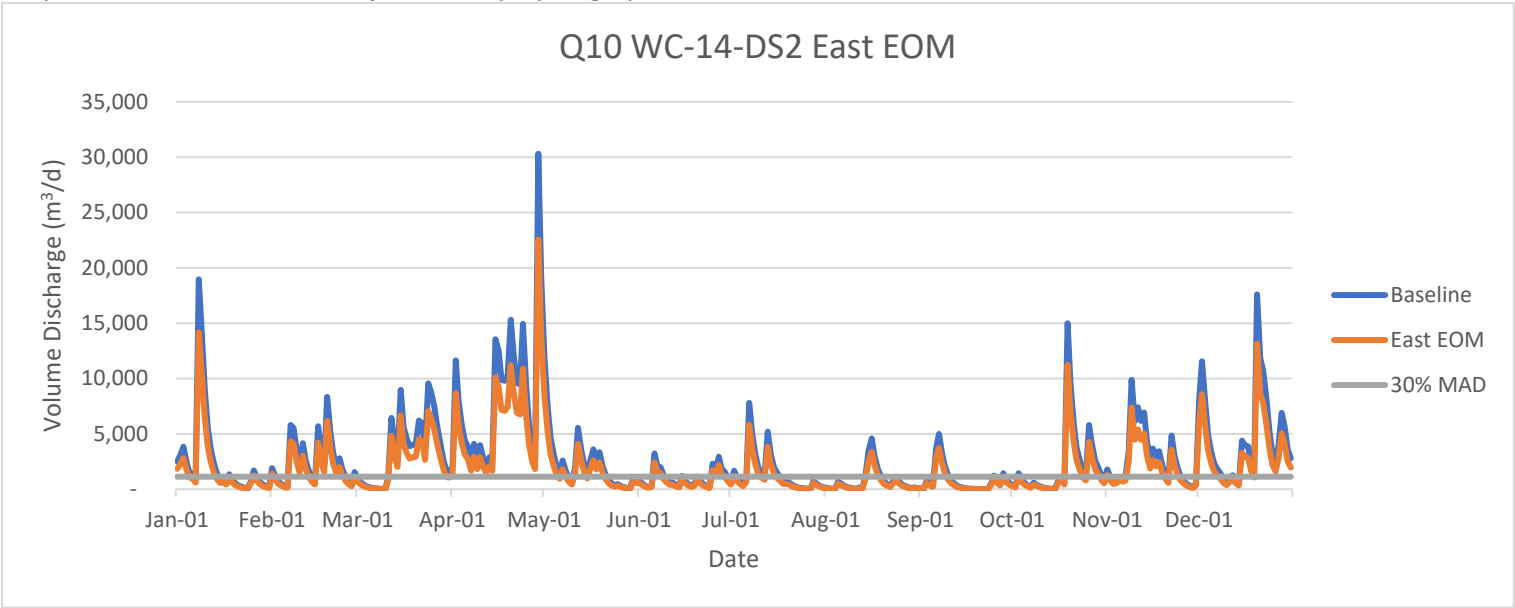


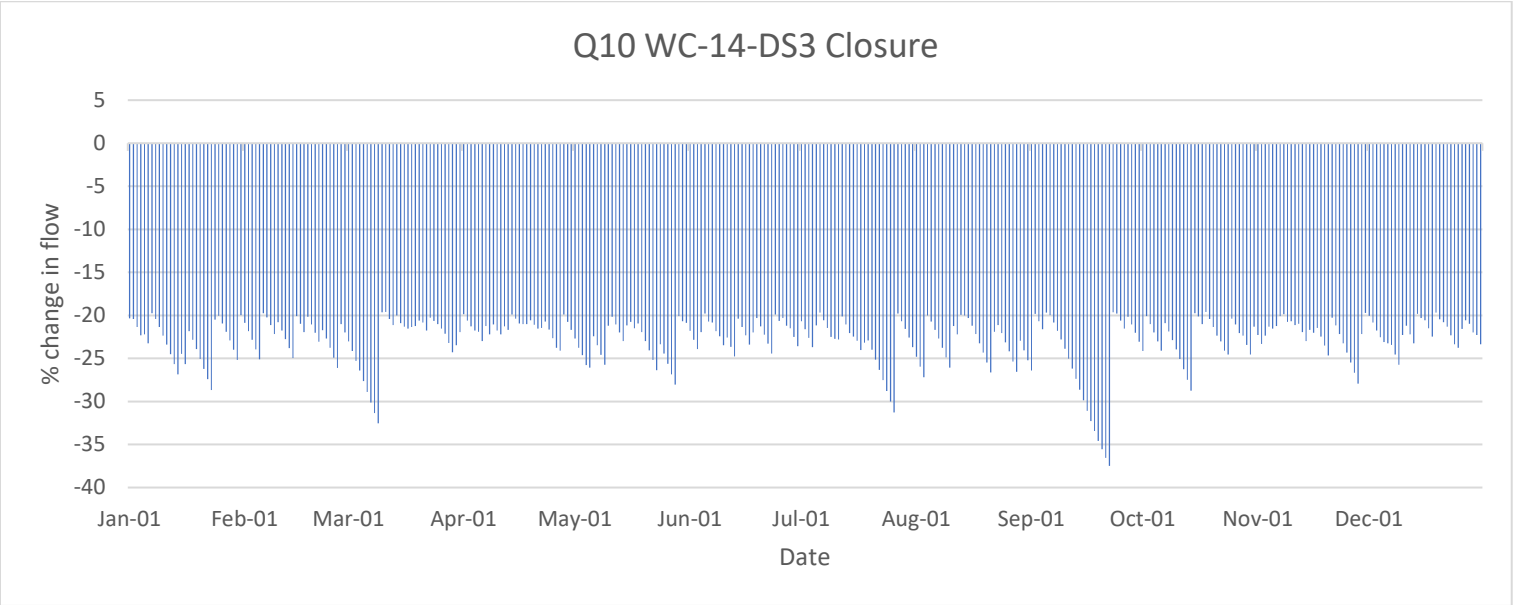
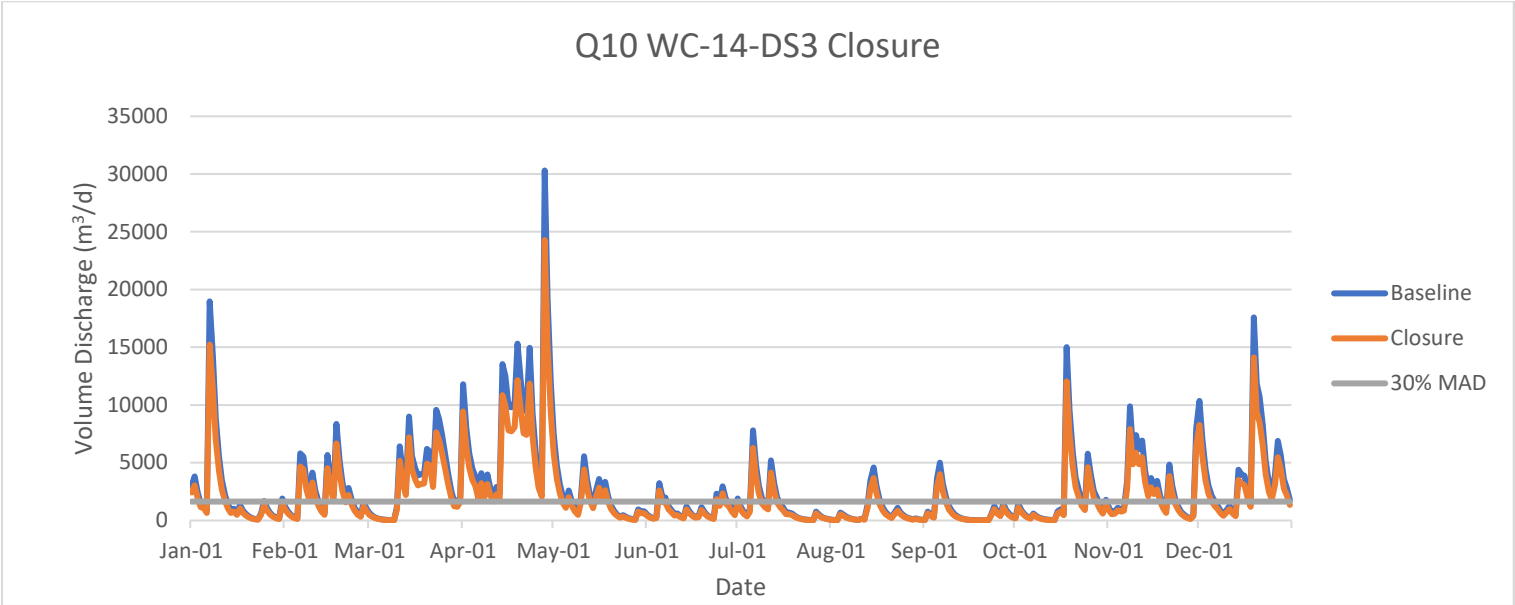
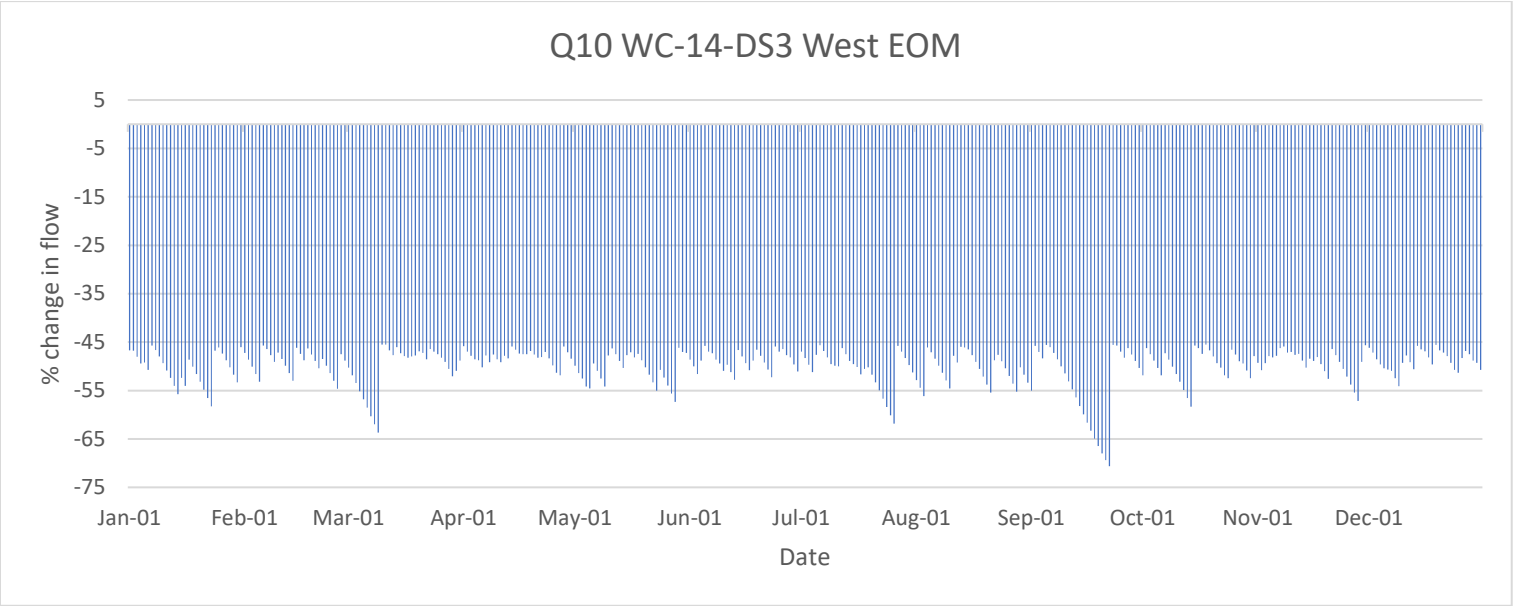
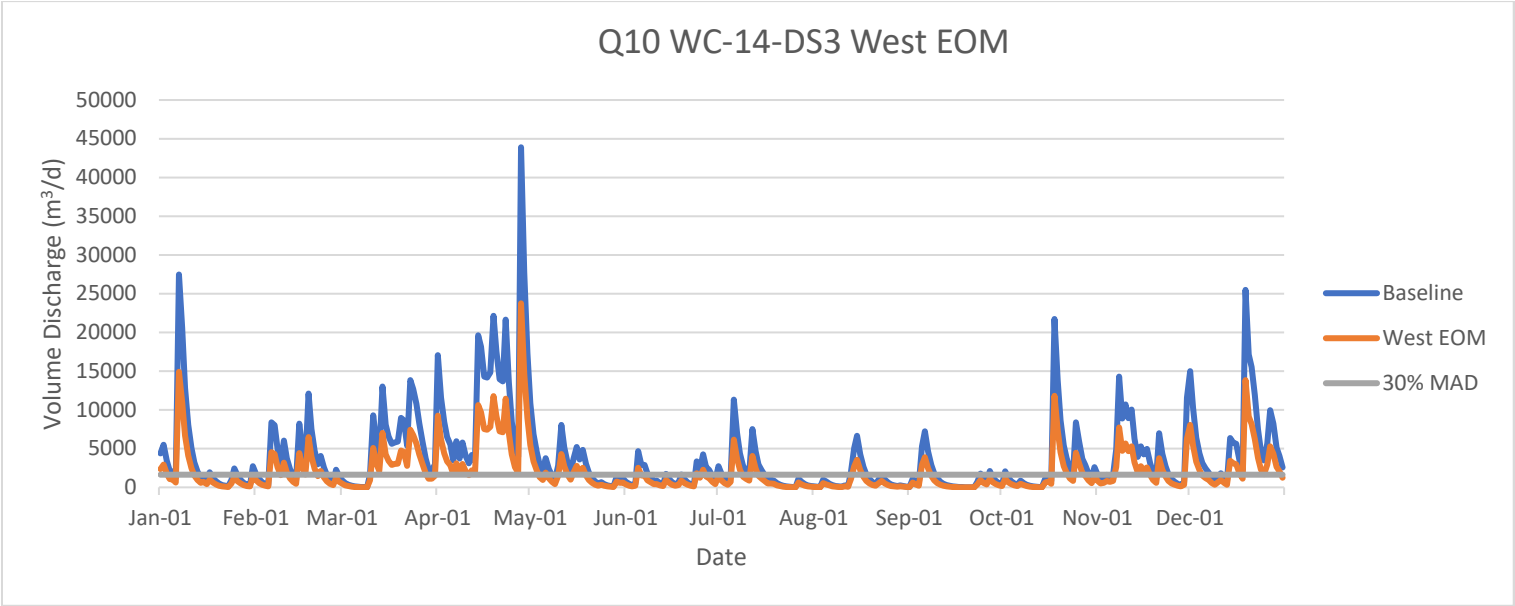
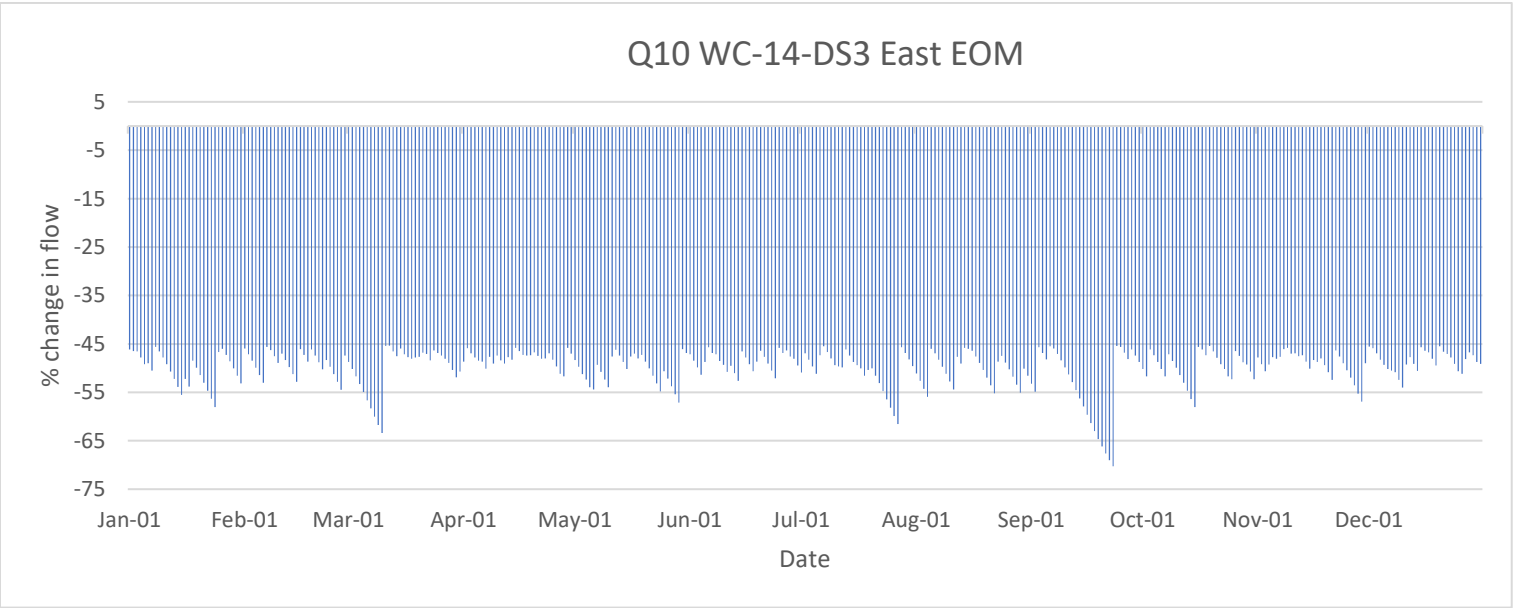
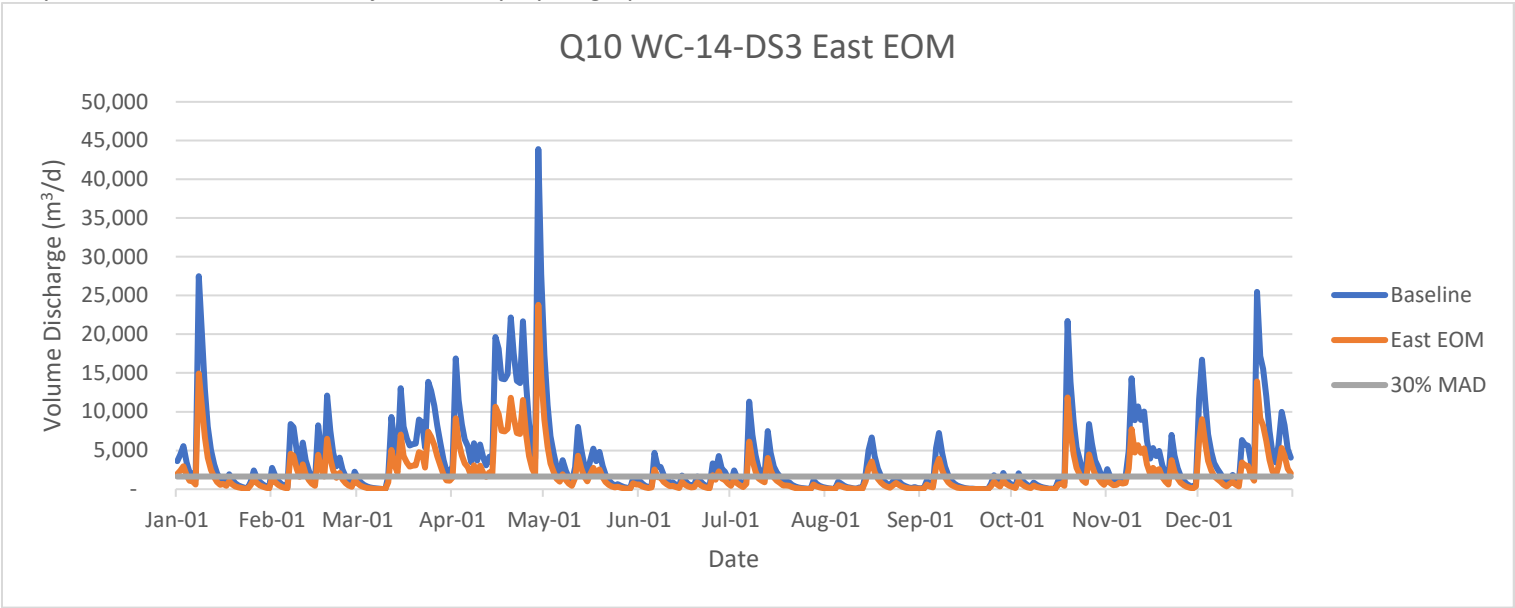
Table 7. Summary of Daily Flow Data Derived from Hydrographs; ‘Dry Year’ Scenario. Northern Tributary System (WC22).

May 2022 – Goldboro Gold Project. – Daily Hydrographs
Figures 193-222: Eastern Tributary System Hydrographs showing Dry Year baseline and predicted daily flows during each Project Phase; and associated percent change in flow from baseline to each corresponding Project project phase.









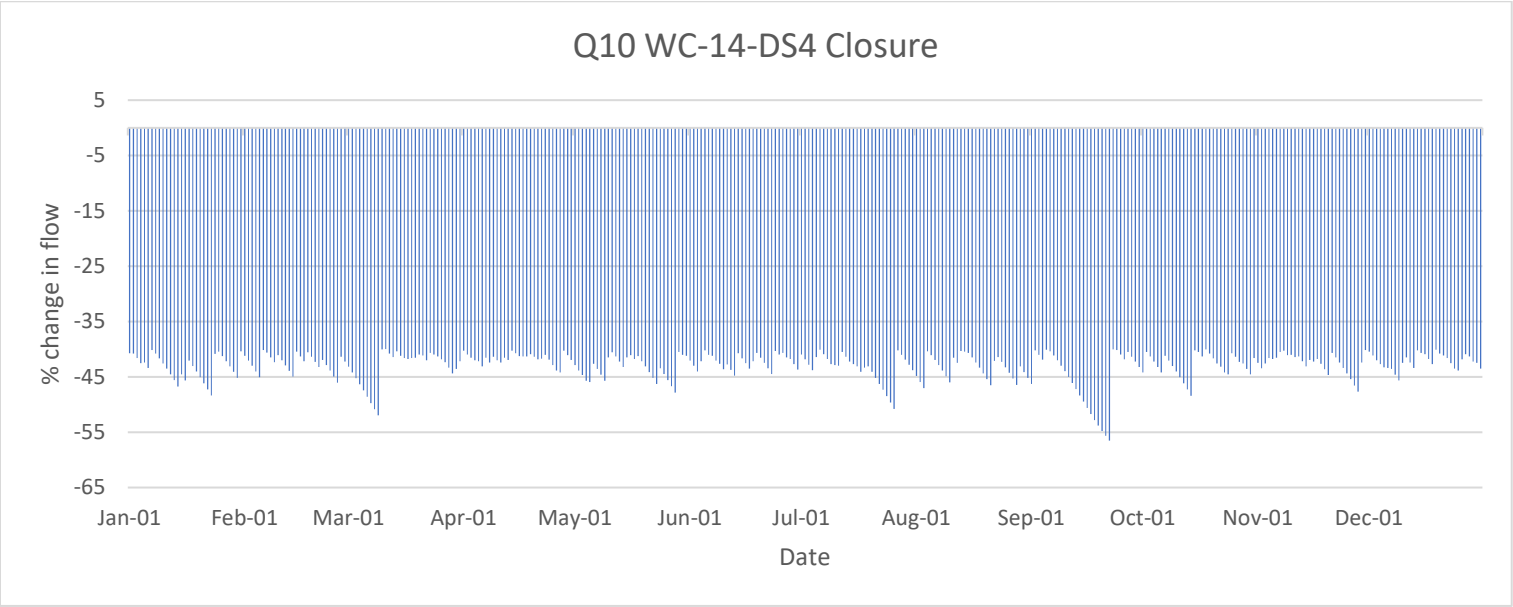
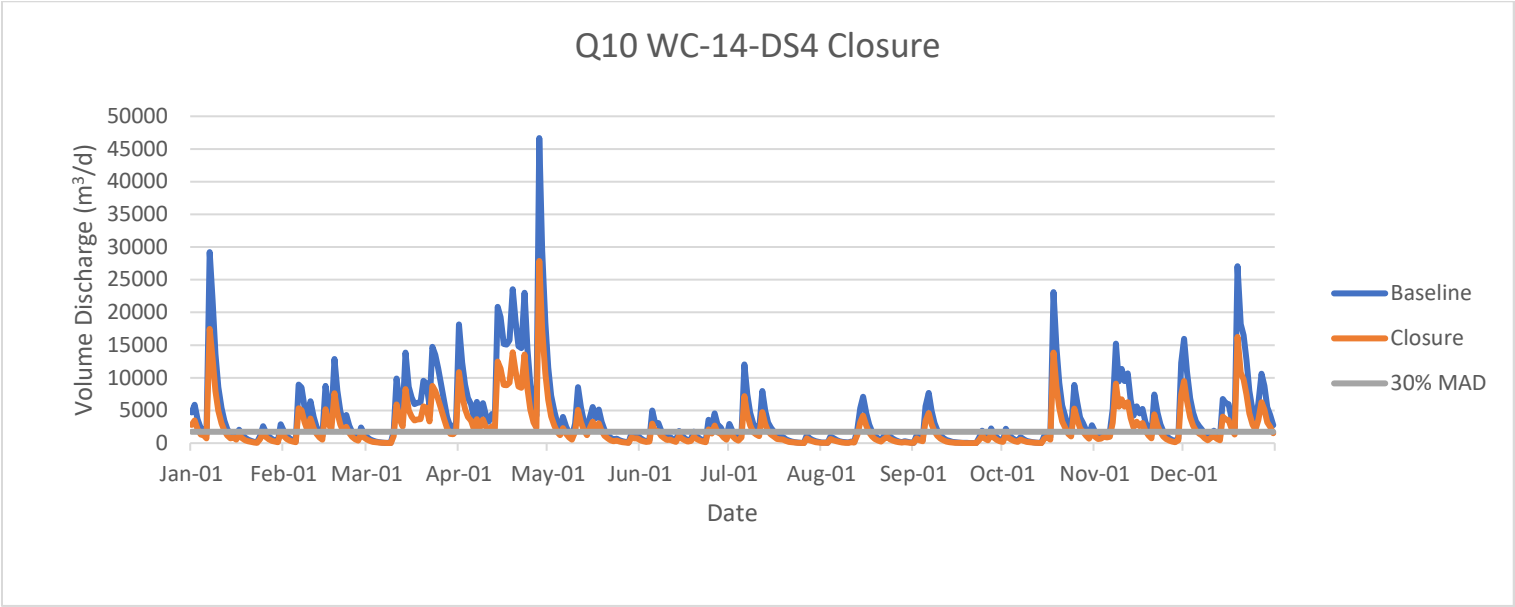
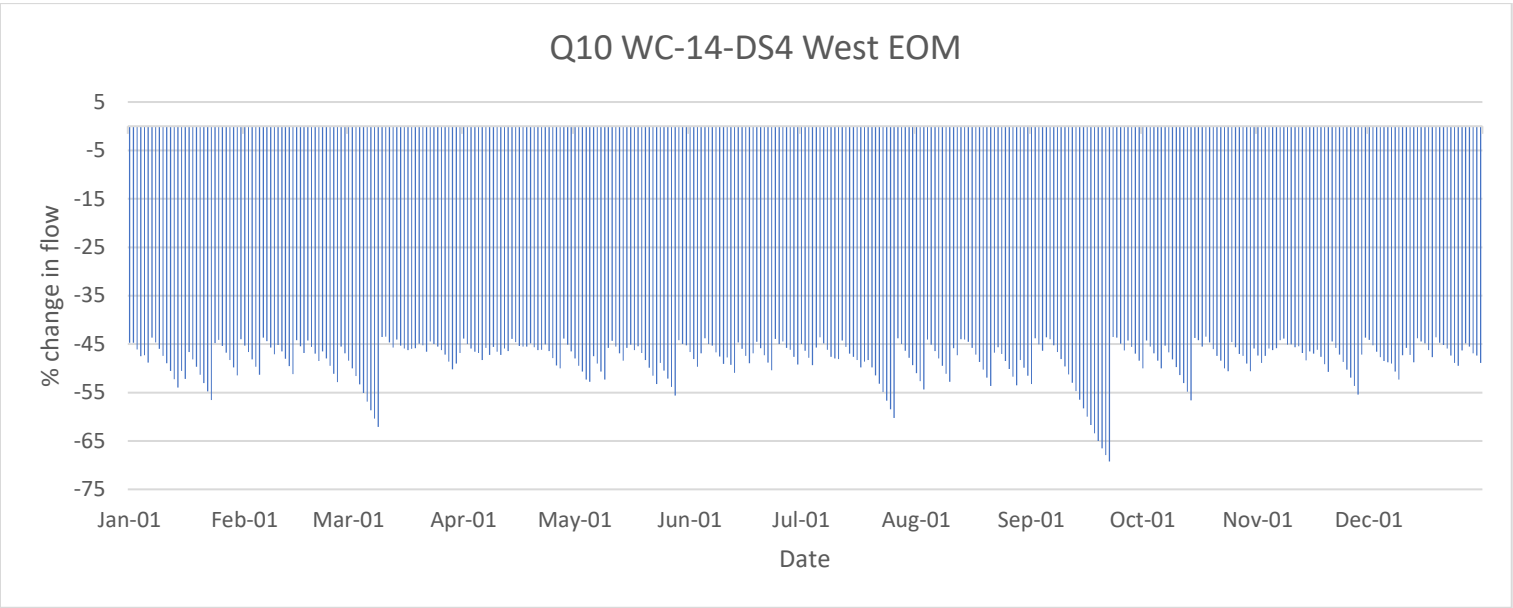
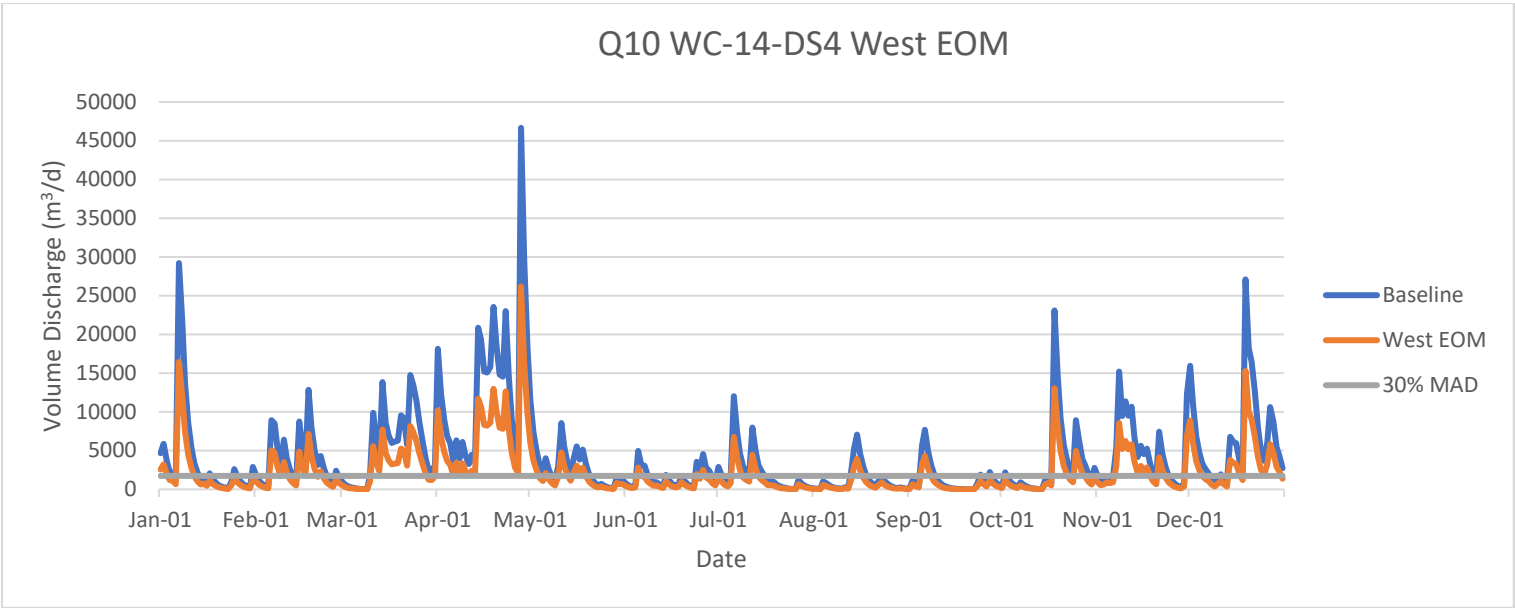
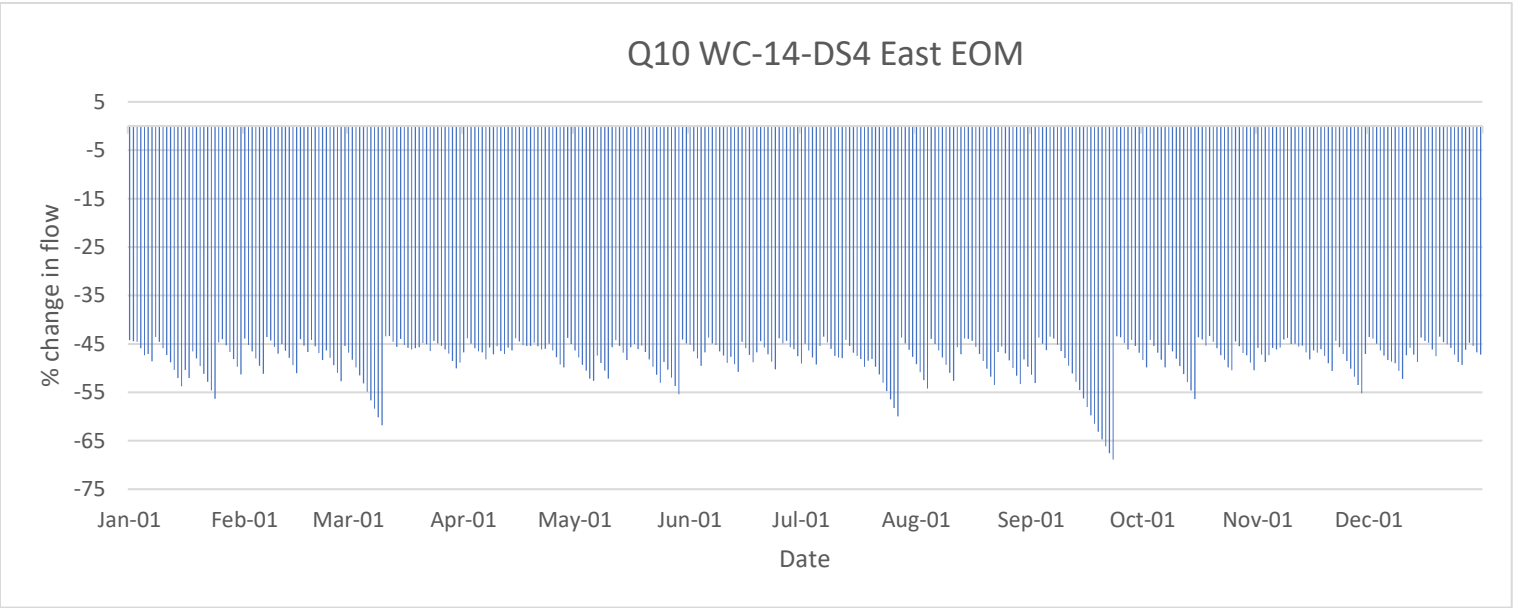
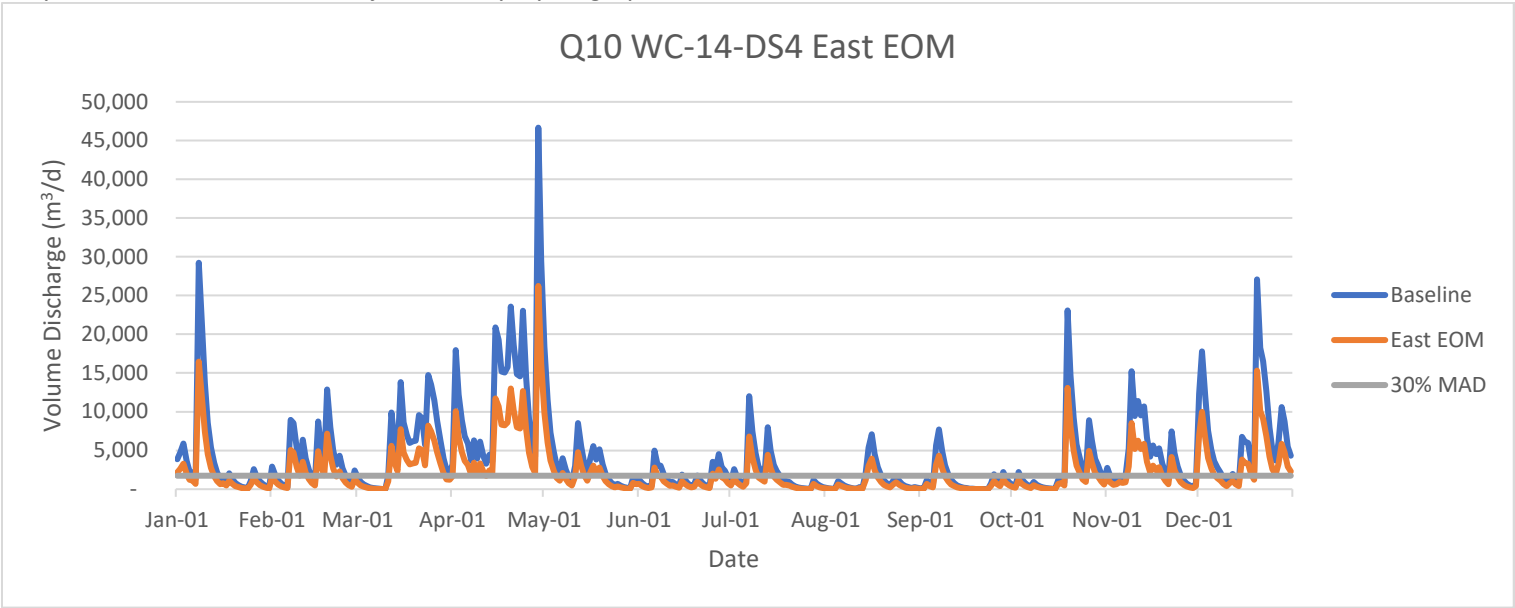


Table 8. Summary of Daily Flow Data Derived from the Hydrographs; ‘Dry Year’ Scenario. Eastern Tributary System (WC14).

		WC-14-US	WC-14-DS1	WC-14-DS2	WC-14-DS3	WC-14-DS4
East EOM	Range in flow change	-1	-15	-25	-45	-43
		-3	-28	-58	-70	-69
	# days with > 10% reduction	0	365	365	365	365
	# baseline days below 30% MAD	169	169	169	169	169
	# of East EOM below 30% MAD	174	185	203	229	228
	# additional days below 30% MAD	5	16	34	60	59
West EOM	Range in flow change	0	-15	-25	-45	-43
		-1	-27	-58	-71	-69
	# days with > 10% reduction	0	365	365	365	365
	# baseline days below 30% MAD	168	168	168	168	168
	# of West EOM below 30% MAD	174	186	204	231	230
	# additional days below 30% MAD	6	18	36	63	62
Closure	Range in flow change	0	-15	-20	-20	-40
		-1	-27	-37	-37	-57
	# days with > 10% reduction	0	365	365	365	365
	# baseline days below 30% MAD	168	168	168	204	168
	# of Closure below 30% MAD	173	186	191	226	217
	# additional days below 30% MAD	5	18	23	22	49

Appendix H.3

Fish Offsetting Plan

Goldboro Gold Project- Conceptual Fish Habitat Offsetting Plan

PREPARED FOR

Anaconda Mining Inc

Suite 790, Cabot Place, 100 New Gower Street
St. John's, NL
A1C 6K3

PREPARED BY

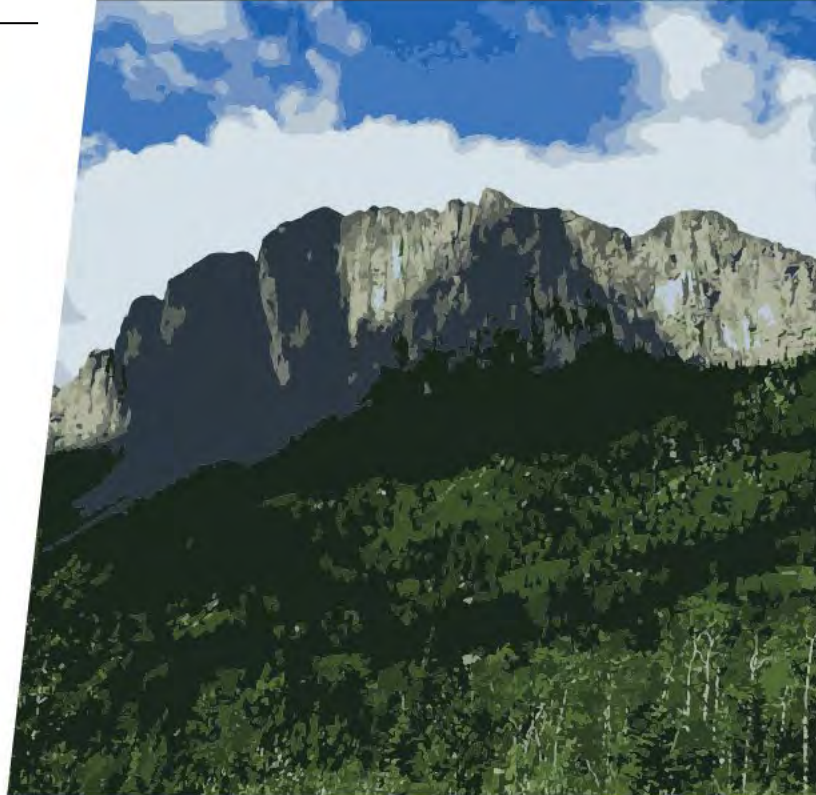
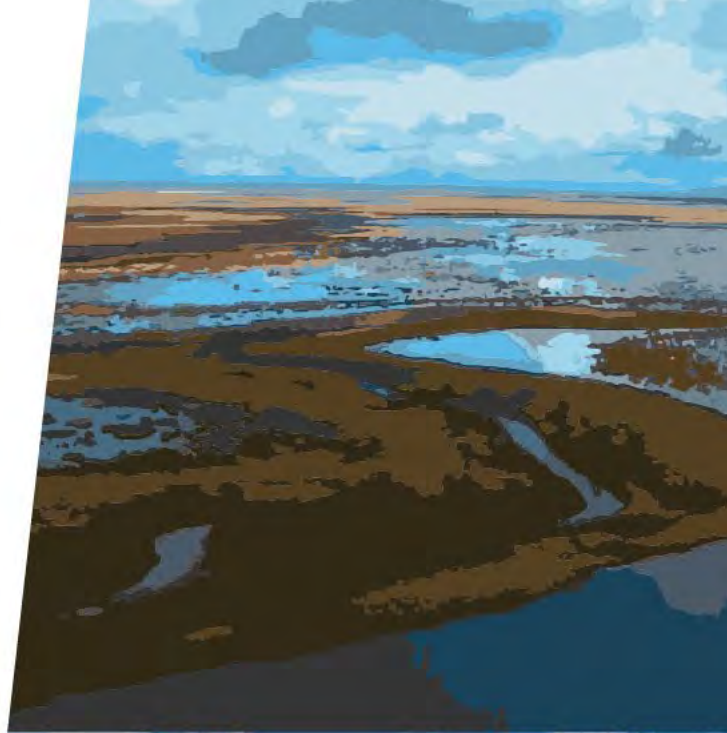
McCallum Environmental Ltd.

2 Bluewater Road, Suite 115
Bedford, Nova Scotia
B4B 1G7

May 25, 2022



McCallum Environmental Ltd.





GOLDBORO GOLD PROJECT

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EXECUTIVE SUMMARY

Anaconda Mining Inc. is proposing to develop the Goldboro Gold Project, an open pit gold mine and processing facility in Goldboro, NS. While avoidance and mitigation measures have been implemented to minimize Project effects to fish and fish habitat, the location of the open pits and associated mine infrastructure will result in permanent loss of fish habitat. This loss of fish habitat is considered a harmful alteration, disruption or destruction (HADD) of fish habitat under the federal *Fisheries Act*, and as such will require authorization under Section 35. In addition, the deposition of deleterious substances into waters frequented by fish will require authorization under the Mineral and Diamond Mining Effluent Regulations (MDMER). A project may obtain permission to deposit deleterious substances (such as mine waste) in waters frequented by fish, but habitat offsetting is required.

The purpose of this Conceptual Offsetting Plan (the Plan) is to describe unavoidable losses of fish habitat as a result of the Project and to demonstrate to DFO that offsetting of these unavoidable losses is achievable. At the conceptual stage, the intent of the Plan is to provide a quantification of fish habitat affected by the Project after all avoidance and mitigation measures have been considered, and to outline appropriate and achievable approaches to offset unavoidable HADD. Anaconda has commenced and will continue early engagement with DFO to identify requirements for Authorization under the *Fisheries Act*, and to identify the scope of the offsetting requirements. Engagement with the Mi'kmaq of Nova Scotia has commenced and will continue through the selection and implementation processes for offsetting projects. The impacts and offsetting concepts described will serve as the basis for ongoing engagement with the Mi'kmaq of Nova Scotia and stakeholders and to ultimately support an application for authorization of HADD of fish habitat as required by the *Fisheries Act*.

As a result of the Project, the total predicted HADD to offset after the implementation of avoidance and mitigation measures is 489 habitat units of watercourse and open water features. No adjustments were made to habitat loss areas to account for reduced habitat suitability (I.e. habitat indexing was not used to decrease the offset area requirements). The fish community that occupies these habitats are typical of small streams and ponds within the southern uplands of Nova Scotia, consisting of American eel, brook trout, yellow perch, and other common, small-bodied fishes.

A multi-step review process has been undertaken to identify potential offsetting concepts in priority watersheds. Conceptual offsetting projects presented within this Plan have been developed using DFO guidelines and include locations where offsets may be both technically and logistically feasible while being primarily beneficial for fish species impacted by the Project.

Conceptual offsetting options considered and ranked include the rehabilitation of degraded aquatic habitats caused by anthropogenic disturbance such as agricultural activities, channelization of streams, and draining of former wetland areas. Four offsetting options were presented that have landowner support to address HADD of fish habitat, which combine to 944.5 habitat units. These offsetting options are located within the St. Mary's and Shubenacadie/Stewiacke primary watersheds.



GOLDBORO GOLD PROJECT

A desktop review of potential offsetting sites resulted in multiple potential opportunities within priority watersheds. Additional options identified through the desktop review have been presented at a high level but will be investigated as offset planning continues, resulting in an additional 770 habitat units.

Offsetting investigations for the Project are ongoing. Additional offsetting locations or complementary measures may be identified through the completion of the desktop analysis, and future engagement with the Mi'kmaq of Nova Scotia, community groups, and landowners.



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1 INTRODUCTION

1.1 Purpose

Anaconda Mining Inc. (Anaconda) is proposing the development of the Goldboro Gold Project (the Project), an open pit gold mine and processing facility in Goldboro, Nova Scotia (NS). While avoidance and mitigation measures have been implemented to minimize Project effects to fish and fish habitat, the location of the open pits and associated mine infrastructure will result in the permanent loss of fish habitat. This loss of fish habitat is considered a harmful alteration, disruption, or destruction (HADD) of fish habitat under the federal *Fisheries Act*, and as such will require authorization under Section 35. Section 36(3) of the *Fisheries Act* prohibits the deposition of deleterious substances into waters frequented by fish. Waters frequented by fish means all Canadian waters such as rivers, lakes, creeks, canals and other water bodies. Under the Mineral and Diamond Mining Effluent Regulations (MDMER), a project may obtain permission to deposit deleterious substances (such as mine waste) in waters frequented by fish, upon approval and addition of the waters to Schedule 2 of the MDMER.

The purpose of this Conceptual Offsetting Plan (the Plan) is to describe unavoidable losses of fish habitat as a result of the Project, and to demonstrate to DFO that the offsetting of these unavoidable losses is achievable. At the conceptual stage, the intent of the Plan is to provide a quantification of fish habitat affected by the project after all avoidance and mitigation measures have been considered, and to outline approaches to offset unavoidable HADD that are appropriate and achievable. The contents and organization of the Plan are based on DFO guidance (DFO, 2014b; 2019a; 2019b). The Plan aims to:

1. Describe the existing fish community and habitat predicted to be affected by the Project;
2. Summarize how the Project will affect fish and fish habitat, resulting in HADD of fish habitat; and
3. Introduce proposed concepts to offset HADD of fish habitat.

The impacts and offsetting concepts described herein will serve as the basis for ongoing engagement with Mi'kmaq, DFO, and other identified stakeholders. This engagement program has already been initiated, and will continue through development of a final offsetting plan, so to support an application for HADD authorization under the *Fisheries Act*.

1.2 Proponent Contact Information

Name and Address of Owner

Anaconda Mining Inc.
20 Adelaide St. East, Suite 915
Toronto, ON M5C 2T6
Tel: (416) 304-6622, Fax: (416) 363-4567

Authorized Contact Person

Name: Deidre Puddister
Title: Manager of Environment, Compliance and Social Responsibility
Tel: (709) 689-8086
Email: dpuddister@anacondamining.com

1.3 Regulatory Considerations

This Plan will be used to support the HADD authorization application process for unavoidable impact to fish habitat. DFO's Policy for Applying Measures to Offset Adverse Effects on Fish and Habitat (DFO, 2019b) states:

Works, undertakings or activities resulting in the death of fish or the harmful alteration, disruption or destruction of fish habitat are prohibited under the Fisheries Act unless otherwise authorized. Before approving works, undertakings or activities that will result in the death of fish and/or the harmful alteration, disruption or destruction of fish habitat, Fisheries and Oceans Canada (the Department), must consider if there are alternatives that avoid adverse effects on fish and fish habitat. If the adverse effects on fish and fish habitat are unavoidable, the Department must consider if there are measures to mitigate that would reduce or minimize those adverse effects. Finally, if there are any residual effects, then the Department must consider measures to offset to counterbalance the death of fish and the harmful alteration, disruption or destruction of fish habitat.

The concepts of “avoid, mitigate and offset” referred to by DFO as the ‘hierarchy of measures’ (DFO, 2019a) have been used in the development of the Project’s infrastructure design to minimize and reduce impacts to fish and fish habitat to the greatest extent possible, and is further described in Section 3.2.1.

Anaconda is submitting an Environmental Assessment Registration Document (EARD) for provincial environmental assessment under the Nova Scotia *Environment Act*. The EARD describes the residual effects on fish and fish habitat when full Project mitigations have been considered. The residual effects on fish and fish habitat are anticipated to result in HADD of fish habitat, as defined under the *Fisheries Act*. As part of the planning and permitting process, the EARD and this Plan will be reviewed by DFO to confirm the likely residual effects of the Project on fish and fish habitat and the need for a Federal Fisheries Act Authorization. Subsequently, a *Fisheries Act* Application for Authorization including a detailed final offsetting plan will be developed.

Additionally, any fish and fish habitat that may be subject to a MDMER Schedule 2 designation will be subject to a fish habitat compensation process. Section 27.1 of the MDMER requires fish habitat compensation to offset losses of fish habitat associated with the deposit of a deleterious substance into the water body(ies) that are added to Schedule 2. While separate plans will eventually be required in accordance with both MDMER and the *Fisheries Act*, at the conceptual stage fish habitat losses and potential offsetting options are considered collectively.

1.4 Regulatory Consultation and Mi’kmaq of Nova Scotia Engagement Efforts

Anaconda has commenced and will continue early engagement with DFO to identify requirements for Authorization under the *Fisheries Act*, and to identify the scope of the offsetting requirements.

Engagement with the Mi’kmaq of Nova Scotia has commenced and will continue through the selection and implementation processes for offsetting projects. The nearest Mi’kmaq community is the Paqtnekek First Nation, located approximately 75 km north of the Project, on Highway 104 approximately 15 km east of the town of Antigonish.

MEL, on behalf of Anaconda, commenced engagement with Mi’kmaq of Nova Scotia in 2017 to support the development of the Project and to commence a respectful dialogue relating to impacts to fish and offsetting requirements and potential offsetting project identification. Furthermore, MEL has reached out to individual community members who are familiar with the local landscape to identify local degraded fish habitat in need of restoration or enhancement in close proximity to the Project. Engagement and

regulatory consultation to date specifically related to fish and fish habitat and potential offsetting projects consists of the following actions:

- In person meeting with Paqtnekek First Nation and KMKNO on November 19, 2019
- Teleconference with Jamie Lantz of the Mi'kmaq Conservation Group (MCG), December 13, 2019
- Email correspondence Darryl McDonald from Paqtnekek First Nation on December 13, 2019 and January 7, 2020
- Email correspondence Charles Clattenburg from the Eastern Shore Wildlife Association on December 13, 2019 and January 7, 2020
- Email correspondence Jim Cameron, retired DFO officer, January 7, 2020
- Teleconference with Warren Parsons, president of the Friends of Taylor Head, retired DFO officer Jan 30, 2020
- In person meeting with ECCC March 5, 2020 to review Schedule 2 amendment process
- Virtual meeting with DFO May 20, 2021 to review fisheries baseline information and direct impacts
- Virtual meeting with KMKNO July 15, 2021
- Virtual meeting with KMKNO August 17, 2021
- Virtual meeting with ECCC on September 14, 2021 to update the regulator regarding Schedule 2 amendment process
- Virtual meeting with Unama'ki Institute of Natural Resources on February 23, 2022 and follow up telephone conversations through 2022
- Meeting with Paqtnekek First Nation (Chief and Council and community meeting) on April 19, 2022
- Virtual One Window regulatory meeting April 22, 2022
- Teleconference with St Mary's River Watershed Association Representatives May 10, 2022

2 PROJECT OVERVIEW

2.1 Project Location

The Project is located in Goldboro, Guysborough County, Nova Scotia, Canada, 175 km northeast of the city of Halifax, and 60 km southeast of the town of Antigonish. The Project Area (PA) is 1.6 km north of the community of Goldboro on the eastern shore of Isaacs Harbour (Figure 1). The PA is primarily disturbed by historical mining activities, road construction and timber harvesting. The region is known for its historic gold deposits and about half of the PA is currently under mineral exploration licenses including the known Goldboro (Upper Seal Harbour), Isaacs Harbour, Forest Hill, and Lower Seal Harbour deposits.



Figure 1. Goldboro Gold Project Area

The Goldboro area was an active and productive mining area from 1893 to 1910. There are historic workings as well as known environmental hazards throughout the area due to this history of mining. Locations that are known to have been used for tailings disposal during past milling operations have neither been contained nor remediated. Tailings migrated from the streams and wetlands where they were deposited into the downstream receiving environment (Gold Brook) and may present a continuing threat to fisheries resources.

Historic tailings in the vicinity of the PA were sampled and characterized in baseline studies conducted by the Geological Survey of Canada (GSC), Anaconda, and others between 2003 and 2021. A limited Phase I and Phase II Environmental Site Assessment (ESA) was conducted in 2021 targeting historic tailings within the proposed mineral lease area for the Project. Tailings were delineated through the Phase II ESA; the locations of confirmed tailings are shown on Figure 2.

2.2 Proposed Work, Undertakings and Activities

Anaconda proposes to develop the Project as a 4,000-tonne per day (tpd) mine and processing facility. For the purposes of the environmental assessment, the PA was defined as the footprint of Project related infrastructure plus a buffer of 100 – 200 m. The mine plan includes two open pits (East Pit and West Pit), an ore processing facility, a tailings management facility (TMF), three waste rock storage areas (WRSAs), overburden and organic stockpiles, support buildings, and associated infrastructure. The anticipated mine life for extraction of ore is approximately 11 years.

The scope of the Project includes activities associated with construction, operation, and closure. Project construction activities will include clearing and grubbing the overburden and organic stockpiles, WRSAs, pit, plant, and TMF areas, and construction of the initial lift of the TMF, plant site, secondary access roads, construction laydowns, Run-of-Mine (ROM) pad, surface water management and other site infrastructure. The operation phase will include conventional ore extraction methods (drilling, blasting, loading, and hauling), ore processing, and waste management. ROM ore will go directly to the crusher while stockpiled high-grade and low-grade ore will be progressively processed throughout the mine life. Non-ore bearing waste rock, not used for construction or backfill, will be stockpiled at its final disposal point, managed and reclaimed in place. The closure phase will include earthworks and demolition required to return the Project Area to a safe, stable, and vegetated state, and all monitoring and treatment, if required. Reclamation and Closure Plan requirements are governed by the *Nova Scotia Mineral Resources Act*.

The Project infrastructure and historic tailings are shown on Figure 2. Detailed descriptions of each Project component can be found in the Goldboro Gold Project EARD.



Figure 2. Goldboro Gold Project Infrastructure and Historic Tailings

3 EXISTING FISH AND FISH HABITAT

The *Fisheries Act* defines fish as “(a) parts of fish, (b) shellfish, crustaceans, marine animals and any parts of shellfish, crustaceans or marine animals, and (c) the eggs, sperm, spawn, larvae, spat and juvenile stages of fish, shellfish, crustaceans and marine animals;”, and fish habitat as “waters frequented by fish

and any other areas on which fish depend directly or indirectly to carry out their life processes, including spawning grounds and nursery, rearing, food supply and migration areas”.

All watercourses within the PA defined as potential fish bearing waters, and therefore fish habitat, as per federal or provincial definitions were surveyed and mapped. Fish and fish habitat with the PA have been identified, described, and quantified with data collected through desktop reviews and comprehensive field programs. Field programs were initiated in 2017, with watercourse, waterbody, and wetland identification and characterization performed by GEMTEC and McCallum Environmental Ltd (MEL) through 2019. The field program was reviewed and expanded in 2020 and continued into 2021 by MEL in response to the modernized *Fisheries Act* (amended in 2019) and a revised PA and infrastructure layout. These field methods and findings are presented in the Fish and Fish Habitat Baseline Report (MEL, 2022).

Detailed fish habitat characterization using standard operating procedures was completed for all watercourses and waterbodies predicted to be directly and indirectly affected by the Project. To determine fish species presence and suitability of fish habitat, surveys were completed using electrofishing, trapping, and environmental DNA (eDNA). The results provide the data required to delineate fish habitat types, species distribution, and estimates of fish abundance within the PA, and allows for the quantification of habitat for HADD determination.

The PA is located on approximately 1,055 ha of both crown and private property. Soils are generally nutrient poor and acidic, supporting softwood stand types such as spruce and balsam fir. Herbaceous layers are often dominated by ericaceous shrubs and bryophytes such as Schreber’s moss, representing nutrient poor soils. Areas located in the southern portion of the PA and in close proximity to Gold Brook generally consist of mature undisturbed conifer dominant stands.

The PA is predominantly located within the New Harbour/Salmon Primary Watershed (1EQ), and the secondary shore direct watershed (1EQ-SD31, herein referred to as the “Gold Brook secondary watershed”). The topography gently slopes towards Gold Brook Lake, and, as the lake empties into the Gold Brook system, the landscape flattens further into a low-relief valley. Elevation within the PA ranges from 42-95 m above sea level. This watershed has a total surface area of 4,003 ha, extending from Oak Hill Lake in the north to Drum Head in the south. The Country Harbour primary watershed (1EP) hugs the western edge of the PA. Smaller fractions of the overall PA fall within additional secondary watersheds that drain to Issacs Harbour, Coddles Harbour, and New Harbour.

Sixty-six (66) watercourses and two hundred and twenty three (223) wetlands have been identified and delineated within the PA. Gold Brook Lake is the central waterbody in the PA, draining to the south through Gold Brook. Rocky Lake, located at the eastern extent of the PA, is a small headwater system that drains west to Gold Brook Lake. Additional open water features identified include two historic settling ponds, the Beaver Pond (located within WL18), and portions of Gold Brook where it opens into wide open flat habitat. Furthermore, two wetland mosaics were identified; Wetland Mosaic A is located south of the Settling Ponds, and Wetland Mosaic B is located at the convergence of channels A and H of Gold Brook. These features are shown on Figure 3.

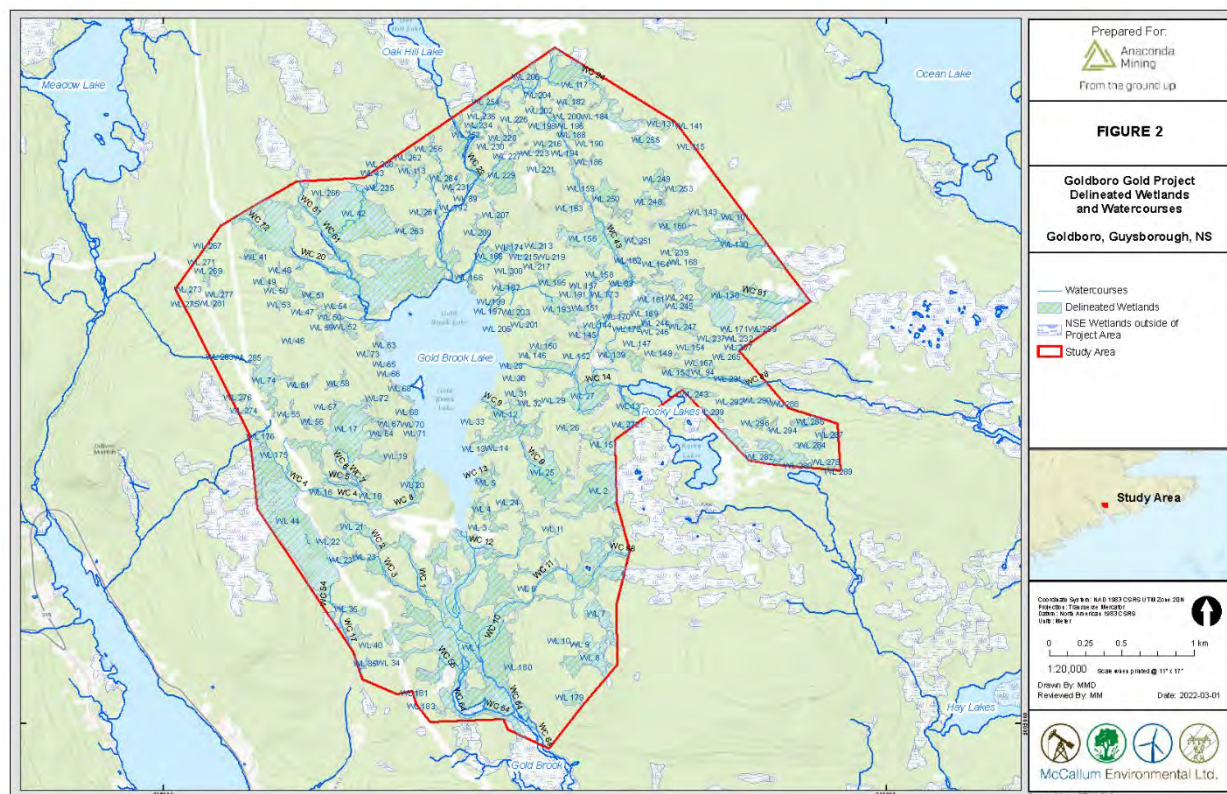


Figure 2. Wetlands and Watercourses within the PA

All watercourses (linear) and waterbodies (lentic) were determined to provide fish habitat, regardless of whether they are directly connected to, or proven to be occupied by fish, for the purposes of the EARD. In an effort to make conservatively inclusive decisions in the effects assessment, even those watercourses which lack connectivity to fish bearing streams (i.e., WC99, WC57, WC69, etc.) are included as fish habitat, and evaluated within the EARD, and considered in the offsetting plan if a Project interaction is proposed. The only wetlands identified as fish habitat are described as wetland mosaics as defined in the Fish and Fish Habitat Baseline Report (MEL, 2022). Where fish habitat is present in a watercourse that flows through a wetland in an entrenched channel, that habitat is described in the context of the watercourse.

3.1 Fish Community

Fish species within the PA were determined through a suite of fish collection methods including electrofishing, fyke netting, eel pots, and minnow traps. Detailed fishing methodologies and results are presented in the Fish and Fish Habitat Baseline Report (MEL, 2022).

During the 2020 to 2021 field program, fish collection efforts involved approximately 4,424 hours of trapping (various types), 546 minutes of qualitative electrofishing and 1,098 minutes of quantitative electrofishing. This resulted in capture of a total of six species and 1,817 individual fish, including yellow perch (*Perca flavescens*), American eel (*Anguilla rostrata*), brook trout (*Salvelinus fontinalis*), golden

shiner (*Notemigonus crysoleucas*), banded killifish (*Fundulus diaphanous*), and blacknose shiner (*Notropis heterolepis*).

Fish habitat within the Project footprint is primarily used by American eel and brook trout and, to a lesser extent, yellow perch and forage fish. Yellow perch captured within the PA were primarily found in Gold Brook Lake (accounting for 63% of all individuals captured) or in very close proximity to the lake (i.e., at the mouths of tributaries to the Lake and at the lake outflow). In addition, 72% of all American eel were captured in Gold Brook and the adjacent settling pond, and 73% of all brook trout were captured in two streams within the eastern tributary to Gold Brook Lake (WC14 and WC43).

While overall fish abundance was generally low as supported by multiple-pass depletion estimates and Catch-per-Unit Effort (CPUE), habitat suitability for American eel is considered high across the PA; consequently, the quantification of habitat lost is reflective of this suitability. The methods to quantify HADD are discussed further in Section 4.

Atlantic salmon (*Salmo salar*) are not expected to be present within the Gold Brook Lake watershed. Environmental DNA results were consistent with expectations of Atlantic salmon distribution based on site knowledge, historical knowledge, and fish collection efforts to date, with no Atlantic salmon being detected within the Gold Brook Lake watershed. Atlantic salmon was detected within the New Harbour River Secondary Watershed as anticipated. Detailed methodology and results for eDNA sampling is provided in the Fish and Fish Habitat Baseline Report (MEL, 2022).

Table 1 summarizes fish collection efforts within the PA. While the complete dataset for all species captured by all methods is provided in the baseline report (MEL, 2022), species abundance estimates developed using electrofishing Catch-per-Unit Effort (CPUE) indices, standardized to 300 seconds of effort (Scruton and Gibson, 1995) are provided in Table 2 for context on the relative species composition within the PA. Fish collection locations and species captured are presented on Figure 4 and Figure 5.

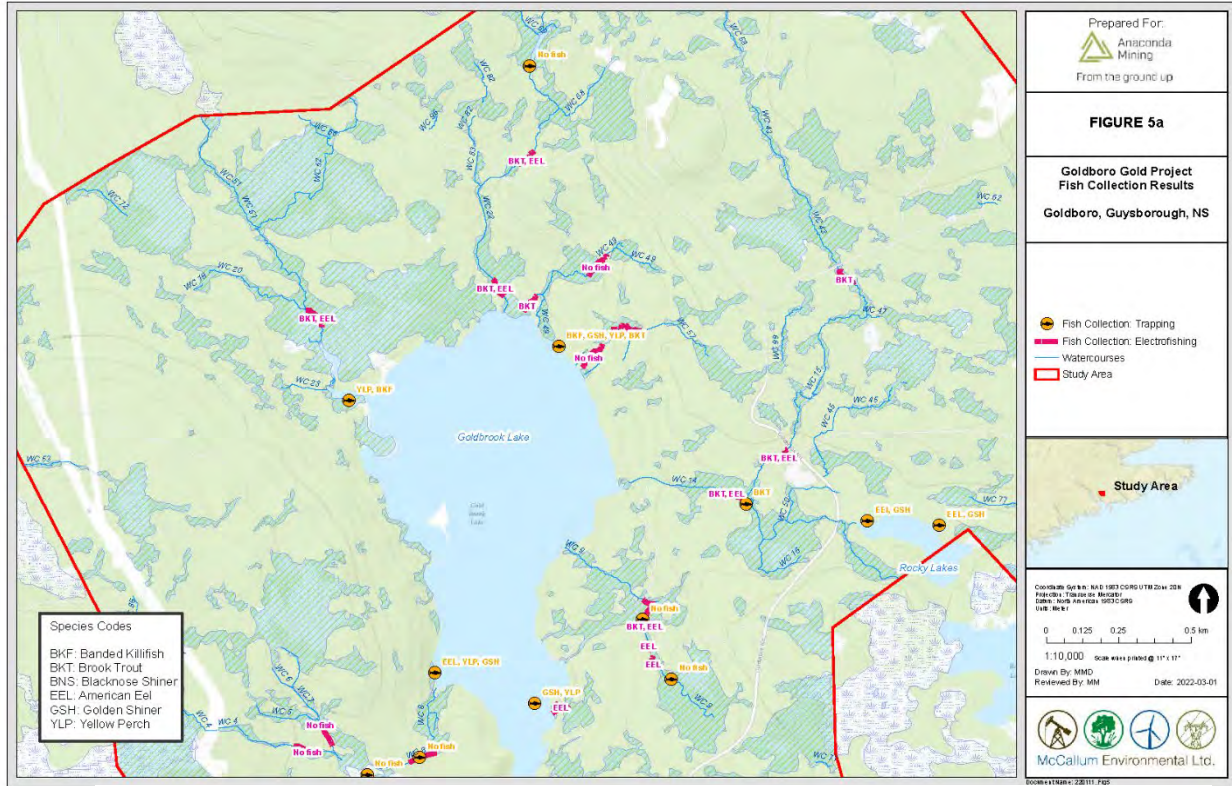


Figure 4. Fish Collection Results - Part 1

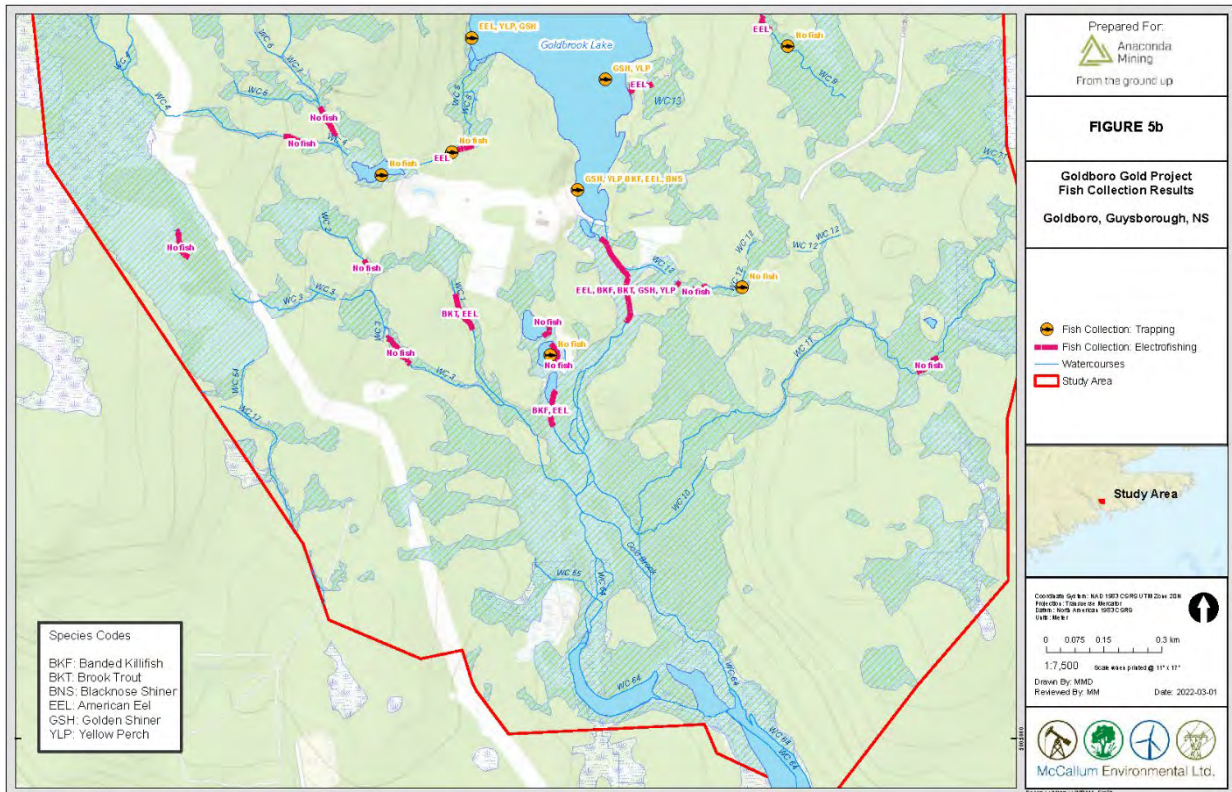


Figure 4. Fish Collection Results - Part 2

Table 1. Fish Collection Methods and Species Captured within predicted Project Area (2020-2021)

Watercourse	Fish Collection Method ¹	Species Caught	Total Catch
WC1	Quantitative and Qualitative Electrofishing	American eel brook trout	21 31
WC2	Qualitative Electrofishing	None	0
WC3	Quantitative Electrofishing	None	0
WC4	Quantitative Electrofishing	None	0
WC7	Quantitative Electrofishing	None	0
WC8	Quantitative Electrofishing and Trapping (MT)	American eel	1
WC9 Reach A	Quantitative Electrofishing and Trapping (MT)	American eel	1
WC9 Reach B	Quantitative Electrofishing and Trapping (MT)	American eel brook trout	2 1
WC11	Qualitative Electrofishing	None	0
WC12	Qualitative Electrofishing and Trapping (MT)	None	0
WC13	Qualitative Electrofishing	American eel	1
WC14	Quantitative Electrofishing and Trapping (MT, EP)	American eel brook trout	10 107
WC20	Quantitative Electrofishing	American eel brook trout	28 15
WC22 Reach A	Qualitative Electrofishing	American eel brook trout	10 2
WC22 Reach B	Quantitative Electrofishing	American eel brook trout	29 36
WC22 Open Water	Trapping (MT, EP)	None	0
WC23/20	Trapping (MT)	banded killifish yellow perch	3 183
WC43 Reach A	Quantitative and Qualitative Electrofishing	brook trout	22
WC43 Reach B	Quantitative Electrofishing	American eel brook trout	1 161
WC49 Reach A	Qualitative Electrofishing	None	0
WC49 Reach B	Qualitative Electrofishing	brook trout	2
WC57	Qualitative Electrofishing	None	0
WC63	Qualitative Electrofishing	None	0
WC70	Qualitative Electrofishing	None	0
Beaver Pond	Trapping (MT)	None	0
Gold Brook Reach A	Qualitative Electrofishing and Trapping (EP)	American eel banded killifish brook trout yellow perch	264 40 17 6
Gold Brook Reach B	Qualitative Electrofishing	American eel banded killifish brook trout golden shiner	85 7 5 1

Watercourse	Fish Collection Method ¹	Species Caught	Total Catch
		yellow perch	10
Beaver Pond	Trapping (MT)	None	0
Gold Brook Lake North	Trapping (MT, EP, FN)	American eel	1
		banded killifish	3
		brook trout	2
		golden shiner	7
		yellow perch	113
Gold Brook Lake East	Trapping (FN)	golden shiner	4
		yellow perch	1
Gold Brook Lake South	Trapping (MT, EP, SN)	American eel	8
		banded killifish	63
		blacknose shiner	25
		golden shiner	1
		yellow perch	168
Gold Brook Lake West	Trapping (MT, EP, SN)	American eel	10
		golden shiner	3
		yellow perch	64
Rocky Lake 1	Trapping (MT, FN)	American eel	8
		golden shiner	160
Rocky Lake 2	Trapping (EP)	American eel	8
		golden shiner	10
Settling Pond 1	Qualitative Electrofishing and Trapping (MT, EP)	None	0
Settling Pond 2	Qualitative Electrofishing and Trapping (MT, EP)	None	0
Settling Pond (SPO1)	Quantitative Electrofishing	American eel	39
		banded killifish	12

¹Trap Types – Minnow Trap (MT), Eel Pot (EP), Fyke Net (FN), and Seine Netting (SN).

Table 2. Summary of Electrofishing Catch-per-Unit Effort (CPUE) within the Project Area (2020-2021)

Species	Quantitative Electrofishing			Qualitative Electrofishing		
	Total Catch	Total Effort (sec)	CPUE (fish/300 seconds)	Total Catch	Total Effort (sec)	CPUE (fish/300 seconds)
American eel	132	37,760	0.012	308	65,880	0.014
brook trout	350		0.032	41		0.002
banded killifish	12		0.001	47		0.002
yellow perch	0		-	15		0.001
golden shiner	0		-	1		0.000
Total	494		0.045	412		0.019

3.2 Habitat Characterization

Detailed fish habitat surveys within selected watercourses were conducted using standard methodologies to gather key measurements such as reach length (m), reach wetted and bankfull width (m), reach slope (%), stream substrate composition (% composition), water depths (m), water velocities (m/s), cover (%), and riparian habitat per habitat unit. The data was used to determine the overall habitat area within each reach as well as the habitat suitability based on measured stream substrate, water depths, and water velocities (habitat parameters) for each fish species identified within the Project Area. Lacustrine surveys were completed within Rocky Lake and Gold Brook Lake, where measurements of depth (m), substrate composition, cover and water quality were recorded. Full descriptions of fish habitat are provided in the Fish and Fish Habitat Baseline Report (MEL, 2022). Habitat descriptions for all watercourses and waterbodies where impacts are predicted will be brought forward into the final Offsetting Plan.

Overall, the aquatic ecosystem within the PA is characterized by acidic conditions, with a site-wide average pH of 4.98 (ranging from 3.89-7.71). Low dissolved oxygen levels also limit fish habitat quality within select systems. Elevated summer temperatures with larger, unshaded watercourses and waterbodies (e.g., Gold Brook) and waterbodies limit fish habitat quality for cold-water species like brook trout within these systems, whereas temperatures within smaller, first and second order streams generally remain within suitable temperature range for salmonids.

Detailed fish habitat assessments revealed that overall fish habitat viability and accessibility within first and second order streams (which are the dominant stream types within the PA) provide suitable habitat for juvenile and adult life forms of American eel and brook trout, with other species confirmed or potentially residing in the PA restricted to low velocity areas with a direct connection to Gold Brook or Gold Brook Lake. Suitable spawning habitat for brook trout is scarce within the PA.

4 EFFECTS ASSESSMENT SUMMARY

The potential effects of the Project on fish and fish habitat are described in the EARD. The effects assessments for fish and fish habitat were used as a basis to identify those effects that could cause death of fish or constitute HADD. Potential effects on fish and fish habitat from Construction, Operations, and Closure of the mine site were identified based on guidance from the DFO Pathways of Effects (DFO, 2014a). The EARD considers both direct and indirect effects, including changes in fish habitat quantity, fish habitat quality, and in fish health and survival.

4.1 Project Design Considerations

DFO's hierarchy of measures for the conservation and protection of fish and fish habitat have been used to guide the planning of Project infrastructure (DFO, 2019b). DFO emphasizes measures to avoid and mitigate as the preferred steps to prevent adverse effects to fish and fish habitat.

DFO's Fish and Fish Habitat Protection Policy Statement (2019a) states that:

Proponents are required to demonstrate that measures and standards have been fully applied to first avoid, then mitigate, and then finally, offset any residual harmful impacts to fish and fish habitat. Measures to avoid, mitigate and offset, as well as requirements for monitoring and reporting, may be included as conditions of authorization. The Department interprets these measures as follows:

Avoid

Avoidance is the undertaking of measures to prevent the harmful impacts to fish and fish habitat. Avoidance measures may include the choice of appropriate location and design of a work, undertaking or activity. In some cases, works, undertakings or activities may need to be redesigned to avoid harmful impacts. Careful timing of certain activities may also avoid impacts to fish and fish habitat. For some works, undertakings, or activities, harm may be fully avoided while for others, it may only be partially avoided. When impacts to fish and fish habitat cannot be fully avoided, mitigation measures must be undertaken.

Mitigate

Mitigation measures reduce the spatial scale, duration, or intensity of harmful impacts to fish and fish habitat when such impacts cannot be avoided. The best available mitigation measures or standards should be implemented by proponents. Mitigation measures include the implementation of best management practices during planning, construction, operation, maintenance, temporary or permanent closures, and decommissioning of a work, undertaking or activity.

Offset

After efforts have been made to avoid and mitigate harmful impacts to fish and fish habitat, any residual impact must be addressed by offsetting. An offsetting measure is one that counterbalances unavoidable death of fish and harmful alteration, disruption or destruction of fish habitat resulting from a work, undertaking or activity with the goal of protecting and conserving fish and fish habitat. Offsetting measures should support available fisheries management objectives and local restoration priorities and be conducted in a manner consistent with the department's offsetting policy.

Offsetting measures may take a variety of forms ranging from localized improvements to fish habitat to more complex measures that address limiting factors to fish production. The choice of appropriate offsetting measures should be guided by the restoration priority for degraded fish habitat, fisheries management objectives, and the expected death of fish and harmful impacts to fish habitat. In some instances, the most desirable offsetting measures may be a replacement of the same type of habitat that is affected by the work, undertaking, or activity. In other situations, better outcomes for fisheries may be achieved by undertaking offsetting in water bodies or for fish species other than those affected by the work, undertaking or activity being considered for authorization.

A summary of how the Policy's hierarchies have been implemented in Project development are provided in the following sections.

4.1.1 Avoid

Through an iterative process of identifying environmental constraints, Project infrastructure has been optimized to reduce impact on fish and fish habitat. Micrositing of infrastructure has been facilitated through the delineation of wetlands and watercourses. As part of early Project planning and site assessment efforts, multiple site layouts were considered to optimize the avoidance of impacts to fish frequented waters. Early in the design process, Gold Brook and Gold Brook Lake were identified as key aquatic habitats for avoidance, and these habitats were therefore considered as constraints for

infrastructure placement. The gold deposit continues through Gold Brook but Anaconda elected to proceed with two pits rather than one to avoid impacts to the brook. Furthermore, it is recognized that the Southern Uplands Atlantic salmon is priority species for protection. According to Bowlby et al. (2013), Atlantic salmon are known to inhabit the New Harbour watershed, eastern and adjacent to the PA. eDNA sampling conducted during baseline field studies confirmed detection of this species in the New Harbour River watershed, and failed to detect salmon DNA within the PA (Gold Brook watershed). As a result, substantial measures were employed to place site infrastructure as much as possible within the Gold Brook watershed to prevent potential impacts to a sensitive population of Southern Uplands (SU) Salmon in the adjacent New Harbour River watershed.

The following Project components were planned to avoid direct impact to fish and fish habitat, after substantial efforts to micro-sight infrastructure:

- Mill site;
- Northwest WRSA;
- Southwest Till Stockpile;
- Employee Accommodation;
- Southwest WRSA;
- Northeast Till Stockpile;
- Northeast WRSA; and,
- Organic Stockpiles

Project components such as the open pits are defined by the resource and cannot be relocated to reduce impacts; however, as mentioned, Anaconda did elect to proceed with two pits rather than one to avoid Gold Brook. The selected, or preferred TMF location and configuration is provided on Figure 2. A Multiple Accounts Assessment (MAA) was completed to optimize placement of the TMF and to demonstrate attempts to reduce impacts to fish and fish habitat. The methodology and results of the MAA are summarized in the EARD. Although significant effort was made to find an appropriate location for the TMF without impacting waters frequented by fish, this was not possible. The MAA conclusions demonstrate that the overall best location for the TMF is at the present location, considering technical, social, and environmental factors, as well as Project economics. This location, however, does cause direct impacts to fish habitat.

4.1.2 Mitigate

Where avoidance and minimization of impacts to fish and fish habitat are not possible, mitigation measures must be employed to further reduce impacts to fish and fish habitat. Best management practices for working in or near water are very well understood and shall be implemented; all road crossings will be designed to meet NSECC fish passage guidelines, and Anaconda will consider bridges as road crossings wherever practical. Standard mitigation measures will include, but are not limited to, erosion and sediment controls, site water management, watercourse and wetland alteration permitting, permitting under the *Fisheries Act*, adherence to timing windows to protect sensitive life cycle periods, and end-of-pipe protection for intakes. Mitigation measures are outlined in the EARD, however key mitigation measures are presented herein.

Anaconda commits to adhere to all federal and provincial regulations related to protection of fish and fish habitat. Anaconda will obtain and adhere to all necessary permits, including a HADD authorization under the *Fisheries Act*, and watercourse alteration approvals under the provincial Activities Designation

Regulations. Key mitigation strategies have been described in the following sections. A more fulsome description of mitigation measures is provided in the EARD.

4.1.2.1 *Fish Rescue*

Watercourses and open water features requiring fish rescue include all identified fish habitat to be directly impacted by Project infrastructure. Direct mortality of fish is expected to be low and limited to incidental loss of fish through fish rescue activities. Recent experience in completion of fish rescues indicates that incidental mortality typically falls in the range of less than 3% of captures, depending on site characteristics and catchability of fishes.

During the permitting phase of the Project, a detailed Fish Rescue Plan for the Project will be prepared and submitted to DFO. Furthermore, a specific plan for each individual fish rescue will be developed on a site-specific basis. Fish rescue work will not occur without permission granted under the *Fisheries Act* for a HADD, and death of fish by means other than fishing.

Guidance for the approach to a fish rescue was obtained from Fisheries and Oceans Canada (2015; Appendix F, Fish Rescue Guidelines). While the specific capture methods will be finalized during permitting, the general approach will involve a combination of passive trapping, seine netting, dip netting, and electrofishing (i.e., low mortality collection methods) in habitats where each is effective. Timing of fish rescue activities will be closely coordinated with habitat dewatering or other water diversion/infilling activities during construction.

Fish rescue release points will be identified within the Fish Rescue Plan. Typically, the fish rescue release point will be planned downstream of the isolated reach; however, in some cases an alternative location may be required, based on species composition and downstream habitat type. Release locations within the same watercourse, or those watercourses where natural connectivity exists will be used. Fish rescue methods are further described in the EARD.

4.1.2.2 *Water Quality and Quantity*

Anaconda will develop and implement a detailed Erosion and Sediment Control (ESC) Plan which is proactive and protective of fish and fish habitat. Detailed ESC plan to be developed and strictly adhered to. A surface water and groundwater monitoring plan has also been developed, which includes monitoring well locations between the proposed pits and Gold Brook Lake, to measure changes in groundwater elevations and groundwater quality.

Contact water will be collected and treated prior to release. Release of contact water from Project ponds will only be permitted if monitoring indicates compliance with all regulatory guidelines. In-stream works will only be completed where approved, adhering to all approval conditions. In-stream works will be completed with minimal disturbance to riparian habitat, which provide shade and erosion protection that is protective of fish habitat.

Temperatures and water levels will be monitored throughout Gold Brook Lake and Gold Brook to ensure that collection of contact water does not result in a harmful alteration, disruption, or destruction of fish habitat. Mitigation measures that will be evaluated for potential implementation include additional vegetation and shading on site ponds and riparian zones, cooling trenches or groundwater wells to remediate any thermal impacts.

The Proponent will avoid refueling, fuel storage, and servicing of equipment within 30 m of a watercourse or water body, to prevent accidental release of deleterious substances to fish habitat. Diligent spill prevention, preparedness and response measures will be key components of construction, operations and reclamation works completed within the PA.

4.1.2.3 *Blasting*

To minimize effects of blasting on fish, a Blast Management Plan will be developed and strictly adhered to. Appropriate blast designs for open pit mining will be developed to limit blasting impacts (vibration, fly-rock and overpressure). All appropriate information for each blast will be documented including hole-depth and the quantity of explosive used, blast timing, and monitoring data. All blasting will adhere to guidelines outlined by Wright and Hopky (1998) and will adhere to Nova Scotia Blasting Regulations.

4.1.2.4 *Mitigation Monitoring*

Anaconda will implement a series of environmental management and monitoring plans to guide the development and operation of the Project, including site water management plans, and erosion and sediment control plans. The Environmental Management Plan (EMP) outlines procedures and mitigations related to equipment fueling, storage of deleterious substances, clearing and grubbing of vegetation, and identification and communication of fish-bearing streams with site personnel.

Mitigation measures specific to fish and fish habitat will be evaluated through the Aquatic Effects Monitoring Plan (AEMP). The AEMP will be established as a requirement of the permits and licenses under which the proposed Project will operate (e.g., MDMER, FAA, provincial Industrial Approval, and other permit requirements). The focus of the AEMP will be to ensure regulatory compliance, monitor the effectiveness of mitigation measures, and to verify the predictions of the effects assessment. The AEMP is anticipated to include monitoring programs for:

- Surface Water Quality: the physical, chemical, biological, and aesthetic characteristics of water;
- Surface Water Hydrology: water quantity and water flow;
- Sediment Quality: the physical, chemical and biological characteristics of sedimentary materials;
- Periphyton: the assemblage of algae, bacteria, and other organisms that attach to submerged substrates (e.g., suspended sediments). As primary producers, periphyton are important food sources for grazers, such as zooplankton and benthic invertebrates;
- Benthic Invertebrates: benthos representing an important link between primary producer communities and higher trophic levels in aquatic ecosystems;
- Fish Habitat & Community Surveys; and
- Fish Health and Fish Tissue Studies, as needed.

An Environmental Effects Monitoring Plan (EEM) will be implemented to support compliance with the monitoring requirements in MDMER and will form one component of the broader AEMP.

Data collected during monitoring programs will document trends in results and enable a comparison to the predicted project effects. Data and analysis will be provided in annual reports, as well as in any mandated regulatory reporting.

4.1.3 Offsetting

Habitat losses that cannot be avoided or mitigated will require offsetting. A summary of the residual HADD and Schedule 2 habitat quantification to offset is provided herein, with additional details provided in the EARD. This preliminary quantification is provided to demonstrate that the offsetting concepts described in Section 5 can be designed to meet HADD offsetting expectations, including required offset ratios.

4.1.4 Characterization of Residual Impact to Fish and Fish Habitat

The residual effects that are anticipated to remain after the implementation of avoidance and mitigation measures are related to direct loss of habitat, removal of upstream catchment areas, and downstream flow alterations from the mine site footprint. Offsetting measures will be required to counterbalance these residual effects.

To inform offsetting requirements, a quantification of habitat loss is presented in the following sections. As described in the baseline program methodology section of the EARD and in the Fish and Fish Habitat Baseline Report, detailed habitat assessments were completed on all fish habitat with predicted direct or indirect impact. The calculation of habitat loss as a result of residual impacts to fish and fish habitat was completed using the surface area of affected instream habitat (in m²) using stream channel measurements collected during baseline field programs, and spatial analysis using GIS software. Detailed transect measurements were recorded at a 50-m frequency within each individual watercourse reach. The bankfull width of each transect survey point was used along with reach length to calculate the impact area. Where impact is proposed to an open water feature or wetland mosaic, the delineated polygon is used to calculate impact area. A “Habitat Unit” is defined as 100 m² of fish habitat.

As described in Bradford et al. (2016), “equivalency” refers to the “process to determine the amount and nature of offsets required to achieve a fair exchange between project impacts and gains associated with offset measures. An equivalency metric (or currency) is the unit of loss or gain that is used to determine how much offsetting is needed to counterbalance unavoidable losses”. There are a variety of equivalency analysis methodologies in existence; a common approach is to adjust the habitat loss for suitability across fish species and life stages.

The Fish and Fish Habitat Baseline Report demonstrates that habitat suitability of aquatic features within the PA is high for juvenile and adult life forms of American eel. American eel occur throughout the province and are “highly plastic in habitat use” (COSEWIC, 2006). In addition, American eel can traverse typical obstacles to fish, like vertical walls and wet terrain. American eel are therefore potentially present, if not confirmed present, in all fish habitat that will be impacted by the Project. Through a conservative approach to impact quantification, all fish habitat impacted has been considered to provide highly suitable habitat for juvenile and/or adult life stages of American eel. And thus, no adjustments were made to habitat loss areas to account for reduced habitat suitability.

It should be noted that fish habitat viability and accessibility throughout first and second order intermittent streams within the PA (the most prevalent stream types) are restricted by seasonally low water levels. Substandard water quality metrics for fish (e.g., DO, temperature, pH), as well as the presence of historical tailings, limit overall fish habitat quality within the PA. Despite these baseline

limitations, the determination of Habitat Unit (HU) values was not adjusted/corrected; therefore, HU is considered to represent the highest ratio of habitat loss to offset.

4.1.4.1 HADD- Direct Impacts

Direct impacts are those Project interactions that are expected to result in changes to fish habitat quantity, measured in square meters of lost habitat. This includes watercourses and waterbodies that are overprinted by Project infrastructure, and sections of downstream habitats if direct impacts to headwater habitats are proposed. Similarly, if direct impact prevents fish passage to an upstream portion of a watercourse and fish passage structures are not practicable or viable, the upstream portion may be considered as a direct impact.

There are a total of 32 watercourses and one open water feature that will be directly impacted by the Project. Each was surveyed and parameters measured to characterize the existing habitat reaches. Habitats directly impacted by Project infrastructure are shown in Table 3 and Figures 6 and 7. In total, 12,236 m², or 122.36 habitat units of riverine habitat and 40.6 habitat units of lacustrine habitat will require authorization under the *Fisheries Act*. Watercourses underlain by the TMF (WC15, 43, 45, 47, 49, 57, 59, and 99) will require addition to Schedule 2 of the MDMER to allow for deposition of mine waste into waters frequented by fish, as described in the EARD.

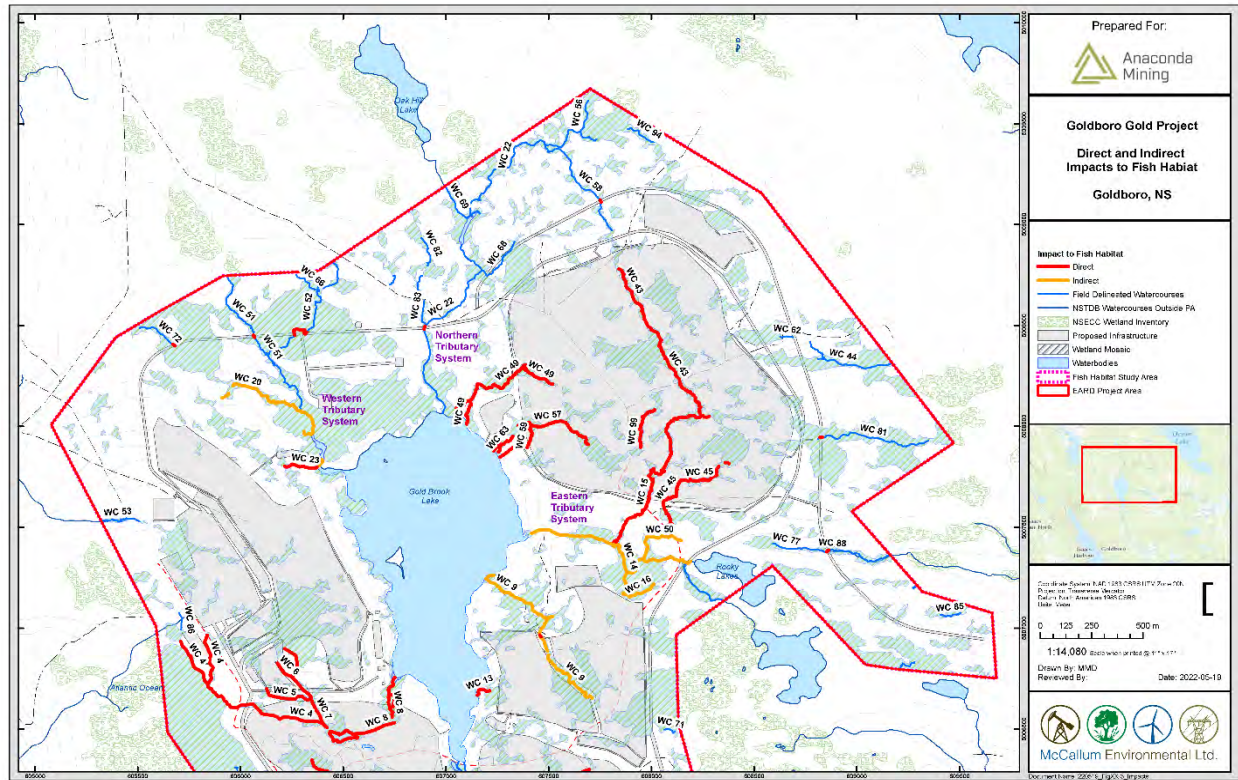


Figure 6. Direct and Indirect Impact to Fish Habitat - Part 1

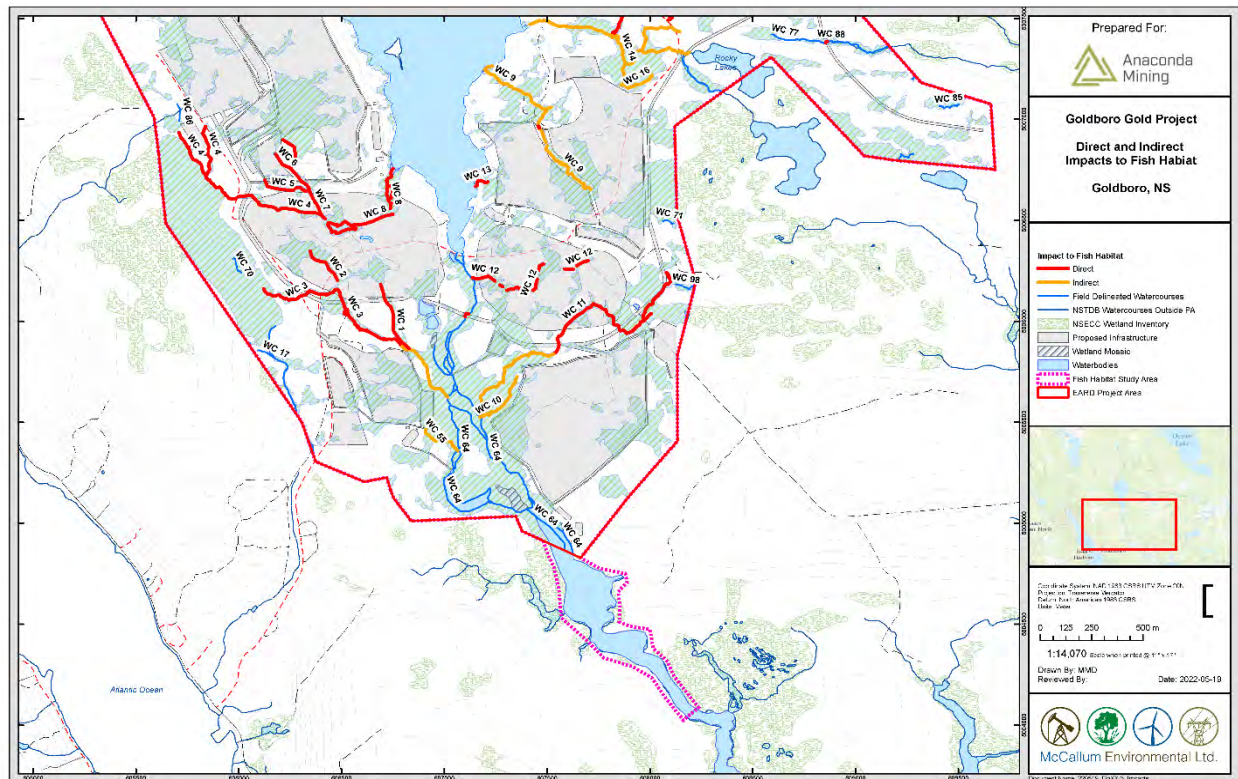


Figure 6. Direct and Indirect Impacts to Fish Habitat - Part 2

Table 3. Riverine Habitat Directly Impacted by the Project

Watercourse	Infrastructure	Fish Species Supported	Area (m ²)	Habitat Units
1	Interruption of flow and Haul Road	BKT, EEL	660	6.6
2	West Pit	BKT, EEL	259	2.59
3	Interruption of flow and Haul Road	BKT, EEL, BFK, GSH	850	8.5
4	Ditch, Haul Road, and interruption of flow	BKT, EEL	1554	15.54
5	Haul Road	BKT, EEL	119	1.19
6	Interruption of flow and Haul Road	BKT, EEL	69	0.69
7	Interruption of flow and Haul Road	BKT, EEL	422	4.22
8	Interruption of flow and Haul Road	BKF, BKT, BNS, EEL, GSH, YLP	594	5.94
9	Water management crossing	BKT, EEL	9	0.09
11	Interruption of flow and Haul Road	BKT, EEL	963	9.63
12	East Pit	EEL	609	6.09
13	Flow reduction	BKT, EEL	83	0.83
15	TMF	BKT, EEL	1894	18.94
22	Haul Road	BKT, EEL, GSH	74	0.74
23	Flow reduction	BKT, EEL, BKF, YLP	225	2.25
43	TMF	BKT, EEL	725	7.25
45	TMF	BKT, EEL	708	7.08
47	TMF	BKT, EEL	38	0.38
49	TMF	BKT, EEL	943	9.43
51	Haul Road	BKT, EEL, BKF	149	1.49
52	Haul Road	BKT, EEL, BKF, YLP	117	1.17
57	TMF	None	460	4.6
58	Haul Road	BKT, EEL	7	0.07
59	Complete loss of catchment area	N/A	107	1.07
61	Flow reduction	BKT, EEL	67	0.67
63	Flow reduction	BKT, EEL	63	0.63
64 (Gold Brook)	Haul Road	BKF, BKT, BNS, EEL, GSH, YLP	127	1.27
65	Flow reduction	BKT, EEL	34	0.34
72	Haul Road	N/A	26	0.26
81	Haul Road	N/A	29	0.29
88	Haul Road	N/A	10	0.1
99	TMF	N/A	242	2.42
Total			12,236	122.36

Table 4. Lacustrine Habitat Directly Impacted by the Project

Water Body	Infrastructure	Fish Species Supported	Area (m ²)	Habitat Units
Beaver Pond	West Pit	BKT, EEL	4060	40.6

4.1.4.2 HADD – Indirect Impacts

The proposed Project has been developed with mitigations such as minimizing direct fish and fish habitat losses by relocating Project infrastructure as much as feasibly possible. While several watercourses are not within the direct footprint, they are located nearby the Project and may be subject to indirect habitat alterations due to reduced surface and/or groundwater input. Habitats indirectly impacted by flow reductions are shown in Table 5 and Figures 6 and 7. The area of indirect impact to fish and fish habitat is quantified based on the total area of each watercourse, water body or wetland mosaic.

The determination of indirect effects to fish habitat through flow reduction is based on modelled results and provided in the Water Balance Analysis completed to support the EARD; a full description of analysis methods, results and sensitivity is provided therein. Results of the analysis were evaluated using regulatory guidance outlined in the Framework for Assessing the Ecological Flow Requirements to support Fisheries in Canada (DFO, 2013a). A full discussion of the interpretation of regulatory guidelines as well as a detailed description of each predicted HADD are provided in the EARD.

Based on reduced flow comparisons to DFO framework for ecological flow, it was determined that flow reductions in 12 watercourses would constitute a potential HADD of fish habitat. Flow reduction is anticipated due to drainage area and/or baseflow reductions in the Western Tributary (WC51, WC20, WC19 and WC24), Eastern Tributary (WC14, WC16 and WC50), WC9, and Gold Brook Tributaries (WC3, WC55, WC10 and WC11). Overall habitat area affected as a result of the predicted flow reductions has been quantified at 10,560 m². Watercourses and impact areas are summarized in Table 5. No HADD is predicted because of indirect impacts to lacustrine habitat or adjacent watersheds.

Table 5. Fish Habitat Indirectly Impacted by the Project

Watercourse	Fish Species Supported	Area (m ²)	Habitat Units
Western Tributary to Gold Brook Lake	BKT, EEL, YLP, GSH, BKF	3,800	38.00
Eastern Tributary to Gold Brook Lake	BKT, EEL.	3,588	35.88
WC9	BKT, EEL	1,082	10.82
Gold Brook Tributaries	BKT, EEL, BKF, GSH	1,056	10.56
Total		10,056	100.56

4.1.4.3 Summary of Residual Impacts and Proposed Offsetting Ratios

Predicted residual impacts from the Project primarily affect first and second order intermittent and perennial streams. Fish habitat viability and accessibility within these systems are partially restricted by seasonally low water levels and resultant temporary obstacles to fish passage. Suitable overwintering habitat within stream systems are limited, particularly for juvenile and adult life stages of trout, which

require stable flows, deeper pools, and rocky instream cover. Aquatic features primarily provide suitable young of year and juvenile rearing habitat for brook trout and juvenile American eel, as well as foraging opportunities for adult life stages. Other species confirmed or potentially residing in the PA are generally restricted to low velocity areas with a direct connection to Gold Brook or Gold Brook Lake. The lack of identified suitable spawning habitat for brook trout within the PA is likely a limiting feature to overall brook trout productivity. Overall, low pH levels and low DO concentrations limit fish habitat quality within the small, intermittent streams throughout the PA. Smaller first and second order streams with more permanent flow regimes may provide areas of summer thermal refuge for brook trout, a cold-water species.

Proposed offsetting ratios for direct and indirect impacts are provided in Table 6. Indirect impacts refer to flow reduction only. The amount of fisheries offsetting required for impacts are preliminary recommendations to satisfy DFO's Fish and Fish Habitat Protection Policy Statement guidance. These ratios may be adjusted to account for any uncertainties with the offset measures or time lags between habitat impacts and offsets. Offsetting ratios may increase if long lag-times are anticipated before offsetting measures become fully functional. Based on the varying degrees of flow reduction, Anaconda is proposing various offsetting ratios to reflect the predicted impacts to fish habitat. Rationale behind the proposed ratios selected is provided in the EARD.

Table 6. Summary of Direct and Indirect Impacts to Fish Habitat

Watercourse system	Impact Type	Impact Area	Proposed Offset Ratio*	Proposed Offset Area*
Multiple	Direct	16,296	2:1	32,592 m ²
Western Tributary to Gold Brook Lake	Indirect	3,800 m ²	1:1	3,800 m ²
Eastern Tributary to Gold Brook Lake	Indirect	3,588 m ²	2:1	7,176 m ²
WC9	Indirect	1,082 m ²	2:1	2,164 m ²
Gold Brook Tributaries	Indirect	1,586 m ²	2:1	3,172 m ²
Total		26,352 m² (264 Habitat Units)		48,904 m² (489 Habitat Units)

* Anaconda acknowledges that DFO will be responsible for determining final ratios for offsetting.

5 CONCEPTUAL FISH HABITAT OFFSETTING

5.1 Approach

Offsetting investigations for the Project are ongoing. A multi-step review process has been undertaken to identify potential offsetting concepts, including:

- Desktop review of local watersheds;
- Desktop review of watersheds containing aquatic Species-at-Risk, with an emphasis on those containing Atlantic salmon;
- Desktop review of watersheds that are known to have been anthropogenically degraded and where fish habitat restoration projects could potentially exist;
- Engagement with the Mi'kmaq of Nova Scotia to discuss fish habitat restoration priorities;
- Engagement with community-based watershed groups to discuss fish habitat restoration priorities;

- Engagement with landowners; and,
- Field assessment of locations identified in the desktop review process to determine their feasibility.

Conceptual offsetting projects presented within this Plan have been developed using DFO guidance and includes locations where offsets may be both technically and logistically feasible while also being primarily beneficial for fish species impacted by the Project – American eel and brook trout. Specifically, fish habitat impacted by the Project provides suitable juvenile rearing, foraging, and thermal refuge for these species.

Sections 5.1.1 through 5.1.3 describe the approach for identification and selection of offset projects. Section 5.2 provides an overview of the preliminary offsetting concepts identified through desktop review. Section 5.3.1 presents conceptual options in more detail where relationships with landowners have been established through ongoing engagement and/or access agreements. Section 5.3.2 describes an additional group of high priority, preliminary offsetting options identified through desktop review that require landowner engagement and field verification.

5.1.1 Goals and Objectives

Preliminary offsetting identification and selection have been guided by the principles from DFO's Policy for Applying Measures to Offset Adverse Effects on Fish and Fish Habitat (2019b):

- Principle 1: Measures to offset should support fisheries management objectives and give priority to the restoration of degraded fish habitat.
- Principle 2: Benefits from measures to offset should balance the adverse effects resulting from the works, undertakings of activities.
- Principle 3: Measures to offset should provide additional benefits to the ecosystem.
- Principle 4: Measures to offset should generate self-sustaining benefits over the long term.

The first principle states that DFO gives priority to offsetting measures that focus on the restoration of degraded fish habitat. Measures to offset should be designed to contribute to the restoration of degraded fish habitat provided within existing fisheries management plans, or to consult with Indigenous groups, fisheries managers, local organizations, and stakeholders to help identify areas that would benefit from restoration or enhancement (DFO, 2019b). Section 5.3 outlines the types of projects considered for offsetting, with priority given to those that address habitat degradation. The Elver Integrated Fisheries Management Plan (IFMP; DFO, 2018) was the only fisheries management plan identified with possible implications for project offsetting; however, elver fishing typically occurs in tidal waters or up to 1000 m upstream of the tidal water boundary, and specific issues relating to freshwater habitat degradation are not addressed in the IFMP. Aside from species predicted to be directly impacted by the project, priority for offsetting projects has been given to those located in watersheds that support aquatic Species-at-Risk, particularly Atlantic salmon. Atlantic salmon are extremely well studied and threats to freshwater habitat are well documented (e.g., COSEWIC Assessments, Recovery Potential Assessments, Recovery Plans and Action Plans). In addition, American eel was identified as a priority species for offset planning through engagement with the Mi'kmaq of Nova Scotia.

The second principle describes how measures to offset should be scaled such that they are proportional to the residual effects. Measures are most likely to balance the residual effects when they benefit the specific local fish population and fish habitat, and it is therefore preferable that offsetting projects be located

within the vicinity of the works or within the same waterbody or watershed (DFO, 2019b). However, there is flexibility in the selection of measures to locations outside of the immediate project area provided the measures are supported by clear fisheries management objectives and regional restoration priorities (DFO, 2019). In keeping with the second principle, the identification of offsetting opportunities was first performed within the local watershed, then in consideration of the regional context, expanded to southern upland watersheds of the Eastern Shore. Rationale for the selection of priority watersheds, including those located away from the project site, is provided in Section 5.2. American eel and brook trout, the two species primarily impacted from residual effects, are ubiquitous throughout mainland Nova Scotia and occupy a variety of freshwater habitat types. As such, opportunities to offset outside of the immediate project area can be targeted towards these species.

The second principle also provides flexibility in offsetting forms, differentiating between “in-kind” and “out-of-kind” approaches. Priority for offsetting concepts was given to in-kind measures to offset, through which fish and fish habitat that is adversely affected is replaced by the same quantity or quality of the same type of fish or fish habitat (DFO, 2019b). Offsetting concepts may also employ an “out-of-kind” approach, by which fish habitat that is adversely affected is replaced by an appropriate quantity and quality of a different type of fish or fish habitat than was adversely affected. Though it can be more difficult to measure and compare the residual effects with fish and fish habitat benefits associated with out-of-kind approaches, in some cases the resulting habitat has greater capability to produce and sustain fish (DFO, 2019b).

Under the third principle, any coincidental positive benefits of the Project authorized have not been considered as measures to offset. Similarly, the restoration of degraded sites, for which the proponent, another person or organization is responsible for (e.g., public road crossings) have not been considered in the overall quantification of offsetting measures. The restoration of orphaned sites (i.e., those with no known responsible party or owner or with no possibility of restoration due to company closure, bankruptcy or other similar circumstance) has been considered as a potential measure during offset identification and selection.

The fourth and final principle states that measures to offset should strive to generate self-sustaining benefits to fish and fish habitat conservation and protection, wherein the benefits of offsetting should last at least as long as the adverse effects from the project (DFO, 2019b). Therefore, measures that would require continuous intervention to sustain fish were not considered.

5.1.2 Priority Watersheds

DFO’s guiding principles clarify a preference for offsetting measures located within the vicinity of a Project, as measures to benefit local fish populations and fish habitat are most likely to balance the residual effects of a project (DFO, 2019b). The PA is predominantly found within the secondary shore direct watershed (1EQ-SD31, herein referred to as the “Gold Brook secondary watershed”), extending slightly into New Harbour/Salmon Primary watershed, with Project impacts present within the Gold Brook secondary watershed (with the exception of minor direct impacts to wetlands straddling the watershed divides). In keeping with DFO’s guiding principles, preliminary offset identification was first initiated within the Gold Brook secondary watershed, in the immediate vicinity of the PA. Potential offset identification was then expanded to primary watersheds that contain the PA – the New Harbour/Salmon and Country Harbour primary watersheds.

The desktop review for potential offset concepts was then broadened to within primary watersheds with anticipated ecological similarities to that of the PA (i.e., Southern Upland watersheds along the Eastern Shore). This included the St. Mary's, Liscomb, and the East/West Sheet Harbour primary watersheds (Figure 8). Proven techniques in these geographic settings that could support similar fish species through in-kind habitat restoration were prioritized to offset lost habitat, as they were considered lower-risk and biologically relevant.

Three additional drivers guided selection of priority watersheds for offset identification (in order of priority): watersheds that support Atlantic salmon, watersheds with proportionally higher rates of anthropogenic disturbance, and watersheds where landowner relationships have been established. Rationale behind these drivers is provided in Sections 5.1.2.1 through 5.1.2.3. Based on these drivers, the Musquodoboit and Shubenacadie/Stewiacke primary watersheds were added to the desktop review (Figure 8).

5.1.2.1 *Atlantic Salmon*

Supported by ongoing consultation with DFO, MEL and Anaconda have identified Atlantic Salmon as a priority species for offsetting projects. Atlantic Salmon populations are categorized into several Designatable Units within Nova Scotia, including but not limited to the Inner Bay of Fundy population (iBoF; Schedule 1 – Endangered, COSEWIC - Endangered), and Southern Uplands population (SU; Schedule 1 – pending, COSEWIC – Endangered). Atlantic Salmon require several different habitats to complete a life cycle including both marine and freshwater habitat. The major freshwater habitat types for Atlantic salmon are used for feeding, overwintering, spawning, early life-stage nursery, and rearing habitats (DFO, 2010).

Freshwater salmon habitat is threatened by the effects of agriculture, urbanization, poor forestry practices, road building, and other factors related to human activities. Decreased smolt production due to habitat degradation, low pH, and temperature increases have been observed. Acidification of freshwater habitats brought about by acidic precipitation is a major threat, particularly for the SU population (DFO, 2010).

Freshwater threats to the iBoF population are not considered to be the leading cause of their decline as marine survival is very low. The persistence of iBoF Salmon currently requires maintaining existing populations through an ongoing live gene bank program. However, creating and maintaining the necessary conditions to conserve the genetic characteristics of iBoF salmon is paramount to re-establishing wild self-sustaining populations. As outlined in the iBoF salmon Recovery Strategy (DFO, 2010), one of the five prioritized supporting recovery objectives is to identify and remedy anthropogenic threats limiting survival and/or recovery of iBoF salmon in the freshwater environment. Threats to the species in the freshwater environment are both historical and current, including loss and degradation of habitat (particularly construction of barriers), interbreeding with escaped farmed fish, and changes in water quality (DFO, 2010). As stated in the Recovery Strategy, “the freshwater habitat quality and quantity must continue to be assessed, protected, and where necessary rehabilitated” (DFO, 2010).

Similarly, marine survival is considered an ongoing threat to the recovery of the SU salmon. In contrast with iBoF salmon, recovery actions focused on improving freshwater productivity are expected to reduce extinction risk for SU salmon. DFO states that “watershed-scale factors have the potential to override factors controlling salmon abundance at smaller spatial scales (i.e., within the stream reach)” (DFO, 2013b). Extinction risk for SU salmon may be reduced by focusing recovery actions on improving

freshwater productivity (DFO, 2013b). More specifically, “the ability to reach recovery targets may be partially dependent on the mitigation of freshwater threats” (DFO, 2013b).

Three of the priority watersheds previously recognized as nearby watersheds to the Project (St. Mary’s, Liscomb, and the West Sheet Harbour) contain focus areas for restoration identified by the Nova Scotia Salmon Association (Figure 8). The Musquodoboit is also considered a priority Southern Upland watershed for restoration and located along the Eastern Shore. The Stewiacke River, located within the Shubenacadie/Stewiacke primary watershed, is designated critical habitat for iBoF salmon.

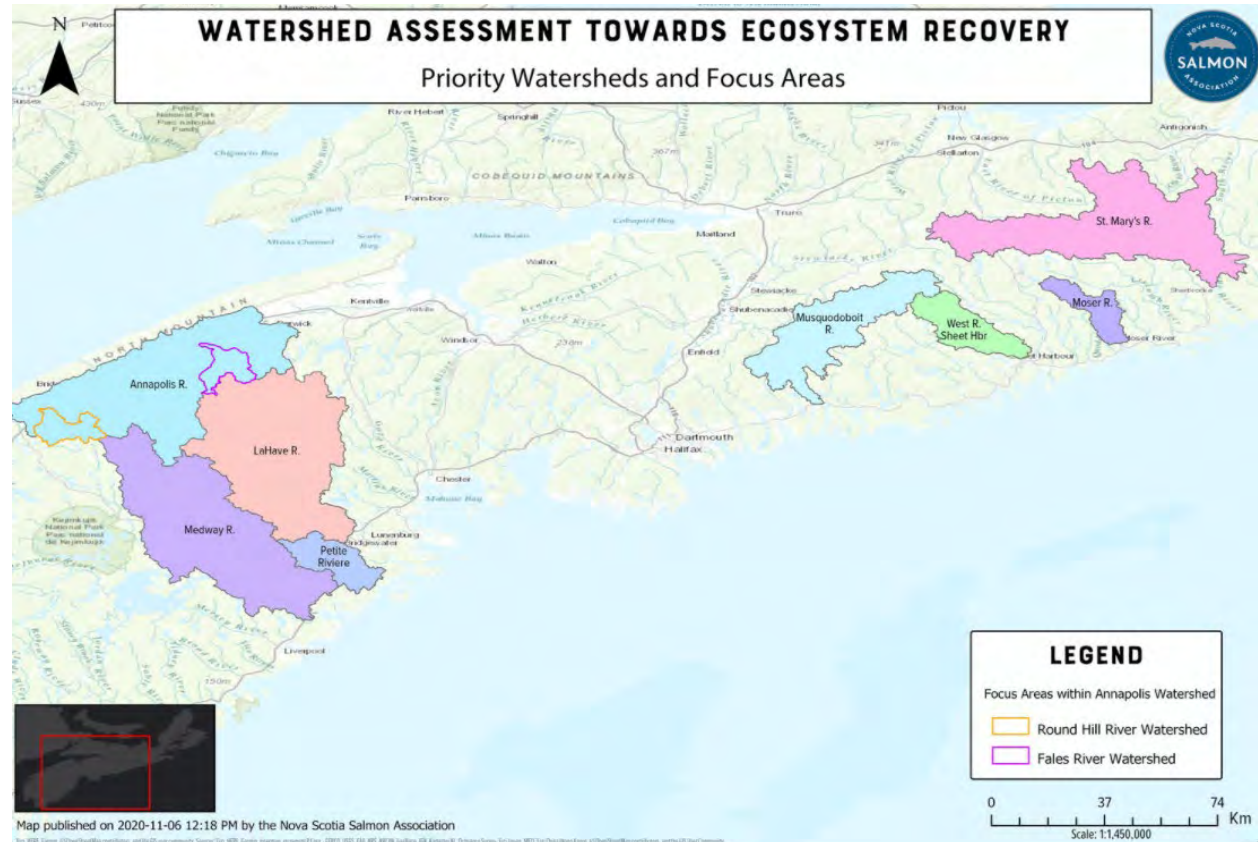


Figure 7. Southern Uplands Atlantic Salmon Priority Watersheds (NSSA, 2020)

5.1.2.2 Anthropogenic Disturbance

Anthropogenic disturbance poses a multitude of threats to fish habitat and its ability to support fish species. Watersheds with higher rates of anthropogenic disturbance were prioritized for review, as the potential for opportunities for restoration of degraded habitats are expanded.

The Nova Scotia Watershed Assessment Program (NSE, 2011) provides information on the current state of watersheds in the province by evaluating watershed impact indices including human land use, acidification, surface and groundwater usage, and road density.

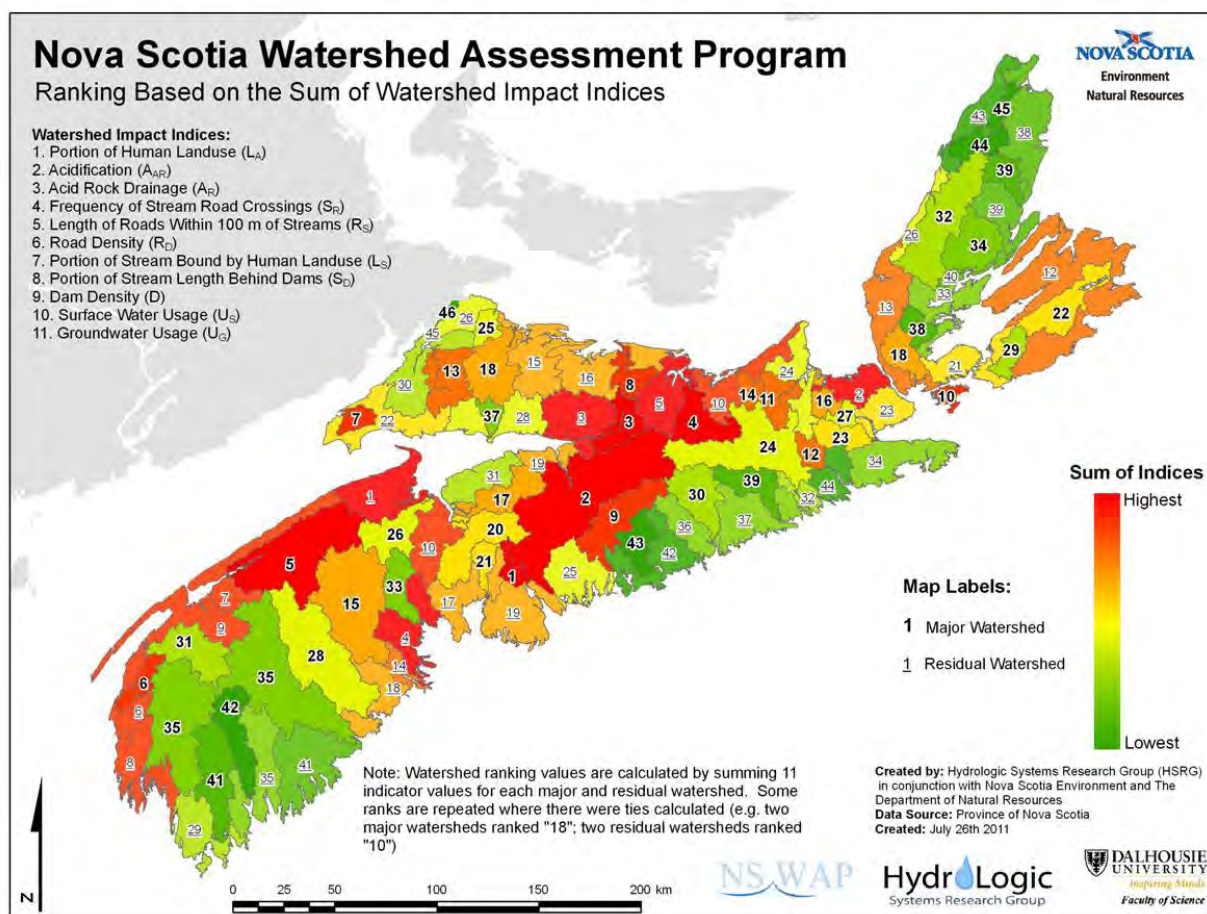


Figure 8. NS Watershed Assessment Program: Watershed Rankings (NSE, 2011)

As noted in Figure 9, watersheds concentrated along the Eastern Shore are amongst the lowest ranking watersheds for impact in the province. In other words, these watersheds are proportionally less impacted than other watersheds in the province, which may limit options for habitat restoration. The St. Mary's River secondary watershed (#24), as an exception, is considered moderately impacted, as well as the Country Harbour River secondary watershed (#44). Accordingly, most offsetting opportunities in proximity to the PA were identified within these areas (Section 5.2).

The Shubenacadie secondary watershed (#2), which contains the Stewiacke River, was ranked 2nd highest in the province overall watershed impact (Figure 9). The most adverse impacts to the watershed include agriculture, forestry, and road density. The Musquodoboit River secondary watershed (#9) is ranked 9th and is similarly impacted by forestry and road density (NSE, 2011). These watersheds may provide ample opportunities for habitat restoration for a variety of fish species including species-at-risk.

5.1.2.3 *Landowner Relations*

Landowner collaboration is essential to the viability of fisheries offsetting projects. MEL has demonstrated productive, working relationships with landowners in the Shubenacadie/Stewiacke and Musquodoboit watersheds through completed and ongoing wetland and fisheries compensation projects. In addition, MEL has been approached by landowners in the St. Mary's watershed to discuss potential fish habitat restoration opportunities. MEL and Anaconda are currently working to foster these relationships as it relates specifically to the Project. Offsetting concepts for which landowner discussions and/or agreements are ongoing are described in Sections 5.3.1.1 through 5.3.1.4.

5.1.3 Types of Projects

Table 6 presents types of offsetting projects considered and investigated within the priority watersheds. As well, the desktop methods used by MEL to identify these projects are presented.

Table 7. Offsetting Project Types and Identification Methods

Offsetting Project Type	Target Receptor Features and Desktop Identification Method	Actions	Fish Habitat Benefits
Stream Naturalization	Linear ditches and anthropogenically straightened watercourses and highly eroded channels. <u>Identification Methods:</u> <i>identification of straight channels via aerial imagery, flow accumulation and provincial watercourse mapping layers.</i>	Physical re-alignment of the straightened channel alignment to a natural pattern, restoring morphological features such as riffles, runs and pools in order to redirect flows to reduce erosion, restore and create new habitat.	Creation of complex habitats to replace homogenous habitat. This will diversify channel characteristics and increase support for fish species/life stages.
Stream Stabilization	Actively eroding banks, lacking vegetative cover and/or intact vegetated buffers. <u>Identification Methods:</u> <i>Flow accumulation and provincial watercourse mapping layers in combination with aerial imagery to identify non vegetated features.</i>	Planting of the watercourse bank with native riparian species and/or a wider extent of buffer. Implement a livestock grazing plan to ensure riparian vegetation can re-establish. Installation of bank stabilization structures (e.g., brush bundles, brush mats, riprap/vegetation combinations, etc.).	Buffers potential contaminants entering feature. This is specifically important in agricultural settings. Reduces potential flooding by storing flood waters. Stabilizes stream banks and provides organic material for food source. Moderates water temperatures during summer and provides shade for fish.

Offsetting Project Type	Target Receptor Features and Desktop Identification Method	Actions	Fish Habitat Benefits
Habitat Enhancement	Features that are considered degraded or present poor productive capacity. <i>Identification Methods: Desktop review and field assessment.</i>	Physical manipulation of habitat to enhance fish use i.e., - installation of in-stream features (reefs, boulders, spawning beds, digger log, woody debris). - Sand wanding: removal of sand and silt and exposure of gravels and rock on substrate. - Placement of spawning and rearing substrates.	Improves habitat function (or specific fish species and lifecycles) such as spawning, rearing, feeding and overwintering.
Barrier Removal	Features that have known barriers to fish passage. <i>NOTE: these projects are only feasible when no regulatory responsibility to a landowner is present.</i> <i>Identification Methods: Flow accumulation and provincial watercourse mapping layers in combination with aerial imagery to identify signs of blocked flow (i.e., back flooding/inundation).</i>	Removal of fish barrier and reinstallation of new structure to allow fish passage.	Allows fish to migrate to potential upstream habitats.

Offsetting Project Type	Target Receptor Features and Desktop Identification Method	Actions	Fish Habitat Benefits
Flow Management	Features (usually rivers and/or lakes) that have been subject to flow regulation (i.e., dams or re-direction of input). Flow regulation could have been as a result of adjacent land development activities where preferred hydraulic characteristics have been altered. <i>Identification Methods: Flow accumulation and provincial watercourse mapping layers in combination with dam locations, and aerial imagery to identify adjacent land development.</i>	Reinstate natural baseflows to an aquatic system to restore pre-development/alteration hydraulics (i.e., barrier or dam removal, realign agricultural ditching/historical stream routes or naturalize surrounding land drainage characteristics).	Increase productivity by changing the availability of preferred hydraulic habitat or water quality conditions (temperature, vegetation and suspended solids).
Habitat Creation	Existing watercourses that have reduced productivity OR dry terrestrial habitat. <i>Identification Methods: Flow accumulation and provincial watercourse mapping layers in combination with aerial imagery to identify water features that could be expanded or created including:</i> - A perennial source of water; - Land availability (i.e., non-developed/unused) - Suitable topographical conditions (flat/gently sloping).	Creation or expansion of streams, lakes, on-line or side channels, estuaries or wetlands. Created features involves connection to existing aquatic features and could potentially involve redirection of surface water systems to provide a source of water to the new feature.	An increase in fish habitat productivity similar to or greater than affected (lost) area. This can be designed and implemented to meet species and/or ecosystem habitat objectives.

5.2 Desktop Review

Desktop analyses were completed to scope preliminary offsetting concepts. Offsetting project locations performed within Priority Watersheds identified in Section 5.1.2 using Google Earth™ and other satellite imagery (e.g., Esri). For each site, potential offsetting project type(s) (those listed in Table 6) were identified and limitations were summarized. Figure 10 provides locations of preliminary opportunities for fisheries offsetting. Offset project identification within the Shubenacadie/Stewiacke and Musquodoboit watersheds is only partially complete and will continue through the offset planning process.

Suitable habitat restoration options were not identified within close proximity of the Project due to the limited size of the secondary watershed, the concentration of Project infrastructure within it, and the relatively hydrologically undisturbed nature of the watershed. No potential offsetting opportunities were identified through desktop investigation within the New Harbour/Salmon, Liscomb, or East/West Sheet Harbour watersheds. This is likely due to the proportionally lower impact of anthropogenic disturbance within these nearby Southern Upland watersheds (Section 5.1.2.2), and limitations related to the resolution of satellite imagery.

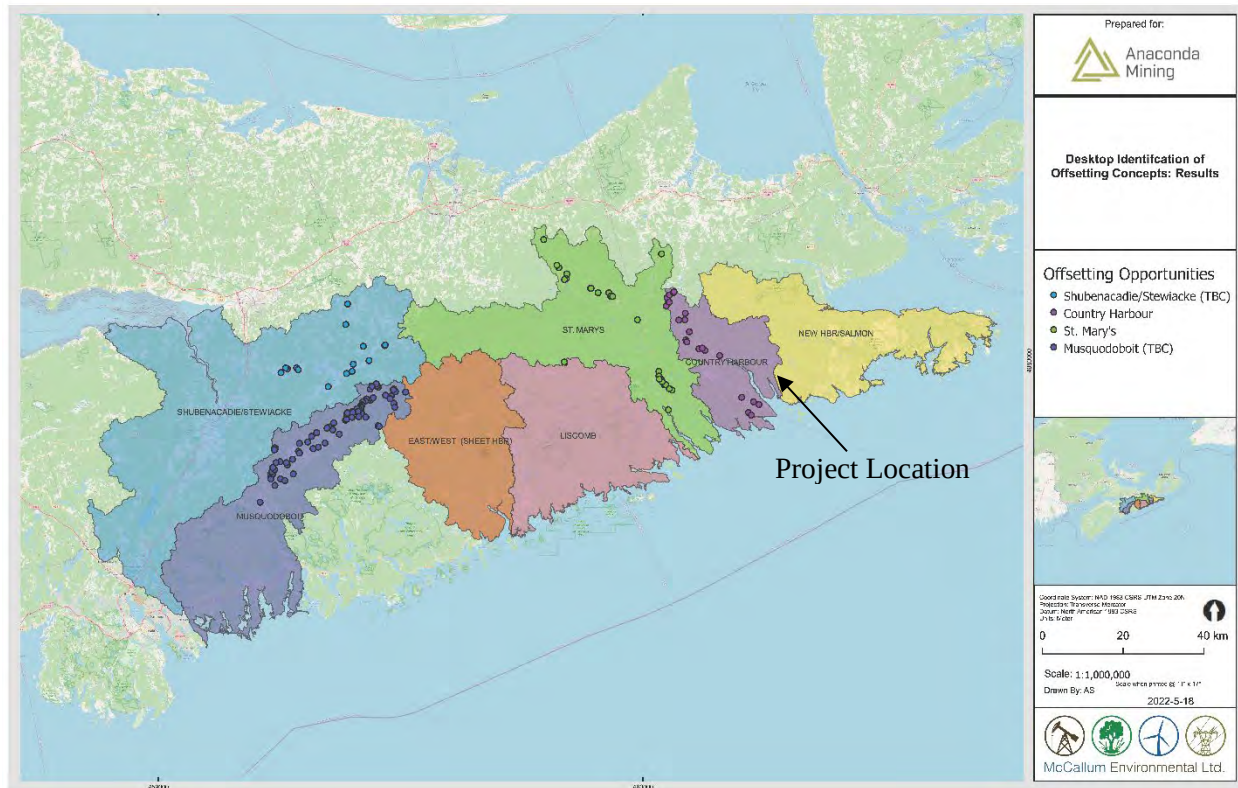


Figure 10. Desktop Review of Preliminary Offsetting Options

A total of 142 potential fisheries offsetting projects were identified through desktop review and located within the Country Harbour, St. Mary's, Musquodoboit, and Shubenacadie/Stewiacke primary watersheds (Figure 10). Based on the results of the desktop review, MEL will continue to undertake field surveys and further evaluation of overall feasibility. During field surveys, MEL will engage with landowners to determine their interest in collaborating in a potential fish offsetting project.

Offsetting concepts that have been further refined based on landowner discussions and/or agreements are described in Sections 5.3.1.1 through 5.3.1.4. High priority offsetting sites identified via desktop review that have not yet been field verified and/or discussed with landowners are outlined in Section 5.3.2.

5.3 Offsetting Options Under Consideration

Potential offsetting concepts (identified in Table 8) were developed with only preliminary regulatory consultation and Mi'kmaq engagement. Preferred offsetting options will be further refined based on discussions with DFO, the Mi'kmaq of Nova Scotia, and relevant stakeholders during the planning process.

Each concept was evaluated across three general categories that describe various aspects of option feasibility: technical, biological, and cost effectiveness. Potential options were scored by consideration of multiple criteria including:

- Adherence to DFO's principles and policy for offsetting;
- Proximity to the PA;
- Self-sustaining;
- Technically feasible and economically viable; and
- Provide similar "in-kind", or higher quality, habitat as an offset

Each criterion was scored from 1-3. Scores are defined in Table 7. Overall scores were used to rank the conceptual offsetting options. Ranking was completed without input from Mi'kmaq, stakeholder, or regulatory consultation and is therefore considered preliminary. This ranking is anticipated to be adjusted with future engagement efforts.

Options considered and ranked include the rehabilitation of degraded aquatic habitats caused by channelization of streams and draining of former wetland areas by agricultural activities. Restoration methods are well-known and can be very successful if used in the proper location.

Table 8. Score Legend for Candidate Fish Habitat Offset Options

Score	Meaning	Definition
1	Low	Low feasibility, certainty, and/or applicability of the proposed offset concept relative to the specific category.
2	Moderate	Moderate feasibility, certainty, and/or applicability of the proposed offset concept relative to the specific category.
3	High	High feasibility, certainty, and/or applicability of the proposed offset alternative relative to the specific category.

Table 9. Description and Evaluation of Candidate Conceptual Offsetting Options

Concept Option	Description	Evaluation			Overall Score	Rank
		Technical	Biological	Cost-Effectiveness		
Stream rehabilitation: Campbell’s Brook and Tributary	Restoration of degraded aquatic riverine habitat through riparian and in-stream rehabilitation.	<u>Design (3)</u> In-stream and riparian restoration techniques are well known and common practice. <u>Access/Land Tenure (3)</u> Site is easily accessed by work crews/equipment. Established landowner relationship. Landowner on board with conceptual plan. <u>Construction (3)</u> Stream rehabilitation uses standard methods.	<u>Location (3)</u> Outside of PA, but in Priority and nearby watershed (St. Mary’s). <u>Relevance (2)</u> Similar species composition expected (southern uplands); however, baseline data gathering required. Desirable to provide riverine habitat gains for riverine losses. <u>Additional Benefits (3)</u> Campbell’s Brook is a known salmon stocking river. Options to improve deficiencies in existing habitat could provide overall higher quality riverine habitat than habitat lost. Restoration of habitat can be focused on target species. Opportunity to provide fish access to additional habitat upstream of dilapidated culverts through replacement (not considered an offset at this time).	<u>Cost (3)</u> In-stream restoration is cost effective, can likely be done by hand/minimal equipment. <u>Habitat Gains (1)</u> The channel is existing and may only receive partial credit for improvement. Habitat amount credited to offset uncertain. Length/habitat area to restore is limited. Additional compensation also required.	21	1
Stream and Floodplain Restoration: Gulley Brook	Restoration of degraded aquatic riverine habitat and floodplain restoration through re-naturalization and the creation of integrated, on-line channel open water features.	<u>Design (3)</u> Re-naturalization of a river that was historically ditched – this is a common practice. On-line open water habitats as part of re-naturalization is a simple and popular concept for offsetting. Basic fisheries and engineering values needed to replicate habitat. Requires information relating to targeted fish community to understand habitat requirements and feasibility within new channel. Most information is available or readily obtainable. Engineering studies required to verify location and depths of channel and open water features. <u>Access/Land Tenure (2)</u> Site accessible via public roadways but may require construction of access roads to mobilize equipment. Established landowner relationship. Landowner on board with conceptual plan. <u>Construction (2)</u>	<u>Location (2)</u> Located outside of PA, but in priority watershed (Shubenacadie/Stewiacke). <u>Relevance (2)</u> Site lies within an existing aquatic corridor. Target species known in watershed; however, baseline data gathering required. <u>Additional Benefits (3)</u> Could provide overall higher quality riverine and open water habitat than habitat lost. Restoration of habitat can be focused on target species but would likely provide benefits to other fish species. Opportunity to provide additional habitat features that support non-fish species (e.g., turtle nesting beaches).	<u>Cost (2)</u> Channel naturalization and waterbody construction cost is moderate. <u>Habitat Gains (2)</u> 100% of the new open water basins should be credited as offset. Partial credit may be given to river restoration to account for alteration to existing ditched channel. Additional compensation also required.	18	2

Concept Option	Description	Evaluation			Overall Score	Rank
		Technical	Biological	Cost-Effectiveness		
		Channel restoration, construction and open water habitat creation is relatively predictable. New basins can be constructed in isolation and filled prior to connection. Excavations and habitat placements within restored channel and open water footprint will require moderately complex sediment and erosion control planning to protect downgradient aquatic features. Located in wet, soft terrain and may require winter construction.				
Habitat Creation: Cove Road	Excavate new open water basins connected to tributaries to mainstem Stewiacke River.	<u>Design (1)</u> Pond creation is simple and popular concept for offsetting. Basic fisheries and engineering values needed to produce suitable habitat for target species. Most information is available or readily obtainable. Engineering studies required but previous wetland/pond creation/hydrological assessment demonstrate concept is feasible. Pond creation considered a lower priority for offsetting design. <u>Access/Land Tenure (2)</u> Site accessible via public roadways and access roads exist, but additional access road creation likely needed. Established landowner relationship. Landowner on board with conceptual plan. <u>Construction (2)</u> New pond construction is relatively predictable. New basins can be constructed in isolation and filled prior to connection. Excavations and habitat placements within new pond footprint will require moderately complex sediment and erosion control planning to protect downgradient aquatic features. Located in wet, soft terrain and may require winter construction.	<u>Location (2)</u> Located outside of PA, but in priority watershed (Shubenacadie/Stewiacke). <u>Relevance (2)</u> Site lies within an existing aquatic corridor. Target species known in watershed; however, baseline data gathering required. <u>Additional Benefits (2)</u> Could provide overall higher quality lacustrine habitat than habitat lost (example: Beaver Pond). Restoration of habitat can be focused on target species but would likely provide benefits to other fish species. Opportunity to provide additional habitat features that support non-fish species (e.g., turtle nesting beaches).	<u>Cost (2)</u> Waterbody construction cost is moderate. <u>Habitat Gains (2)</u> 100% of the new open water basins should be credited as offset. Pond sizes are limited by natural topography, additional compensation also required.	15	4
Channel restoration: Gays River	Realignment to reflect historic, natural geomorphic channel.	<u>Design (2)</u> Restoration of original alignment of river – this is a common practice. Basic fisheries and	<u>Location (2)</u> Located outside of PA and in unique ecological unit – tidal influence. In priority watershed (Shubenacadie/Stewiacke). <u>Relevance (1)</u>	<u>Cost (1)</u> Cost per unit of restored channel is high. <u>Habitat Gains (2)</u>	16	3

Concept Option	Description	Evaluation			Overall Score	Rank
		Technical	Biological	Cost-Effectiveness		
		engineering values needed to replicate habitat. Requires information relating to targeted fish community to understand habitat requirements and feasibility within new channel. <u>Access/Land Tenure (3)</u> Site accessible via public roadways and access roads exist throughout the site. Established landowner relationship. <u>Construction (2)</u> New channel construction is relatively common and predictable. Actual new alignment is in soft wetland terrain and may require winter construction and or a new construction access road. Sizeable drainage area/tidal influence results in larger water management needs. Can use existing channel and construct most of the new alignment in isolation.	Target species unlikely to use as residence, but potential for American eel migratory passage. Baseline data gathering required to further understand fish community. <u>Additional Benefits (3)</u> Additional design features can be readily integrated to convert the realignment into a full ecologically functional channel with integrated floodplain. Potential to provide upstream flood mitigation in combination with wetland restoration project.	100% of the realigned channel could be credited towards offsetting but may only receive partial credit due to partial dewatering of existing ditched channel. Additional compensation would also be required.		
Restoration of Degraded Aquatic Habitat – Preliminary Desktop Review	Restoration of degraded habitats in priority watersheds identified through desktop review.	<u>Design (2)</u> Measures to improve existing habitat would require detailed baseline data to compare to predicted values. Data requirements would be determined on a location-by-location basis. Preliminary offsetting measures identified largely incorporate in-stream, bank and riparian restoration which are common practice. <u>Access/Land Tenure (1)</u> Access unknown without further study. Landowner agreements would be required. <u>Construction (2)</u> Habitat rehabilitation methods relatively standard. Complexity of construction methods and mitigation required will depend on the site.	<u>Location (2)</u> Projects have been located in priority watersheds, including some within a primary watershed of PA. <u>Relevance (2)</u> American eel and brook trout are found in a variety of aquatic habitats and are distributed throughout the province. Rehabilitation of habitat in other watersheds can generally target these species. <u>Additional Benefits (1)</u> Possible collaboration with Mi’kmaq or local conservation groups.	<u>Cost (1)</u> Cost per unit of habitat is unknown but is expected to be high. <u>Habitat Gains (2)</u> Habitat area to meet Project requirements is currently being refined, but multiple projects likely needed. Existing habitat improvements may only be given partial offsetting credit.	13	6

Concept Option	Description	Evaluation			Overall Score	Rank
		Technical	Biological	Cost-Effectiveness		
Complementary Measures	Measures to improve existing fisheries knowledge in areas of interest to Mi'kmaq.	<u>Design (2)</u> Study designs vary in complexity. Often involves collaboration between multiple groups.	<u>Location (2)</u> Works are generally requested/proposed in locations of interest to Mi'kmaq, the public or government.	<u>Cost (2)</u> Generally cost effective to conduct studies, but may be adjusted to overall plan cost.	15	5
		<u>Access/Land Tenure (1)</u> Land access likely feasible but may require landowner agreements.	<u>Relevance (2)</u> Studies commonly examine existing aquatic habitat/fisheries.	<u>Habitat Gains (1)</u> Maximum credit of 10% of the total offset.		
		<u>Construction (3)</u> Limited construction, if any. Centers on study design and logistics.	<u>Additional Benefits (2)</u> Measure can inform decision-making and can be relevant to ongoing project activities and/or future habitat restoration initiatives.			

5.3.1 Offsetting Opportunities – Current Evaluations

5.3.1.1 *Proposed Offsetting Concept – Campbells Brook and Unnamed Tributary*

MacLennan's Brook is an unnamed, 1st order stream that drains into Campbells Brook, a major tributary to the East Branch of the St. Mary's River near Willowdale (referred to herein after current landowners, Westland and Judy MacLennan). The location of the proposed offsetting concept is provided in Figure 11.



Figure 11. Campbells Brook and Tributary Offsetting Concept

The MacLennan's Brook channel meanders through an active beef farming operation, and cattle are not restricted from the watercourse. Cattle have trampled the channel banks and bed while grazing and watering, which has led to a lack of a defined channel, over-widening, and fine sediment input. The existing channel is devoid of any riparian cover, and the stream banks are actively eroding (Figure 12). These factors have resulted in a homogenous, shallow riffle habitat type. Proposed rehabilitation to target these sources of degradation include riparian restoration as well as the installation of instream structures.



Figure 12: Representative Photos of MacLennan's Brook

Riparian re-establishment, through the exclusion of livestock and bank stabilization through plantings, will greatly enhance the habitat for fish. The full length of channel (approximately 560 m) will have fencing erected on either side at an estimated distance of 5 m from the bank full width (final location of fencing will need approval from the landowner), and streamside vegetation will be planted.

Instream features such as digger logs, deflectors, and/or rock sills will be installed to re-instate pool:riffle habitat complexity and to encourage channel narrowing. The types and placement of instream structures would be determined at the design stage once additional site information is collected. The ultimate wetted width within the channel will be adjusted by natural processes (e.g., erosion and deposition); however, estimates of channel flow energy will be completed to ensure any installed structure will remain in place. Fine sediment removal may be conducted via SandWand if fine sediment accumulation is noted as a limiting factor during baseline surveys.

Campbells Brook is an important salmon spawning and nursery tributary with salmon redds being observed in the fall of 2020 (SMRA, 2021). Armour rocking installed as erosion control in the 1980s, and a riparian zone protection project was implemented as part of a wood turtle conservation project further north of the project site (SMRA, 2021). Since the fencing project (2013), the riparian zone vegetation within the fenced corridor has improved and now contains alders, choke cherries and other pioneer floodplain tree and shrub species (SMRA, 2021). However, landowners have indicated that bank armouring work has caused a lack of habitat diversity. Currently, Campbells Brook is dominated by riffle habitat, lacking deeper, slower pools and riparian cover (Figure 13). This portion of the brook is not fenced and like its tributary, cattle are still free to roam.



Figure 13. Representative Photo of Campbells Brook

Restoration of Campbells Brook is proposed to include cattle management through fencing, in addition to riparian planting with a focus on areas where armour rock has been used to stabilize banks. Instream structures like digger logs or deflectors will be installed to promote greater habitat complexity through the formation of deeper pools. It is anticipated that fencing and riparian planting along MacLennan's and Campbells Brook will provide similar results to that observed through SMRA's wood turtle project. Similarly, this proposed restoration plan is in line with the findings of a recent SMRA report that suggest the largest gain for habitat improvement could be achieved by focusing on extensive instream restoration of the tributaries using low-tech structures (e.g., digger logs and riparian zone plantings; SMRA, 2021).

Baseline data, including water quality and fish collection, are required prior to further restoration planning. Water quality parameters are not expected to be limiting to overall restoration, as water quality in the East River is generally considered comparatively much higher quality than the other branches,

making it a good candidate for habitat restoration work (SMRA, 2021). More specifically, the East Branch typically has acceptable pH levels for fish (mid-6 range), as opposed to the low pH of the West Branch (SMRA, 2021). Furthermore, the current landowners have indicated that the tributary used to support recreational fishing for brook trout, but that the activity was no longer viable. The habitat rehabilitation proposed is anticipated to improve habitat suitability for rearing by brook trout, among other species, and potential brook trout spawning in MacLennan's Brook. Erosion control through bank stabilization is anticipated to reduce sedimentation within downstream features, including salmon spawning areas identified in Campbells Brook. The installation of instream structures within Campbells Brook will promote the formation of deeper, salmon holding pools.

The proposed objective of the offset project is the creation of approximately 55 habitat units of high-quality stream habitat to offset HADD related to existing stream habitat within and near the Project infrastructure footprint. Based on past discussions and feedback from DFO, it is anticipated that offsetting projects like the rehabilitation MacLennan's Brook are preferred and should be prioritized. As such, engagement with local Mi'kmaq and watershed groups is ongoing to identify additional similar potential offsetting opportunities to restore degraded habitat in SU salmon watersheds, with a focus on rivers along the eastern shore. Potential additional offsetting opportunities identified through desktop analysis are presented in Section 5.3.2. As shown in Table 8, this alternative was ranked as highest due to the simplicity of habitat restoration techniques and construction, as well as potential additional ecological benefits from the concept.

5.3.1.2 *Proposed Offsetting Concept – Gully Brook*

Gully Brook is located mid-watershed within the Stewiacke River sub-basin. The brook is a third order stream which collects surface water from first order headwaters from topographic highs in Upper Stewiacke, and ultimately terminates at the Stewiacke River. The proposed Gully Brook Project Site is located to the north of the community of Upper Stewiacke, lying west of Otterbrook Road. The project is located on a single property (Figure 14).



Figure 14. Gully Brook Offsetting Concept

Land to the north and east of the lower lying floodplain area rise in elevation and is dominated by undeveloped forested land that has been subject to infrequent tree harvesting activities. Gully Brook's headwater streams originate from these higher lands and these streams drain through the lower lying agricultural area via a combination of undisturbed streams and ditching networks into Gully Brook, which itself has been redirected via ditching through the property from east to west. The current landowner has indicated that the most northern tributary that enters the property from the east contains good brook trout spawning habitat, should trout be able to access it (see Figure 14). Gully Brook eventually re-naturalizes through a low-gradient wetland floodplain at the western end of the property, which has also been drained historically for pastureland. The proposed restoration area will be integrated into this historic floodplain area, which is now characterized as permanently saturated, seasonally inundated former pasture.

The proposed offsetting concept comprises the restoration of Gully Brook and a former floodplain that has been dewatered as a result of agricultural activities. Topographic surveys are still required, but the land parcel proposed for the project site is generally low profile. Small ponds (1000 to 2000 m²) would be constructed as on-line pond habitat and would be located north and south of the re-naturalized channel.

The proposed concept is shown on Figure 15. The concept shown is also easily scalable to cover a larger or smaller area and refined based on future discussions concerning fish habitat losses and offsetting requirements. Channel and on-line pond locations will be determined based on topographic survey data.

Channel naturalization would involve instream channel enhancements such as the addition of rock clusters, woody debris, and rootballs, which are anticipated to provide suitable habitat for rearing for several species, including brook trout and American eel. The on-line open water installations are intended to create integrated, deeper open water habitat suitable for rearing and overwintering by several fish species present in the drainage, including brook trout and American eel. Access would be through a narrow channel connected to the primary mainstem habitat.



Figure 15. Conceptual Design – Gully Brook Restoration

The total catchment area to the project site is 919 ha and contributes flow to the site via two upstream tributaries of Gully Brook. The south tributary has a contributing catchment area of approximately 366 ha and the north tributary conveys flow from the remaining 553 hectares. The tributaries converge at the project site. During site investigations, both reaches have exhibited base flow at all times of the year. June

Q60 flow was calculated as 80 litres per second for the northern tributary and 53 litres per second for the southern tributary. There is sufficient base flow predicted to provide oxygenation of the pond system.

Ponds would be constructed with minimum 4:1 side slopes and riparian planting will provide shade cover around the edges of the pond. Pond depth and total volume would be determined following construction of test pits but are expected to be approximately 2.0 to 2.5 m deep. Depth of ponds will be designed with consideration for freezing, but exact depths will be confirmed with further investigation and design.

Maintaining appropriate summer water temperatures will be key to providing self-sustaining habitat for targeted species. The deeper, on-line open water areas are anticipated to increase the residency time of runoff flow through the ditch system, particularly during base flow periods (low flow). To manage water temperature and reduce the risks associated with high temperatures, riparian planting will be completed along the ponds' edges that provide margin shading. Depending on pond size, vegetated islands may be installed to provide greater shade and overhead cover.

Excavation in close proximity to other aquatic features has the potential of resulting in the sedimentation of fish habitat; therefore, a detailed sediment and erosion control plan will be formalized and appended to the final offsetting plan. Furthermore, excavation will be prioritized to be completed during the winter months when travel across frozen ground would reduce impacts of heavy machinery, minimize the need for access construction, and allow easy removal of frozen material. Likewise, construction periods may be timed for when surface flows are at their lowest, making it easier to manage and detain water for a sufficient duration to allow settling.

Brook trout tend to favor the shallow (littoral) areas of lakes; as such, the size of the body of water can be an important indicator of brook trout abundance (Bonney, 2009). Smaller ponds and lakes generally produce more trout per acre than larger ones. In Maine, more than three quarters of the state's brook trout waters are 200 acres or less in size (Bonney, 2009). The on-line open water areas will be constructed with irregular shapes to increase habitat complexity and, depending on size, islands may be strategically placed to increase habitat diversity. Habitat structures, for example rock placement and logs, will be positioned strategically throughout open water features, providing in-situ cover for rearing fish. Gravel "shoals" may be developed to promote brook trout spawning opportunities.

To decrease energetic costs, studies have shown a need for trout to seek suitable winter habitat, which includes low-flow velocities and greater water depth (Cunjak, 1996; Petays et al., 1997; Whalen et al., 1999). The formation of in-stream ice during the winter has been shown to be either detrimental to fish populations (de-watering channels or creating unstable habitat) or beneficial (surface ice acting as cover). Unstable environments caused by frequent thawing and freezing events increase ice formation and movement, forcing fish to move more often, which can lead to a depletion of energy reserves and increase predation (TUC, 2020). Beaver ponds are considered vital overwintering habitats for trout because of their stability. The dams they create halt the movement of frazil and anchor ice, and the pools that form

are deep, with consistent water levels, and slow-moving water (TUC, 2020). Similar conditions are anticipated to be provided through design measures within on-line open water habitats, which will allow stationary ice cover to form and prevent it from breaking and moving. These features will likely provide stable, overwintering habitat for brook trout.

Further investigations and data collection will be required, if deemed an appropriate concept, to finalize the design. Water quality has not been assessed at this site but would be conducted as part of baseline site data collection to ensure parameters are within a suitable range for targeted aquatic species. However, pH values within the site are not anticipated to be limiting based on watershed location and available baseline watershed data. A comprehensive fish community and habitat assessment would also be conducted as part of baseline data collection.

The proposed objective of the restoration project is at a minimum 87.5 habitat units of high-quality stream and open water habitat which could provide partial offset for habitat losses related to streams and open water features within the PA. This alternative was ranked as second highest as it provides restoration through multiple habitat types.

5.3.1.3 *Proposed Offsetting Concept - Cove Road*

The proposed Cove Road Project Site is situated within two properties, both currently owned by the same landowner. The properties lie approximately 360 meters south of the Stewiacke River in between the communities of Middle Stewiacke and Upper Stewiacke, NS (Figure 16). The project site exists on former (and now unused) agricultural land. Land adjacent to the project site comprises additional unused agriculture (east, north and west) land, and undeveloped forested land to the south. Historically, the project site was used for harvesting hay; however, in recent years has been left fallow. The landowner confirmed that prior to farming activities, the project site was much wetter at surface, and that drainage ditches were installed to drain the water from the land.



Figure 16. Cove Road Offsetting Concept

Linear ditching has been historically used to drain the land, reduce surface water levels, and encourage the establishment of suitable grass species for hay making practices. Prior to the installation of the drainage ditches, the project site would likely have detained water as a wetland, prior to naturally draining toward the Stewiacke River via watercourses and open bodies of water. MEL has conducted a wetland restoration project involving the restoration of a large tract of former wetland habitat that has been dewatered as a result of agricultural activities. The restored wetland is a shallow graminoid marsh that incorporates two open water ponds as waterfowl enhancement features. MEL has established a productive relationship with the landowner, as is shown by the successful completion of this wetland restoration project.

A preliminary hydrological assessment for Cove Road is provided in Appendix A. Site conditions are expected to perform the same as the previously constructed wetland restoration areas, shown on Figure 16, at the west end of the site. Because existing ponded areas, depressions, and channels have demonstrated to have water at all times of the year through monitoring associated with the wetland restoration project, the proposed offsetting ponds can be expected to perform similarly. Surface water contributions to the new ponds are from the same large 100.5-hectare catchment area, and the

hydrological analysis indicates there is sufficient base flow contribution from upstream tributaries to provide oxygenation of the proposed pond system. Current ponds are full year-round, which suggests current habitats are also intersect groundwater.

The proposed fisheries offsetting designs include the creation of two additional small, permanent ponds: one within the shallow floodplain area north of a backwater feature of the Stewiacke River (eastern pond), and one west of the berm constructed for the previous wetland restoration project (Figure 16). The construction of a small channel is required at this site to connect the eastern pond to the existing water feature to the south. The existing water feature exhibits bi-directional flow primarily to the Stewiacke River with a subsidiary to the roadside ditching and into previously constructed wetland restoration areas. The new connector channel would be required to provide fish access to the eastern pond and ensure the previously constructed wetland restoration areas supply of water is maintained. The western pond would be tied into an existing tributary which directs flow north to the Stewiacke River.

Approximate proposed pond surface areas are 2.9 ha for the western pond and 1.9 ha for the eastern pond. Pond depth and total volume would be determined during detail design but are expected to be approximately 1.5 to 2.0 m deep, consistent with pond previously constructed on this site associated with the wetland restoration project. The concept is also easily scalable to include smaller ponds over larger areas.

To manage water temperature and reduce the risks associated with high temperatures, riparian planting will be completed along the ponds' edges to provide margin shading, as well as in-pond vegetated islands to provide greater shade cover. Ponds would be constructed with irregular shapes to increase habitat complexity, with islands strategically placed to increase habitat diversity and provide additional overhead cover. Habitat structures, for example rock placement and logs, would be positioned strategically throughout the ponds, providing in-situ cover for rearing fish. Gravel "shoals" would be developed to promote brook trout spawning opportunities adjacent to the shoreline. Consistent water levels within the ponds, anticipated through preliminary hydrological analyses and previous on-site pond creation, are predicted to promote the formation of stationary ice cover. These features would provide stable, overwintering habitat for brook trout and American eel.

Sediment and erosion control measures that were implemented during the wetland restoration project were successful at preventing sedimentation to downstream aquatic features; as such, these measures would be implemented again to support this proposed offsetting conceptual project. Cofferdams and settling ponds would be used to capture sediment while excavation occurs. This method constructs a portion of a pond which is then separated using a berm or other barrier to flow. Then, the next segment of the pond is excavated, all while maintaining flow barriers. Past construction has shown that during summer, surface flows are lower at this site and land is flat, so that it is easy to manage/detain water in the field for a sufficient duration to allow settling.

Further investigations and data collection will be required, if deemed an appropriate concept, to finalize the design. A comprehensive water quality, fish community and habitat assessment would also be conducted as part of baseline data collection.

Overall, the creation of small ponds with integrated habitat features are anticipated to provide 480 habitat units (4.8 ha) of permanent, suitable habitat for young-of-year, juvenile, and adult habitat for most of the species identified within the Project footprint, including brook trout and American eel. In addition, brook trout spawning may be promoted through the installation of suitable gravel substrates. This alternative was ranked as fourth highest due to its constructability but ranks lower due to the type of offset (habitat creation rather than restoration).

5.3.1.4 *Proposed Offsetting Concept - Gays River*

The proposed Gays River Project Site is located near the downstream extent of the river, approximately 250 m upstream of the confluence with the Shubenacadie near Milford, NS (Figure 17). Historically, this portion of the river was realigned to allow access to land for agricultural use (primarily hay production) in the floodplain. The land was further developed/dried by adding dewatering channels throughout the floodplain that drain to the relocated ditched channel.

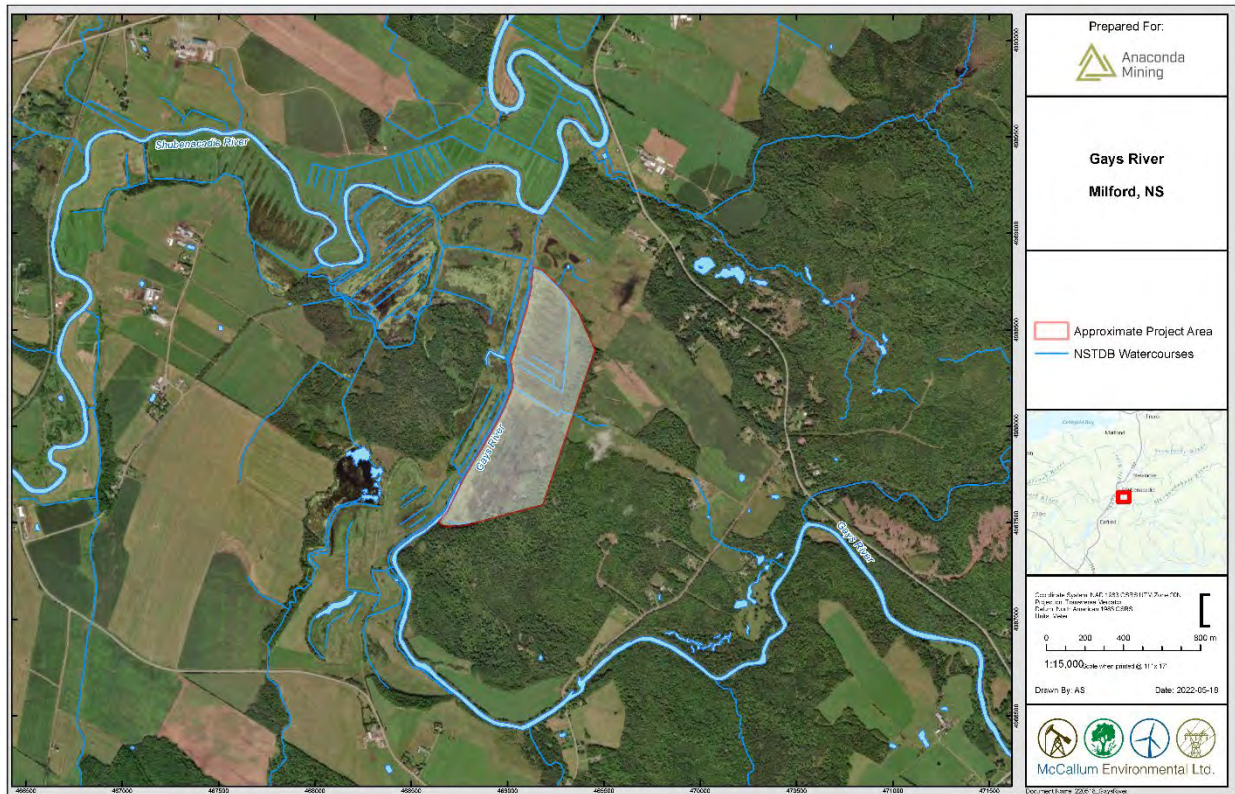


Figure 17. Gays River Offsetting Concept

The ditched channel currently conveys flow from the upstream catchment area and allows a relief path for the dewatering ditches in the subject property to the east of the ditched channel. The ditched channel also receives flow from the western fields through breaks in a dyke that is no longer functioning but was originally constructed to prevent flow from tidal events from inundating the fields. This berm is not on the subject property and is not considered in this assessment. However, the ditched channel reach will remain to provide continuity of flow from this adjacent property. Restoration of the Gays River channel is part of a broader proposed restoration plan at the project site which includes floodplain restoration, which is presented in the Preliminary Wetland Compensation Plan (MEL, 2022) appended to the EARD.

The proposed offsetting concept involves the restoration of the Gays River to its historical route, restoring the river to its natural alignment. MEL has a working relationship with this landowner and has been granted access for initial conceptual analysis of the site. A concept sketch of the proposed design is shown in Figure 18 and is detailed in the preliminary hydrological assessment provided in Appendix A.

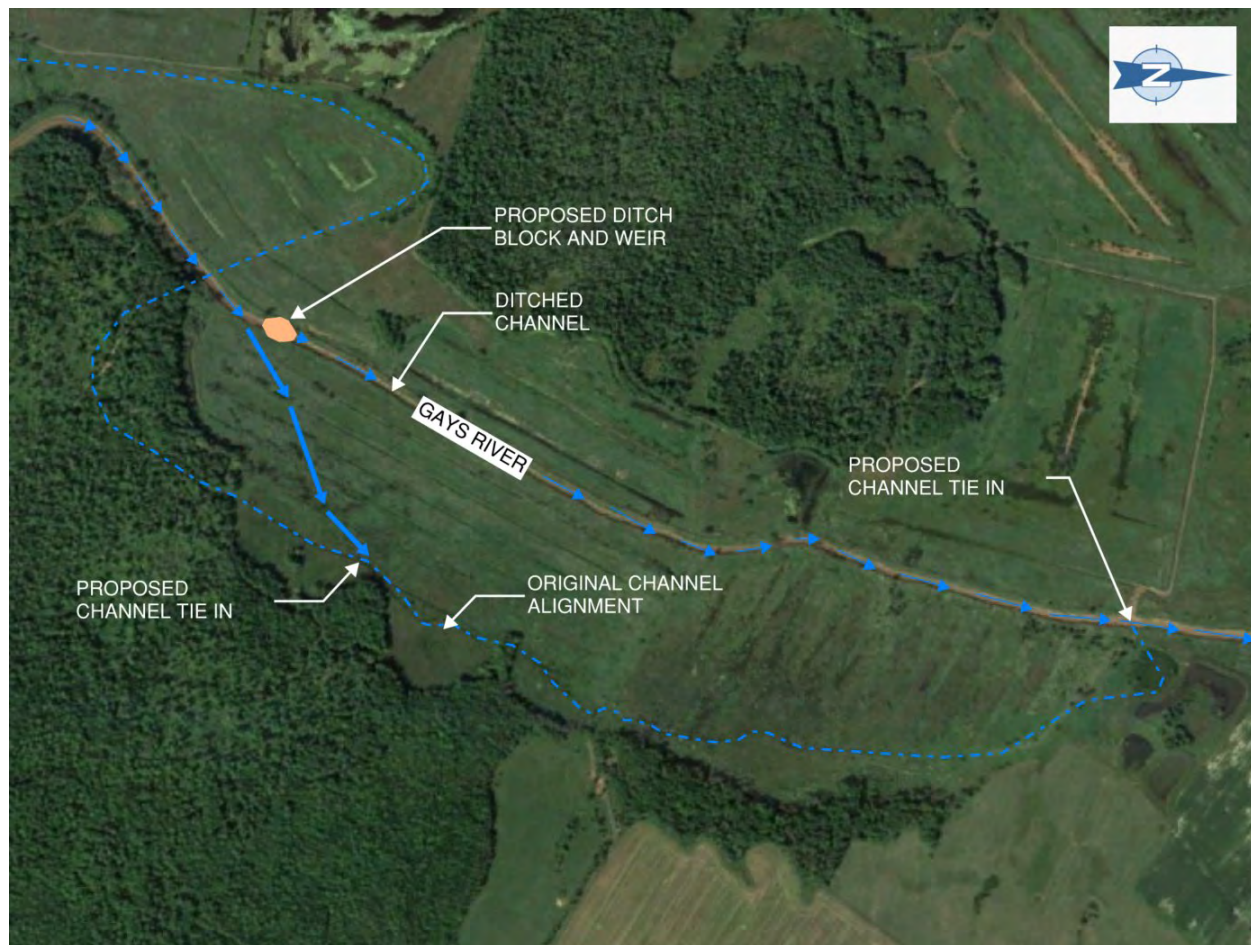


Figure 18. Conceptual site plan for the proposed Gays River Offsetting Project (from preliminary hydrological assessment, Appendix A)

A ditch block and weir would be constructed within the existing ditched channel to allow flow to be diverted through a new constructed channel to restore the original river alignment. Once flow reaches the original riverbed, it would follow that original alignment until it ties back in with the ditched channel to the north. All base flow would be directed through the original channel alignment, while large volume flows will be allowed to overtop the diversion and flow within the existing ditched channel. The tidal range would not be affected and would extend up to the same limits currently observed in the system. Tidal events will continue to result in high and low tide water levels in the ditched channel, along with flow in and out of the reach.

Current estimate for the realigned channel width is 15 m, which is based on aerial footage of the upstream undisturbed reaches and the former natural river which is being restored. Channel dimensions will be

confirmed in the detailed design phase. The restored channel measures approximately 2,150 m in length, and will follow its historic, natural meander through the floodplain. Channel banks would be lined with woody debris, rock clusters, root balls and vegetation plugs to accelerate the establishment of natural growth. Furthermore, these features will serve to provide fish habitat complexity within the channel, providing necessary instream cover and oxygenation sources to support multiple life stages of a variety of species while restoring natural river processes. It is anticipated that restoring the river to its natural meander will aid migrating species like American eel and by slowing flows and providing areas of refuge. Upon completion of the river restoration project, it is anticipated that the wetland restoration component of the floodplain could commence.

In agricultural areas, there is a long history of river channel dredging and realignment, leading to morphological degradation (Lepori et al., 2005) and reduced biodiversity (Palmer et al., 2010). By realigning flow within the Gays River to its natural meander, and increasing habitat heterogeneity through instream and riparian structures, it is anticipated that fish within the restored reach will provide higher quality habitat than that of the current ditched channel. The Natural Water Retention Measures Project (NWRM) of the European Commission has summarized the major benefits of re-meandering, including (but not limited to):

- Slowing down flows by increasing channel length;
- Decreasing erosion and increasing sedimentation;
- Improving the quality and habitat diversity of benthic fauna and fish;
- Improving the preservation and resilience of ecological communities and habitats; and,
- Increasing biomass production and biodiversity (NRWM, 2014).

However, Lepori et al. (2005) stress that restoration might have little beneficial effect on biodiversity if the restoration schemes do not affect structural heterogeneity relevant to the target organisms. Baseline surveys will be conducted to determine the fish community present so that instream features can be tailored to suit habitat requirements. The habitat features noted herein are considered typical habitat features that may support a variety of species and life stages.

The restoration of the Gays River to its historic route with integrated habitat features is anticipated to provide 322 habitat units (3.2 ha) of high-quality, tidal riverine habitat. This is considered an “out-of-kind” option to offsetting, in which the freshwater stream and open water habitats within the PA are partially offset by different type of fish habitat (tidal riverine). However, the restored habitat from the proposed Gays River offset concept may result in a greater capacity to produce and sustain fish, and targeted species like American eel are expected to benefit. Field investigations and data collection would be required, if deemed an appropriate concept, to further evaluate potential impacts to the local fish community and finalize the design. As shown in Table 6, this alternative was ranked as third highest as it provides additional benefits to the ecosystem (flood mitigation).

5.3.2 Offsetting Opportunities – Desktop Review

To date, the desktop review revealed many potential offsetting opportunities within priority watersheds. MEL has highlighted a selection of these opportunities for inclusion in the conceptual offsetting plan. Selected opportunities are considered higher priority based on the location, type of offset, biological relevance, and potential habitat gains associated with the offset concept. A quantification of potential habitat gains has also been provided for each concept, calculated through area of restoration. These descriptions and quantifications are based desktop analysis and are therefore preliminary. The general locations of potential opportunities are provided in Figures 19 through 21.

MEL has scheduled aerial surveys, ground-truthing, and field evaluations of offsetting concepts identified through desktop review for Summer 2022. If determined feasible, these offsetting concepts will be presented in future versions of the offsetting plan. These opportunities are included herein to demonstrate the breadth of potential offsetting opportunities available within nearby and priority watersheds.

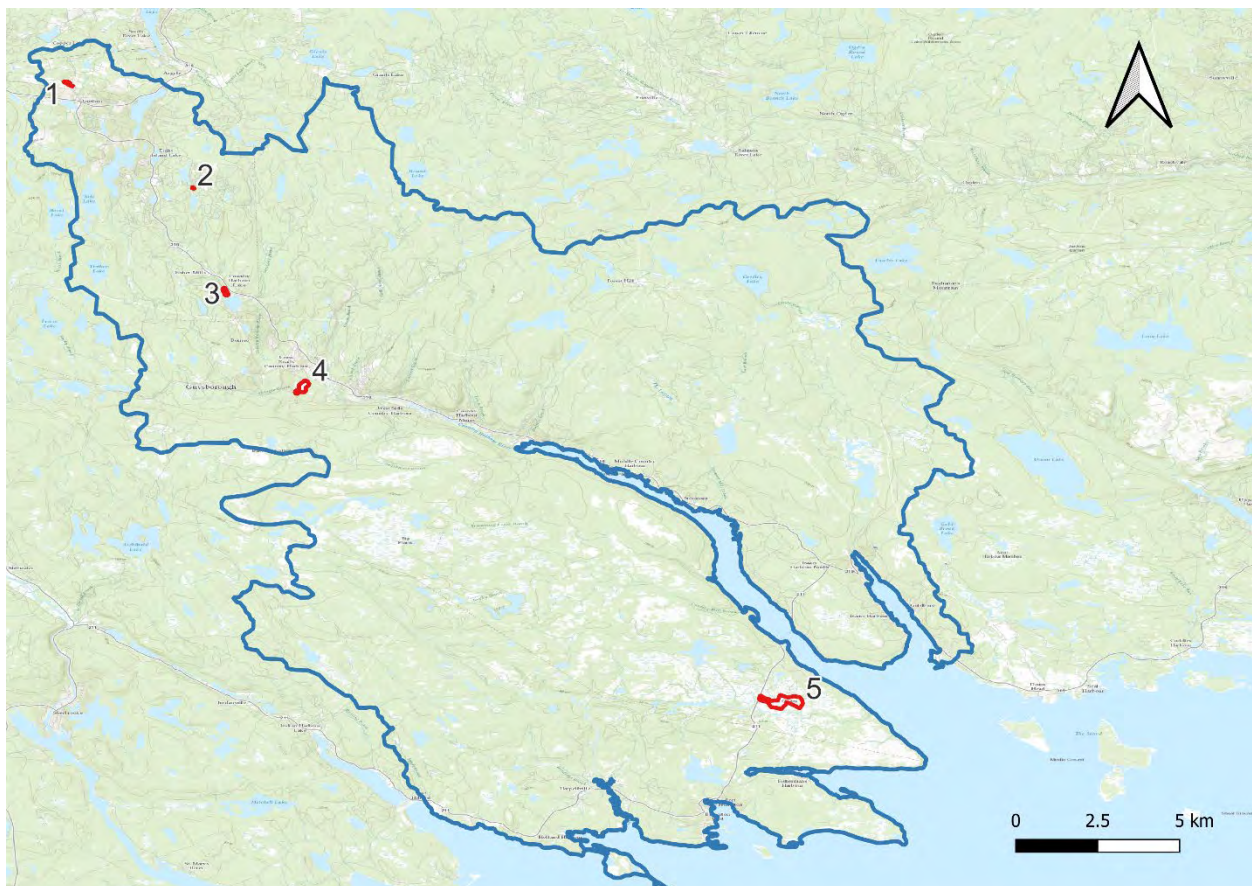


Figure 19. High Priority Preliminary Offsetting Concepts - Country Harbour

Country Harbour Preliminary Offsetting Concepts:

- 1: Approximately 400 m of a first order stream runs through an agricultural field. Riparian vegetation is absent and bank erosion is likely. Channel appears to have lost sinuosity. Habitat restoration could be achieved through riparian planting, bank stabilization, fencing (if required), and low-tech instream structures. Potential habitat gains = 8 HU.
- 2: Approximately 250 of a first order stream has potentially be moved from its original path. Riparian vegetation has been cleared. Road crossing upstream appears blocked which would provide access to Lawthie Lake. Habitat restoration could be achieved through riparian planting and low-tech instream features. Road crossing condition and ownership to be ground-truthed. Potential habitat gains = 2.5 HU (stream only)
- 3: Mainstream of Country Harbour River just upstream of Country Harbour Lake is abutted by agricultural land which has been cleared and appears ditched. Riparian vegetation appears absent on west side of channel and erosion is likely. Habitat restoration could be achieved through riparian planting and bank stabilization. Instream restoration possible depending on results of field evaluation (e.g., channel narrowing structures). Potential habitat gains = 27.6 HU.
- 4: Third order tributary to Country Harbour River has riparian area cleared of vegetation on southern bank for approximately 600 m just upstream of confluence with mainstem. Channel meander appears disturbed. Habitat restoration could be achieved through riparian planting and low-tech instream features. Potential habitat gains = 30 HU.
- 5: Multiple watercourse lines ditched through possible peat harvesting area. Redirected/ditched watercourses may prohibit fish passage to upstream/downstream habitats. Habitat restoration could be achieved through instream restoration of existing watercourses if fish presence/access determined, or through restoration of original channel alignments. Potential habitat gains = 10 HU.

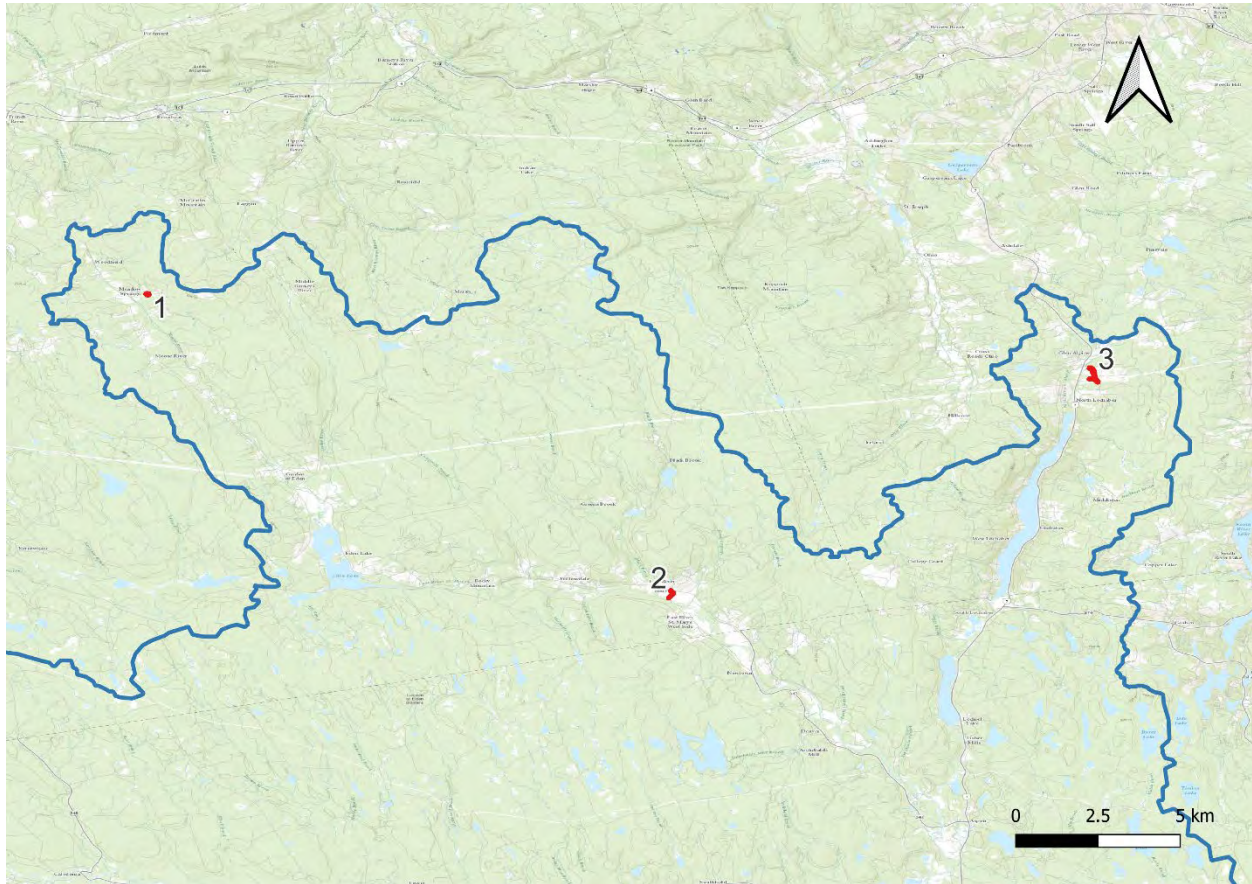


Figure 20. High Priority Preliminary Offsetting Concepts - St. Mary's

St. Mary's Preliminary Offsetting Concepts:

- 1: Excavated pit/pond on second order stream. Part of mapped wetland, riparian vegetation is absent, and pond appears dammed. Fish presence/access into pond or upstream tributaries unknown. Habitat restoration could be achieved through riparian planting, pond naturalization by incorporating habitat features, and access provisions through dam (if required). Potential habitat gains = 27 HU (pond only).
- 2: Approximately 630 m of a first order tributary to the East Branch runs through agricultural fields. Channel is ditched/straightened and riparian vegetation is absent. Habitat restoration could be achieved through riparian planting and low-tech instream features. Channel restoration to natural alignment possible as proximity to road limits riparian buffer/restoration capacity. Potential habitat gains = 6.3 HU.

- 3: A 1.1 km reach of Gusset Brook appears straightened in proximity to agricultural fields. Possible bank erosion present. An additional tributary contains online ponds within agricultural fields and riparian vegetation is absent. Habitat restoration of Gusset Brook could be achieved through low-tech instream structures and bank stabilization. Riparian planting on ponds/tributary and installation of habitat features could increase suitability for fish. Potential habitat gains = 79.1 HU.

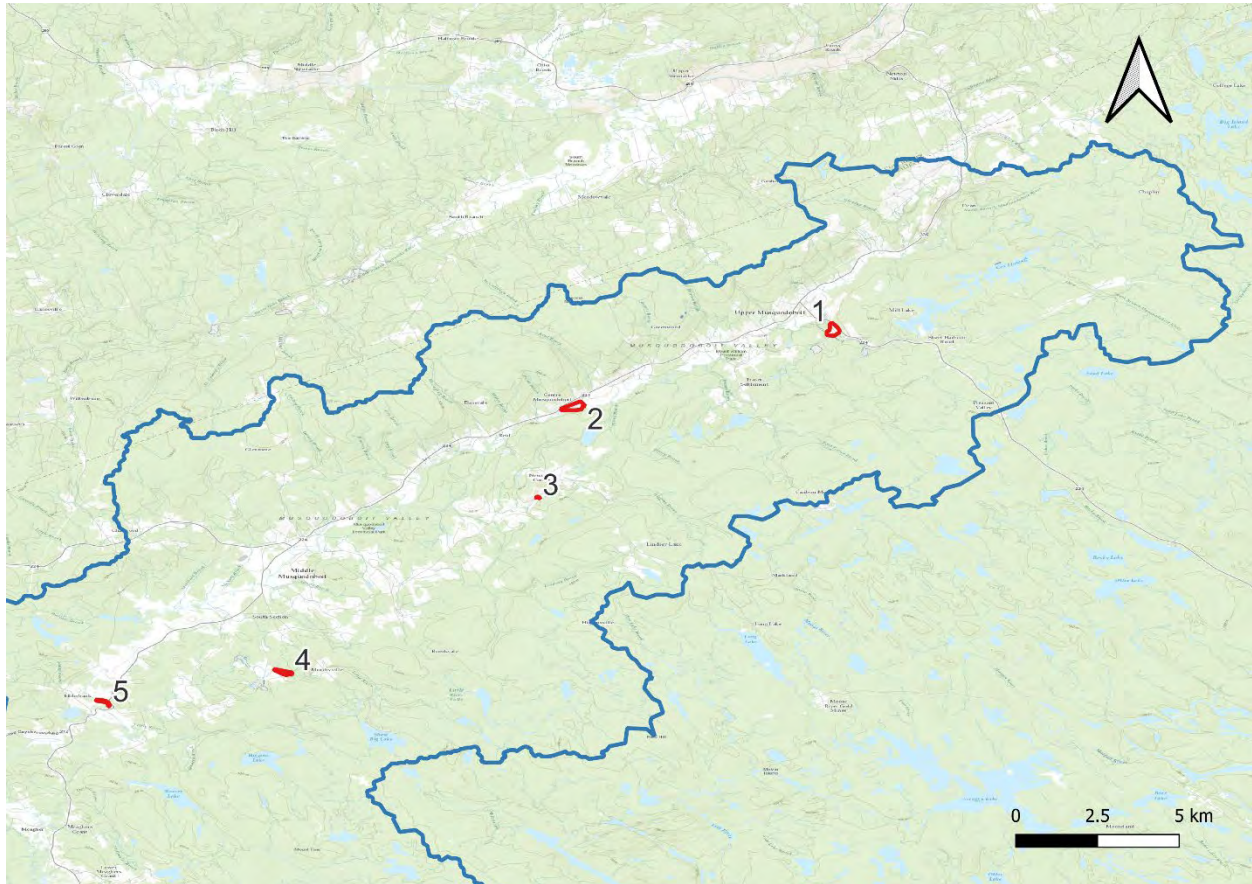


Figure 21. High Priority Preliminary Offsetting Concepts - Musquodoboit

Musquodoboit Preliminary Offsetting Concepts:

- 1: A 1.3 km reach of Sherlock Brook, a direct tributary to the Musquodoboit River, lacks meander pattern and is abutted by agricultural land on its eastern bank. Habitat restoration could be achieved through riparian planting, bank stabilization, and the installation of low-tech instream features. Potential habitat gains = 78 HU.
- 2: An 850 m reach of Kent Brook, a direct tributary to the Musquodoboit River, has been straightened by road construction/agricultural development. Banks appear to be actively eroding

in select areas. Habitat restoration could be achieved through bank stabilization and low-tech instream features. Potential habitat gains = 42.5 HU.

- 3: Approximately 780 m of Higgins Brook appears straightened through agricultural fields. Riparian buffer appears intact, but areas of possible active bank erosion identified. Habitat restoration could be achieved through bank stabilization and low-tech instream features. Potential habitat gains = 39 HU.
- 4: Approximately 450 m of Little River identified with potential eroding banks and an over-widened channel. River travels through cleared fields with varying amount of riparian vegetation. Habitat restoration could be achieved through riparian planting, bank stabilization, and instream features to promote channel narrowing (e.g., deflectors).
- 5: Approximately 3.5 km of the Musquodoboit mainstem appears straightened, lacks natural meander through agricultural areas. Many areas of riparian vegetation absent. In addition, a large, cleared tract of land may be actively eroding and may act as a source of silt. Habitat restoration could be achieved through riparian planting, bank stabilization, and the installation of low-tech instream features. Potential habitat gains = 420 HU.

The overall potential habitat gains from these selected preliminary offsetting concepts is 770 HU. These only represent a small portion of the 142 sites identified and desktop analysis for additional offsetting opportunities are ongoing. Currently, these preliminary offsetting concepts are given a lower overall ranking due to numerous uncertainties with their implementation.

5.3.3 Complementary Measures

Measures to improve existing fisheries knowledge in areas of interest to Mi'kmaq could provide information related to possible future habitat rehabilitation options. Studies may also serve to provide information related to fisheries productivity, habitat use, and/or species distributions in Nova Scotia. Complementary measures will be limited to a maximum of 10% of the Plan, and the exact format of complementary measures will rely on future engagement between Anaconda and the Mi'kmaq of Nova Scotia, and consultation with DFO.

As detailed in the Wetland Compensation Plan (MEL, 2022), Anaconda has met with the Unama'ki Institute of Natural Resources (UINR) to discuss collaboration in finishing a partially completed Barachois Pond study as a method of secondary wetland compensation. The study includes the proposed use of eDNA sampling to determine fish species use within the ponds, as traditional fish capture methods are problematic due to pond depth and variable conditions. By investigating fish presence and utilization within these ponds, the study aims to provide a clear understanding of the ecological and socio-cultural functional value of barachois ponds. Anaconda is continuing engagement with UINR to identify additional research studies as a complementary measure to fisheries offsetting relating the design and application of eDNA studies in these distinct, brackish ecosystems. This study could be considered as partial complementary measures for this Plan.

As shown in Table 6, this alternative was ranked as fifth due to its ability to align with specific interests of Mi'kmaq, but overall lower contribution to offsetting.

5.4 Offset Summary

The habitat characterization and HADD quantification process identified fish habitat that will be directly and indirectly impacted by the Project. Table 9 provides a summary of the HADD as well as the known, potential offset options.

Table 10. Summary HADD and Offset Quantities

Habitat Measure	Project Area	Habitat Type	Proposed Offset Area (HU)	Description
HADD	Direct Impact	Streams and Open Water Pond Habitat	325.92	Small, 1 st -2 nd order headwater streams. Support brook trout and eel rearing, foraging, and thermal refuge. Shallow open water feature with limited access, dominated by muck/detritus substrates, formerly disturbed by historic mining activities.
	Indirect Impact	Western Tributary	38.00	1 st -2 nd order streams with habitat supporting all life history stages of banded killifish, yellow perch and golden shiner (golden shiner and yellow perch mostly in close proximity to Gold Brook Lake), and adult American eel and brook trout.
		Eastern Tributary	71.76	1 st -2 nd order streams with habitat supporting young of year, juvenile and adult brook trout, and adult American eel.
		WC9	21.64	1 st order tributary to Gold Brook Lake, with habitat that supports young of year, juvenile and adult brook trout, and juvenile and adult American eel.
		Gold Brook Tributaries	31.72	1 st -2 nd order streams with habitat supporting all life stages of banded killifish, young of year, juvenile and adult brook trout, and adult American eel.
Total Residual HADD			489 Habitat Units	
Offsets	Gulley Brook	Stream and small on-line open water features similar to the Mine Site streams and open water habitat.	87.5	Re-naturalization of Gully Brook and associated floodplain.

Habitat Measure	Project Area	Habitat Type	Proposed Offset Area (HU)	Description
	Cove Road	Ponds similar to the Mine Site open water habitat.	480	Two small ponds connected to Stewiacke River tributaries in a known project location with a completed wetland restoration project.
	Gays River	Restored tidal riverine habitat.	322	Restoring former watercourse route through re-channelization.
	Campbell's Brook and Tributary (MacLellan's)	Small stream similar to Mine Site streams, larger river.	55	Instream and bank restoration Campbells Brook and unnamed tributary.
	Preliminary Desktop Review	Small tributaries to mainstems of larger river systems in nearby and priority watersheds.	770	Riparian, bank, and instream techniques for freshwater habitat restoration.
Total Offsets			944.5 (+ 770) Habitat Units	

5.4.1 Next Steps

The proposed offsetting concepts require further engagement with the Mi'kmaq of Nova Scotia, consultation with DFO, and relevant stakeholders on acceptability and ranking of the preliminary options. Preferred offsetting options will be further refined based on these discussions as Anaconda begins the detailed offset planning process. It is also possible that alternative approaches not described herein will be integrated into any Final Authorization Application (via an Offset Plan) if required.

Once preliminary options for offsetting have been selected, baseline field evaluations will commence to support detailed design and supplement existing baseline data gaps. The detailed designs of the habitat restoration offsetting measures will be informed through ongoing engagement with the community, the Mi'kmaq of Nova Scotia, and DFO.

5.5 **Implementation**

Time lags between the adverse effects from Project impacts and benefits from measures to offset may contribute to loss of fish or fish habitat; therefore, it is the preferred approach that measures to offset are implemented before HADD of habitat or death of fish is realized. DFO's guidance policy on offsetting (DFO, 2019b) specifies that proponents should make all reasonable efforts to avoid time lags between the adverse effects and the implementation of the measures to offset. Though exact timelines for both permitting and fisheries offsetting are unknown, the construction and establishment of the selected offset projects will be scheduled to occur prior to Project impact to the greatest extent possible. If time lags are

unavoidable, the proposed offsetting concepts will include measures that account for the time delay to make up for the lost fish or fish habitat (i.e., by increasing the gain-to-loss ratio).

A monitoring program will be developed in consultation with DFO as part of detailed offsetting planning. The monitoring plan will be clearly defined at the permitting stage and included in the final offset plan and FAA. To ensure that the offsetting measures are implemented as proposed, qualified personnel will monitor construction and implementation of selected works. Monitoring will clearly be defined in the final offset plan and be reported to DFO in an “as constructed” report following the works being completed. The “as constructed” monitoring report will document the construction of the offset and works as per the approved plans, and a summary of the mitigation measures and any contingency measures implemented to prevent further impacts to fish habitat. A detailed photographic record will be taken during implementation of the plan using consistent vantage points prior to, during and post construction.

As outlined in DFO’s guidance policy (DFO, 2019b), monitoring should be designed to confirm that measures to offset are effective in counterbalancing the HADD and identify corrective actions or contingency measures if deficiencies are found. The monitoring program design will integrate guidance from Smokorowski et al. (2015), reflecting the hierarchy of monitoring components for compliance, functionality, and effectiveness. It is anticipated that an adaptive management approach will be adopted to periodically identify the need for any further mitigation or compensation measures if deficiencies are detected.

6 CONCLUSION

The total predicted HADD to offset as a result of Project losses to fish and fish habitat is as 489 habitat units of watercourse and open water features. The fish community that occupies these habitats are typical of small streams and ponds within the southern uplands of Nova Scotia, consisting of brook trout, yellow perch, and other common, small-bodied fishes. Migratory American eel were also prevalent throughout the site.

A desktop review of potential offsetting sites resulted in multiple potential opportunities within priority watersheds. Four offsetting options were presented that have current landowner relationships to address HADD of fish habitat, which combine to 944.5 habitat units. Additional options identified through the desktop review were presented at a high level and will be investigated as offset planning continues, adding up to an additional 770 potential habitat units. Offsetting options were scored across multiple criteria assessing overall feasibility. Ranking was completed without input from Mi’kmaq, stakeholder, or regulatory consultation and is therefore considered preliminary, but will serve as a discussion for future engagement efforts.

All four options with landowner relationships proposed are technically feasible. Additional offsetting locations or complementary measures may be identified through the completion of the desktop analysis, and future engagement with the Mi’kmaq of Nova Scotia, community groups, and landowners. Based on

the nature of the habitat losses and alterations, fisheries offsetting that counterbalances Project impacts can be achieved.

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APPENDIX A: HYDROLOGICAL ASSESSMENTS



TECHNICAL MEMORANDUM

To: McCallum Environmental

From: Matt Delorme, P.Eng.

Cc: Ian Tenhaaf, EIT

Subject: Cove Road Offsetting Project: Hydrotechnical Assessment

Date: April 28, 2022

1. Introduction

The following memo provides a summary of the hydrological assessment of the potential Cove Road fisheries offsetting site. It provides a concept basis for design of earthworks required to construct new ponds in the catchment with the goal of improving habitat for aquatic species and improving the groundwater regime in the area.

2. Land Use and Soil Classifications

The catchment areas for the Cove Road fisheries offsetting project (referred to herein as the Project Area) and surrounding watershed are shown in **Figure 1**. The main channels that contribute runoff to the Project Area are shown in blue. Channels at the southern extent of the catchment area, north of Cove Road, are steep gradient channels on the hillside draining to flat wetland within the Project Area.

Land cover for the catchment area is shown in **Figure 2**. Land use in the tributary catchment is sparsely developed with insignificant impervious area in the form of roads. It contains a mix of second growth forest, grassland, and shrubs. Land use in the Project Area is a mix of second growth forest, grassland and wetland.

The soil properties for the Project Area are shown in **Figure 3**. Underlying soils are indicated on the soils map of Nova Scotia as the Stewiacke group throughout most of the catchment area and the entirety of the flat lowland area. The Stewiacke group is a medium to coarse, well to moderately well drained soil. However, a previously constructed wetland installation at the west end of the site, adjacent to Pond 1, shows no evidence of high losses through infiltration. The performance of the existing wetland area indicates poorly drained overburden with localized low points with standing water at all times of the year. Low points in channels on the site have standing water even during mid-summer dry periods. This suggests that either there is a localized surface layer of poorly drained fine-grained soils and fibrous peat on top of a better drained underlying soil group, or more likely, that the soils map of Nova Scotia has not captured the correct nature of soils in this location. A portion of the catchment is indicated as the Pugwash group, which is moderately well drained; however, this is in steep upland areas that will not experience high infiltration rates and are not part of the fisheries offsetting project.

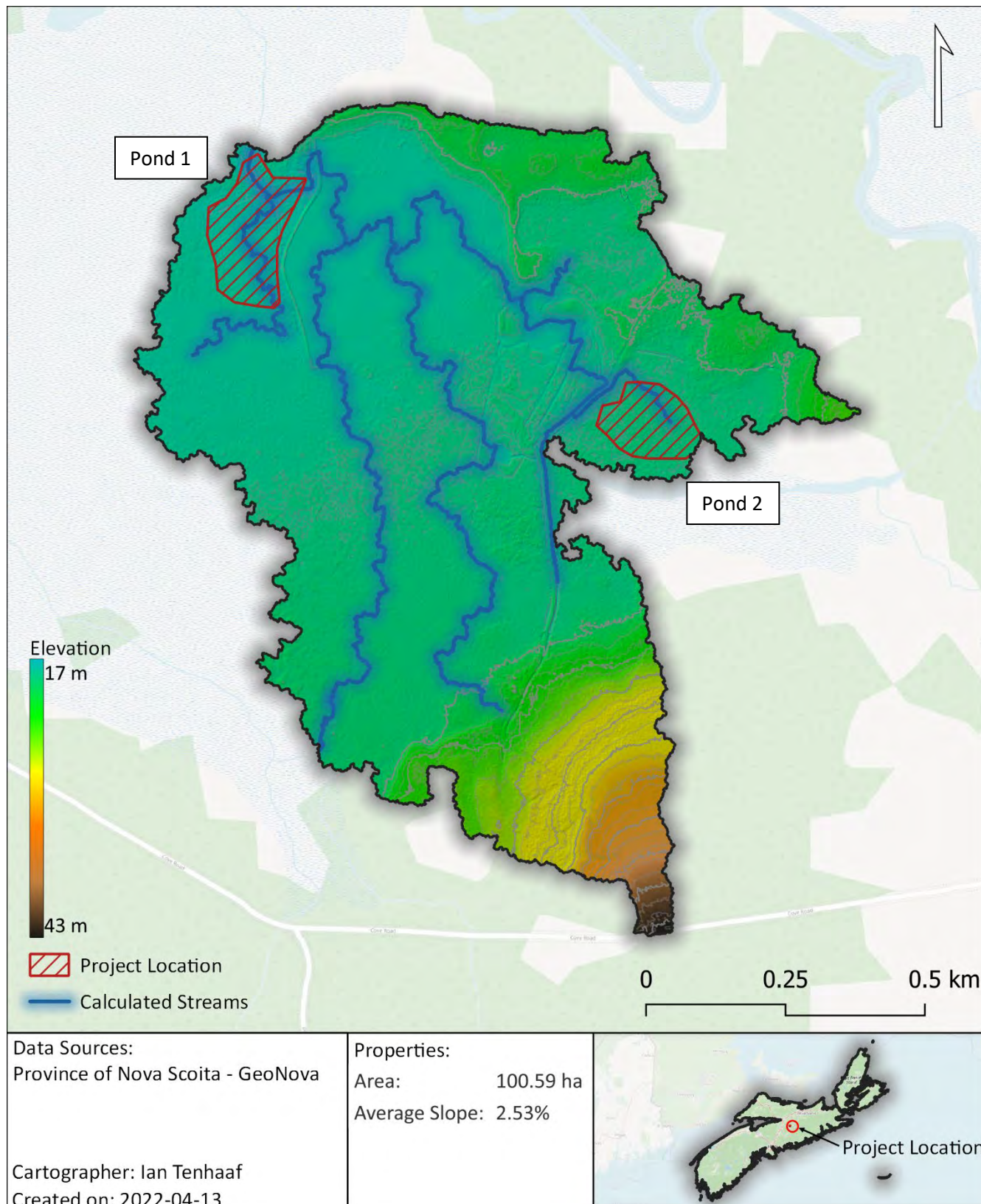


Figure 1: Cove Road Project Area Catchment

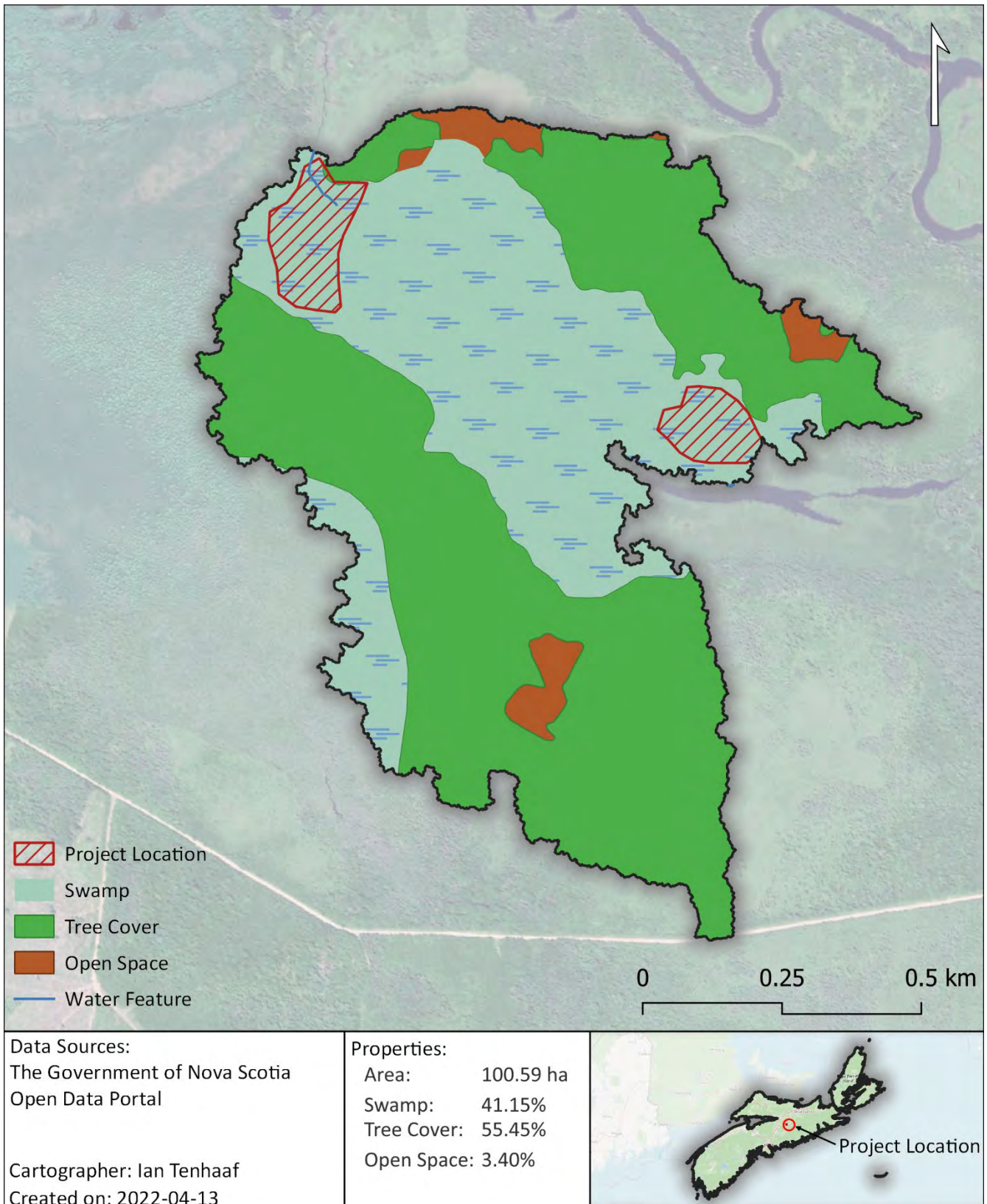
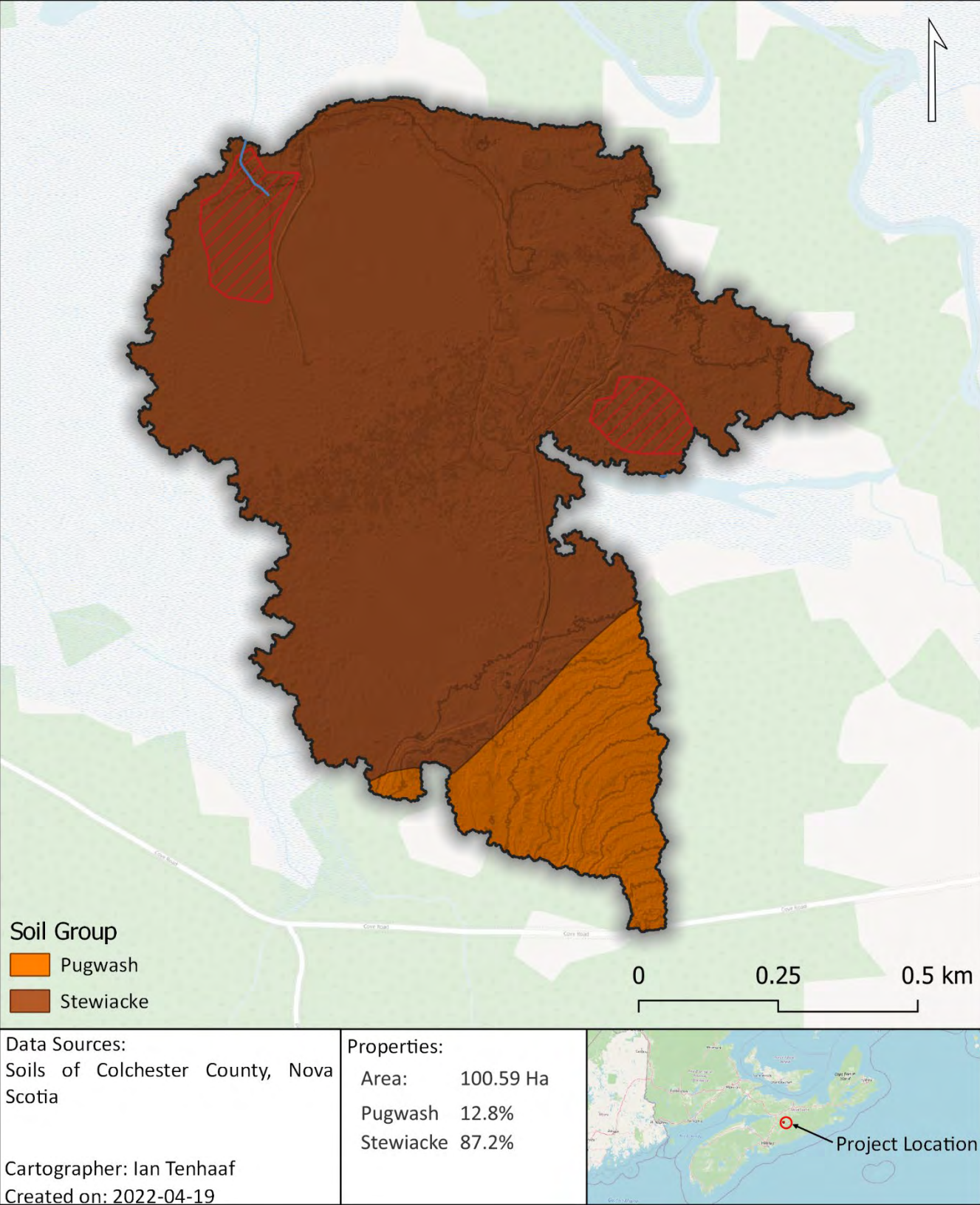


Figure 2: Cove Road Project Area Land Cover



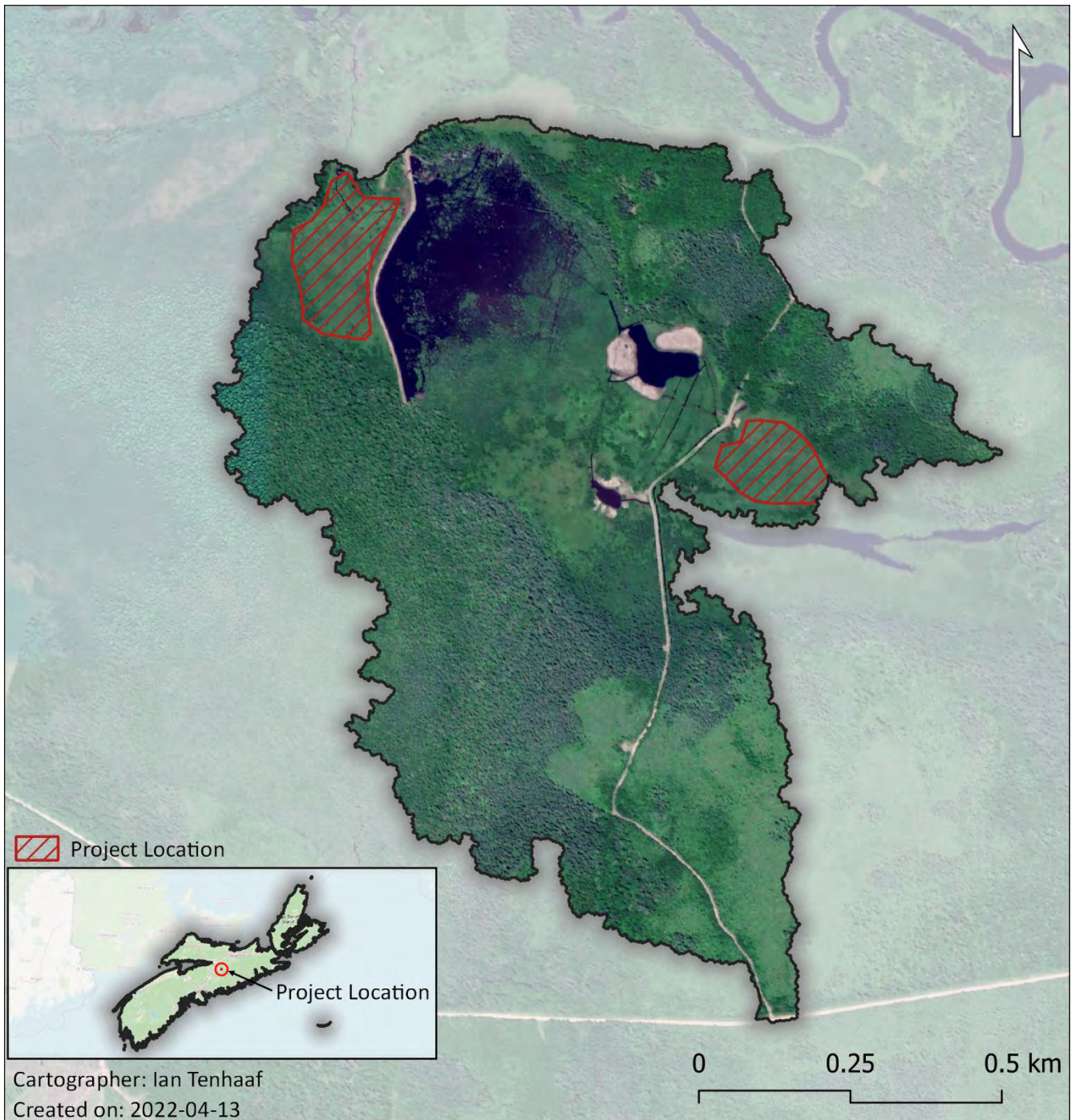


Figure 4: Cove Road Existing Restoration Areas

3. Hydrotechnical Feasibility Assessment

Site conditions are expected to perform the same as the previously constructed wetland restoration areas, shown in **Figure 4**, at the west end of the site. The hydrologic contribution is from the same 100.5-hectare catchment area and the existing ponded area has water at all times of the year. Runoff from the catchment area drains to the site from the south, and once it reaches the lowland area, it splits between flow to the east and west of the site. Because existing ponded areas, depressions and channels have water at all times of the year, the proposed offsetting ponds can be expected to perform similarly.

4. Proposed Design

The proposed fisheries offsetting designs includes excavation of two ponds: one within the shallow floodplain area and one east of the berm constructed for a previous wetland restoration project. Channel construction is required at this site to connect Pond 2 to the existing water feature to the south. The existing water feature exhibits bi-directional flow primarily to the Stewiacke River with a subsidiary to the roadside ditching and into previously constructed wetland restoration areas. The new connector channel would be required to provide fish access to Pond 2 and ensure the previously constructed wetland restoration areas supply is not interfered with.

Approximate pond surface areas are 29,000 square metres for the northern pond and 19,000 square metres for the southern pond. Ponds will be constructed with minimum 4:1 side slopes and riparian planting will provide shade cover around the edges of the pond. Pond depth and total volume will be determined during detail design but are expected to be approximately 1.5 to 2.0 meters deep.

There are no in-stream controls proposed to manage flow in or out of the ponds. Preliminary hydrological analysis and site visits suggest there is sufficient base year-round to provide fish access through the project area.

5. Conclusions

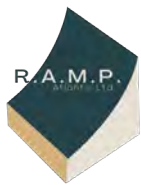
The proposed ponds will function with similar hydrology to the existing, successfully constructed wetland at the west end of the site. Site conditions are similar throughout the lowland areas and the hydrologic contribution is from the same catchment. Following Project work, a greater volume of water is expected to be retained on site for a longer period, and surficial wetting surrounding the pond areas will increase because of the proposed strategy. The ponds will increase the total habitat area with a consistent wetland hydrology in the upper regions of the surrounding soil for a longer duration throughout the year by retaining a larger volume of water in the channel reaches. This will result in an extended duration of wet periods and slower period of wetting and drying cycles.

Ponding water levels are expected to remain constant through the year with continuous base flow contribution from the upstream tributaries. Because the proposed design does not contain any control structures and grade rises to the south toward Cove Road with discharge directed to the northeast and northwest, there is no increase to flood risk to transportation infrastructure. Active agricultural land is separated from the site by the Stewiacke River.

Depth of ponds are designed with considerations for freezing. The depth will be confirmed during detailed design to allow for freezing while maintaining a lower temperature, but unfrozen layer at the bottom of the pond.

Considering the size and location of the ponds along with the surrounding topography, they are not expected to provide any attenuation function above that already provided in existing lowland areas. Flow rates to the downstream system will not be impacted.

The ponding areas will increase the residency time of runoff flow through the ditch system, particularly during base flow periods. To manage water temperature and reduce the risk of anoxic conditions or algal blooms, the ponds should consider riparian planting that provides margin shading, as well as in-pond vegetated islands to provide greater shade cover on the installation. There is sufficient base flow predicted to provide oxygenation of the pond system.



TECHNICAL MEMORANDUM

To: Andy Walter

From: Matt Delorme, P.Eng.

Cc: Ian Tenhaaf

Subject: Gays River Offsetting Project: Hydrological Assessment

Date: May 02, 2022

1. Introduction

The following memo provides a summary of the hydrological assessment of the Gays River fisheries offsetting site (referred to herein as the Project Area). It provides a basis for design of the earthworks required to restore the Project Area to pre-development flow patterns. Gays River was realigned to allow access to land for agricultural use in the floodplain. Furthermore, the land was developed by adding dewatering channels throughout the floodplain that drain to the relocated ditched channel.

The ditched channel conveys flow from the upstream catchment area and allows a relief path for the dewatering ditches in the subject property to the east of the ditched channel. The ditched channel also receives flow from the western fields through breaks in a dyke that is no longer functioning but was originally constructed to prevent flow from tidal events from inundating the fields. This berm is not on the subject property and is not considered in this assessment. However, the ditched channel reach will need to remain to provide continuity of flow from the adjacent property.

2. Land Use and Soil Classifications

The catchment area for the Project Area and surrounding watershed are shown in **Figure 1**. The main channels that contribute runoff to the Project Area are shown in blue. The southern boundary of the catchment conveys flow from a steep gradient to multiple downstream channels which converge at the Project Area. The eastern border of the catchment is a ridge separating the catchment from the low-lying area of the Meagher's River. The northern border of the catchment conveys flow from a steep gradient to multiple downstream channels which converge at the Project Area. The western border of the catchment is a ridge separating the catchment from the low-lying area of the Shubenacadie River which the Gays River connects to approximately 450m from the Project Area.

Land cover for the Project Area is shown in **Figure 2**. Land use in the tributary catchment is sparsely developed with insignificant impervious area in the form of roads. It contains a mix of second growth forest, grassland, lakes, agricultural development, industrial development and shrubs. The Project Area is wetland.

The soil properties for the Project Area are shown in **Figure 3**. Underlying soils and their characteristics are outlined in **Table 1**.

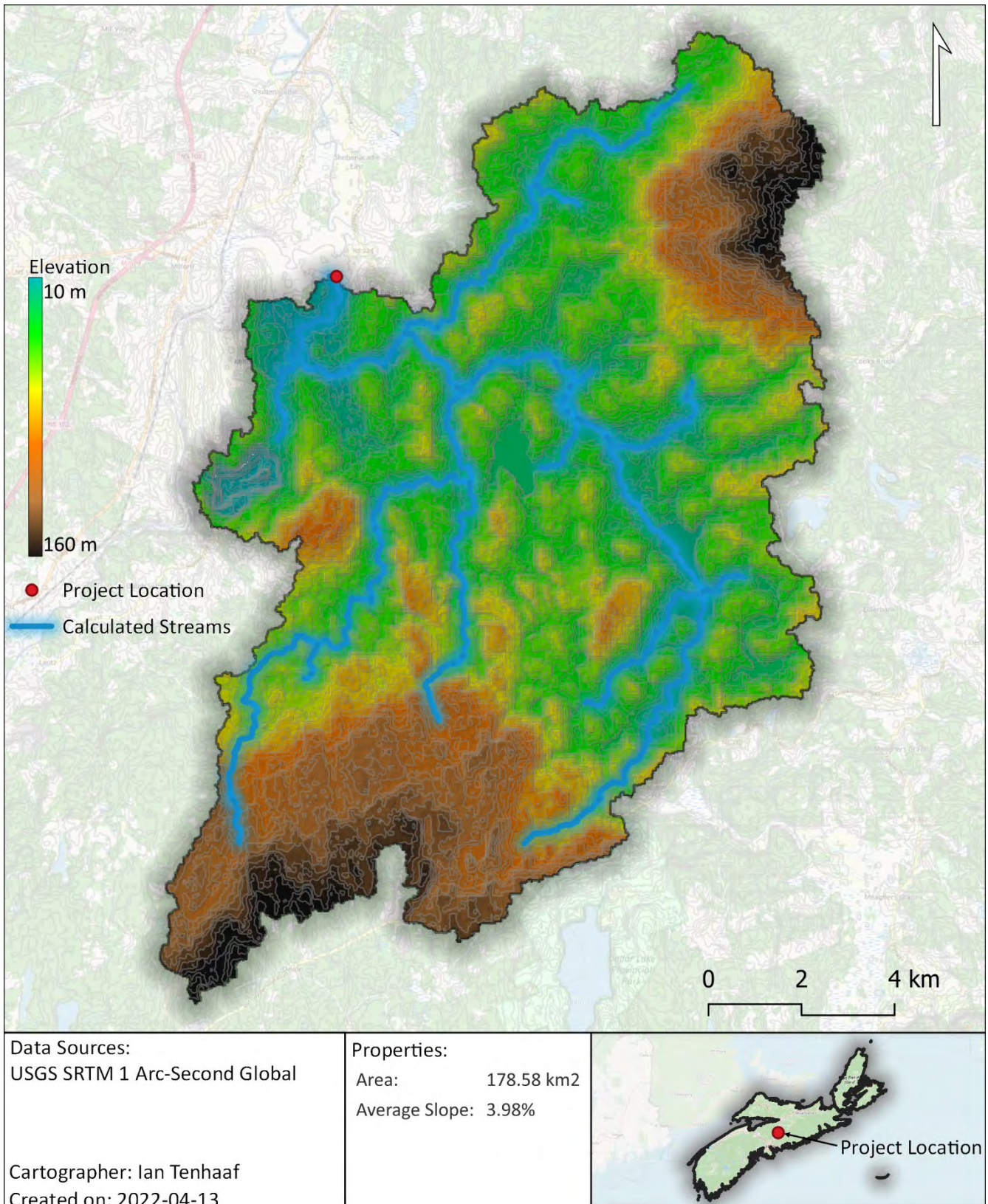


Figure 1: Gays River Project Area Catchment

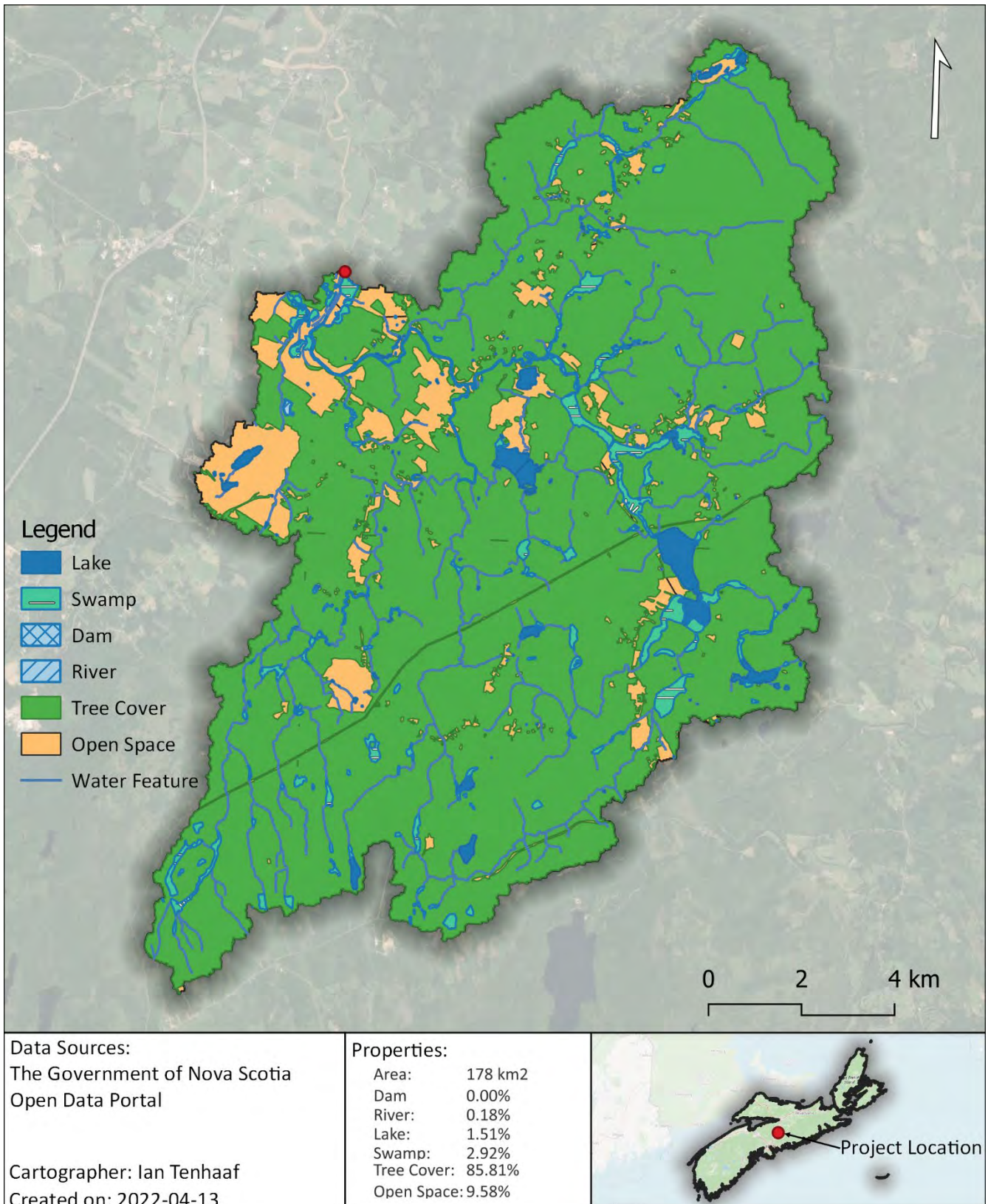


Figure 2: Gays River Project Area Land Cover

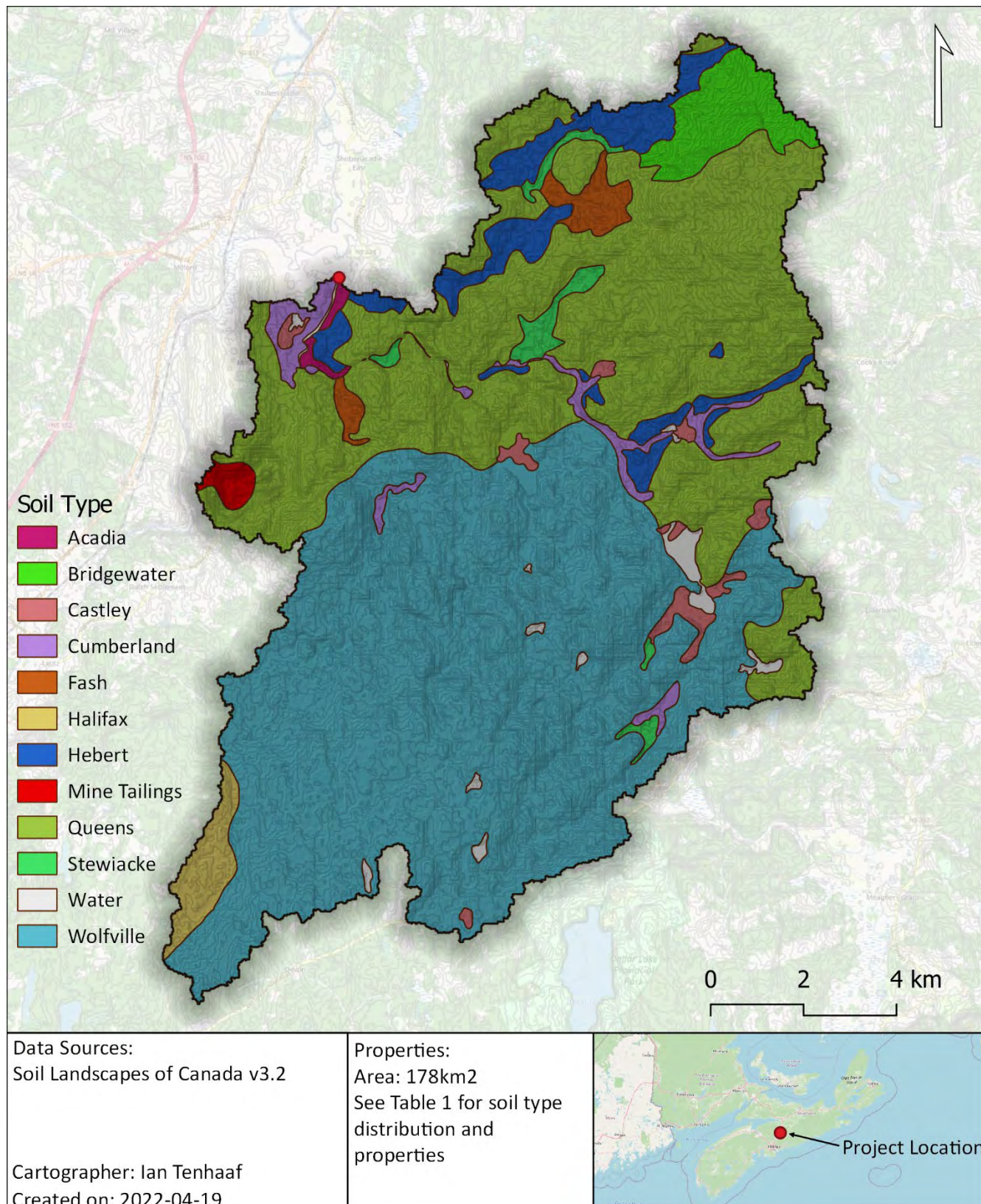


Figure 3: Gays River Project Area Soil Properties

Soil Type	Distribution	Drainage
Acadia	0.28%	Imperfect to Poor
Bridgewater	2.82%	Well to Poor
Castley	1.21%	Very Poor
Cumberland	2.02%	Well to Poor
Fash	1.28%	Imperfect to Poor
Halifax	1.47%	Well to Poor
Hebert	4.83%	Rapid to Poor
Mine Tailings	0.47%	NA
Queens	34.96%	Moderately Well to Poor
Stewiacke	1.27%	Moderately Well to Poor
Water	0.88%	NA
Wolfville	48.52%	Well to Poor

Table 1: Soil Type Distribution & Properties

3. Hydrological Assessment

Since a stream gauge was not available at the project location, runoff to the Project Area was determined using a stream gauge transposition, see **Equation 1**, with Gumbel extreme distribution and 95% confidence interval to determine the flow for the 100-year storm. Three reference stream gauges were selected to estimate the runoff to the Project Area. Stream gauges were selected based on similar land cover, catchment area, and distance from the Project Area to ensure hydrologically similar watersheds and precipitation patterns. The years of data for the stream gauges peak instantaneous annual flow range from 40 to 70 years. Results were validated against the rational method with the Kerby-Kirpich method to determine time of concentration.

Table 2 presents the calculated flow of the design catchment based on each reference catchment and the resulting average design flow.

$$Q_{Design} = Q_{Reference} \times \left(\frac{A_{Design}}{A_{Reference}} \right)^{0.8}$$

Equation 1

ID	Name	Area (km ²)	Q ₁₀₀ (cms)
01DG003	BEAVERBANK RIVER NEAR KINSAC	96.9	133.9
01EK001	MUSQUODOBOIT RIVER AT CRAWFORD FALLS	650	114.8
01EJ001	SACKVILLE RIVER AT BEDFORD	146	125.1
Design Basin		178.6	124.6

Table 2: Stream Gauge Transposition

4. Hydrotechnical Feasibility Assessment

Channel restoration is not expected to have any adverse impacts on the upstream or downstream hydrology because the relic channel from the original watercourse alignment is still present in the agricultural field. Because of the large flow rate, significant base flow and tidal interaction causing rapidly fluctuating water levels, channel erosion will be a key consideration for the restoration. The historical channel bed will need to be dredged to reduce the risk of flood flows causing debris flows that may be detrimental to downstream waterbodies.

5. Proposed Design

A concept sketch of the proposed design is shown in **Figure 4**. A ditch block and weir will be constructed within the existing ditched channel to allow flow to be diverted through a new constructed channel to the original river alignment. The location of the ditch block and weir are selected to minimize erosion risk and future natural meandering onto surrounding properties by avoiding sharp bends in the new constructed channel section. Once flow reaches the original riverbed, it will follow that original alignment until it ties back in with the ditched channel to the north.

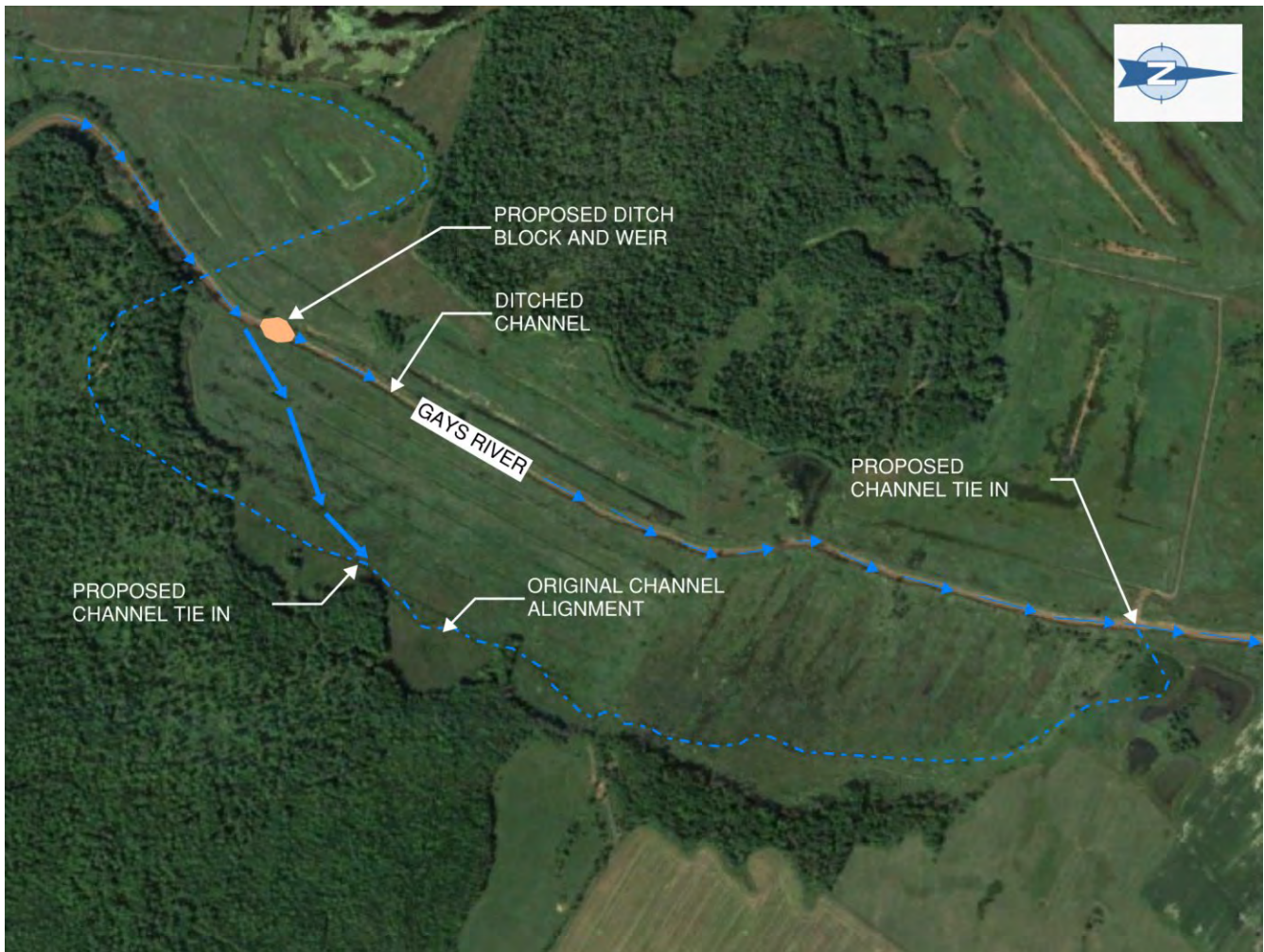


Figure 4: Concept Site Plan

The ditch block will be constructed with a core of impermeable material and a minimum top width of five metres. Slopes and riprap topping will be designed to prevent erosion from the river during the 1 in 100-year flood event. The top of the berm will be set at an elevation that is consistent with a yearly (2-year return period) flow estimate at high tide. This will ensure that all base flow is directed through the original channel alignment. The berm will be designed for overtopping so that flows greater than the 2-year return period will overtop and contribute flow to the existing ditched channel. The tidal range will not be affected and will extend up to the same limits currently observed in the system. By allowing periodic and large volume flows to overtop the diversion and flow through the existing ditched channel, natural scour processes will continue to prevent build up of tidal sediment in the channel. Tidal events will continue to result in high and low tide water levels in the ditched channel, along with flow in and out of the reach.

The proposed design will serve as second purpose in that during extreme flood events, flow will split between the two channels and reduce the water elevation (hydraulic grade line) at the split location. This in turn will result in lower upstream water elevations, reducing the flood risk from existing conditions.

No protection is anticipated to be required at the downstream connection of the original channel alignment to the existing ditched channel. There is a relic channel section across from the tie in location that will provide energy dissipation in the standing water and prevent bank erosion. This will be confirmed with hydraulic models during the detail design phase.

To protect the channel banks and bottom from eroding once the original channel is dredged, the banks will be lined with woody debris, rock clusters, root balls and vegetation plugs to accelerate the establishment of natural growth.

Finally, existing dewatering channels within the agricultural field on the subject property will be filled in with impermeable material at the connection to the engineered channel. This will prevent flow from the realigned channel from short circuiting through the field to the engineered channel that is being retained. It will also restore the floodplain function of the field during extreme storm events, reducing hydraulic gradelines and reducing erosion potential by slowing the rate of flow in the channel.

6. Conclusions

It is hydraulically feasible to restore Gays River to its original alignment without increasing the risk of upstream or downstream flooding.

A ditch block and overflow weir will be required at the southern confluence of the original channel alignment and the ditched channel that replaced it.

Erosion protection design will be required throughout to manage the risk of bank failure and erosion during the 100-year flood. This is an opportunity to include environmental features such as woody debris, root balls and rock clusters.

The proposed work will result in a net decrease in upstream flooding potential, particularly during flood events that occur during high tide.



TECHNICAL MEMORANDUM

To: Andy Walter

From: Matt Delorme, P.Eng.

Cc: Ian Tenhaaf, EIT

Subject: Gulley Brook Offsetting Project: Hydrological Assessment

Date: May 18, 2022

1. Introduction

The following memo provides a summary of the hydrological assessment of the potential Gulley Brook fisheries offsetting site, located on Otter Brook Road in Colchester County. It provides a basis for design of the earthworks required to naturalize the existing main channel and create multiple off-channel ponds providing deeper water habitat to increase the aquatic and riparian habitat on the site. The Project aims to provide an improvement over the pre-agricultural development surface water, groundwater and foliage regimes.

2. Land Use and Soil Classifications

The catchment areas for the Gulley Brook fisheries offsetting project (referred to herein as the Project Area) and surrounding watershed are shown in **Figure 1**. The main channels that contribute runoff to the Project Area are shown in blue. East of Otter Brook Road, the upstream channels that convey flow to the Project Area are steep gradient channels on a hillside. At Otter Brook Road, runoff is conveyed below the roadway in a culvert. Otter Brook Road is located at the foot of the hillside and on the west side of the road the topography is moderate grade pasture for approximately 500 metres after which it flattens into a low-gradient floodplain of Gulley Brook, which has also been drained historically to be used as intermittent pastureland. The fisheries offsetting areas are proposed in the low gradient area with connection to the undisturbed reaches of Gulley Brook, which ultimately terminates at the Stewiacke River.

Land cover for the Project Area is shown in **Figure 2**. Land use in the tributary catchment is sparsely developed with insignificant impervious area in the form of roads and residential developments. It contains a mix of second growth forest, grassland, shrubs and cleared farmland. The Project Area is fallow farmland with anthropogenic drainage ditches and land cover consisting of a mix of forest, grassland and shrubs.

The soil properties for the Project Area are shown in **Figure 3**. Underlying soils are indicated primarily as the Queens throughout the catchment area, the group is described as a moderately fine Imperfectly drained soil. Near the site the primary soil group is Stewiacke, the group is described as medium coarse, well to moderately well drained soil. However, a well-drained soil is inconsistent with site observations, with frequent standing water following rainfall or melt events at the project site. Localized low points in channels on the site had standing water even during mid-summer dry periods. This suggests that a localized surface layer of poorly drained fine-grained soils is deposited on the native soil group in this location. It is not expected from manual investigation that the proposed ponds will break through the relatively low permeability overburden into higher

permeability base soils. Test holes will be completed prior to detail design of the ponds to determine pond depth to prevent unexpected loss of flow through a high permeability underlying soil layer. A negligible portion of the catchment is indicated as Herbert. This group is described as moderately coarse, very coarse and moderately coarse over coarse skeletal material and is rapidly drained; however, this area is outside the proposed site.

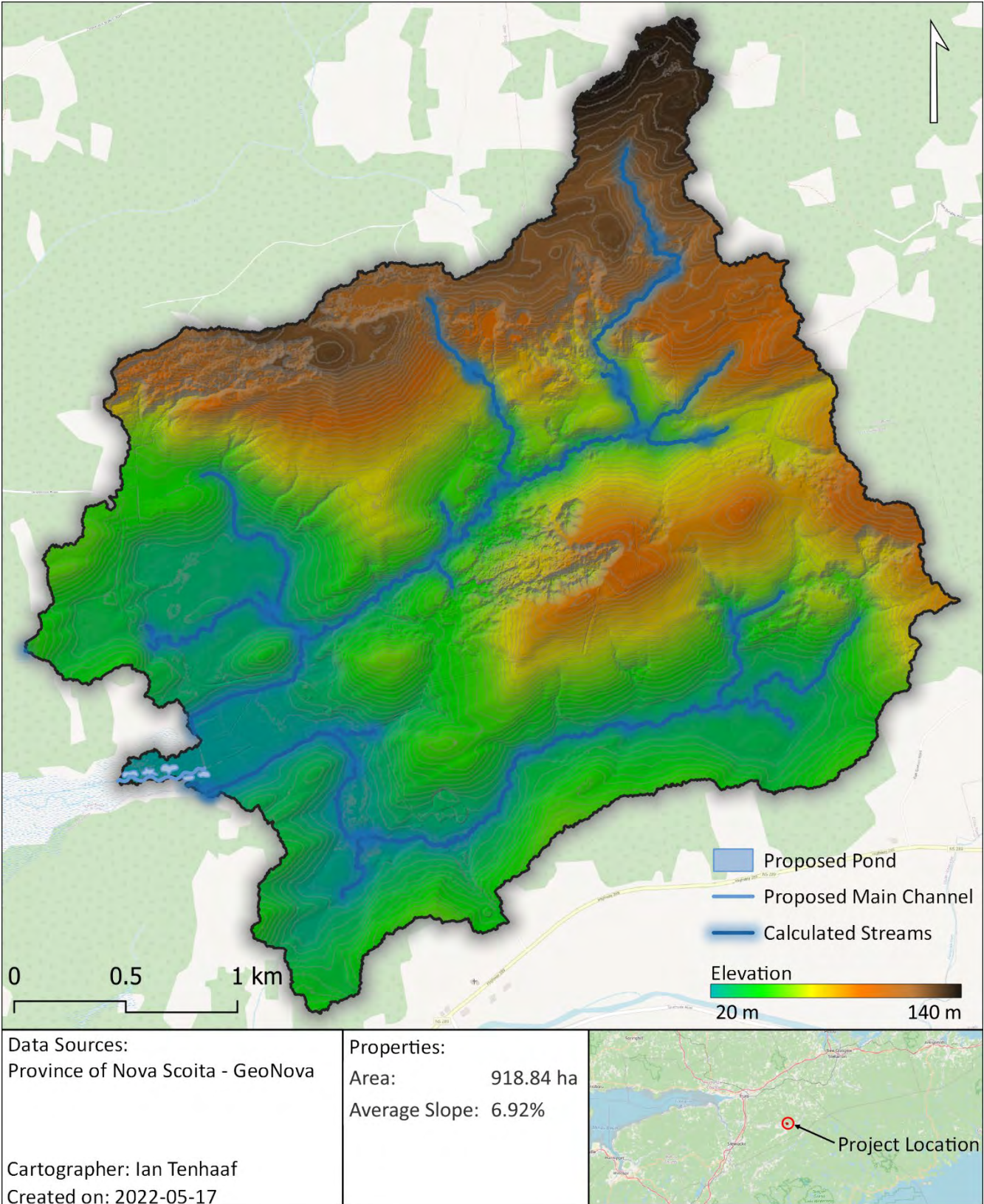


Figure 1: Gulley Brook Project Area Catchment

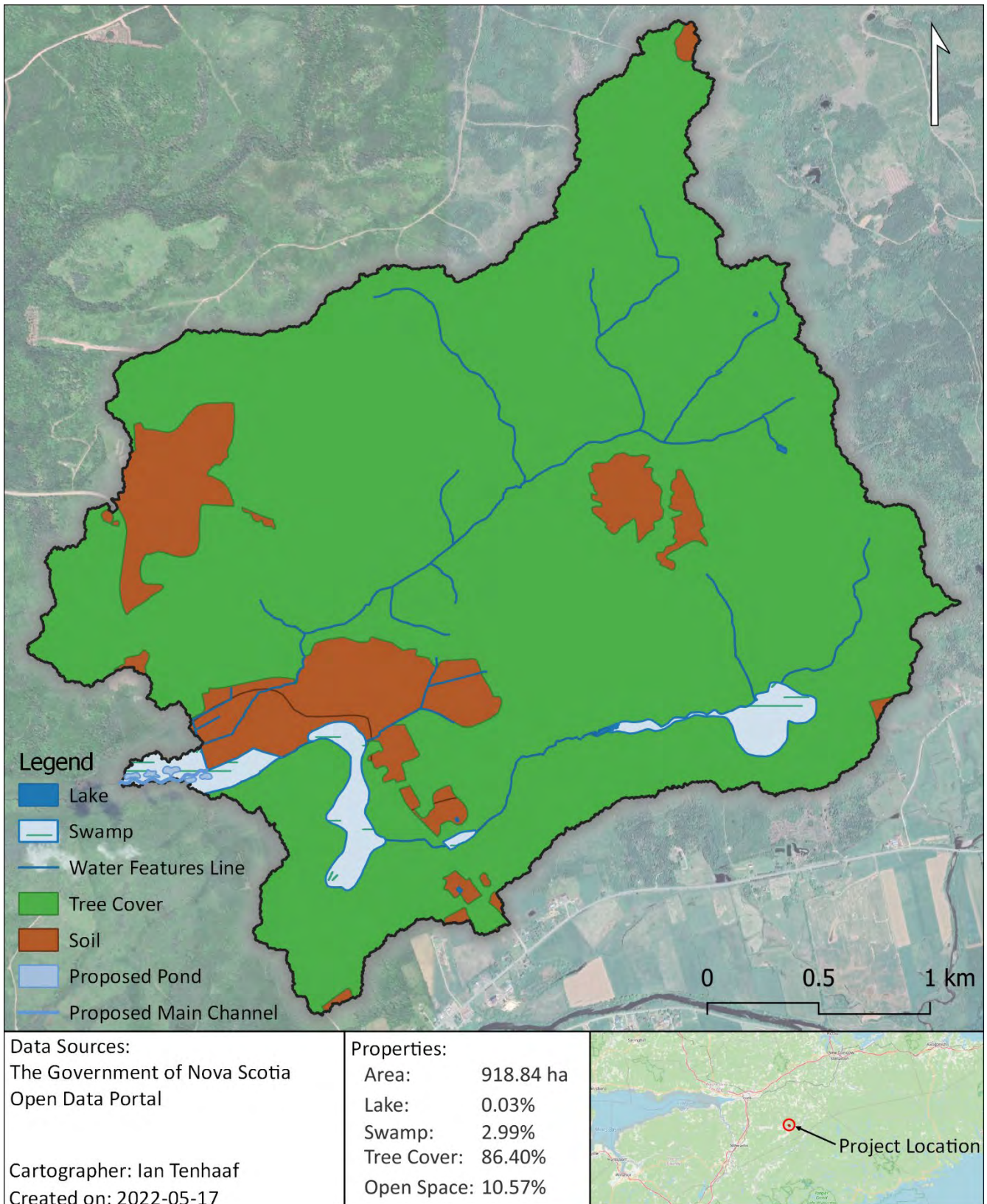


Figure 2: Gulley Brook Project Area Land Cover

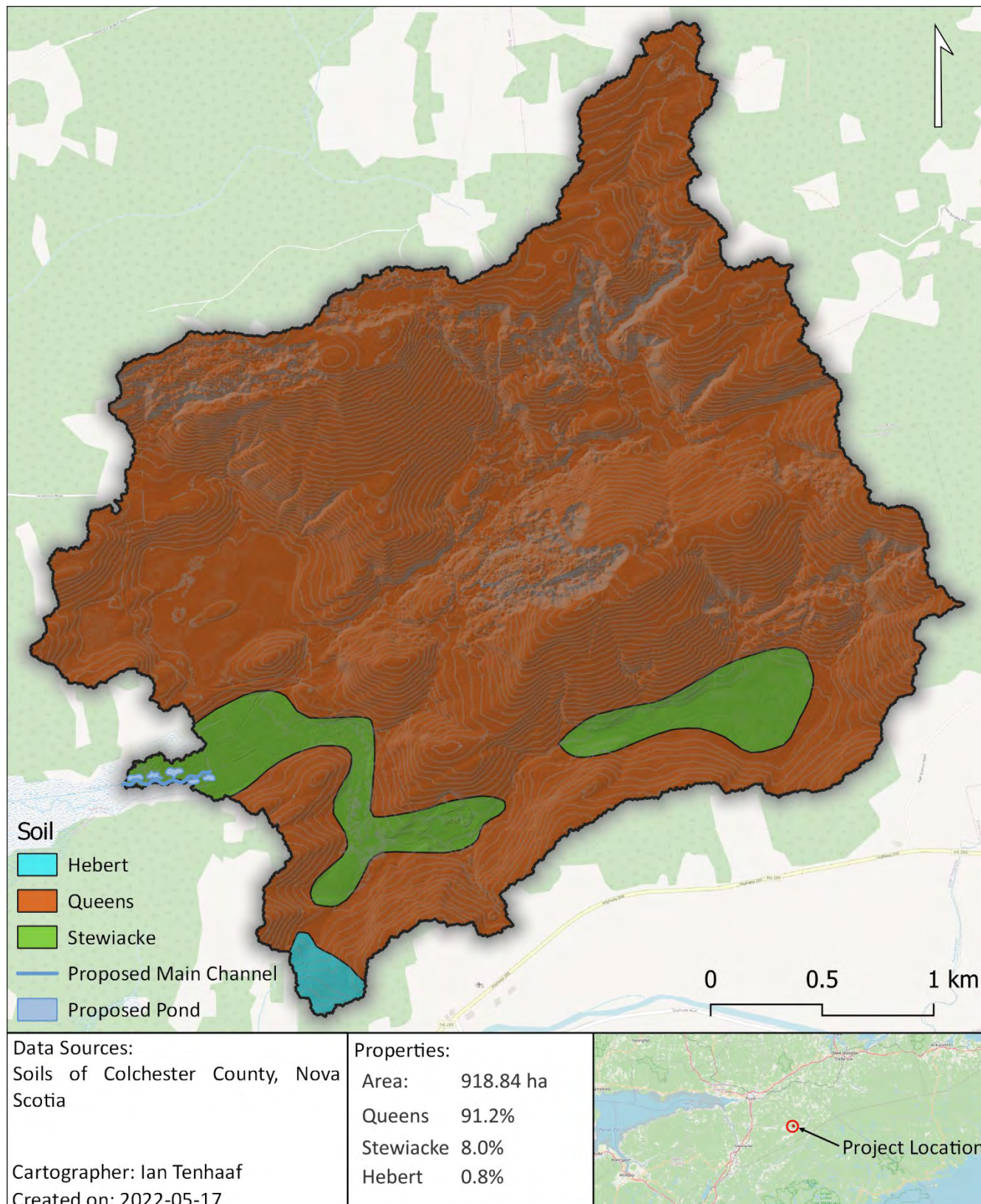


Figure 3: Gulley Brook Project Area Soil Properties

3. Hydrotechnical Feasibility Assessment

The total catchment area to the project site is 919 hectares and contributes flow to the site via two upstream tributaries of Gulley Brook. The south tributary has a contributing catchment area of approximately 366 hectares and the north tributary conveys flow from the remaining 553 hectares. The tributaries converge at the project site. During site investigations, both reaches have exhibited base flow at all times of the year. June Q60 flows, the flow rate expected to be exceeded 60% of the time in June dry weather flow, was calculated using the methods provided in *Guidelines for the Design of Fish Passage for Culverts in Nova Scotia*, Fisheries Protection Program, Maritimes Region, February 2015.

June Q60 flow was calculated as 80 litres per second for the northern tributary and 53 litres per second for the southern tributary.

4. Proposed Design

The proposed fisheries offsetting design includes the naturalization of the existing main channel connect upstream and downstream reaches of the Gulley Brook Tributaries. Multiple deep-water, pond like areas ranging from 1000 to 2000 m² will be connected to the main channel with short channel diversions to provide additional aquatic habitat. Ponds will be constructed with minimum 4:1 side slopes and riparian planting will provide shade cover around the edges of the pond. Pond depth and total volume will be determined following construction of test pits but are expected to be approximately 2.0 to 2.5 meters.

Proposed works presented in **Figures 1-3** are meant to demonstrate the methodology of the approach and do not represent a proposed site plan.

5. Conclusions

The naturalization of the main channel and ponds present an integrated approach to the restoration of the floodplain resulting in a more natural state than the developed condition. The proposed works will increase aquatic habitat areas with a consistent wetland hydrology within the upper portions of the surrounding soil for a greater period of the year by retaining a larger volume of water in the channel reaches and field area currently exhibiting saturated soil conditions. This will result in an extended duration of wet periods and slower period of wetting and drying cycles. Ponding water levels are expected to remain constant through the year with continuous base flow contribution from the Gulley Brook tributaries. Because the proposed design does not contain any control structures and the upstream pasture area has a moderate grade increasing to the east from the project site, there is no increase to flood risk within current agricultural land.

Depth of ponds are designed with consideration for freezing. The depth will be confirmed with test pits to ensure that the proposed construction will not penetrate a low-permeability overburden layer into a high-permeability underlying soil layer which could increase infiltration from the ponds and decrease downstream flows during low-flow periods.

Because ponding areas attenuate flow and reduce peak flow rates, there may be a small decrease in downstream flood risk during large storm events. However, the ponds are designed without control structures, so this attenuation has not been quantified and can be considered negligible to hydrologic function of the system.

The ponding areas will increase the residency time of runoff flow through the ditch system, particularly during base flow periods. To manage water temperature and reduce the risk of anoxic conditions or algal blooms, the ponds should consider riparian planting that provides margin shading, as well as in-pond vegetated islands to provide greater shade cover on the installation. There is sufficient base flow predicted to provide oxygenation of the pond system.

Appendix I.1

Avifauna Baseline Report

Goldboro Gold Project- Biophysical Baseline Report: Avifauna

PREPARED FOR

Anaconda Mining Inc

Suite 790, Cabot Place, 100 New Gower Street
St. John's, NL
A1C 6K3

PREPARED BY

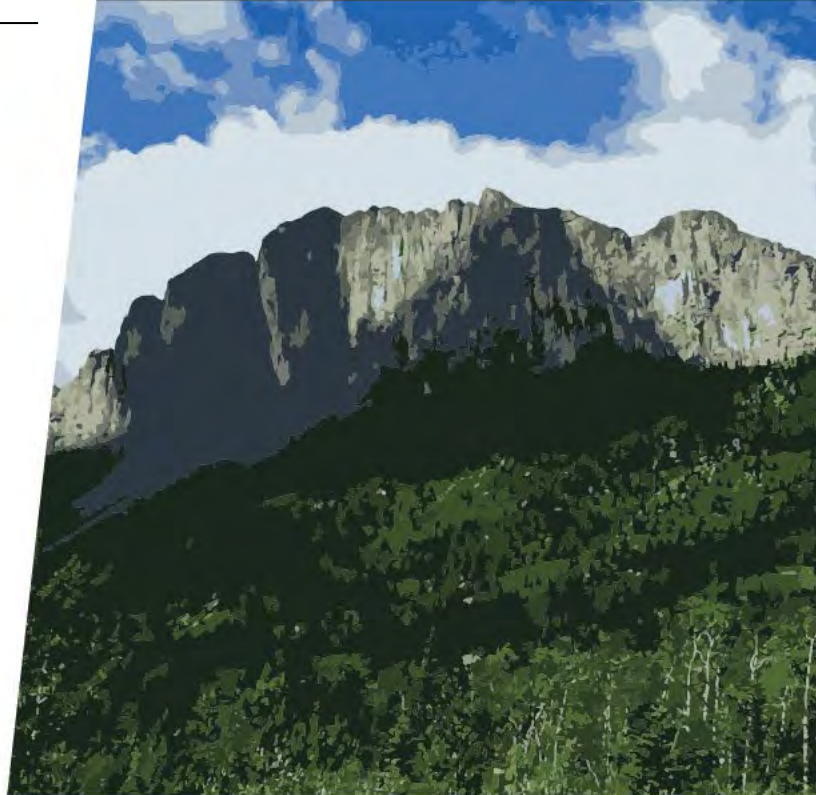
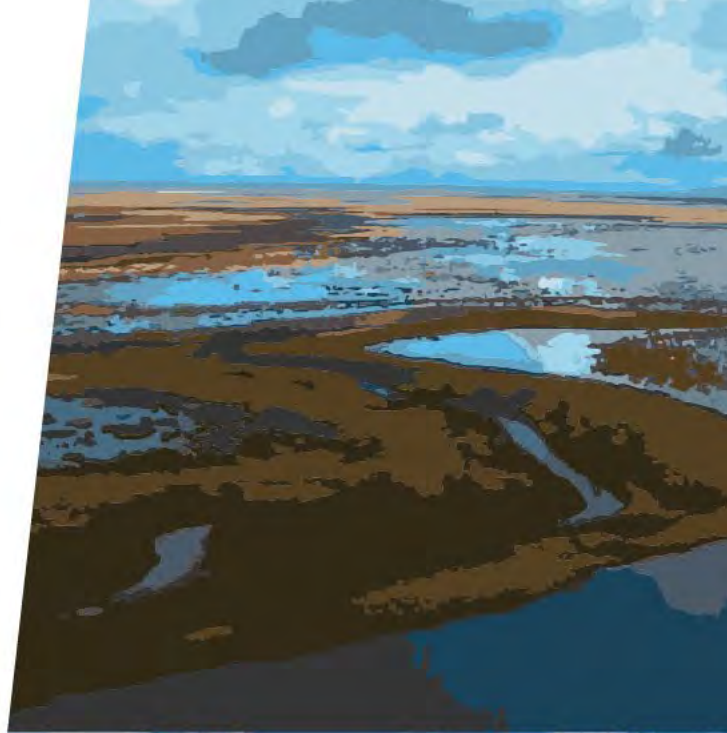
McCallum Environmental Ltd.

2 Bluewater Road, Suite 115
Bedford, Nova Scotia
B4B 1G7

March 3, 2022



McCallum Environmental Ltd.





GOLDBORO GOLD PROJECT

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EXECUTIVE SUMMARY

McCallum Environmental Ltd. (MEL) was commissioned by Anaconda Mining Inc. (Anaconda) to complete avifauna bird surveys for the proposed Goldboro Gold Project (the Project), located in Goldboro, Nova Scotia. These assessments are to support the preparation and submission of the provincial Environmental Assessment Registration Document (EARD).

The objective of the avifauna species surveys were to:

- Identify species and habitat usage with a focus on Species at Risk (SAR) and Species of Conservation Interest (SOCI) within and surrounding the Project Area PA; and,
- Determine trends in species composition and bird group usage throughout different seasons.

The results of these surveys will be carried forward to the EARD and discussed in the effects assessment.

In 2017, biophysical field components were initiated, which continued through until September 2021. The field studies were focused on avifauna presence within the PA and included:

1. Spring migration surveys (May 2019, May 2021)
2. Breeding bird surveys (June 2017, June – July 2019, June 2021)
3. Fall migration surveys (September 2019, August – September 2021)
4. Common nighthawk surveys (June 2017, June 2021)
5. Nocturnal owl surveys (April 2017, April 2021)
6. Waterfowl surveys (August – September 2021)

Baseline avifauna surveys were completed from April to September between 2017 to 2021, by GEMTEC and MEL biologists. A total of 4,065 minutes (68 hours) of surveys were completed. These surveys resulted in the observation of 3,747 individuals, representing 91 bird species within the PA. The most abundant bird group observed was Group 6 (passerines) accounting for 85.8% of total individuals, followed by Group 4 (diurnal raptors; 5%), Group 3 (other waterbirds; 4.1%), Group 7 (other landbirds; 3%), Group 1 (waterfowl; 1.8%), and Group 2 (shorebirds; 0.2%) of total individuals.

The survey design included six survey types and include breeding bird, fall and spring migration, common nighthawk, nocturnal owl and waterfowl surveys and included:

- Sixty-six breeding bird PCs and 23 transects;
- Sixty-six point counts (PCs) and two watch counts (WC) for spring migration;
- Forty-nine PCs and three WCs for fall migration;
- Ten common nighthawk PCs
- Eight owl PCs; and,
- One waterfowl PC.



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The PA is comprised of a mosaic of cutovers, regenerative stands, historical mine workings, roads, trails, and intact, mature conifer and mixedwood stands and open and forested wetlands. Stand heterogeneity and diversity of landscapes observed within the PA provided a range of habitats suitable for a variety of bird species with different habitat requirements. Open habitat such as cutovers, provided suitable hunting habitat for predatory birds such as northern hairy woodpecker and American kestrel, and open water habitats provided foraging and hunting habitat for waterfowl, waterbirds, shorebirds and predatory birds such as Ospreys. Forests with stand heterogeneity (i.e. stands with different height classes) provided suitable habitat for foraging and breeding for many passerine species.

Although suitable breeding habitat for common nighthawk (e.g. clear cuts, ROW clearings, clearings etc.) was widespread throughout the PA, no common nighthawks were observed during the surveys from 2017 – 2021. During the spring, fall and breeding bird surveys, PC locations associated with wetland habitats (treed swamps and bogs) or upland habitats with stand heterogeneity had some of the highest species richness and species abundance.

During the nocturnal owl surveys, three owl species were observed in 2017 and 2021 and includes one SOCI species (boreal owl). The species observed during the surveys were northern saw-whet owl (*Aegolius acadicus*), boreal owl (*Aegolius funereus*), and great horned owl (*Bubo virginianus*).

Four SAR avifauna species were observed within and surrounding the PA and include:

- Canada warbler (*Cardellina canadensis*; ACCDC: S3B; SARA: Threatened; NSESA Endangered);
- Evening grosbeak (*Hesperiphona vespertine*, ACCDC: S3S4B, S3N; SARA: Special Concern, NSESA: Vulnerable);
- Olive-sided flycatcher (*Contopus cooperi*, ACCDC: S2B, SARA: Threatened, NSESA: Threatened); and,
- Wood thrush (*Hylocichla mustelina*, ACCDC: SUB, SARA: Threatened).

Breeding habitat for all SAR species were present within the PA, with Canada warbler and olive-sided flycatcher habitat was the most widely observed. Although breeding habitat was present within the PA for evening grosbeak, this species was only observed as a flyover during migration, and it is likely this species uses the PA as a stop over site and for foraging. One wood thrush was observed outside the PA during the breeding season and this species prefers contiguous mixedwood and hardwood forested mosaics. Although this habitat is present within the PA, the observed forested communities are predominately coastal or near-coastal conifer dominant forests.

Across all survey seasons, a total of 28 priority species were observed. The species and the survey season and type when they were observed are as follows:

- American kestrel (*Falco sparverius*, fall 2021, incidental);
- Bay-breasted warbler (*Dendroica castanea*; fall 2021);



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- Black-backed woodpecker (*Picoides arcticus*; spring 2019, incidental);
- Blackpoll warbler (*Dendroica striata*, spring 2021)
- Boreal chickadee (*Poecile hudsonica*; spring 2021, breeding 2017, breeding 2019, breeding 2021, fall 2018, fall 2021, incidental);
- Canada jay (*Perisoreus canadensis*; spring 2019, spring 2021, breeding 2021, fall 2021, incidental);
- Canada warbler (*Cardellina canadensis*; Breeding 2017, Breeding 2019, incidental);
- Evening grosbeak (*Coccothraustes vespertinus*, spring 2019, incidental);
- Fox sparrow (*Passerella iliaca*, breeding 2017);
- Gray catbird (*Dumetella carolinensis*, fall 2021, incidental);
- Greater yellowlegs (*Tringa melanoleuca*, spring 2021, incidental);
- Northern harrier (*Circus cyaneus*, breeding 2021, incidental);
- Olive-sided flycatcher (*Contopus cooperi*, breeding 2021, incidental);
- Pine grosbeak (*Pinicola enucleator*, incidental);
- Pine siskin (*Carduelis pinus*, spring 2019);
- Red crossbill (*Loxia curvirostra*, incidental)
- Red-breasted nuthatch (*Sitta canadensis*; spring 2019, Breeding 2017, breeding 2019, breeding 2021, fall 2018, incidental);
- Rough-legged hawk (*Buteo lagopus*, incidental)
- Ruby-crowned kinglet (*Regulus calendula*; spring 2019, spring 2021, breeding 2017, breeding 2019, breeding 2021, fall 2021, common nighthawk survey, incidental);
- Solitary sandpiper (*Tringa solitaria*, incidental);
- Spotted sandpiper (*Actitis macularius*, breeding 2017, waterfowl 2021, incidental);
- Swainson's thrush (*Catharus ustulatus*; spring 2021, breeding 2017, breeding 2019);
- Turkey vulture (*Cathartes aura*, fall 2021);
- Willet (*Tringa semipalmata*, spring 2021);
- Wilson's warbler (*Cardellina pusilla*, breeding 2017, breeding 2021, incidental);
- Wood thrush (*Hylocichla mustelina*, breeding 2021);
- Yellow-bellied flycatcher (*Empidonax flaviventris*; spring 2019, breeding 2017, breeding 2019, breeding 2021, incidental); and,
- Boreal owl (*Aegolius funereus*, S2?B, 2017 nocturnal owl surveys).



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1 INTRODUCTION

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The objective of the avifauna species surveys is to:

- Identify species and habitat usage with a focus on Species at Risk (SAR) and Species of Conservation Interest (SOCI) within and surrounding the Project Area (PA); and,
- Determine trends in species composition and bird group usage throughout different seasons.

The results of these surveys will be carried forward to the EARD to evaluate Project impacts to avifauna.

1.1 Background

The Project is located approximately 175 kilometres (km) northeast of Halifax, 60 km southeast of Antigonish, and 1.6 km northeast of the community of Goldboro on the eastern shore of Isaac's Harbour, in Guysborough County, Nova Scotia, Canada. Anaconda Mining Inc. (Anaconda) proposes to develop the Project as a 4,000-tonne per day (tpd) mine and processing facility. For the purposes of this environmental assessment, a PA was defined as the footprint of Project related infrastructure plus a buffer of 100 – 200 m. The mine plan includes two surface extraction areas (open pits), an ore processing facility, a tailings management facility (TMF), three waste rock storage areas (WRSAs), overburden and organic stockpiles, support buildings including an employee accommodation building, and associated infrastructure. The anticipated mine life for extraction of ore is approximately 11 years.

The scope of the Project includes activities associated with construction, operation, and closure. Project construction activities will include clearing and grubbing the overburden and organic stockpiles, WRSAs, pit, plant, and TMF areas, and construction of the initial lift of the TMF, plant site, secondary access roads, construction laydowns, Run-of-Mine (ROM) pad, surface water management and other site infrastructure. The operation phase will include conventional ore extraction methods (drilling, blasting, loading, and hauling), ore processing, and waste management. ROM ore will go directly to the crusher while stockpiled high-grade and low-grade ore will be progressively processed throughout the mine life. Non-ore bearing waste rock, not used for construction or backfill, will be stockpiled at its final disposal point, managed and reclaimed in place. The closure phase will include earthworks and demolition required to return the PA to a safe, stable, and vegetated state, and all monitoring and treatment, if required.

The Site is primarily disturbed by historical mining activities, road construction and timber harvesting. The region is known for its historic gold deposits and about half of the parcel is currently under mineral



exploration licenses including the known Goldboro (Upper Seal Harbour), Isaacs Harbour, Forest Hill, and Lower Seal Harbour deposits.

1.2 Regulatory Context

The Project has potential to interact with avifauna species which may be protected under several federal and provincial legislations as well as regulatory guidelines. The avifauna surveys were designed to detect species which may be listed in these documents. Legislation that may direct resource development and conservation of avifauna species and their habitat include:

- **Federal Legislation:**
 - *Species at Risk Act.*
- **Provincial Legislation:**
 - *Nova Scotia Wildlife Act;* and,
 - *Nova Scotia Endangered Species Act.*

The Project is also driven by policies, guidelines and standards that provide guidance on the development of the Project and the survey design. These guidance documents and policies include:

- *Nova Scotia Wetland Conservation Policy (NSE 2019);*
- *The Guide to Addressing Wildlife Species and Habitat in an EA Registration Document (NSECC, 2005);*
- Various Nova Scotia Department of Natural Resources and Renewables (NSDNRR) *Special Management Practices (SMP)* and Environment and Climate Change (ECC) *Species at Risk Management Plans.*

1.3 Project Area

The biophysical surveys occurred within the PA which encompasses the immediate area of the Project with a 100 – 200 m buffer to account for potential indirect effects to Valued Components (VCs). The PA is approximately 1,221 ha and 85 ha of this area are open water features (Figure 1, Appendix A). The remainder of the land comprises of forested and harvested landscapes, historical and current mine workings, access roads and trails, forested swamps and peatlands.

1.4 Project Team

A project team consisting of terrestrial ecologists proficient in avifauna identification were selected to complete the field studies and reporting for these surveys. Team members with integral roles in the surveying, reporting and project management are listed below (Table 1).



Table 1. Project Team

Team Member	Role and Duties
John Gallop, B.Sc., P.Biol	Terrestrial Ecologist, Senior Report Review
Chris Pepper	Terrestrial Ecologist, Lichenologist
Jessica Lohnes, B.Sc	Terrestrial Ecologist
Meaghan Quanz, B.Sc., M.E.S.	Terrestrial Ecologist, Report Writer
Emma Posluns, B.Sc., MSc	Project Coordinator
Meaghan Milloy, B.Sc., M.E.S.	Vice President and Project Manager

2 METHODOLOGY

Completion of the avifauna surveys is a two-part process consisting of a desktop review and field surveys. The desktop component involved a preliminary screening of the area and survey design followed by field surveys. A description of the methods used are described below.

2.1 Desktop Review Methodology

A review of the Canada Important Bird Areas database, ACCDC report, Maritime Breeding Bird Atlas (MBBA), old forest GIS database, and Canada Wildlife Service Migratory Bird Sanctuaries (MBS) was completed to support bird survey design.

The Provincial Landscape Viewer (<https://nsgi.novascotia.ca/plv/>) was also reviewed to determine whether the PA is within, or adjacent to special features, such as protected areas. To ensure the PA is not located within any ecologically sensitive regions, the following databases were also reviewed:

- Nova Scotia Department of Natural Resources and Renewables (NSDNRR) Significant Habitats;
- Maritime Breeding Bird Atlas (MBBA);
- Canada Wildlife Service Migratory Bird Sanctuary (CWS-MBS);
- Canada Important Bird Area (IBA);
- SARA Critical Habitat layers;
- SARA Recovery strategies; and,
- Special Management Practice (SMPs) layers.

2.1.1 Priority Species List

Development of a priority species list for birds was completed based on a compilation of listed species from the following sources:

1. **Committee on the Status of Endangered Wildlife in Canada (COSEWIC) and Species at Risk Act (SARA):** All species listed as Endangered, Threatened, or Special Concern;
2. **Nova Scotia Endangered Species Act (NSES):** All species listed as Endangered, Threatened, or Vulnerable; and,



3. **Atlantic Canada Conservation Data Centre (ACCDC) Conservation Rank:** All Species designated as S1, S2, or S3 as defined by the ACCDC.

Species listed under SARA and/or NSESA are termed Species at Risk (SAR) and species listed under COSEWIC and/or ACCDC, are termed Species of Conservation Interest (SOCI). The priority list of species was first narrowed by a broad geographic area and then further narrowed by identifying specific habitat requirements for each species. For example, if a listed species on the NSESA required abandoned or cultivated fields, and that habitat is not present inside the PA, this species was not carried forward to the final list of priority species.

The data sets and reports described above and in section 2.1 were reviewed and used to develop the priority species list. The ACCDC report was one of the key documents used in the development of the priority species list, as this report summarizes known and observed occurrences of rare species in the general location of the PA.

The final priority species list is included in Appendix B, the ACCDC report is included in Appendix C, and a list of birds observed during the MBBA atlas in the Guysborough region (square 20PR00) is provided in Appendix D.

2.2 Desktop Survey Design Methodology

Prior to conducting field surveys, a preliminary desktop survey design was developed to target suitable habitat for the avifauna species or species groups of interest (e.g. breeding birds, common night hawk, owls etc.). Survey methodology was consistent with the guidelines stated in the *Recommended Protocols for Monitoring Impacts of Wind Turbines on Birds* (EC CWS, 2007). Although this document is specific to wind turbine projects, these protocols provide a variety of survey methods that can be considered applicable to other developments such as quarries, goldmines etc., and is an appropriate guidance document for avifauna surveys in general. This document provided instruction in the following areas: survey site selection, survey location spacing, number of point counts, survey duration, and season selection.

Based on the *Recommended Protocols for Monitoring Impacts of Wind Turbines on Birds* (EC CWS, 2007), *The Guide to Addressing Wildlife Species and Habitat in an EA Registration Document* (NSECC, 2005), and results from the priority species list and the ACCDC report, the following avifauna survey types were chosen:

- Spring and Fall Migration;
- Breeding Birds;
- Nocturnal Owl;
- Common Nighthawk; and,
- Waterfowl surveys.



To determine suitable avifauna survey locations the following databases were used:

- NSDNRR Forest Inventory;
- Nova Scotia Environment and Climate Change Canada (NSECC) Wetland Inventory;
- Nova Scotia Topographic Database (NSTDB) which includes road, watercourse and topography layers;
- NSECC Wet Areas Mapping (WAM) and Flow Accumulation; and,
- Aerial imagery (provided by Google Earth).

These databases were then categorized, and the major habitat types listed below were identified. Depending on the target avifauna species or species groups, a subset or all habitat types may have been targeted.

- Mature forested softwood stands;
- Mature forested mixedwood stands;
- Mature forested softwood stands;
- Cutovers;
- Wetlands (i.e. swamps, fens, bogs);
- Anthropogenic (e.g. roads, quarries etc.);
- Open waterbodies; and,
- Areas with edge habitat.

2.2.1 Breeding Bird, Spring and Fall Migration Survey Design

Point count (PC) locations were used to determine the presences of breeding and migratory birds using habitat within the PA and the surrounding areas. Since these surveys are not species-specific, and a variety of avifauna species have different habitat requirements, a representative number of all major habitats listed in Section 2.2 were targeted both within the PA and surrounding areas. PC locations were spaced approximately 250 m to 400 m apart depending on the complexity of habitat types. During the migration surveys, watch count (WC) survey locations were also selected which targeted open waterbodies that could potentially serve as stop over sites during migration. All attempts were made to establish PCs within and surrounding the PA, should post-construction avifauna monitoring be required. However, at the time of the survey design, the placement of Project infrastructure was not finalized. The preliminary survey design resulted in:

- Sixty-six breeding bird PCs and twenty-three transects;
- Sixty-six PCs and two WC for spring migration; and,
- Forty-nine PCs and three WCs for fall migration.



2.2.2 Common Nighthawk (*Chordeiles minor*) Survey Design

Suitable common nighthawk breeding habitat: gravel road clearings, cutovers and barrens (MBBA, 2008), were selected as PC locations both within the PA and the surrounding area. An 800 m spacing was used to provide adequate coverage of the area while avoiding overlapping observations (i.e. hearing the same individual at multiple locations). All survey locations were along gravel roads to assure the PCs could be safely surveyed during the nocturnal surveys. Ten PC locations were selected in the preliminary desktop review.

2.2.3 Nocturnal Owl Surveys

Survey locations were selected within and outside the PA along roads and adjacent to mature forests and wetlands. All survey locations were spaced a minimum of 1.6 km to avoid overlapping observations (i.e. detecting the same owl from multiple stations). PCs were adjacent to roads and access trails to allow for easy and safe access during the nocturnal owl surveys. In total, the survey design included eight PCs (four within and four outside the PA).

2.2.4 Waterfowl Surveys

One waterfowl survey location was selected along the Gold Brook Lake shore. This location was selected due to the good vantage point and suitable habitat which has potential to support habitat for waterfowl, waterbirds and shorebirds.

2.3 **Field Program Methodology**

Survey locations determined in the desktop survey design (section 2.2) were visited and adjusted if required and completed by trained terrestrial ecologists. A breakdown of the time of year, survey rationale and consultants responsible for the surveys are described in Table 2.

Table 2. Avian surveys completed within the PA.

Survey Type	Dates	Survey Rounds	Consultant	Rationale	Source
Spring migration	May 14 th , 29 th , 2019 May 10 th – 13 th , 18 th – 21 st , 2021	4	MEL	This time of year, bird species begin to migrate back to Canada to breed. Resident species may begin to breed on March 30. Surveying at this time period will detect on early nesters and the beginning of spring migration.	<i>Nesting Periods – Government of Canada (2018)</i>



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Survey Type	Dates	Survey Rounds	Consultant	Rationale	Source
Breeding bird	June 2 nd – 5 th , 27 th – 29 th , 2017 June 2 nd - 4 th , June 17 th -18 th , 2021	4	GEMTEC (2017) MEL (2021)	June is the peak breeding season in Nova Scotia. Different species breed on different schedules, therefore, spreading surveys out within June allow for greater chances to detect species.	<i>Maritimes Breeding Bird Atlas (2020)</i>
Fall migration	September 28 th - 29 th , 2018 August 31 st , September 1 st – 2 nd , September 14 th -16 th , September 28 th – 30 th , 2021	4	MEL	From late August to September, bird species begin to migrate south for the winter months. Surveying at this time period will detect migrating species.	<i>Maritimes Breeding Bird Atlas (2020)</i>
Nocturnal owl	April 24 th , 2017 April 15 th , 21 st , 29 th , 2021	4	GEMTEC (2017) MEL (2021)	The ACCDC reported a short-eared owl sighting and long-eared owl sighting within 5 km of the site, and a boreal owl sighting within 31.4 +/- 7.0 km.	ACCDC, 2021
Waterfowl	August 31 st , September 14 th , September 28 th , 2021	3	MEL	A large waterbody (Gold Brook Lake) is present within the Project Area. Surveys were completed to understand which waterfowl species use Gold Brook Lake as habitat. This survey was completed as part of studying the effects of traditionally hunted species for First Nations communities.	
Common Nighthawk	June 25 th , 2017 June 2 nd , June 15 th , 2021	2	GEMTEC (2017) MEL (2021)	The ACCDC reported a common nighthawk sighting within 2.3 +/- 7.0 km.	ACCDC, 2021



Habitat descriptions at each PC were recorded and each field-verified PC location was georeferenced by a handheld Garmin GPS. General observations including temperature, visibility, wind speed, date, start, and end time were also recorded. Bearings were recorded for priority species observed during dedicated survey periods and incidentally.

Bird species were identified based on functional bird groups to understand how each group uses the PA. These functional groups include:

1. **Waterfowl:** Ducks, geese, or other large aquatic birds, especially when regarded as game;
2. **Shorebirds:** Waders, from the Order Charadriiformes;
3. **Other waterbirds:** Includes seabirds (i.e. marine birds), grebes (Order Podicipediformes), loons (Order Gaviiformes), Ciconiiformes (i.e. storks, herons, egrets, ibises, spoonbills, etc.), pelicans (Order Pelicaniformes), flamingos (Order Phoenicopteriformes), Gruiformes (i.e. cranes and rails), kingfishers, gulls and dippers (the only family of passerines considered waterbirds);
4. **Diurnal Raptors:** Birds within the families Accipitridae (i.e. hawks, eagles, buzzards, harriers, kites and old-world vultures), Pandionidae (i.e. osprey), Sagittariidae (i.e. secretary bird), Falconidae (i.e. falcons, caracaras, and forest falcons), Cathartidae (i.e. new world vultures), and one species from the Order Strigiformes (i.e. hawk owl);
5. **Nocturnal Raptors:** Birds of the Order Strigiformes (i.e. owls; with exception of the hawk owl, which is a diurnal species of owl);
6. **Passerines:** Any bird of the Order Passeriformes, which includes more than half of all bird species. This is with exception of the dippers, which are a passerine considered a waterbird; and,
7. **Other Landbirds:** Birds within the Orders Galliformes (i.e. quail, pheasant, and grouse), Columbiformes (i.e. pigeons and doves), Cuculiformes (i.e. cuckoos), Caprimulgiformes (i.e. nighthawks and whip-poor-wills), Apodiformes (i.e. swifts and hummingbirds), and Piciformes (i.e. woodpeckers, flickers and sapsuckers).

Survey specifics varied for each survey type and are described in detail below.

2.3.1 Spring Migration Surveys

Sixty-six PCs and two WC locations were surveyed on May 14th and May 29th, 2019, May 10th – 12th, and May 18th-21st, 2021. The total survey effort was 20.5 hours.

Surveys began at, or within, half an hour of sunrise and were completed within four-and-a-half hours. Each PC was surveyed for a duration of 10 minutes. During each survey, weather conditions (i.e., precipitation and visibility) were monitored and bird observations were recorded at three distance regimes: within a 50 m radius, 50 to 100 m radius, outside the 100 m radius. Flyovers were also documented. Surveys took place with winds of 0 – 19 km/hr, temperatures ranging from -2 – 10 °C and clear to light rain and light fog conditions. Surveys did not occur during high rainfall events if vision was significantly impaired or if winds impaired hearing. Refer to Figure 2, Appendix A for survey locations.



Table 3 lists the PC locations and associated habitat and vegetation types. Surveys were completed by MEL biologists, Mr. John Gallop, Ms. Emma Posluns, Ms Amber Stoffer, Mr. Chris Pepper and Ms. Jessica Lohnes.

Table 3. Spring Migration PC Locations and Associated Habitat and Vegetation Types

Point Count	Coordinates		Habitat Type(s)	Vegetation Type(s) VT ¹	Dates Surveyed
	Easting	Northing			
14-May-19					
PC1	605680	5007399	Raised bog	PG1	May 14 th
PC2	605549	5007718	Forestry trail in regenerated forest	SH5	May 14 th
PC3	605985	5007540	Forestry trail in conifer forest	SH5	May 14 th
PC4	606157	5007744	Forested Swamp	WC6	May 14 th
PC5	606213	5007032	Bog edge	PG1	May 14 th
PC6	606389	5007279	Clearcut	MW4	May 14 th
WC1	606575	5007418	Edge of Gold Brook Lake	WC1	May 14 th
29-May-19					
PC1	605696	5007391	Raised bog	PG1	May 29 th
PC2	606188	5007044	Forested Swamp	WC2	May 29 th
PC3 (WC2)	606639	5007278	Edge of Gold Brook Lake	WC1	May 29 th
PC4	606355	5007273	Clearcut	MW4	May 29 th
PC5	605682	5007665	Upland	SH5	May 29 th
PC6	606044	5007533	Upland forest	SH5	May 29 th
PC7	606001	5007848	Upland forest	SH5	May 29 th
PC8	605775	5008147	Upland forest	MW2	May 29 th
PC9	606349	5007905	Forested Swamp	WC2	May 29 th
PC10	606477	5007522	Upland forest	SH5	May 29 th
2021					
PC1	606557	5006444	Road, beaver pond/fen, Softwood forest	WC1	May 10 th and May 18 th
PC2	606547	5005719	Pipeline ROW, coniferous forest.	Cutover	May 10 th and May 18 th
PC3	606637	5005368	Road. Pipeline. Coniferous forest.	MW4	May 10 th and May 18 th
PC4	606085	5005517	Conifer swamp.	-	May 10 th and May 18 th



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Point Count	Coordinates		Habitat Type(s)	Vegetation Type(s) VT ¹	Dates Surveyed
	Easting	Northing			
PC5	607814	5006906	Cut trail. Softwood dominant forest. Regen. Upland.	CO4	May 11 th and May 19 th
PC6	608051	5005926	Road, coniferous forest.	MW4	May 11 th and May 19 th
PC7	608317	5005628	Road, coniferous forest.	-	May 11 th and May 19 th
PC8	607250	5006432	Trail. Softwood dominant forest.	SH8	May 11 th and May 19 th
PC9	608113	5007456	Road. Softwood dominant forest. Forested swamp.	SH5	May 12 th and May 20 th
PC10	607045	5006230	Roadside. Fen and flood plain, swamp, along watercourse, softwood forest.	WC2/SH8	May 11 th and May 18 th
PC11	606123	5006036	Open bog, pipeline ROW.	PG1	May 10 th and May 18 th
PC12	605643	5007263	Road, Pipeline ROW, Softwood forest.	SH5	May 10 th and May 18 th
PC13	606294	5004744	Edge of road, cemetery, softwood upland swamp.	-	May 10 th and May 18 th
PC14	607842	5006212	Trail, softwood dominant forest.	CO4	May 11 th and May 19 th
PC15	608177	5005279	Softwood dominant forest.	-	May 11 th and May 19 th
PC16	607016	5006499	Lakeside, softwood dominant forest.	SH5	May 10 th and May 18 th
PC17	606590	5006192	Drill line, softwood forest.	SH8	May 10 th and May 18 th
PC18	607769	5005952	Trail. Softwood dominant forest.	SH8	May 11 th and May 19 th
PC19	606113	5006777	Coniferous forest. Upland cut-block.	SP7	May 10 th and May 18 th
PC20	606364	5005331	Coniferous regenerative upland forest, river, road.	S3	May 10 th and May 18 th
PC21	606249	5006480	Road, softwood dominant forest.	SP7	May 10 th and May 18 th
PC22	605910	5006602	Raised bog. Pipeline. Coniferous forest.	WC1	May 10 th and May 18 th
PC23	607727	5006519	Road, softwood dominant forest by a watercourse.	CO4	May 11 th and May 19 th
PC24	607807	5005602	Trail, softwood dominant forest.	CO4	May 11 th and May 19 th
PC25	607475	5005573	Trail. Softwood dominant forest.	CO4	May 11 th and May 19 th



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Point Count	Coordinates		Habitat Type(s)	Vegetation Type(s) VT ¹	Dates Surveyed
	Easting	Northing			
PC26	607894	5007875	Road, softwood dominant forest by tree/shrub swamp complex.	WC2	May 12 th and May 20 th
PC27	607546	5008207	Mixed wood swamp. Cutover.	MW4	May 13 th and May 21 st
PC28	607507	5008550	Road, softwood dominant forest/regen.	Cutover	May 13 th and May 21 st
PC29	607784	5008807	Softwood dominant. Trail.	SH6	May 13 th and May 21 st
PC30	608365	5008325	Road, regenerative upland forest.	SH5	May 12 th and May 20 th
PC31	608368	5007989	Forested Swamp.	WC2	May 13 th and May 20 th
PC32	607086	5008928	Leather leaf fen, treed bog.	WC2, PG2	May 13 th and May 21 st
PC33	608863	5008658	Road, cutover, treed bog.	SH8, Cutover	May 12 th and May 20 th
PC34	609078	5008982	Road, cutover, treed bog.	-	May 12 th and May 20 th
PC35	609509	5008722	Road, cutover, treed bog.	-	May 12 th and May 20 th
PC36	608940	5009354	Conifer forested swamp.	-	May 13 th and May 21 st
PC37	610195	5008531	Road, cutover, coniferous forest, softwood dominant.	-	May 12 th and May 20 th
PC38	609535	5009698	Upland softwood forest, softwood swamp.	-	May 13 th and May 21 st
PC39	609240	5009511	Shrub bog, cutover.	-	May 13 th and May 21 st
PC40	607781	5009333	Regen. Softwood dominant. Trail.	SH6	May 13 th and May 21 st
PC41	608502	5009853	Bog. Surrounded by softwood forest.	-	May 13 th and May 21 st
PC42	606581	5008787	Road, cut-block, hardwood dominant.	SP7	May 13 th and May 21 st
PC43	605209	5008034	By underground pipeline, shrubbed field. Shrub, softwood dominant forest.	SP7	May 13 th and May 21 st
PC44	609710	5009047	Cutover, watercourse	-	May 13 th and May 20 th
PC45	608671	5007651	Trail, softwood dominant forest, adjacent to wetland.	MW4	May 12 th and May 20 th
PC46	607556	5006764	Treed bog/shrub bog complex.	WC2	May 11 th and May 20 th
PC47	607455	5006184	Road. Softwood dominant forest.	WC2	May 11 th and May 19 th



Point Count	Coordinates		Habitat Type(s)	Vegetation Type(s) VT ¹	Dates Surveyed
	Easting	Northing			
PC48	609180	5008431	Cutover, treed bog, softwood dominant forest.	-	May 13 th and May 20 th
PC49	605451	5008682	Road, softwood dominant upland, prominent shrub layer.	-	May 13 th and May 21 st
PC50	608245	5009496	Softwood dominant forest.	-	May 13 th and May 21 st

¹Vegetation types are as per the classification systems used in the Goldboro Gold Project – Vegetation Community Assessments (MEL, 2022) biophysical report.

Notes: “-“ indicates areas where VT types were not assigned.

2.3.2 Breeding Bird Surveys

Breeding bird surveys occurred on June 2nd – 5th, 27th – 29th, 2017 at 23 PC locations (GEMTEC), June 20th and July 4th, 2019 at 9 PC locations, and June 2nd – June 4th and June 17th – 18th, 2021 at 34 PC locations (MEL). In total, 66 breeding bird PC locations were surveyed for a total effort of 22.67 hours (Table 4 below, and Figure 3, Appendix A). Breeding bird surveys were repeated twice in the month of June except for PCs 4 and 15 in the 2017 surveys. These surveys were not repeated by GEMTEC in the second round as representative habitats were already surveyed. Since multiple years of surveys took place and are discussed in this report, the original numbering system of the PC locations are used.

The methodology for breeding bird surveys is identical to those described for spring migration (section 2.3.1), except for the addition of area searches in 2021 and the time of year. Area searches are recommended by CWS during the breeding season to visit more habitat types and/or search habitats more thoroughly for species use during the breeding season (EC CWS, 2007). Twenty-three meandering searches (transects) were conducted by MEL biologists, between a subset of PC locations and the same data was collected as per the PC methodology. Meandering transects only occurred between point counts which required walking and the primary focus of these surveys were to identify any additional SAR/SOCI species which may have not been detected in the PC surveys. Transects between roadside PCs did not occur. Approximate locations of meandering transects are shown in Figure 3.

The breeding status of the bird species observed during breeding bird surveys was also recorded. The surveyor documented bird behavior observed, including distraction display, carrying food, and carrying nesting material. The following are the breeding status indicators described in Atlassing for Species at Risk in the Maritime Provinces (MBBA, 2008):

- **Observed** - species observed in its breeding season;
- **Possible** - species observed during breeding season in suitable nesting habitat or singing males or breeding calls heard, in suitable nesting habitat during breeding season;



- **Probable** - agitated behavior observed or the occurrence of an adult bird, at the same place, on at least two days a week during breeding season; and
- **Confirmed** - adult carrying food or distraction display.

Surveys began at, or within, half an hour of sunrise and were completed within approximately four hours. Ten-minute point counts were completed at each survey location. During each survey, weather conditions (i.e., precipitation and visibility) were monitored and bird observations were recorded at three distance regimes: within a 50 m radius, 50 to 100 m radius and outside the 100 m radius. Additionally, flyovers were recorded. Surveys took place with winds of 0 – 19 km/hr, temperatures ranging from 6 – 23 °C and clear to light rain conditions. Surveys did not occur during high rainfall events or if vision was significantly impaired or if winds impaired hearing.

Table 4. Breeding Bird Point Count Locations and Associated Habitats

Point Count	Coordinates (NAD 83 UTM 20)		Habitat Types	Vegetation Type(s) (VT) ¹	Dates Surveyed
	Easting	Northing			
2017					
PC1	606557	5006444	Forested wetland and upland, open water	SP7, WC1	June 2 nd and June 29 th
PC2	606546	5005719	Forested upland and cutover	SH8, cutover	June 2 nd and June 29 th
PC3	606637	5005368	Forested upland, cutover	MW4, cutover, SH6	June 2 nd and June 29 th
PC5	607813	5006906	Forested upland	CO4	June 5 th and June 27 th
PC6	608050	5005926	Forested upland	CO1	June 5 th and June 27 th
PC7	608316	5005628	Road, forested upland	-	June 5 th and June 27 th
PC8	607250	5006432	Forested upland and wetland	WC1, CO4	June 5 th and June 27 th
PC9	608152	5007501	Cutover, forested upland, forested swamp	SH5, WC2	June 5 th and June 27 th
PC10	607045	5006230	Forested upland	SH8	June 5 th and June 27 th
PC11	606123	5006036	Raised bog	PG1	June 2 nd and June 29 th
PC12	605642	5007263	Forested upland	SH5	June 2 nd and June 29 th
PC13	606293	5004743	Forested wetland and upland, road	WC2, SH5, MW4, SP5	June 2 nd and June 29 th
PC14	607842	5006212	Forested upland	CO4	June 5 th and June 27 th
PC16	607016	5006499	Forested upland	SH5	June 5 th and June 27 th
PC17	606590	5006192	Forested upland	SH8	June 5 th and June 27 th
PC18	607768	5005952	Forested upland	SH8	June 5 th and June 27 th



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Point Count	Coordinates (NAD 83 UTM 20)		Habitat Types	Vegetation Type(s) (VT) ¹	Dates Surveyed
	Easting	Northing			
PC19	606112	5006777	Forested upland	SP7	June 2 nd and June 29 th
PC20	606363	5005331	Shrubland	S3	June 2 nd and June 29 th
PC21	606248	5006480	Forested upland	SP7	June 2 nd and June 29 th
PC22	605909	5006602	Forested Wetland	WC1	June 2 nd and June 29 th
PC23	607727	5006519	Forested upland	CO4	June 5 th and June 27 th
PC24	607807.1	5005602	Forested upland	CO4	June 5 th and June 27 th
PC25	607474.9	5005573	Forested upland	CO4	June 5 th and June 27 th
2019					
PC1	605696	5007391	Raised bog	PG1	June 20 th and July 4 th
PC2	606188	5007044	Forested Wetland	WC2	June 20 th and July 4 th
PC4	606355	5007273	Regenerative Forest	MW4	June 20 th and July 4 th
PC5	605682	5007665	Forested upland	SH5	June 20 th and July 4 th
PC6	606044	5007533	Forested upland	SH5	June 20 th and July 4 th
PC7	606001	5007848	Forested upland	SH5	June 20 th and July 4 th
PC8	605775	5008147	Forested upland	MW2	June 20 th and July 4 th
PC9	606349	5007905	Forested Wetland	WC2	June 20 th and July 4 th
PC10	606477	5007522	Forested upland	SH5	June 20 th and July 4 th
2021					
PC1	605696	5007391	Large bog, softwood dominant forest	PG1	June 2 nd – June 4 th , June 16 th – June 18 th
PC2	605682	5007665	Trail	SH5	June 2 nd – June 4 th , June 16 th – June 18 th
PC3	606044	5007533	Lakeside. Goldbrook lake. Shrub dominant and softwood dominant forest. Trail that branches off pipeline.	SH5	June 2 nd – June 4 th , June 16 th – June 18 th
PC4	605775	5008147	Regenerative forest adjacent to lake. Softwood dominant forest. Edge of forested swamp.	MW2, WC6	June 2 nd – June 4 th , June 16 th – June 18 th
PC5	606001	5007848	Softwood dominant forest. Forested swamp and prominent shrub layer.	MW4, WC6	June 2 nd – June 4 th , June 16 th – June 18 th
PC6	606349	5007905	Lakeside. Softwood	WC2	June 2 nd – June 4 th ,



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Point Count	Coordinates (NAD 83 UTM 20)		Habitat Types	Vegetation Type(s) (VT) ¹	Dates Surveyed
	Easting	Northing			
			dominant forest. Watercourse that goes to lake. Forested swamp.		June 16 th – June 18 th
PC7	606477	5007522	Lakeside. Softwood dominant forest.	SH5	June 2 nd – June 4 th , June 16 th – June 18 th
PC8	606639	5007278	Lakeside. Goldbrook lake. Softwood dominant forest.	WC1	June 2 nd – June 4 th , June 16 th – June 18 th
PC9	606355	5007273	Softwood dominant forest. Close to lake, large regenerative forests, forested wetlands.	MW4	June 2 nd – June 4 th , June 16 th – June 18 th
PC10	606188	5007044	Edge of forested swamp and raised bog. Softwood dominant forest.	WC2, PG1	June 2 nd – June 4 th , June 16 th – June 18 th
PC11	606085	5005517	Softwood dominant forest adjacent to forested swamp	-	June 2 nd – June 4 th , June 16 th – June 18 th
PC12	608175	5005279	Forested upland	-	June 2 nd – June 4 th , June 16 th – June 18 th
PC13	607894	5007870	Road. Softwood dominant forest. By treed swamps and bogs.	WC2, SH5	June 2 nd – June 4 th , June 16 th – June 18 th
PC14	607546	5008207	Forested swamp. Softwood dominant forest.	MW4, WC1	June 2 nd – June 4 th , June 16 th – June 18 th
PC15	607507	5008550	Roadside. Softwood dominant forest. This area is very shrubby.	Cutover	June 2 nd – June 4 th , June 16 th – June 18 th
PC16	607086	5008928	By fen/swamp. Softwood dominant forest.	WC2, PG2	June 2 nd – June 4 th , June 16 th – June 18 th
PC17	607784	5008807	Trail. Softwood dominant forest.	SH6	June 2 nd – June 4 th , June 16 th – June 18 th
PC18	607781	5009333	Trail. Softwood dominant forest, adjacent to cutover	SH6, cutover	June 2 nd – June 4 th , June 16 th – June 18 th



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Point Count	Coordinates (NAD 83 UTM 20)		Habitat Types	Vegetation Type(s) (VT) ¹	Dates Surveyed
	Easting	Northing			
			swamp.		
PC19	608365	5008325	Roadside. One side cut-block/regen. Softwood dominant forest.	SH5	June 2 nd – June 4 th , June 16 th – June 18 th
PC20	608368	5007989	Forested swamp. Softwood dominant forest.	WC2, SH5	June 2 nd – June 4 th , June 16 th – June 18 th
PC21	608863	5008658	Roadside, cutover, softwood dominant upland forest.	SH8, SH6, cutover	June 2 nd – June 4 th , June 16 th – June 18 th
PC22	609509	5008722	Roadside and regenerative softwood forest.	-	June 2 nd – June 4 th , June 16 th – June 18 th
PC23	610195	5008531	Roadside, regenerative softwood forest.	-	June 2 nd – June 4 th , June 16 th – June 18 th
PC24	609078	5008982	Roadside, regenerative softwood forest.	-	June 2 nd – June 4 th , June 16 th – June 18 th
PC25	608940	5009354	Edge of regenerative forest, softwood dominant forest and forested bog.	-	June 2 nd – June 4 th , June 16 th – June 18 th
PC26	609240	5009511	Edge of cut-block/regen. Softwood dominant forest, forested bog.	-	June 2 nd – June 4 th , June 16 th – June 18 th
PC27	609535	5009698	Forest, softwood dominant and forested swamp.	-	June 2 nd – June 4 th , June 16 th – June 18 th
PC28	608502	5009853	Edge of large wetland complex. Mix of bogs/fens. Softwood dominant forest surrounds with cutover areas.	-	June 2 nd – June 4 th , June 16 th – June 18 th
PC29	608246	5009497	Regenerative forest. Shrubby. Softwood dominant forest.	-	June 2 nd – June 4 th , June 16 th – June 18 th
PC30	607524	5006925	Logging road, and softwood dominant forest.	CO4	June 2 nd – June 4 th , June 16 th – June 18 th



Point Count	Coordinates (NAD 83 UTM 20)		Habitat Types	Vegetation Type(s) (VT) ¹	Dates Surveyed
	Easting	Northing			
PC31	606392	5009062	Regenerative upland forest, surrounded by mature forests, mixed but more hardwood dominant, shrub dominant.	-	June 2 nd – June 4 th , June 16 th – June 18 th
PC32	608671	5007651	Trail, softwood dominant forest adjacent to forested wetland.	-	June 2 nd – June 4 th , June 16 th – June 18 th
PC33	609235	5008775	Road, regenerative forest, softwood dominant forest. Wetlands to South.	-	June 2 nd – June 4 th , June 16 th – June 18 th
PC34	609710	5009047	Cutover, regenerative Softwood dominant forest, logging road.	-	June 2 nd – June 4 th , June 16 th – June 18 th

¹Vegetation types are as per the classification systems used in the Goldboro Gold Project – Vegetation Community Assessments (MEL, 2022) biophysical report.

Notes: “-“ identified areas where vegetation type was not defined.

2.3.3 Fall Migration Surveys

Three rounds of fall migration surveys occurred on September 28th – 29th, 2018, August 31st, September 1st – 2nd, September 14th – 16th, September 28th – 30th, 2021. In total, there were 49 PCs and three WCs surveyed and 19.8 hours surveyed for fall migration (

and Figure 4, Appendix A). Seventeen PCs and three 20-minute watch counts (WC) in 2018 and 32 PC locations in 2021 were surveyed.

Surveys began at, or within, half an hour of sunrise and were completed approximately within four-and-a-half hours. Ten-minute point counts were completed at each PC location. During each survey, weather conditions (i.e., precipitation and visibility) were monitored and bird observations were recorded at three distance regimes: within a 50 m radius, 50 to 100 m radius and outside the 100 m radius. Flyovers were also recorded. Surveys took place with winds of 0 – 19 km/hr, temperatures ranging from 5 – 22 °C and clear to light mist conditions. Surveys did not occur during high rainfall events if vision was significantly impaired or if winds impaired hearing.



Table 5. Fall Migration PCs and Associated Habitat Types

Point Count	Coordinates(NAD 83 UTM 20)		Habitat Type(s)	Vegetation Type(s) (VT) ¹	Dates Surveyed
	Easting	Northing			
2018					
PC1	605954	5006503	Upland forest	SH5	September 29 th
PC2	605770	5006984	Upland forest	SP7	September 29 th
PC3	606479	5006406	Upland forest	SP7	September 28 th
PC4	606226	5006252	Upland forest	SP7	September 28 th
PC5	606394	5005836	Cutover	Cutover	September 29 th
PC6	606580	5005574	Wetland	WC2	September 29 th
PC7	607892	5006995	Coastal forest	CO4	September 28 th
PC8	607828	5006663	Coastal forest	CO1	September 28 th
PC9	607613	5006430	Coastal forest	CO4	September 28 th
PC10	607338	5006310	Upland forest	SH5	September 28 th
PC11	607815	5006160	Coastal forest	CO4	September 28 th
PC12	608007	5005956	Wetland	WC2	September 28 th
PC13	607777	5005803	Coastal forest	CO4	September 29 th
PC14	607803	5005513	Coastal forest	CO1	September 29 th
PC15	607530	5005582	Coastal forest	CO4	September 29 th
PC16	607204	5005481	Wetland	WC2	September 29 th
PC17	606977	5006031	Upland forest	SH8	September 29 th
WC1	607052	5006338	Wetland, by lake edge	WC2	September 29 th
WC2	608206	5007325	Upland forest, by lake edge	SP5	September 29 th
WC3	608507	5006904	By lake edge	-	September 29 th
2021					
PC1	605696	5007391	Large bog, adjacent to upland softwood dominant forests.	PG1	September 1 st , September 15 th and September 30 th
PC2	605682	5007665	Softwood dominant forest.	SH5	September 1 st , September 15 th and September 30 th
PC3	606044	5007533	Lakeside. Goldbrook lake. Shrub and treed softwood dominant forest.	SH5	September 1 st , September 15 th and September 30 th
PC4	605775	5008147	Softwood dominant	MW2	September 1 st , September 15 th



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Point Count	Coordinates(NAD 83 UTM 20)		Habitat Type(s)	Vegetation Type(s) (VT) ¹	Dates Surveyed
	Easting	Northing			
			forest, edge of forested swamp.		and September 30 th
PC5	606001	5007848	Softwood dominant forest, shrub dominant.	SH5	September 1 st , September 15 th and September 30 th
PC6	606349	5007905	Lakeside (Goldbrook Lake). Softwood/mixedwood dominant forest. Watercourse and forested swamp.	WC2	September 1 st , September 15 th and September 30 th
PC7	606477	5007522	Lakeside. Goldbrook lake. Upland softwood dominant forest.	SH5	September 1 st , September 15 th and September 30 th
PC8	606639	5007278	Lakeside, softwood dominant forest.	WC1	September 1 st , September 15 th and September 30 th
PC9	606355	5007273	Softwood dominant forest. Close to lake. Regenerative upland forests.	MW4	September 1 st , September 15 th and September 30 th
PC10	606188	5007044	Forested swamp.	WC2	September 1 st , September 15 th and September 30 th
PC11	606085	5005517	Softwood dominant forest adjacent to forested swamp.	-	August 31 st , September 14 th and September 28 th
PC12	608175	5005279	Mature softwood dominant forest.	-	August 31 st , September 14 th and September 28 th
PC13	607894	5007870	Road, forested swamp and softwood dominant upland forest.	WC2	September 2 nd , September 16 th and September 29 th
PC14	607546	5008207	Softwood dominant forest and cutover.	MW4, Cutover	September 2 nd , September 16 th and September 29 th
PC15	607507	5008550	Roadside, softwood dominant forest.	Cutover, mixedwood forests	September 2 nd , September 16 th and September 29 th
PC16	607086	5008928	Forested swamp	WC2	September 2 nd , September 16 th and September 29 th
PC17	607784	5008807	Trail, softwood dominant forest.	SH6	September 2 nd , September 16 th and September 29 th



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Point Count	Coordinates(NAD 83 UTM 20)		Habitat Type(s)	Vegetation Type(s) (VT) ¹	Dates Surveyed
	Easting	Northing			
PC18	607781	5009333	Trail, softwood dominant forest.	SH6	September 2 nd , September 16 th and September 29 th
PC19	608365	5008325	Roadside, cutover, and softwood dominant forest.	SH5	September 2 nd , September 16 th and September 29 th
PC20	608368	5007989	Forested swamp, softwood dominant forest.	WC2	August 31 st , September 16 th and September 28 th
PC21	608863	5008658	Roadside. Softwood dominant.	SH8	September 2 nd , September 14 th and September 28 th
PC22	609509	5008722	Roadside, cutover, softwood dominant forest.	-	August 31 st , September 14 th and September 28 th
PC23	610195	5008531	Roadside, cutover, softwood dominant forest.	-	August 31 st , September 14 th and September 28 th
PC24	609078	5008982	Roadside, softwood dominant forest.	-	August 31 st , September 14 th and September 28 th
PC25	608940	5009354	Regenerative and mature softwood dominant forest, forested swamp.	-	August 31 st , September 14 th and September 28 th
PC26	609240	5009511	Cutover, regenerative, and mature softwood dominant forest, forested swamp.	-	August 31 st , September 14 th and September 28 th
PC27	609535	5009698	Softwood dominant forest.	-	August 31 st , September 14 th and September 28 th
PC28	608502	5009853	Edge of large wetland complex and forest upland softwood forest.	-	September 2 nd , September 16 th and September 29 th
PC29	608246	5009497	Regenerative forests with prominent shrub layer. Softwood dominant forest.	-	September 2 nd , September 16 th and September 29 th
PC30	607524	5006925	Forestry access road, softwood dominant forest.	CO4	August 31 st , September 14 th and September 28 th



Point Count	Coordinates(NAD 83 UTM 20)		Habitat Type(s)	Vegetation Type(s) (VT) ¹	Dates Surveyed
	Easting	Northing			
PC31	606392	5009062	Regenerative forests, surrounded by mature forest.	-	September 2 nd , September 16 th and September 29 th
PC32	608672	5007650	Trail, softwood dominant forest adjacent to forested swamp.	-	August 31 st , September 14 th and September 28 th

¹Vegetation types are as per the classification systems used in the Goldboro Gold Project – Vegetation Community Assessments (MEL, 2022) biophysical report

Notes: Vegetation types are defined in Section X: Habitat. “-” identifies areas where vegetation types were not defined

2.3.4 Common Nighthawk Surveys

The common nighthawk (*Chordeiles minor*) prefers nesting in open and partially open areas which include forest clearings, open forests, burn areas, open wetlands, disturbed and gravelled areas (COSEWIC 2007) and is best detected while foraging for insects shortly after sunset (MBBA, 2008). Common nighthawk is documented by ACCDC and the MBBA as present in the area surrounding the PA.

Dedicated surveys for the common nighthawk were conducted on June 25th, 2017 (GEMTEC) at four PC locations, and on June 2nd and 15th, 2021 at six PC locations (MEL) (Table 6; Figure 5, Appendix A). These dates were selected because common nighthawk breed between early June and late July in the Maritimes (MBBA 2020). In 2021, surveys were repeated twice with 12 day spacing and a total of 1.1 hrs of survey effort, with temperatures ranging from 12 – 16 °C with no precipitation. Targeted surveys for this species were selected because they are not reliably detected during the breeding bird PC surveys due to their crepuscular nature (Saskatchewan Ministry of Environment 2015). Surveys were conducted one hour before sunset and ending 30 minutes after sunset (Saskatchewan Ministry of Environment, 2015; MBBA, 2008).

At each CONI PC location, surveys consisted of a three-minute passive surveying period, followed by three minutes of alternating 30-seconds call playback of the common nighthawk call and 30-seconds of silence (passive surveying) as per survey protocol by Saskatchewan Ministry of Environment (2015). CONI PCs were spread throughout (minimum of 800 m) and on the edge of the PA in order to provide coverage, while avoiding overlapping observations (i.e. hearing the same individual at multiple locations).

The MBBA *Species at Risk Atlassing Guide* states that common nighthawk are territorial, therefore using call playback methods may increase the probability of observations (2008). Any observations of common nighthawk were recorded, including the number of individuals heard, sex, distance, bearing, dominant



habitat that the bird is observed within, bird behaviour, and whether or not the bird is observed during the allotted survey time. Any other birds observed during the survey time were recorded.

Table 6: Point Count locations and Associated Habitat Types

Point Count	Coordinates (NAD 83 UTM 20)		Habitat Types	Vegetation Types (VT) ¹	Date Surveyed
	Easting	Northing			
2017					
CONI1	607855	5006686	Forested	CO1	June 25 th
CONI2	606247	5006204	Cutover	Cutover	June 25 th
CONI3	608663	5005256	Cutover / trails / regenerative forests	Cutover	June 25 th
CONI4	604567	5006773	Cutover / trails / regenerative forests -	Cutover	June 25 th
2021					
CONI1	606049	5006461	Pipeline ROW / cutover	SP7	June 2 nd and June 15 th
CONI2	607109	5006329	Permanent river/stream /road / clearings / lake	SH8	June 2 nd and June 15 th
CONI3	607992	5005979	Trail / clearing along road / softwood forests	WC1	June 2 nd and June 15 th
CONI4	607972	5007598	Permanent river/stream / cutovers/ closed canopy coniferous with tall shrubs	SH6	June 2 nd and June 15 th
CONI5	608467	5008358	Road / cutover / softwood forests	SH8	June 2 nd and June 15 th
CONI6	605595	5007340	Pipeline ROW / cutover	MW4, Cutover	June 2 nd and June 15 th

¹Vegetation types are as per the classification systems used in the Goldboro Gold Project – Vegetation Community Assessments (MEL, 2022) biophysical report. Notes: "-" indicates areas where vegetation type was not defined

2.3.5 Nocturnal Owl Surveys

The methods for monitoring nocturnal owls followed the *Guideline for Nocturnal Owl Monitoring in North America* (Takats *et al.*, 2001). Nocturnal owl surveys occurred when vocal activity of most owl species is greatest (mid-March to mid-May), as identified by Takats and colleagues (2001). Four rounds of nocturnal owl surveys occurred at eight PC locations on April 24th, 2017 and April 15th, April 21st, April 29th, 2021 (Figure 5; Appendix A). Temperatures ranged from -1 – 7 °C with clear to 100% cloud cover sky conditions. In total, there were 2.67 hours of survey effort for owls.



Prior to starting the survey, the selected broadcaster was tested to ensure that owl calls are audible and recognizable at 400 m. The broadcaster test was carried out under weather and noise conditions similar to those that are likely to be encountered during the survey.

The Bird Studies Canada (BSC) Nova Scotia Nocturnal Owl Survey program broadcast were used, which consists of a 9.5-minute track that follows the following format and owl data recording method (Bird Studies Canada - Atlantic Region, 2019):

- Initiates with a beep to indicate the start of the first silent listening period, which lasts 1 minute. All owls heard or seen are recorded. Only if an owl is calling during this period, estimate a distance and bearing, then immediately proceed ~300 m along the road (toward the owl if possible) and record a second distance and bearing to permit triangulation of the owl and facilitate habitat association. Another beep marks the end of the first silent listening minute.
- A second silent listening minute will follow. All new owls seen or heard in the second minute are recorded, as well as any owls that continue to call from the first silent listening minute. As described above, if a new owl is heard during the second silent listening minute record a second distance and bearing was taken to permit triangulation of the owl and facilitate habitat association.
- During each of the following 20-second broadcasts, rotate the speakers fully.
- A 20-second boreal owl broadcast begins, which is followed by a one-minute silent listening period. All owls heard or seen during this period are to be recorded separately and it is important to keep track of whether the owls heard in the first two-minutes continue to call as well as any new owls.
- The boreal owl broadcast is repeated, which is again followed by a one-minute silent listening period. All owls heard or seen during this period continue to be recorded separately.
- A 20-second barred owl broadcast begins, which is followed by a two-minute silent listening period. All owls heard or seen during this period continue to be recorded separately.
- The barred owl broadcast is repeated, which is again followed by another two-minute silent listening period. All owls heard or seen during this period continue to be recorded separately.
- A beep marks the end of the broadcast track.

2.3.6 Waterfowl Surveys

Waterfowl surveys were introduced during the 2021 Fall Migration surveys to understand which waterfowl species use Gold Brook Lake. Waterfowl surveys occurred at one WC location for 30-minutes on the southern shore of Gold Brook Lake on August 31st, September 14th and September 28th, 2021 (Figure 5, Appendix A).

2.3.7 Survey Methods Summary

1. Chosen survey types were selected based on the known habitats within the general area of the PA, results from the ACCDC report and the priority species list. All survey methods are as per



industry standards and guidelines commonly used in biophysical surveys to support projects pursuant of an EA registration document. In total, there were approximately 68 hours of survey effort for avifauna and six avifauna survey types: Spring migration surveys (May 2019, May 2021)

2. Breeding bird surveys (June 2017, June – July 2019, June 2021)
3. Fall migration surveys (September 2019, August – September 2021)
4. Common nighthawk surveys (June 2017, June 2021)
5. Nocturnal owl surveys (April 2017, April 2021)
6. Waterfowl surveys (August – September 2021)

3 RESULTS

Results from the desktop review, and field surveys that took place from 2017 – 2021, are described below.

3.1 Desktop Results

In the ACCDC report within a 5 km radius, 7 SAR and 20 SOCI avifauna species were observed (Figure 1; Appendix A). The SAR observed in the report are summarized below. For a complete list of SOCI species see the ACCDC report in Appendix C:

- Bank swallow (*Riparia riparia*, SARA Threatened, NSESA Endangered);
- Bank swallow (*Hirundo rustica*, SARA Threatened, NSESA Endangered);
- Canada warbler (*Cardellina canadensis*, SARA Threatened, NSESA Endangered);
- Short-eared owl (*Asio falmmeus*, SARA Special Concern);
- Common nighthawk (*Chordeiles minor*, SARA Threatened, NSESA Threatened);
- Olive-sided flycatcher (*Contopus cooperi*, SARA Threatened, NSESA Threatened); and
- Evening grosbeak (*Circus hudsonius*, SARA Special Concern, NSESA Vulnerable).

The closest IBA, Country Island Complex (NS028), is approximately 6.4 km southwest of the PA (Figure 1, Appendix A) (Bird Studies Canada, 2012). The Country Island Complex (NS028) is located off the southeast coast of Nova Scotia, near Country Harbor and Tor Bay, and is composed of several islands, peninsulas, and sites. Country Island is predominantly treeless and has supported many Roseate Terns in recent years. Roseate Terns have also been recorded nesting in nearby Goose Island, an unnamed island off Charlos Cove, Inner West Bird Island, Cooks Island, Dorts Island and Hog Island.

The closest Canada Wildlife Service Migratory Bird Sanctuary (MBS) in Nova Scotia is the Sea Wolf Island National Wildlife Area, located approximately 130 km northeast of the PA. This MBS is a sandstone bedrock formation, and is located in the Gulf of St. Lawrence, approximately 4 km off the coast of Cape Breton, Nova Scotia. It supports over forty species of birds, including great cormorants, herring gulls and great blue herons (ECCC, 2020). The habitats provided within this MBS are not consistent with habitat present within the PA.



The MBBA square 20PR00 encompasses the entirety of the PA (results are provided in Appendix D). In the first MBBA Atlas, 44 possible, 16 probable and 21 confirmed breeders were observed. Of these species, there were four SAR: Canada warbler (*Cardellina canadensis*), common nighthawk (*Chordeiles minor*), barn swallow (*Hirundo rustica*) and evening grosbeak (*Coccothraustes vespertinus*).

There are five NSDNRR significant habitat polygons within the PA and several others outside and in the general area (Figure 1; Appendix A).

- **Deer Wintering Polygons** – These polygons are located south and east outside the PA with a small portion within the southern extent of the PA;
- **Species at Risk and Species of Concern Polygons** – four polygons are within the PA with observations of 11 priority species including two SAR; Canada warbler and olive-sided flycatcher.

3.2 Field Results

The following subsections outline the survey results of the point count surveys (spring migration, breeding season, fall migration, nocturnal owl, and common nighthawk surveys), waterfowl surveys and all incidental observations.

Breeding bird status qualifiers were used to determine whether a species is a priority species, based on the time of year in which the species was observed. If a species has only one seasonal ranking, such as S3B, it was considered a SOCI regardless of the time of year it was observed. However, if the species had an alternate ranking, such as a SRank of S2S3B, S5N, the species was considered a priority species if observed during the breeding season. Outside of breeding season, this species was not considered a priority species.

3.2.1 Spring Migration Surveys

During spring migration, a total of 1,232 individuals representing 58 species were observed during dedicated surveys. One SAR species (evening grosbeak) and nine SOCI species (black-backed woodpecker, blackpoll warbler, boreal chickadee, gray jay, pine siskin, red-breasted nuthatch, ruby-crowned kinglet, Swainson's thrush, and yellow-bellied flycatcher (Figure 6 and 7, Appendix A and Table 7), were observed during the spring migration surveys.

Passerines comprised 88% of all individuals observed, followed by other landbirds (8%), other waterbirds (3%), and waterfowl (1%). White-throated sparrow (n=169) was the most abundant species observed, followed by palm warbler (n=92) and yellow-rumped warbler (n=72). No large flocks or obvious migration patterns were observed. All the species identified are native species in this region of Nova



Scotia and the province in general. Typical and common habitat to support these species are present within the PA and surrounding landscape.

The PC with the largest number of individuals observed was PC 11 (n=39) and had the second highest diversity (20 species observed). This PC was within open peatland habitat and had treed swamp portions along the edges. The PC with the second highest number of individuals observed but highest diversity during spring migration was PC 3 (23 species and 33 individuals) and was located within the pipeline ROW and mature conifer forest with a considerable amount of heterogeneity, which likely contributed to the higher species abundance (Table 7 and Table 8Table 8). All avian SAR and SOCI are discussed in section 3.3 and 3.4.



Table 7: Species and Abundance of Birds Observed During Spring Migration Surveys

Code	Common Name	Scientific Name	SARA	NSESA	S-Rank	#	Age	Gender	PC Observations	Date Surveyed	Group
2019											
RBNU	Red-breasted nuthatch	<i>Sitta canadensis</i>	-	-	S3	1	A	-	6	14 th May	6
RCKI	Ruby-crowned kinglet	<i>Regulus calendula</i>	-	-	S3S4B	3	A	-	1, 3, 4	14 th May	6
ABDU	American black duck	<i>Anas rubripes</i>	-	-	S5	1	A	-	WC 1	14 th May	1
AMCR	American crow	<i>Corvus brachyrhynchos</i>	-	-	S5	2	A	-	1, WC1	14 th May	6
AMGO	American goldfinch	<i>Carduelis tristis</i>	-	-	S5	1	A	-	1	14 th May	6
AMRO	American robin	<i>Turdus migratorius</i>	-	-	S5B	3	A	-	1	14 th May	6
BAWW	Black-and-white warbler	<i>Mniotilta varia</i>	-	-	S5B	1	A	-	4	14 th May	6
BCCH	Black-capped chickadee	<i>Poecile atricapilla</i>	-	-	S5	1	A	-	1	14 th May	6
BLJA	Blue jay	<i>Cyanocitta cristata</i>	-	-	S5	2	A	-	2, 6	14 th May	6
BHVI	Blue-headed vireo	<i>Vireo solitarius</i>	-	-	S5B	1	A	-	4	14 th May	6
CAGO	Canada goose	<i>Branta canadensis</i>	-	-	S4N	1	A	-	4	14 th May	1
COLO	Common loon	<i>Gavia immer</i>	-	-	S4B, S4N	2	A	-	WC1	14 th May	3
DEJU	Dark-eyed Junco	<i>Junco hyemalis</i>	-	-	S4S5	3	A	-	1, 2, 4	14 th May	6
GCKI	Golden-crowned kinglet	<i>Regulus satrapa</i>	-	-	S5	3	A	-	1, 4, 6	14 th May	6
NOFL	Northern Flicker	<i>Colaptes auratus</i>	-	-	S5B	4	A	-	1, 2, 4, 5	14 th May	7
RUGR	Ruffed grouse	<i>Bonasa umbellus</i>	-	-	S5	1	A	-	4	14 th May	7
WTSP	White-throated sparrow	<i>Zonotrichia albicollis</i>	-	-	S5B	2	A	-	2, 4	14 th May	6
YRWA	Yellow-rumped warbler	<i>Dendroica coronata</i>	-	-	S5B	1	A	-	3	14 th May	6
2019 (new point count numbers)											
<u>EVGR</u>	<u>Evening grosbeak</u>	<u><i>Coccothraustes vespertinus</i></u>	<u>SC</u>	<u>V</u>	<u>S3S4B, S3N</u>	<u>2</u>	<u>A</u>	<u>±</u>	<u>10</u>	29 th May	<u>6</u>
PISI	Pine siskin	<i>Carduelis pinus</i>	-	-	S2S3	1	A	-	3	29 th May	6
RBNU	Red-breasted nuthatch	<i>Sitta canadensis</i>	-	-	S3	1	A	-	1	29 th May	6
GRAJ	Gray jay	<i>Perisoreus canadensis</i>	-	-	S3	2	A	-	9	29 th May	6
BBWO	Black-backed woodpecker	<i>Picoides arcticus</i>	-	-	S3S4	1	A	-	2	29 th May	7
RCKI	Ruby-crowned kinglet	<i>Regulus calendula</i>	-	-	S3S4B	6	A	-	1, 5, 7, 9, 10	29 th May	6
YBFL	Yellow-bellied flycatcher	<i>Empidonax flaviventris</i>	-	-	S3S4B	2	A	-	8	29 th May	6
AMCR	American crow	<i>Corvus brachyrhynchos</i>	-	-	S5	2	A	-	1, 3	29 th May	6
AMGO	American goldfinch	<i>Carduelis tristis</i>	-	-	S5	2	A	-	8, 10	29 th May	6
AMRE	American redstart	<i>Setophaga ruticilla</i>	-	-	S5B, S3N	1	A	-	6	29 th May	6
AMRO	American robin	<i>Turdus migratorius</i>	-	-	S5B, S3N	2	A	-	2	29 th May	6



Code	Common Name	Scientific Name	SARA	NSESA	S-Rank	#	Age	Gender	PC Observations	Date Surveyed	Group
BAWW	Black-and-white warbler	<i>Mniotilta varia</i>	-	-	S5B	6	A	-	1, 3, 5, 6, 8	29 th May	6
BTNW	Black-throated green warbler	<i>Dendroica virens</i>	-	-	S5B	7	A	-	1, 2, 5, 6, 7, 8	29 th May	6
BHVI	Blue-headed vireo	<i>Vireo solitarius</i>	-	-	S5B	11	A	-	1, 2, 3, 4, 5, 6, 7, 10	29 th May	6
BWHA	Broad-winged hawk	<i>Buteo platypterus</i>	-	-	S5B	1	A	-	3	29 th May	4
COLO	Common loon	<i>Gavia immer</i>	-	-	S4B, S4N	9	A	1M: 1F	1, 3, 4, 10	29 th May	3
COYE	Common yellowthroat	<i>Geothlypis trichas</i>	-	-	S5B	16	A	-	1, 2, 3, 4, 6, 7, 8, 10	29 th May	6
DEJU	Dark-eyed junco	<i>Junco hyemalis</i>	-	-	S4S5	1	A	-	1	29 th May	6
HETH	Hermit thrush	<i>Catharus guttatus</i>	-	-	S5B	8	A	-	1, 2, 3, 8, 9	29 th May	6
LISP	Lincoln's sparrow	<i>Melospiza lincolni</i>	-	-	S4B	1	A	-	2	29 th May	6
MAWA	Magnolia warbler	<i>Dendroica magnolia</i>	-	-	S5B	21	A	-	1, 2, 3, 4, 5, 6, 7, 8, 9, 10	29 th May	6
NAWA	Nashville warbler	<i>Vermivora ruficapilla</i>	-	-	S4S5B	1	A	-	6	29 th May	6
NOFL	Northern flicker	<i>Colaptes auratus</i>	-	-	S5B	2	A	-	2, 6	29 th May	7
OVEN	Ovenbird	<i>Seiurus aurocapilla</i>	-	-	S5B	1	A	-	6	29 th May	6
PAWA	Palm warbler	<i>Dendroica palmarum</i>	-	-	S5B	5	A	-	1, 2, 3, 9	29 th May	6
SOSP	Song sparrow	<i>Melospiza melodia</i>	-	-	S5B	5	A	-	3, 10	29 th May	6
SPSA	Spotted sandpiper	<i>Actitis macularius</i>	-	-	S3S4B	1	A	-	3	29 th May	2
SWSP	Swamp sparrow	<i>Melospiza georgiana</i>	-	-	S5B	3	A	-	3, 9	29 th May	6
WTSP	White-throated sparrow	<i>Zonotrichia albicollis</i>	-	-	S5B	6	A	-	2, 4, 5, 6, 8	29 th May	6
YRWA	Yellow-rumped warbler	<i>Dendroica coronata</i>	-	-	S5B	11	A	-	1, 3, 5, 6, 7, 9, 10	29 th May	6
2021											
WILL	Willet	<i>Tringa semipalmata</i>	-	-	S2S3B	1	A	-	24	11 th May	2
BOCH	Boreal chickadee	<i>Poecile hudsonica</i>	-	-	S3	16	A	-	2, 4, 11, 17, 20, 21, 23, 28, 29, 32, 47, 48	10 th May, 11 th May, 13 th May, 18 th May, 21 st May	6
CAJA	Canada jay	<i>Perisoreus canadensis</i>	-	-	S3	4	A	-	3, 42, 46		6
GRYE	Greater yellowlegs	<i>Tringa melanoleuca</i>	-	-	S3B, S3S4M	1	A	-	25	11 th May	2
BLPW	Blackpoll warbler	<i>Dendroica striata</i>	-	-	S3S4B	1	A	-	28	21 st May	6
RCKI	Ruby-crowned kinglet	<i>Regulus calendula</i>	-	-	S3S4B	57	A	-	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 13, 14, 15, 17, 18, 19, 20, 23, 25, 26, 27, 29, 30, 31, 33, 34, 38, 40, 43, 44, 45, 46, 47, 48	10 th May, 12 th May, 13 th May, 19 th May, 20 th May, 21 st May	6
SWTH	Swainson's thrush	<i>Catharus ustulatus</i>	-	-	S3S4B	3	A	-	2, 13, 43	18 th May, 21 st May	6



Code	Common Name	Scientific Name	SARA	NSESA	S-Rank	#	Age	Gender	PC Observations	Date Surveyed	Group
AMCR	American crow	<i>Corvus brachyrhynchos</i>	-	-	S5	37	A	-	1, 3, 4, 10, 11, 13, 14, 16, 17, 19, 20, 21, 22, 24, 43, 47	10 th May, 11 th May, 18 th May, 20 th May	6
AMGO	American goldfinch	<i>Carduelis tristis</i>	-	-	S5	7	A	-	4, 12, 32, 26, 27, 29, 40	13 th May, 18 th May, 20 th May, 21 st May	6
AMRE	American redstart	<i>Setophaga ruticilla</i>	-	-	S5B, S3N	9	A	-	3, 24, 28, 29, 42, 49	18 th May, 19 th May, 21 st May	6
AMRO	American robin	<i>Turdus migratorius</i>	-	-	S5B,S3N	25	A	-	1, 2, 3, 6, 8, 9, 10, 11, 12, 13, 16, 18, 19, 21, 22, 28, 29, 32, 40, 42, 43, 46	10 th May, 13 th May, 18 th May, 19 th May, 20 th May, 21 st May	6
BAWW	Black-and-white warbler	<i>Mniotilta varia</i>	-	-	S5B	60	A	-	1, 2, 3, 4, 7, 8, 9, 10, 11, 12, 13, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 38, 39, 40, 41, 43, 45, 46, 47, 48, 49, 50	10 th May, 12 th May, 13 th May, 18 th May, 19 th May, 20 th May, 21 st May	6
BCCH	Black-capped chickadee	<i>Poecile atricapilla</i>	-	-	S5	27	A	-	3, 4, 8, 9, 10, 14, 17, 18, 19, 22, 23, 25, 32, 34, 35, 36, 37, 42, 48, 50	10 th May, 11 th May, 12 th May, 13 th May, 18 th May, 19 th May, 20 th May, 21 st May	6
BTNW	Black-throated green warbler	<i>Dendroica virens</i>	-	-	S5B	41	A	-	1, 2, 3, 4, 6, 7, 10, 12, 15, 19, 20, 21, 23, 24, 28, 29, 30, 32, 35, 36, 37, 38, 42, 43, 45, 46, 47	10 th May, 11 th May, 13 th May, 18 th May, 19 th May, 20 th May, 21 st May	6
BLJA	Blue jay	<i>Cyanocitta cristata</i>	-	-	S5	2	A	-	2, 3	10 th May	6
BHVI	Blue-headed vireo	<i>Vireo solitarius</i>	-	-	S5B	43	A	-	1, 2, 3, 6, 7, 8, 9, 10, 11, 12, 13, 14, 16, 18, 19, 21, 22, 25, 27, 28, 31, 32, 33, 34, 35, 36,	11 th May, 12 th May, 13 th May, 18 th May,	6



Code	Common Name	Scientific Name	SARA	NSESA	S-Rank	#	Age	Gender	PC Observations	Date Surveyed	Group
									37, 38, 39, 40, 41, 43, 44, 45, 47, 48, 49	19 th May, 20 th May, 21 st May	
CAGO	Canada goose	<i>Branta canadensis</i>	-	-	SNAB,S4N	43	A	-	2, 3, 4, 5, 6, 10, 11, 13, 14, 15, 16, 19, 22, 23, 25, 27, 28, 32, 36, 38, 41, 42, 49	10 th May, 11 th May, 13 th May, 18 th May, 19 th May, 21 st May	1
COLO	Common loon	<i>Gavia immer</i>	-	-	S4B,S4N	16	A	-	2, 3, 4, 5, 6, 10, 11, 13, 14, 15, 16, 19, 22, 23, 25, 27, 28, 32, 36, 38, 41, 42, 49, 16	10 th May, 12 th May, 13 th May, 20 th May, 21 st May	3
CORA	Common raven	<i>Corvus corax</i>	-	-	S5	3	A	-	27, 37, 44	12 th May, 13 th May, 20 th May	6
COYE	Common yellowthroat	<i>Geothlypis trichas</i>	-	-	S5B	47	A	-	1, 3, 6, 8, 9, 11, 13, 15, 16, 17, 18, 19, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50	18 th May, 19 th May, 20 th May, 21 st May	6
DEJU	Dark-eyed junco	<i>Junco hyemalis</i>	-	-	S4S5	53	A	-	1, 2, 4, 5, 6, 9, 10, 11, 13, 14, 16, 17, 18, 20, 21, 22, 26, 27, 28, 30, 31, 33, 34, 35, 36, 38, 39, 40, 42, 43, 45, 47, 49	10 th May, 11 th May, 12 th May, 13 th May, 18 th May, 19 th May, 20 th May, 21 st May	6
GCKI	Golden-crowned kinglet	<i>Regulus satrapa</i>	-	-	S5	19	A	-	5, 7, 8, 9, 11, 13, 19, 25, 26, 30, 39, 40, 42, 46	10 th May, 12 th May, 13 th May, 19 th May, 20 th May, 21 st May	6
GWTE	Green-winged teal	<i>Anas crecca</i>	-	-	S4S5B	2	A	1M:1F	10	18 th May	1
HAWO	Hairy woodpecker	<i>Picoides villosus</i>	-	-	S5	4	A	-	12, 21, 49	10 th May, 13 th May, 18 th May	7
HETH	Hermit thrush	<i>Catharus guttatus</i>	-	-	S5B	43	A	-	1, 2, 3, 4, 6, 7, 11, 13, 15, 20, 21, 23, 24, 27, 28, 30, 31, 32, 33, 38, 39, 40, 41, 42, 43, 45, 48, 49	10 th May, 12 th May, 13 th May, 18 th May	6



Code	Common Name	Scientific Name	SARA	NSESA	S-Rank	#	Age	Gender	PC Observations	Date Surveyed	Group
										19 th May, 20 th May, 21 st May	
LEFL	Least flycatcher	<i>Empidonax minimus</i>	-	-	S4S5B	2	A	-	38, 39	21 st May	6
LISP	Lincoln's sparrow	<i>Melospiza lincolni</i>	-	-	S4B	7	A	1M	22, 33, 36, 38, 39, 40, 41	18 th May, 20 th May, 21 st May	6
MAWA	Magnolia warbler	<i>Dendroica magnolia</i>	-	-	S5B	41	A	-	3, 5, 8, 9, 11, 12, 14, 16, 17, 19, 20, 21, 23, 24, 25, 26, 27, 28, 29, 30, 32, 33, 34, 35, 36, 37, 38, 40, 41, 42, 43, 44, 45, 46, 47, 48, 50	18 th May, 19 th May, 20 th May, 21 st May	6
MERL	Merlin	<i>Falco columbarius</i>	-	-	S5B	2	A	-	37, 49	12 th May, 13 th May	4
NAWA	Nashville warbler	<i>Vermivora ruficapilla</i>	-	-	S4S5B	20	A	-	3, 4, 8, 12, 15, 23, 27, 28, 29, 30, 34, 35, 37, 41, 43, 48, 49, 50	12 th May, 13 th May, 18 th May, 19 th May, 20 th May, 21 st May	6
NOFL	Northern flicker	<i>Colaptes auratus</i>	-	-	S5B	27	A	-	1, 3, 5, 6, 7, 9, 14, 16, 17, 18, 24, 25, 32, 34, 35, 36, 37, 41, 44, 46, 47, 50	12 th May, 13 th May, 18 th May, 19 th May, 20 th May, 21 st May	7
NOPA	Northern parula	<i>Parula americana</i>	-	-	S5B	1	A	-	9	12 th May	6
OSPR	Osprey	<i>Pandion haliaetus</i>	-	-	S4B	2	A	-	21, 48	13 th May, 18 th May	4
OVEN	Ovenbird	<i>Seiurus aurocapilla</i>	-	-	S5B	3	A	-	27, 32, 49	21 st May	6
PAWA	Palm warbler	<i>Dendroica palmarum</i>	-	-	S5B	87	A	-	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 12, 15, 17, 18, 19, 22, 23, 24, 25, 26, 27, 28, 30, 31, 32, 33, 34, 35, 36, 37, 38, 40, 41, 43, 44, 45, 46, 47, 48, 49, 50	10 th May, 11 th May, 12 th May, 13 th May, 18 th May, 19 th May, 20 th May, 21 st May	6
PIWO	Pileated woodpecker	<i>Dryocopus pileatus</i>	-	-	S5	2	A	-	41	13 th May	7
PUFI	Purple finch	<i>Carpodacus purpureus</i>	-	-	S4S5B,S3S4N	17	A	1M:2F	3, 4, 5, 6, 7, 11, 12, 14, 22, 26, 28, 30, 39, 44	10 th May, 13 th May, 18 th May, 19 th May,	6



Code	Common Name	Scientific Name	SARA	NSESA	S-Rank	#	Age	Gender	PC Observations	Date Surveyed	Group
										20 th May, 21 st May	
RWBL	Red-winged blackbird	<i>Agelaius phoeniceus</i>	-	-	S4B	5	A	-	4, 17, 25	10 th May, 11 th May, 18 th May	6
RIPH	Ring-necked pheasant	<i>Phasianus colchicus</i>	-	-	SNA	1	A	-	43	13 th May	7
RUGR	Ruffed grouse	<i>Bonasa umbellus</i>	-	-	S5	17	A	-	2, 3, 11, 13, 28, 42, 43, 49	10 th May, 13 th May, 18 th May, 21 st May	7
SAVS	Savannah sparrow	<i>Passerculus sandwichensis</i>	-	-	SNA	2	A	-	23	10 th May	6
SOSP	Song sparrow	<i>Melospiza melodia</i>	-	-	S5B	6	A	-	10, 11, 13, 43, 49	10 th May, 11 th May, 13 th May	6
SPGR	Spruce grouse	<i>Falcapennis canadensis</i>	-	-	S4	2	A	-	43, 49	13 th May	7
SWSP	Swamp sparrow	<i>Melospiza georgiana</i>	-	-	S5B	6	A	-	11, 29, 32, 39, 40	13 th May, 18 th May, 21 st May	6
TRES	Tree swallow	<i>Tachycineta bicolor</i>	-	-	S4B	1	A	-	20	18 th May	6
WTSP	White-throated sparrow	<i>Zonotrichia albicollis</i>	-	-	S5B	161	A	-	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50	10 th May, 11 th May, 12 th May, 13 th May, 18 th May, 19 th May, 20 th May, 21 st May	6
WIWR	Winter wren	<i>Troglodytes troglodytes</i>	-	-	S5B	11	A	-	1, 2, 11, 14, 17, 24, 32, 37	10 th May, 11 th May, 12 th May, 18 th May	6
YWAR	Yellow warbler	<i>Dendroica petechia</i>	-	-	S5B	2	A	-	3, 29	18 th May, 21 st May	6
YRWA	Yellow-rumped warbler	<i>Dendroica coronata</i>	-	-	S5B	60	A	-	1, 2, 3, 5, 6, 7, 9, 10, 11, 12, 13, 14, 15, 16, 18, 19, 20, 21, 22, 24, 25, 26, 27, 28, 30, 31, 34, 35, 36, 37, 38, 39, 41, 44, 45, 46, 47, 48, 49	10 th May, 11 th May, 13 th May, 18 th May	6

Notes: A= Adult; J = Juvenile; Bird group is coded as: 1 = waterfowl, 2 = shorebirds; 3 = other waterbirds (i.e. that are not waterfowl or shorebirds); 4 = diurnal raptors; 5 = nocturnal raptors; 6 = passerines (excluding dippers) and 7 = other landbirds. Bolded species are priority species. ACCDC rankings retrieved from: <http://accdc.com/webranks/NSall.htm> (November 2021). “-” represents no federal or provincial designation. Table does not include observations when unable to identify at species level.



Table 8. Total number of Individuals per PC per Round During Spring Migration Surveys.

PC Locations	Round 1		Round 2		Total # of Individuals Detected	Total Number of Species Detected per PC
	# of Individuals	# of Species	# of Individuals	# of Species		
2019						
1	10	8	18	13	28	18
2	4	4	16	11	20	12
3	2	2	29	12	31	13
4	9	9	7	5	16	12
5	1	1	10	10	11	10
6	3	3	17	11	20	14
7	-	-	8	6	8	8
8	-	-	13	8	13	13
9	-	-	9	7	9	9
10	-	-	10	9	10	10
WC1	5	4	-	-	5	5
2019 Total	34	18*	137	30*	171	
2021						
1	9	6	12	11	21	14
2	11	10	15	13	26	16
3	19	12	14	14	33	23
4	24	11	12	11	36	11
5	7	4	10	8	17	10
6	8	6	14	12	22	13
7	6	6	10	9	16	11
8	4	4	13	11	17	11
9	8	7	11	11	18	15
10	10	6	14	11	24	14
11	21	11	18	14	39	20
12	-	-	11	11	11	11
13	18	10	16	12	34	17
14	15	4	11	9	26	12
15	-	-	10	9	10	10
16	5	4	10	9	15	11
17	6	5	11	10	17	13
18	14	5	9	9	23	11



GOLDBORO GOLD PROJECT

PC Locations	Round 1		Round 2		Total # of Individuals Detected	Total Number of Species Detected per PC
	# of Individuals	# of Species	# of Individuals	# of Species		
19	10	6	14	10	24	14
20	15	7	11	8	26	12
21	9	5	10	10	19	13
22	10	6	11	9	21	13
23	7	4	12	11	19	13
24	10	5	9	9	19	13
25	6	5	10	9	16	14
26	9	5	9	8	18	9
27	9	7	12	11	21	14
28	12	9	20	15	32	18
29	8	8	11	8	19	12
30	10	7	10	9	20	13
31	8	7	8	7	16	10
32	8	6	15	15	23	14
33	4	3	12	9	16	11
34	7	6	9	8	16	12
35	14	9	12	9	26	12
36	11	7	13	11	24	11
37	8	6	10	8	18	13
38	4	3	14	13	18	15
39	10	7	8	7	18	13
40	10	9	11	10	21	14
41	7	6	10	9	17	13
42	8	7	14	11	22	13
43	15	12	13	11	18	19
44	10	8	7	6	17	11
45	7	6	10	10	17	11
46	7	5	12	10	19	12
47	6	5	12	10	18	14
48	14	10	15	11	29	14
49	10	9	11	10	21	17
50	6	5	11	6	17	8
2021 Total	474	39*	587	39*	1,061	

Notes: Total number of individuals observed include observations that were not able to be identified at the species level. * Total number of unique species observed.



1.1.1 Breeding Bird Surveys

During breeding bird surveys, a total of 1,662 individuals representing 64 species were observed. Three SAR species (Canada warbler, wood thrush and olive-sided flycatcher) and 11 SOCI species (boreal chickadee, fox sparrow, gray jay, greater yellowlegs, northern harrier, red-breasted nuthatch, ruby-crowned kinglet, spotted sandpiper, Swainson's thrush, Wilson's warbler, and yellow-bellied flycatcher; Figure 6, 7, Appendix A) were observed during the breeding bird surveys.

Passerines were the most common bird functional group observed and comprised of 96% of all individuals, followed by other landbirds (1.2%), other waterbirds (1.1%), waterfowl (<1%), shorebirds (<1%) and diurnal raptors (<1%). White-throated sparrow (n=179) was the most abundant species observed, followed by common yellowthroat (n=149), black-and-white warbler (n=95), hermit thrush (n=93) and magnolia warbler (n=92). No large flocks or obvious migration patterns were observed. All of the species identified are native species in this region of Nova Scotia and the province in general. Typical and common habitat to support these species are present within the PA and surrounding landscape.

In 2017, the PC with the highest species diversity (number of species) was PC 1 with a total of 19 species and 29 individuals observed. This PC location was adjacent to multiple habitats including open water, bogs and swamp that are suitable for a variety of different bird species and groups. The 2019 PC 1 location also had high species diversity, with 18 species and 30 individuals observed. This PC location was situated in raised bog habitat with varying tree heights along the margins. All species, their abundance and observed PC locations, are listed in Table 9 and Table 10 (below). All avian SAR and SOCI are discussed in section 3.3 and 3.4.



Table 9: Species and abundance of birds observed during Breeding Bird surveys

Code	Common	Scientific	S-Rank	SARA	NSESA	#	Age	Gender	PC Observations	Group	Dates Surveyed	Breeding Potential
2017												
<u>CAWA</u>	<u>Canada Warbler</u>	<u>Cardellina canadensis</u>	<u>S3B</u>	<u>T</u>	<u>E</u>	<u>5</u>	<u>A</u>	-	<u>18, 19</u>	<u>6</u>	5 th June, 27 th June, 29 th June	<u>Probable</u>
BOCH	Boreal Chickadee	Poecile hudsonicus	S3	-	-	9	<u>A</u>	-	3, 5, 7, 8, 20, 23, 24, 25	6	5 th June, 27 th June, 29 th June	Confirmed
RBNU	Red-breasted Nuthatch	Sitta canadensis	S3	-	-	11	<u>A</u>	-	3, 5, 9, 11, 13, 14, 17, 18, 20	6	2 nd June, 5 th June, 27 th June, 29 th June	Possible
WIWA	Wilson's Warbler	Cardellina pusilla	S3B	-	-	1	<u>A</u>	-	1	6	2 nd June	Possible
YBFL	Yellow-bellied Flycatcher	Empidonax flaviventris	S3S4B	-	-	5	<u>A</u>	-	5, 6, 9, 14, 23	6	5 th June, 27 th June	Possible
FOSP	Fox Sparrow	Passerella iliaca	S3S4B	-	-	1	<u>A</u>	-	20	6	29 th June	Possible
RCKI	Ruby-crowned Kinglet	Regulus calendula	S3S4B	-	-	22	<u>A</u>	-	2, 6, 7, 8, 9, 11, 12, 13, 14, 17, 18, 20, 21, 23, 24, 25	6	2 nd June, 5 th June, 27 th June, 29 th June	Possible
SPSA	Spotted Sandpiper	Actitis macularius	S3S4B	-	-	1	<u>A</u>	-	10	2	27 th June	Possible
SWTH	Swainson's Thrush	Catharus ustulatus	S3S4B	-	-	12	<u>A</u>	-	1, 3, 5, 11, 13, 17, 19, 20, 21, 22, 25	6	2 nd June, 27 th June, 29 th June	Possible
ALFL	Alder Flycatcher	Empidonax alnorum	S5B	-	-	29	<u>A</u>	-	1, 2, 3, 8, 9, 10, 11, 12, 16, 17, 18, 20, 22, 23, 24	6	2 nd June, 5 th June, 27 th June, 29 th June	Possible
AMCR	American Crow	Corvus brachyrhynchos	S5	-	-	6	<u>A</u>	-	2, 10, 13, 20, 22	6	2 nd June, 5 th June, 29 th June	Possible
AMGO	American Goldfinch	Spinus tristis	S5	-	-	13	<u>A</u>	-	2, 3, 8, 11, 12, 13, 17, 19, 20, 21	6	2 nd June, 5 th June, 29 th June	Possible
AMRE	American Redstart	Setophaga ruticilla	S5B, S3N	-	-	17	<u>A</u>	-	1, 3, 5, 6, 8, 12, 13, 16, 19, 21, 22	6	2 nd June, 5 th June, 27 th June, 29 th June	Possible
AMRO	American Robin	Turdus migratorius	S5B,S3N	-	-	15	<u>A</u>	-	1, 2, 3, 10, 11, 12, 13, 16, 17, 20, 22	6	2 nd June, 27 th June, 29 th June	Possible
BTNW	Black Throated Green Warbler	Setophaga virens	S5B	-	-	36	<u>A</u>	-	3, 5, 6, 7, 9, 10, 11, 12, 13, 14, 18, 19, 20, 21, 24, 25	6	2 nd June, 5 th June, 27 th June, 29 th June	Possible
BAWW	Black-and-white Warbler	Mniotilta varia	S5B	-	-	18	<u>A</u>	-	1, 5, 8, 9, 11, 14, 16, 21, 22, 23, 24, 25	6	2 nd June, 5 th June, 27 th June, 29 th June	Possible
BCCH	Black-capped Chickadee	Poecile atricapillus	S5	-	-	6	<u>A</u>	-	3, 5, 14, 18, 23	6	5 th June, 29 th June	Possible
BLJA	Blue Jay	Cyanocitta cristata	S5	-	-	2	<u>A</u>	-	11, 21	6	2 nd June	Possible
BHVI	Blue-headed Vireo	Vireo solitarius	S5B	-	-	20	<u>A</u>	-	1, 3, 6, 7, 9, 10, 11, 12, 13, 14, 20, 22, 23, 24, 25	6	2 nd June, 5 th June, 27 th June, 29 th June	Possible
BWHA	Broad-winged Hawk	Buteo platypterus	S5B	-	-	1	<u>A</u>	-	17	4	2 nd June	Possible
CAGO	Canada Goose	Branta canadensis	SNAB,S4N	-	-	5	<u>A</u>	-	10	1	5 th June	Possible
CEDW	Cedar Waxwing	Bombycilla cedrorum	S5B	-	-	1	<u>A</u>	-	5	6	5 th June	Possible
CSWA	Chestnut-sided Warbler	Setophaga pensylvanica	S5B	-	-	4	<u>A</u>	-	1, 2, 11	6	2 nd June, 29 th June	Possible
COGR	Common Grackle	Quiscalus quiscula	S5B	-	-	4	<u>A</u>	-	1, 17	6	2 nd June, 29 th June	Possible



Code	Common	Scientific	S-Rank	SARA	NSESA	#	Age	Gender	PC Observations	Group	Dates Surveyed	Breeding Potential
COLO	Common Loon	<i>Gavia immer</i>	S4B,S4N	-	-	4	<u>A</u>	-	16, 18, 22, 23	3	2 nd June, 5 th June, 27 th June	Possible
COYE	Common Yellowthroat	<i>Geothlypis trichas</i>	S5B	-	-	43	<u>A</u>	-	1, 2, 3, 5, 6, 7, 9, 10, 11, 12, 13, 14, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25	6	2 nd June, 5 th June, 27 th June, 29 th June	Possible
DEJU	Dark-eyed Junco	<i>Junco hyemalis</i>	S4S5	-	-	16	<u>A</u>	-	1, 3, 5, 6, 7, 8, 9, 10, 14, 16, 19, 22, 23	6	2 nd June, 5 th June, 27 th June, 29 th June	Possible
DOWO	Downy Woodpecker	<i>Picoides pubescens</i>	S5	-	-	2	<u>A</u>	-	18, 24	7	27 th June	Possible
GCKI	Golden-crowned Kinglet	<i>Regulus satrapa</i>	S5	-	-	9	<u>A</u>	-	7, 8, 9, 10, 11, 12, 13, 21	6	2 nd June, 5 th June, 27 th June, 29 th June	Possible
GBHE	Great Blue Heron	<i>Ardea herodias</i>	S4B	-	-	1	<u>A</u>	-	20	3	2 nd June	Non-breeding
GWTE	Green-winged Teal	<i>Anas carolinensis</i>	S4S5B	-	-	2	<u>A</u>	-	1	1	2 nd June	Possible
HAWA	Hairy Woodpecker	<i>Picoides villosus</i>	S5	-	-	1	<u>A</u>	-	16	7	27 th June	Possible
HETH	Hermit Thrush	<i>Catharus guttatus</i>	S5B	-	-	27	<u>A</u>	-	2, 3, 5, 6, 8, 9, 10, 11, 12, 13, 14, 16, 17, 18, 20, 22, 23, 24, 25	6	2 nd June, 5 th June, 27 th June, 29 th June	Possible
LEFL	Least Flycatcher	<i>Empidonax minimus</i>	S4S5B	-	-	12	<u>A</u>	-	1, 2, 3, 12, 13, 14, 17, 19, 25	6	2 nd June, 5 th June 29 th June	Possible
LISP	Lincoln's Sparrow	<i>Melospiza lincolni</i>	S4B	-	-	10	<u>A</u>	-	1, 2, 10, 12, 17, 22	6	2 nd June, 5 th June 29 th June	Possible
MAWA	Magnolia Warbler	<i>Setophaga magnolia</i>	S5B	-	-	37	<u>A</u>	-	1, 2, 5, 6, 7, 8, 9, 10, 12, 13, 14, 16, 17, 18, 19, 20, 21, 23, 24, 25	6	2 nd June, 5 th June, 27 th June, 29 th June	Possible
NAWA	Nashville Warbler	<i>Oreothlypis ruficapilla</i>	S4S5B	-	-	5	<u>A</u>	-	5, 11, 14, 18, 23	6	27 th June, 29 th June	Possible
NOFL	Northern Flicker	<i>Colaptes auratus</i>	S5B	-	-	9	<u>A</u>	-	2, 5, 8, 9, 13, 17, 18, 25	7	2 nd June, 5 th June, 27 th June, 29 th June	Possible
NOWA	Northern waterthrush	<i>Parkesia noveboracensis</i>	S4B	-	-	1	<u>A</u>	-	10	6	27 th June	Possible
OSPR	Osprey	<i>Pandion haliaetus</i>	S4B	-	-	2	<u>A</u>	-	20, 25	4	2 nd June, 5 th June	Possible
PAWA	Palm Warbler	<i>Setophaga palmarum</i>	S5B	-	-	18	<u>A</u>	-	2, 5, 6, 9, 11, 16, 18, 22, 23, 24, 25	6	2 nd June, 5 th June, 27 th June, 29 th June	Possible
PUFI	Purple Finch	<i>Haemorhous purpureus</i>	S4S5B,S3S4N	-	-	4	<u>A</u>	-	2, 3, 5, 20	6	2 nd June 27 th June, 29 th June	Possible
REVI	Red-eyed Vireo	<i>Vireo olivaceus</i>	S5B	-	-	7	<u>A</u>	-	6, 9, 12, 17, 19	6	27 th June, 29 th June	Possible
RTHU	Ruby-throated Hummingbird	<i>Archilochus colubris</i>	S5B	-	-	2	<u>A</u>	-	3, 22	6	2 nd June, 29 th June	Possible
SOSP	Song Sparrow	<i>Melospiza melodia</i>	S5B	-	-	1	<u>A</u>	-	16	6	27 th June	Possible
SWSP	Swamp Sparrow	<i>Melospiza georgiana</i>	S5B	-	-	3	<u>A</u>	-	1, 8, 21	6	2 nd June, 5 th June, 29 th June	Possible
TRES	Tree Swallow	<i>Tachycineta bicolor</i>	S4B	-	-	2	<u>A</u>	-	16, 17	6	2 nd June, 5 th June	Possible
WTSP	White-throated Sparrow	<i>Zonotrichia albicollis</i>	S5B	-	-	59	<u>A</u>	-	1, 2, 3, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25	6	2 nd June, 5 th June, 27 th June, 29 th June	Probable
WIWR	Winter Wren	<i>Troglodytes hiemalis</i>	S5B	-	-	5	<u>A</u>	-	1, 16, 17, 25	6	5 th June, 27 th June, 29 th June	Possible
YEWA	Yellow Warbler	<i>Setophaga petechia</i>	S5B	-	-	1	<u>A</u>	-	8	6	2 nd June, 27 th June	Possible



Code	Common	Scientific	S-Rank	SARA	NSESA	#	Age	Gender	PC Observations	Group	Dates Surveyed	Breeding Potential
YRWA	Yellow-rumped Warbler	<i>Setophaga coronata</i>	S5B	-	-	25	<u>A</u>	-	1, 3, 6, 7, 9, 10, 11, 12, 13, 14, 20, 22, 23, 24, 25	6	2 nd June, 5 th June, 27 th June, 29 th June	Possible
2019												
<u>CAWA</u>	<u>Canada Warbler</u>	<i>Cardellinia canadensis</i>	<u>S3B</u>	<u>T</u>	<u>E</u>	<u>6</u>	<u>A</u>	-	<u>2, 8</u>	<u>6</u>	<u>20th June, 4th July</u>	<u>Possible</u>
BOCH	Boreal Chickadee	<i>Poecile hudsonica</i>	S3	-	-	2	<u>A</u>	-	5, 6	6	20 th June, 4 th July	Possible
RBNU	Red-breasted Nuthatch	<i>Sitta canadensis</i>	S3	-	-	3	<u>A</u>	-	1, 6	6	20 th June	Possible
RCKI	Ruby-crowned Kinglet	<i>Regulus calendula</i>	S3S4B	-	-	5	<u>A</u>	<u>2M</u>	2, 5, 7	6	20 th June, 4 th July	Possible
SWTH	Swainson's Thrush	<i>Catharus ustulatus</i>	S3S4B	-	-	4	<u>A</u>	-	1, 2, 7, 8	6	20 th June	Possible
YBFL	Yellow-bellied Flycatcher	<i>Empidonax flaviventris</i>	S3S4B	-	-	6	<u>A</u>	<u>4M</u>	1, 6, 7, 8, 9	6	20 th June, July 4 th	Possible
AMCR	American Crow	<i>Corvus brachyrhynchos</i>	S5	-	-	2	<u>A</u>	1M	1, 5	6	20 th June, 4 th July	Possible
AMGO	American Goldfinch	<i>Carduelis tristis</i>	S5	-	-	1	<u>A</u>	-	8	6	20 th June	Possible
AMRE	American Redstart	<i>Setophaga ruticilla</i>	S5B, S3N	-	-	1	<u>A</u>	-	6	6	20 th June	Possible
AMRO	American Robin	<i>Turdus migratorius</i>	S5B,S3N	-	-	1	<u>A</u>	1M	9	6	4 th July	Possible
BAWW	Black-and-white Warbler	<i>Mniotilta varia</i>	S5B	-	-	8	<u>A</u>	4M	1, 2, 5, 7, 8	6	20 th June, 4 th July	Possible
BCCH	Black capped chickadee	<i>Poecile atricapillus</i>	S5	-	-	1	<u>A</u>	1M	7	6	4 th July	Possible
BTNW	Black-throated Green Warbler	<i>Dendroica virens</i>	S5B	-	-	8	<u>A</u>	2M	1, 2, 5, 6, 7, 8	6	20 th June, 4 th July	Possible
BHVI	Blue-headed Vireo	<i>Vireo solitarius</i>	S5B	-	-	12	<u>A</u>	4M	1, 2, 4, 5, 7, 8, 10	6	20 th June, 4 th July	Possible
COLO	Common Loon	<i>Gavia immer</i>	S4B,S4N	-	-	7	<u>A</u>	1F:2M	4, 6, 7, 8, 9, 10	3	20 th June, 4 th July	Possible
COYE	Common Yellowthroat	<i>Geothlypis trichas</i>	S5B	-	-	16	<u>A</u>	7M	1, 2, 6, 7, 8, 9, 10	6	20 th June, July 4 th	Possible
DEJU	Dark-eyed Junco	<i>Junco hyemalis</i>	S4S5	-	-	2	<u>A</u>	-	1	6	20 th June	Possible
HETH	Hermit Thrush	<i>Catharus guttatus</i>	S5B	-	-	14	<u>A</u>	8M	1, 2, 7, 8, 9, 10	6	20 th June, 4 th July	Possible
MAWA	Magnolia Warbler	<i>Dendroica magnolia</i>	S5B	-	-	20	<u>A</u>	6M	1, 2, 5, 6, 7, 9, 10	6	20 th June, 4 th July	Possible
NAWA	Nashville Warbler	<i>Vermivora ruficapilla</i>	S4S5B	-	-	1	<u>A</u>	-	6	6	20 th June	Possible
NOFL	Northern Flicker	<i>Colaptes auratus</i>	S5B	-	-	1	<u>A</u>	-	2	7	20 th June	Possible
OVEN	Ovenbird	<i>Seiurus aurocapilla</i>	S5B	-	-	2	<u>A</u>	1M	1, 6	6	20 th June, July 4 th	Possible
PAWA	Palm Warbler	<i>Dendroica palmarum</i>	S5B	-	-	3	<u>A</u>	-	1, 2, 9	6	20 th June	Possible
REVI	Red-eyed Vireo	<i>Vireo olivaceus</i>	S5B	-	-	3	<u>A</u>	2M	1	6	20 th June, 4 th July	Possible
SOSP	Song Sparrow	<i>Melospiza melodia</i>	S5B	-	-	1	<u>A</u>	-	10	6	20 th June	Possible
SWSP	Swamp Sparrow	<i>Melospiza georgiana</i>	S5B	-	-	3	<u>A</u>	2M	1, 9	6	20 th June, 4 th July	Possible
WTSP	White-throated Sparrow	<i>Zonotrichia albicollis</i>	S5B	-	-	12	<u>A</u>	4M	1, 2, 4, 5, 6, 8, 9	6	20 th June, 4 th July	Possible
YRWA	Yellow-rumped Warbler	<i>Dendroica coronata</i>	S5B	-	-	12	<u>A</u>	2M	1, 2, 4, 5, 6, 7, 9, 10	6	20 th June, 4 th July	Possible
2021												
<u>OSFL</u>	<u>Olive-sided Flycatcher</u>	<u>Contopus cooperi</u>	<u>S2B</u>	<u>T</u>	<u>T</u>	<u>1</u>	<u>A</u>	-	<u>t8</u>	<u>6</u>	<u>2nd June</u>	<u>Possible</u>



Code	Common	Scientific	S-Rank	SARA	NSESA	#	Age	Gender	PC Observations	Group	Dates Surveyed	Breeding Potential
WOTH	Wood Thrush	<i>Hylocichla mustelina</i>	SUB	T	-	1	A	-	t11	6	4 th June	Possible
BOCH	Boreal Chickadee	<i>Poecile hudsonica</i>	S3	-	-	4	A	-	8, 17, t4, t10	6	2 nd June, 3 rd June, 18 th June	Possible
GRAJ	Gray Jay	<i>Perisoreus canadensis</i>	S3	-	-	1	A	-	1	6	2 nd June	Possible
RBNU	Red-breasted Nuthatch	<i>Sitta canadensis</i>	S3	-	-	1	A	-	2	6	2 nd June	Possible
WIWA	Wilson's Warbler	<i>Wilsonia pusilla</i>	S3B	-	-	2	A	-	11, t10	6	18 th June	Possible
NOHA	Northern Harrier	<i>Circus cyaneus</i>	S3S4B	-	-	1	A	-	t8	6	2 nd June	No evidence
RCKI	Ruby-crowned Kinglet	<i>Regulus calendula</i>	S3S4B	-	-	29	A	-	1, 14, 15, 17, 18, 19, 20, 21, 24, 27, 28, 29, 30, 32, 34, t1, t14, t17, t18, t20, t32, t5, t8	6	2 nd June, 3 rd June, 4 th June, 16 th June, 17 th June, 18 th June	Probable
YBFL	Yellow-bellied Flycatcher	<i>Empidonax flaviventris</i>	S3S4B	-	-	12	A	-	12, 13, 14, 30, 31, 32, 33, 34, t12, t16, t2	6	3 rd June, 4 th June	Possible
ALFL	Alder Flycatcher	<i>Empidonax alnorum</i>	S5B	-	-	17	A	-	1, 9, 15, 16, 17, 22, 26, 28, 32, 33, t10, t14, t17, t25, t27, T34, t9	6	16 th June, 17 th June, 18 th June	Possible
AMCR	American Crow	<i>Corvus brachyrhynchos</i>	S5	-	-	5	A	-	3, 9, t8, t11	6	2 nd June, 18 th June	Possible
AMRE	American Redstart	<i>Setophaga ruticilla</i>	S5B, S3N	-	-	36	A	-	1, 2, 5, 6, 8, 11, 12, 13, 14, 15, 17, 19, 22, 24, 27, 30, 31, 32, 33, t2, t12, t17, t20, t30, t32, t34, t5	6	2 nd June, 3 rd June, 4 th June, 16 th June, 17 th June, 18 th June	Probable
AMRO	American Robin	<i>Turdus migratorius</i>	S5B,S3N	-	-	20	A	-	t2, 1, 2, 3, 5, 8, 11, 31, 34, t1, t11, t12, t16, t3, t32, t6	6	2 nd June, 3 rd June, 4 th June, 16 th June, 17 th June, 18 th June	Probable
BEKI	Belted Kingfisher	<i>Megaceryle alcyon</i>	S5B	-	-	3	A	-	8, 30, 34	3	3 rd June, 4 th June, 18 th June	Possible
BAWW	Black-and-white Warbler	<i>Mniotilta varia</i>	S5B	-	-	73	A	-	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 20, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, t1, t2, t6, t7, t10, t11, t12, t14, t16, t18, t20, t26, t27, t28, t31, t32, t34	6	2 nd June, 3 rd June, 4 th June, 16 th June, 17 th June, 18 th June	Probable
BLBW	Blackburnian Warbler	<i>Dendroica fusca</i>	S4B	-	-	1	A	-	t34	6	16 th June	Possible
BCCH	Black-capped Chickadee	<i>Poecile atricapilla</i>	S5	-	-	16	A	-	4, 6, 7, 9, 10, 14, 23, 27, 34, t1, t11, t34, t4, t8, t9	6	2 nd June, 4 th June, 16 th June, 17 th June, 18 th June	Possible
BTNW	Black-throated Green Warbler	<i>Dendroica virens</i>	S5B	-	-	51	A	-	2, 3, 5, 7, 8, 9, 12, 14, 15, 16, 17, 18, 19, 20, 27, 30, 31, 32, 34, t2, t5, t7, t8, t9, t11, t12, t14, t17, t18, t27, t3, t30, t31, t32, t34	6	2 nd June, 3 rd June, 4 th June, 16 th June, 17 th June, 18 th June	Probable
BLJA	Blue Jay	<i>Cyanocitta cristata</i>	S5	-	-	10	A	-	1, 11, 14, 17, 19, 32, t1, t20	6	2 nd June, 3 rd June, 4 th June, 18 th June	Possible



Code	Common	Scientific	S-Rank	SARA	NSESA	#	Age	Gender	PC Observations	Group	Dates Surveyed	Breeding Potential
BHVI	Blue-headed Vireo	<i>Vireo solitarius</i>	S5B	-	-	37	A	-	1, 2, 4, 5, 6, 7, 8, 9, 10, 13, 14, 16, 22, 23, 24, 27, 28, 29, 31, 32, 33, 34, t1, t12, t2, t26, t28, t4, t5, t7, t8	6	2 nd June, 3 rd June, 4 th June, 16 th June, 17 th June, 18 th June	Possible
BWHA	Broad-winged Hawk	<i>Buteo platypterus</i>	S5B	-	-	1	A	-	t2	4	2 nd June	No evidence
CAGO	Canada Goose	<i>Branta canadensis</i>	SNAB,S4N	-	-	4	A	-	3, 7, t2, t9	1	2 nd June	Possible
CSWA	Chestnut-sided Warbler	<i>Dendroica pensylvanica</i>	S5B	-	-	3	A	-	5, t1, t32	6	2 nd June, 3 rd June	Possible
COLO	Common Loon	<i>Gavia immer</i>	S4B,S4N	-	-	4	A	-	3, 20, 29, t30	3	3 rd June, 17 th June, 18 th June	Possible
CORA	Common Raven	<i>Corvus corax</i>	S5	-	-	1	A	-	27	6	4 th June	Possible
COYE	Common Yellowthroat	<i>Geothlypis trichas</i>	S5B	-	-	95	A	-	1, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 18, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 31, 32, 33, 34, t1, t9, t10, t11, t14, t2, t20, t25, t26, t27, t28, t29, t32, T34, t5, t6, t7, t8, t9	6	2 nd June, 3 rd June, 4 th June, 16 th June, 17 th June, 18 th June	Probable
DEJU	Dark-eyed Junco	<i>Junco hyemalis</i>	S4S5	-	-	40	A	-	1, 2, 4, 6, 7, 8, 9, 10, 11, 12, 13, 14, 16, 18, 20, 21, 25, 27, 28, 29, 32, 33, 34, t1, t11, t2, t27, t34, t6, t8, t9	6	2 nd June, 3 rd June, 4 th June, 16 th June, 17 th June, 18 th June	Probable
GCKI	Golden-crowned Kinglet	<i>Regulus satrapa</i>	S5	-	-	21	A	-	2, 3, 8, 32, 34, t1, t2, t10, t11, t20, t25, t3, t30, t32, t5	6	2 nd June, 4 th June, 16 th June, 17 th June, 18 th June	Possible
HAWO	Hairy Woodpecker	<i>Picoides villosus</i>	S5	-	-	1	A	-	31	7	3 rd June	Possible
HETH	Hermit Thrush	<i>Catharus guttatus</i>	S5B	-	-	60	A	-	1, 2, 3, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 18, 19, 20, 21, 22, 23, 24, 25, 30, 31, 32, 33, 34, t1, t10, t11, t12, t2, t20, t26, t3, t30, t32, t34	6	2 nd June, 3 rd June, 4 th June, 16 th June, 17 th June, 18 th June	Probable
LEFL	Least Flycatcher	<i>Empidonax minimus</i>	S4S5B	-	-	39	A	-	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 14, 15, 16, 17, 19, 20, 21, 23, 26, 27, 31, 33, 34, t10, t11, t16, t2, t3, t7, t9	6	2 nd June, 3 rd June, 4 th June, 16 th June, 17 th June, 18 th June	Probable
LISP	Lincoln's Sparrow	<i>Melospiza lincolnii</i>	S4B	-	-	13	A	-	9, 10, 25, 33, 34, t25, t26, t27, t34, t8, t9	6	2 nd June, 3 rd June, 4 th June, 16 th June, 18 th June	Possible
MAWA	Magnolia Warbler	<i>Dendroica magnolia</i>	S5B	-	-	40	A	-	t2, 2, 3, 4, 5, 6, 8, 9, 12, 15, 16, 17, 18, 20, 21, 24, 25, 27, 28, 29, 31, 32, t1, t12, t17, t3, t31, t32, T34, t4, t5, t6, t7, t8	6	2 nd June, 3 rd June, 4 th June, 16 th June, 17 th June, 18 th June	Probable
MOWA	Mourning Warbler	<i>Oporornis philadelphia</i>	S4B	-	-	1	A	-	23	6	16 th June	Possible



Code	Common	Scientific	S-Rank	SARA	NSESA	#	Age	Gender	PC Observations	Group	Dates Surveyed	Breeding Potential
NAWA	Nashville Warbler	<i>Vermivora ruficapilla</i>	S4S5B	-	-	31	A	-	3, 6, 8, 11, 12, 13, 16, 18, 20, 23, 25, 26, 27, 28, 30, 31, 32, t10, t12, t18, t25, t26, t28, t29, t30, t5	6	2 nd June, 3 rd June, 4 th June, 16 th June, 17 th June, 18 th June	Possible
NOFL	Northern Flicker	<i>Colaptes auratus</i>	S5B	-	-	3	A	-	10, 14, t25	7	2 nd June, 16 th June, 17 th June	Possible
NOPA	Northern Parula	<i>Parula americana</i>	S5B	-	-	2	A	-	t9, t31	6	2 nd June, 17 th June	Possible
OSPR	Osprey	<i>Pandion haliaetus</i>	S4B	-	-	1	A	-	t11	4	2 nd June, 17 th June, 18 th June	Confirmed
OVEN	Ovenbird	<i>Seiurus aurocapilla</i>	S5B	-	-	13	A	-	2, 3, 5, 13, 22, 27, 31, t10, t20, t3, t4	6	2 nd June, 3 rd June, 4 th June, 16 th June, 18 th June	Possible
PAWA	Palm Warbler	<i>Dendroica palmarum</i>	S5B	-	-	67	A	-	1, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, t1, t9, t10, t12, t16, t18, t20, t25, t26, t27, t28, t29, t34, t8, t9	6	2 nd June, 3 rd June, 4 th June, 16 th June, 17 th June, 18 th June	Confirmed
PUFI	Purple Finch	<i>Carpodacus purpureus</i>	S4S5B,S3S4N	-	-	8	A	-	2, 10, 15, 17, 20, 27, t8	6	2 nd June, 3 rd June, 4 th June, 17 th June, 18 th June	Possible
REVI	Red-eyed Vireo	<i>Vireo olivaceus</i>	S5B	-	-	14	A	-	14, 15, 16, 18, 20, 23, 24, 30, 31, 34, t14	6	2 nd June, 3 rd June, 16 th June, 17 th June	Probable
RNDU	Ring-necked Duck	<i>Aythya collaris</i>	S5B	-	-	2	A	-	t7	1	18 th June	Probable
SOSP	Song Sparrow	<i>Melospiza melodia</i>	S5B	-	-	9	A	-	6, 7, 8, t3, t7	6	2 nd June, 18 th June	Probable
SPGR	Spruce Grouse	<i>Falcapennis canadensis</i>	S4	-	-	4	A	-	t10	7	18 th June	Confirmed
SWSP	Swamp Sparrow	<i>Melospiza georgiana</i>	S5B	-	-	5	A	-	8, 10, 16	6	2 nd June, 3 rd June, 17 th June, 18 th June	Possible
TRES	Tree Swallow	<i>Tachycineta bicolor</i>	S4B	-	-	2	A	-	28, t6	6	3 rd June, 18 th June	Possible
WTSP	White-throated Sparrow	<i>Zonotrichia albicollis</i>	S5B	-	-	112	A	-	1, 2, 3, 4, 5, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, t1, t2, t10, t11, t12, t14, t16, t17, t18, t20, t25, t26, t27, t28, t29, t30, t31, t32, t34, t5, t8, t9	6	2 nd June, 3 rd June, 4 th June, 16 th June, 17 th June, 18 th June	Confirmed
WIWR	Winter Wren	<i>Troglodytes troglodytes</i>	S5B	-	-	2	A	-	32, t32	6	3 rd June	Possible
YRWA	Yellow-rumped Warbler	<i>Dendroica coronata</i>	S5B	-	-	10	A	-	5, 6, 8, 9, 14, 15, 17, 20, 23, 31	6	3 rd June, 4 th June, 16 th June, 17 th June, 18 th June	Possible
Total Species:		64	Total Individuals:		1,637							

Notes: Bird group is coded as: 1 = waterfowl, 2 = shorebirds; 3 = other waterbirds (i.e. that are not waterfowl or shorebirds); 4 = diurnal raptors; 5 = nocturnal raptors; 6 = passerines (excluding dippers) and 7 = other landbirds. Bolded species are priority species. ACCDC rankings retrieved from: <http://accdc.com/webranks/NSall.htm> (November 2021). Bolded species are priority species. Underlined species are SAR. “-“ represents no federal or provincial designation. Breeding status qualifiers are defined in the Maritime Breeding Bird Atlas (<http://www.mba-aom.ca/jsp/codes.jsp?lang=en&pg=breeding>). Where multiple observations of breeding evidence were observed, the highest breeding evidence is presented in the table



Table 10: Species and Abundance of Birds Observed During Breeding Bird Surveys

PC Locations	Round 1		Round 2		Total # of Individuals Detected	Total Number of Species Detected per PC
	# of Individuals	# of Species	# of Individuals	# of Species		
2017						
1	15	13	14	12	29	19
2	14	9	13	12	27	16
3	16	12	14	13	30	18
5	14	13	11	11	25	19
6	12	10	8	7	20	13
7	10	8	11	9	21	10
8	10	10	9	8	19	15
9	12	10	19	15	31	17
10	14	10	13	11	27	16
11	15	12	12	11	27	17
12	12	12	11	8	23	15
13	-	-	11	9	11	17
14	10	9	9	8	19	14
16	12	10	8	8	20	16
17	15	12	12	11	27	19
18	14	11	12	10	26	15
19	7	6	10	9	17	11
20	14	12	12	10	26	18
21	12	10	9	7	21	12
22	15	11	10	10	25	15
23	9	9	10	9	19	15
24	9	8	11	10	20	13
25	17	12	12	10	29	16
Total	278	43*	261	43*	539	
2019						
1	19	13	11	9	30	18
2	13	9	6	5	19	11
4	5	4	2	2	7	4
5	11	7	9	7	20	11
6	16	9	8	8	24	16
7	10	8	11	8	21	12
8	14	9	7	5	21	11
9	6	5	7	1	13	10
10	7	6	3	3	10	7
Total	101	25*	59	19*	165	



GOLDBORO GOLD PROJECT

PC Locations	Round 1		Round 2		Total # of Individuals Detected	Total Number of Species Detected per PC
	# of Individuals	# of Species	# of Individuals	# of Species		
2021						
1	12	10	14	11	26	14
2	12	10	11	11	23	14
3	9	9	11	9	20	13
4	8	7	3	3	11	8
5	9	9	5	5	14	12
6	11	10	5	5	16	12
7	8	7	6	6	14	10
8	13	13	11	10	24	18
9	9	9	8	7	17	15
10	11	10	10	9	21	13
11	4	4	11	11	15	12
12	5	5	9	9	14	11
13	10	8	9	7	19	11
14	12	11	11	11	23	17
15	12	10	7	7	19	14
16	6	6	12	12	18	13
17	10	9	7	6	17	13
18	11	10	9	7	20	11
19	7	7	6	5	13	8
20	5	5	16	15	21	15
21	6	5	10	5	16	8
22	6	6	6	5	12	8
23	6	6	12	11	18	12
24	8	7	8	7	16	10
25	4	4	7	7	11	9
26	5	4	10	7	15	7
27	13	12	9	9	22	16
28	8	8	7	7	15	11
29	7	7	5	5	12	9
30	8	8	8	8	16	11
31	15	13	9	9	24	17
32	10	10	12	11	22	17
33	9	9	10	8	19	12
34	10	10	13	12	23	17
Total	299	39*	307	39*	606	



3.2.3 Fall Migration Surveys

In total, 683 individuals representing 29 species were observed during dedicated fall migration surveys. Eight SOCI species (American kestrel, bay-breasted warbler, boreal chickadee, gray jay, gray catbird, red-breasted nuthatch, ruby-crowned kinglet, and turkey vulture; Figure 6, 7, Appendix A) were observed during the fall migration surveys.

Passerines were the most abundant functional bird group and comprised 85% of all individuals observed, followed by diurnal raptors (8%), other waterbirds (5%), and other landbirds (2%). Black-capped chickadee (n=108) was the most abundant species observed, followed by blue jay (n=57) and golden-crowned kinglet (n=54). No large flocks or obvious migration patterns were observed. All the species identified are native species in this region of Nova Scotia and the province in general. Typical and common habitat to support these species are present within the PA and surrounding landscape.

The 2021 PC 6 had the highest diversity with 17 species observed and 22 individuals. This PC was adjacent to several different habitat types and include open peatlands, forested swamps, and shrubland habitat. PC 15 had the second highest diversity with 14 species and 18 individuals observed. This PC was adjacent to cutover and mature mixedwood forests and the variation in vegetation heights and habitat could contribute to a high species diversity. All species, their abundance and observed PC locations, are listed in Table 11 and Table 12 (below). All avian SAR and SOCI are discussed in section 3.3 and 3.4.



Table 11: Species and Abundance of birds observed during Fall Migration surveys

Code	Common Name	Scientific Name	S-Rank	SARA	NSESA	#	Age	Gender	Point Observations	Dates Surveyed	Group
2018											
BOCH	Boreal Chickadee	Poecile hudsonica	S3	-	-	5	5A	-	9, 11, 13, 14, 15	28 th Sep, 29 th Sep	6
RBNU	Red-breasted nuthatch	Sitta canadensis	S3	-	-	7	5A	-	2, 6, 9, 10, 11, 14, 17	28 th Sep, 29 th Sep	6
AMCR	American Crow	Corvus brachyrhynchos	S5	-	-	3	3A	-	3, 14, 16	28 th Sep, 29 th Sep	6
AMGO	American Goldfinch	Carduelis tristis	S5	-	-	1	1A	-	WC10	28 th Sep	6
AMRO	American Robin	Turdus migratorius	S5B,S3N	-	-	3	3A	-	6, 7, 16	28 th Sep, 29 th Sep	6
BEKI	Belted kingfisher	Megacerylle alcyon	S5B	-	-	1	1A	-	Incidental		3
BCCH	Black-capped Chickadee	Poecile atricapilla	S5	-	-	42	17A	-	2, 4, 5, 6, 8, 9, 10, 11, 12, 14, 15, 17, WC10, WC2, WC3	28 th Sep, 29 th Sep	6
BLJA	Blue Jay	Cyanocitta cristata	S5	-	-	4	4A	-	6, 7, 15	28 th Sep, 29 th Sep	6
DEJU	Dark-eyed Junco	Junco hyemalis	S4S5	-	-	2	2A	-	11	28 th Sep	6
GCKI	Golden-crowned Kinglet	Regulus satrapa	S5	-	-	9	9A	-	1, 10, 13, 15, WC3	28 th Sep, 29 th Sep	6
NASA	Nashville Warbler	#N/A	S4S5B	-	-	1	1A	-	2	29 th Sep	6
NOFL	Northern Flicker	Colaptes auratus	S5B	-	-	3	3A	-	9, 10, 14	28 th Sep, 29 th Sep	7
OSPR	Osprey	Pandion haliaetus	S4B	-	-	1	1A	-	7	28 th Sep	4
PAWA	Palm Warbler	Dendroica palmarum	S5B	-	-	1	1A	-	17	28 th Sep	6
SWSP	Swamp Sparrow	Melospiza georgiana	S5B	-	-	1	1A	-	17	28 th Sep	6
WTSP	White-throated Sparrow	Zonotrichia albicollis	S5B	-	-	1	1A	-	9	28 th Sep	6
2021											
TUVU	Turkey Vulture	Cathartes aura	S2S3B	-	-	1	1A	-	27	14 th Sep	4
BOCH	Boreal Chickadee	Poecile hudsonica	S3	-	-	21	16A	-	4, 9, 10, 11, 12, 13, 14, 15, 16, 17, 27, 30	14 th Sep, 15 th Sep, 16 th Sep, 28 th Sep, 29 th Sep, 30 th Sep	6
GRAJ	Gray Jay	Perisoreus canadensis	S3	-	-	13	12A	-	6, 7, 23, 24, 26, 27, 29	14 th Sep, 15 th Sep, 28 th Sep, 29 th Sep	6
AMKE	American Kestrel	Falco sparverius	S3B	-	-	1	1A	-	8	30 th Sep	4
GRCA	Gray Catbird	Dumetella carolinensis	S3B	-	-	1	1A	-	17	29 th Sep	6
BBWA	Bay-breasted Warbler	Dendroica castanea	S3S4B	-	-	1	1A	-	15		6
RBNU	Red-breasted Nuthatch	Sitta canadensis	S3	-	-	7	7A	-	2, 6, 9, 10, 11, 14, 17	28 th Sept, 29 th Sept	6
RCKI	Ruby-crowned Kinglet	Regulus calendula	S3S4B	-	-	3	3A	-	5, 21, 32	28 th Sep, 30 th Sep	6
AMCR	American Crow	Corvus brachyrhynchos	S5	-	-	14	14A	-	3, 9, 11, 14, 16, 18, 28, 30, 32	2 nd Sep, 14 th Sep, 15 th Sep, 28 th Sep, 29 th Sep, 30 th Sep	6
AMGO	American Goldfinch	Carduelis tristis	S5	-	-	14	14A	-	3, 12, WC10	31 st Aug, 1 st Sep, 2 nd Sep, 28 th Sep	6
AMRO	American Robin	Turdus migratorius	S5B, S3N	-	-	24	24A	-	2, 4, 5, 6, 7, 9, 10, 14, 15, 16, 19, 20, 29, 31, 32	31 st Aug, 1 st Sept, 2 nd Sept, 14 th Sept, 15 th Sept, 16 th Sept, 28 th Sept, 29 th Sept, 30 th Sept	6
BAEA	Bald Eagle	Haliaeetus leucocephalus	S5	-	-	3	2A 1j	-	6, 7, 22	31 st Aug, 30 th Sep	4
BWWA	Black-and-white Warbler	Mniotilta varia	S5B	-	-	13	13A	-	1, 2, 3, 6, 12, 15, 19, 21, 30	31 st Aug, 1 st Sept, 2 nd Sept, 14 th Sept 15 th Sept	6
BCCH	Black-capped Chickadee	Poecile atricapilla	S5	-	-	108	67A	1M 3F	2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 20, 22, 23, 24, 27, 28, 30, 32, WC2, WC3, WC10	31 st Aug, 1 st Sep, 2 nd Sep, 14 th Sep, 15 th Sep, 16 th Sep, 28 th Sep, 29 th Sep, 30 th Sep	6
BTNW	Black throated Green Warbler	Setophaga virens	S5B	-	-	2	2A	-	3, 15	2 nd Sept, 15 th Sept	6
BLJA	Blue Jay	Cyanocitta cristata	S5	-	-	57	57A	-	1, 2, 3, 4, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 18, 19, 21, 23, 25, 27, 30, 31, 32	31 st Aug, 1 st Sep, 2 nd Sep, 14 th Sep, 15 th Sep, 16 th Sep, 28 th Sep, 29 th Sep, 30 th Sep	6
BHVI	Blue-headed vireo	Vireo solitarius	S5B	-	-	12	12A	-	4, 12, 16, 17, 18, 22, 24, 30, 32, 20*	2 nd Sept, 14 th Sept, 16 th Sept, 28 th Sept, 29 th Sept, 30 th Sept	6
CEWD	Cedar waxwing	Bombycilla cedrorum	S5B	-	-	13	13A	-	2, 5, 6, 11, 18, 21, 26, 28	31 st Aug, 1 st Sept, 2 nd Sept, 14 th Sept, 15 th Sept, 16 th Sept	6



Code	Common Name	Scientific Name	S-Rank	SARA	NSESA	#	Age	Gender	Point Observations	Dates Surveyed	Group
CSWA	Chesnut-sided warbler	<i>Setophaga pensylvanica</i>	S5B	-	-	1	1A	-	22	31 st Aug	6
COLO	Common Loon	<i>Gavia immer</i>	S4B,S4N	-	-	19	19A	-	1, 2, 3, 5, 6, 11, 13, 14, 16, 19, 21, 26, 27, 28, 29, 31	31 st Aug, 1 st Sep, 2 nd Sep, 14th -Sep, 15th Sep, 16th Sep, 28th Sep, 30th Sep	3
CORA	Common Raven	<i>Corvus corax</i>	S5	-	-	13	13A	-	1, 6, 8, 9, 18, 21, 22, 23, 29	1st Sep, 2nd Sep, 14th Sep, 28th Sep, 29th Sep, 30th Sep	6
COYE	Common Yellowthroat	<i>Geothlypis tolmiei</i>	S5B	-	-	27	27A	-	3, 6, 9, 10, 12, 14, 15, 16, 18, 21, 22, 23, 25, 29	31st Aug, 1st Sept, 2nd Sept, 14th Sept, 15th Sept, 16th Sept, 29 Sept, 30th Sept	6
DEJU	Dark-eyed Junco	<i>Junco hyemalis</i>	S4S5	-	-	13	13A	-	1, 3, 11, 15, 19, 30	1 st Sep, 2 nd Sep, 15 th Sep, 16 th Sep	6
GCKI	Golden-crowned Kinglet	<i>Regulus satrapa</i>	S5	-	-	51	51A	-	1, 3, 4, 5, 6, 7, 10, 11, 12, 13, 14, 15, 17, 19, 22, 23, 25, 26, 31, 32	31 st Aug, 1 st Sep, 2 nd Sep, 14th Sep, 15th Sep, 16th Sep, 28th Sep, 29th Sep, 30th Sep	6
HETH	Hermit thrush	<i>Catharus guttatus</i>	S5B	-	-	26	26A	-	1, 2, 3, 4, 5, 11, 12, 13, 17, 19, 23, 25, 30, 31, 32	31 st Aug, 1 st Sept, 2 nd Sept, 15 th Sept, 28 th Sept, 29 th Sept, 30 th Sept	6
LISP	Lincoln's Sparrow	<i>Melospiza lincolnii</i>	S4B	-	-	3	3A	-	18, 24	14 th Sep, 16 th Sep	6
MAWA	Magnolia Warbler	<i>Setophaga magnolia</i>	S5B	-	-	5	5A	-	6, 15, 32	1 st Sept, 2 nd Sept, 28 th Sept	6
MERL	Merlin	<i>Falco columbarius</i>	S5B	-	-	2	2A	-	7, 23	14 th Sept, 15 th Sept	4
MODO	Mourning Dove	<i>Zenaida macroura</i>	S5	-	-	1	1A	-	2	1 st Sep	7
NAWA	Nashville Warbler	<i>Vermivora ruficapilla</i>	S4S5B	-	-	1	1A	-	4	15 th Sep	6
NOFL	Northern Flicker	<i>Colaptes auratus</i>	S5B	-	-	39	39A	-	1, 4, 5, 6, 7, 9, 10, 11, 12, 13, 14, 16, 18, 19, 20, 21, 23, 24, 25, 27, 28, 30, 31, 32	31 st Aug, 1 st Sept, 2 nd Sept, 14 th Sept, 15 th Sept, 16 th Sept, 28 th Sept, 29 th Sept	7
NOPA	Northern Parula	<i>Setophaga americana</i>	S5B	-	-	1	1A	-	32	14 th Sept	6
OSPR	Osprey	<i>Pandion haliaetus</i>	S4B	-	-	24	24A	-	7, 9, 10, 11, 12, 14, 15, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28	31 st Aug, 1 st Sep, 2 nd Sep, 14th Sep, 15th Sep, 16th Sep, 28th Sep, 29th Sep, 30th Sep	4
PAWA	Palm Warbler	<i>Setophaga palmarum</i>	S5B	-	-	11	11A	-	4, 5, 8, 12, 15, 17, 25, 30, 32	31 st Aug, 1 st Sept, 2 nd Sept, 14 th Sept, 15 th Sept, 28 th Sept	6
RTHU	Ruby-throated Hummingbird	<i>Archilochus colubris</i>	S5B	-	-	1	1A	-	30	31 st Aug	6
SOSP	Song Sparrow	<i>Melospiza melodia</i>	S5B	-	-	7	7A	-	7, 10, 19, 31	1 st Sept, 2 nd Sept, 29 th Sept	6
SWSP	Swamp Sparrow	<i>Melospiza georgiana</i>	S5B	-	-	1	1A	-	16	16 th Sept	6
WTSP	White-throated Sparrow	<i>Zonotrichia albicollis</i>	S5B	-	-	38	38A	-	1, 4, 6, 8, 9, 10, 12, 13, 15, 16, 18, 23, 25, 26, 28, 29, 30, 32, 20*	31 st Aug, 1 st Sept, 2 nd Sept, 14 th Sept, 15 th Sept, 16 th Sept, 28 th Sept, 29 th Sept, 30 th Sept	6
YWAR	Yellow Warbler	<i>Setophaga petechia</i>	S5B	-	-	1	1A	-	6	1 st Sept	6
YRWA	Yellow-rumped Warbler	<i>Setophaga coronata</i>	S5B	-	-	12	12A	-	6, 16, 17, 21, 24, 27, 30	1 st Sept, 14 th Sept, 28 th Sept, 29 th Sept	6
RUGR	Ruffed Grouse	<i>Bonasa umbellus</i>	S5	-	-	3	3A	-	5, 21, 32	31 st Aug, 16 th Sep	7
Total Species		29		Total Individuals		654					

Notes: * Point count was completed approximately 100m north of original position due to bear presence. Bird group is coded as: 1 = waterfowl, 2 = shorebirds; 3 = other waterbirds (i.e. that are not waterfowl or shorebirds); 4 = diurnal raptors; 5 = nocturnal raptors; 6 = passerines (excluding dippers) and 7 = other landbirds. Bolded species are priority species. ACCDC rankings retrieved from: <http://accdc.com/webranks/NSall.htm> (November 2021). “-” represents no federal or provincial designation. Total number of individuals represented in table does not include unknowns.



Table 12. Species and Number of Individuals Observed during Fall Migration

PC Locations	Round 1		Round 2		Round 3		Total # of Individuals Detected	Total Number of Species Detected per Survey Location
	# of Individuals	# of Species	# of Individuals	# of Species	# of Individuals	# of Species		
2018								
1	2	1	--	-	-	-	2	1
2	5	4	-	-	-	-	5	4
3	1	1	-	-	-	-	1	1
4	4	2	-	-	-	-	4	2
5	5	1	-	-	-	-	5	1
6	14	4	-	-	-	-	14	4
7	3	3	-	-	-	-	3	3
8	1	1	-	-	-	-	1	1
9	8	5	-	-	-	-	8	5
10	6	4	-	-	-	-	6	4
11	5	4	-	-	-	-	5	4
12	1	1	-	-	-	-	1	1
13	4	3	-	-	-	-	4	3
14	5	5	-	-	-	-	5	5
15	4	4	-	-	-	-	4	4
16	2	2	-	-	-	-	2	2
17	13	4	-	-	-	-	13	4
WC2	2	1	-	-	-	-	2	1
WC3	4	2	-	-	-	-	4	2
WC 10	3	3	-	-	-	-	3	3
Total 2018	92	8*					92	8*



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PC Locations	Round 1		Round 2		Round 3		Total # of Individuals Detected	Total Number of Species Detected per Survey Location
	# of Individuals	# of Species	# of Individuals	# of Species	# of Individuals	# of Species		
2021								
1	4	4	5	3	5	4	14	9
2	2	2	14	5	7	5	23	9
3	5	4	6	4	8	5	19	12
4	5	4	9	6	7	5	21	11
5	5	5	6	3	4	4	15	9
6	10	9	8	5	4	4	22	17
7	3	2	8	4	1	1	12	10
8	2	1	2	2	5	4	9	6
9	3	2	4	4	7	5	14	11
10	4	4	4	4	9	5	17	11
11	5	5	7	5	8	6	20	12
12	16	9	4	4	11	5	31	13
13	2	2	4	3	4	3	10	8
14	3	3	4	4	7	4	14	11
15	10	9	4	3	4	3	18	14
16	8	8	11	8	10	4	29	12
17	2	1	1	1	8	6	11	9
18	1	1	8	5	12	7	21	11
19	12	9	5	3	3	2	20	10
20	2	2	2	2	5	4	9	5
21	7	7	3	2	7	3	17	10
22	2	2	4	2	4	4	10	8
23	5	3	3	3	10	8	18	11
24	1	1	4	3	4	2	9	7



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PC Locations	Round 1		Round 2		Round 3		Total # of Individuals Detected	Total Number of Species Detected per Survey Location
	# of Individuals	# of Species	# of Individuals	# of Species	# of Individuals	# of Species		
25	2	2	3	3	8	5	13	8
26	3	1	4	4	2	2	9	6
27	5	4	3	3	6	4	14	9
28	4	3	8	3	9	5	21	7
29	4	4	4	4	5	4	13	6
30	5	4	13	8	16	7	34	13
31	3	3	4	4	6	3	13	8
32	4	4	15	7	12	7	31	13
Total 2021	149	31*	184	28*	218	28*	551	

Notes: Total number of individuals observed include observations that were not able to be identified at the species level. * Total number of unique species observed.



3.2.4 Common Nighthawk Surveys

An abundance of suitable habitat for the common nighthawk was widespread within and adjacent to the PA including a pipeline ROW, open bogs and disturbed areas. However, despite of this habitat, no common nighthawks were observed during the surveys.

A total of 48 individuals representing 14 species, including one SOCI: Ruby-crowned kinglet (Figure 7, Appendix A), were recorded incidentally during the common nighthawk surveys (Table 13).

Table 13: Common Nighthawk Survey Results

Code	Common Name	Scientific Name	S-Rank	#	Point Count Observations	Group
RCKI	Ruby-crowned kinglet	<i>Regulus calendula</i>	S3S4B	1	3	6
AMRE	American redstart	<i>Setophaga ruticilla</i>	S4S5B	2	3, 5	6
AMRO	American robin	<i>Turdus migratorius</i>	S5B, S3N	1	2	6
BAWW	Black-and-white warbler	<i>Mniotilta varia</i>	S5B	2	2, 4	6
BEKI	Belted kingfisher	<i>Megasceryle alcyon</i>	S5B	1	2	3
COYE	Common yellowthroat	<i>Geothlypis trichas</i>	S5B	3	3, 4	6
DEJU	Dark-eyed junco	<i>Junco hyemalis</i>	S4S5	6	1, 2, 3, 4, 5	6
GCKI	Golden-crowned kinglet	<i>Regulus satrapa</i>	S5	1	3	6
HETH	Hermit thrush	<i>Catharus guttatus</i>	S5B	12	1, 2, 3, 4, 5, 6	6
MAWA	Magnolia warbler	<i>Setophaga magnolia</i>	S5B	3	2, 4	6
MOWA	Mourning warbler	<i>Geothlypis philadelphia</i>	S4B	1	4	6
PAWA	Palm warbler	<i>Setophaga palmarum</i>	S5B	2	1, 4	6
PUFI	Purple finch	<i>Hawmorrhous purpureus</i>	S4S5B, S3S4N	1	2	6
WTSP	White-throated sparrow	<i>Zonotrichia albicollis</i>	S5B	12	1, 2, 3, 4, 5, 6	6
Total Species: 14			Total number of individuals: 48			

Notes: Incidental observations not included (those observed outside of point count locations). Bird group is coded as: 1 = waterfowl; 2 = shorebirds; 3 = other waterbirds (i.e. that are not waterfowl or shorebirds); 4 = diurnal raptors; 5 = nocturnal raptors; 6 = passerines (excluding dippers) and 7 = other landbirds. Bolded species are priority species. ACCDC rankings retrieved from: <http://accdc.com/webranks/NSall.htm> (January 2022).



3.2.5 Nocturnal Owl Surveys

Three owl species were observed during the surveys in 2017 and 2021 and includes one SOCI species (boreal owl). The species observed during the surveys were northern saw-whet owl (*Aegolius acadicus*), boreal owl (*Aegolius funereus*), and great horned owl (*Bubo virginianus*).

In 2017, evidence for possible breeding owls was detected within the PA. A northern saw-whet owl and a boreal owl were detected during the 2017 survey. The boreal owl was detected approximately 500 m from the Owl 1 PC location (Figure 1; Appendix A), indicating the owl was using a relatively large patch of mature coniferous forest on the edge of a coniferous swamp/bog. During the 2017 moose survey, a great horned owl was detected near the OWL 1 PC location (Figure 1; Appendix A). Two owls (northern saw-whet owl) were detected during the April 21st, 2021 survey. No other SAR or SOCI birds were recorded during the nocturnal owl surveys (Table 14).

Table 14: Nocturnal Owl Survey Results

Code	Common Name	Scientific Name	S-Rank	#	Point Count Observations	Group
2017						
BOOW	Boreal owl	<i>Aegolius funereus</i>	S2?B	1	OWL 1	5
GHOW	Great horned owl	<i>Bubo virginianus</i>	S4	1	OWL 1 (Incidental)	5
NSWO	Northern saw-whet owl	<i>Aegolius acadicus</i>	S4B	1	OWL 3	5
2021						
NSWO	Northern saw-whet owl	<i>Aegolius acadicus</i>	S4B	2	OWL 3, OWL 4	5
Total Species		3	Total Individuals		5	

Notes: Bird group is coded as: 1 = waterfowl; 2 = shorebirds; 3 = other waterbirds (i.e. that are not waterfowl or shorebirds); 4 = diurnal raptors; 5 = nocturnal raptors; 6 = passerines (excluding dippers) and 7 = other landbirds. Bolded species are priority species

3.2.6 Waterfowl Surveys

One priority species, the spotted sandpiper was observed on September 14th, 2021 (Table 15). In total, 12 individuals representing five species were observed during dedicated surveys. Drilling activity was occurring near Gold Brook Lake throughout the surveys, which caused a high level of human noise and disturbance. This may have resulted in a fewer number of avian observations.



Table 15: Waterfowl Survey Results

Code	Common Name	Scientific Name	S-Rank	#	Group
SPSA	Spotted sandpiper	<i>Actitis macularius</i>	S3S4B	1	2
BCCH	Black-capped chickadee	<i>Poecile atricapillus</i>	S5	6	6
CCGO	Canada goose	<i>Branta canadensis</i>	S4N	2	
GCKI	Golden-crowned kinglet	<i>Regulus satrapa</i>	S5	1	6
OSPR	Osprey	<i>Pandium haliaetus</i>	S4B	2	
Total Species:	5	Total Individuals:		12	

Notes: Incidental observations not included (those observed outside of point count locations). Bird group is coded as: 1 = waterfowl; 2 = shorebirds; 3 = other waterbirds (i.e. that are not waterfowl or shorebirds); 4 = diurnal raptors; 5 = nocturnal raptors; 6 = passerines (excluding dippers) and 7 = other landbirds. Bolded species are priority species.

3.2.7 Incidentals

A total of 105 individuals were recorded incidentally during various biophysical surveys across the PA. Observations included three SAR, Canada warbler, evening grosbeak and olive-sided flycatcher, and 16 SOCI species, as listed below. Table 16 summarizes all priority bird incidentals.

Table 16: Priority Species incidental observations during various surveys

Code	Common Name	Scientific Name	S-Rank	#	Survey Type	Group
2017-2018						
AMKE	American kestrel	<i>Falco sparverius</i>	S3B	1	Breeding bird 2017	6
<u>CAWA</u>	<u>Canada warbler</u>	<i>Cardellinia canadensis</i>	<u>S3B</u>	<u>2</u>	Wetland Delineation	<u>6</u>
BOCH	Boreal chickadee	<i>Poecile hudsonicus</i>	S3	5	Wetland Delineation	6
CAJA	Canada jay	<i>Perisoreus canadensis</i>	S3	2	Wetland Delineation	6
RBNU	Red-breasted nuthatch	<i>Sitta canadensis</i>	S3	1	Wetland Delineation	6
GRCA	Gray catbird	<i>Dumetella carolinensis</i>	S3B	3	Breeding bird 2017	6
WIWA	Wilson's warbler	<i>Cardellina pusilla</i>	S3B	2	Wetland Delineation	6
GRYE	Greater yellowlegs	<i>Tringa melanoleuca</i>	S3B,S3S4M	1	Wetland Delineation	6



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Code	Common Name	Scientific Name	S-Rank	#	Survey Type	Group
NOHA	Northern Harrier	<i>Circus cyaneus</i>	S3S4B	1	Wetland Delineation	4
RCKI	Ruby-crowned kinglet	<i>Regulus calendula</i>	S3S4B	3	Wetland Delineation	6
SPSA	Spotted sandpiper	<i>Actitis macularius</i>	S3S4B	1	Wetland Delineation	2
YBFL	Yellow-bellied flycatcher	<i>Empidonax flaviventris</i>	S3S4B	5	Wetland Delineation	6
Total Species:	12	Total:			27	
2021						
<u>CAWA</u>	<u>Canada warbler</u>	<i>Cardellinia canadensis</i>	S3B	3	Early Botanical and Wetland Delineation	6
<u>OSFL</u>	<u>Olive-sided flycatcher</u>	<i>Contopus cooperi</i>	S2B	1	Wetland Delineation	6
<u>EVGR</u>	<u>Evening grosbeak</u>	<i>Coccothraustes vespertinus</i>	S3S4B,S3N	18	Lichen and Wetland Delineation	6
BBWO	Black-backed woodpecker	<i>Picoides arcticus</i>	S3S4	2	Wetland Delineation	7
BOCH	Boreal chickadee	<i>Poecile hudsonicus</i>	S3	30	Breeding Bird, Spring Migration, Coastal Survey, Wetland Delineation, Moose/Winter	6
GRJA	Canada jay	<i>Perisoreus canadensis</i>	S3	11	Spring Migration, Wetland Delineation, Moose/Winter	6
NOHA	Northern harrier	<i>Circus cyaneus</i>	S3S4B	3	Breeding Bird, Spring Migration	4
PIGR	Pine grosbeak	<i>Pinicola enucleator</i>	S2S3B,S5N	4	Lichen and Wetland Delineation	6



Code	Common Name	Scientific Name	S-Rank	#	Survey Type	Group
RECR	Red crossbill	<i>Loxia curvirostra</i>	S3S4	1	Wetland Delineation	6
RBNU	Red-breasted nuthatch	<i>Sitta canadensis</i>	S3	1	Wetland Delineation	6
RLHA	Rough-legged hawk	<i>Buteo lagopus</i>	S3N	1	Fall Migration	4
RCKI	Ruby-crowned kinglet	<i>Regulus calendula</i>	S3S4B	2	Blue Felt Lichen and Early Botanical	6
SOSA	Solitary sandpiper	<i>Tringa solitaria</i>	SUB, S3S4M	1	Fall Migration	2
Total Species:		13	Total:		78	

Notes: Bird group is coded as: 1 = waterfowl; 2 = shorebirds; 3 = other waterbirds (i.e. that are not waterfowl or shorebirds); 4 = diurnal raptors; 5 = nocturnal raptors; 6 = passerines (excluding dippers) and 7 = other landbirds. Underlined species are SAR. ACCDC rankings retrieved from: <http://accdc.com/webranks/NSall.htm> (January 2022).

3.3 Species at Risk (SAR) Observed

Four SAR avifauna species were observed during surveys throughout the dedicated survey period as well as incidentally during all other biophysical surveys completed from 2017-2021. The habitat within the PA comprises of a mosaic of softwood, mixedwood forested stands, regenerative forests, open water, treed and shrubbed wetlands and clearings which provide a wide range of habitats for bird species. The SAR avifauna species observed and a description of each SAR species, habitat requirements and the habitat present within the PA, are described below. For a complete list of all priority species (inclusive of SOCI) observed, refer to section 4.

- Canada warbler (*Cardellina canadensis*; ACCDC: S3B; SARA: Threatened; NSESA Endangered)
- Evening grosbeak (*Hesperiphona vespertina*, ACCDC: S3S4B, S3N; SARA: Special Concern, NSESA: Vulnerable)
- Olive-sided flycatcher (*Contopus cooperi*, ACCDC: S2B, SARA: Threatened, NSESA: Threatened)
- Wood thrush (*Hylocichla mustelina*, ACCDC: SUB, SARA: Threatened)

Canada Warbler

The Canada warbler is a small brightly colored songbird; the males have blue-gray upperparts and tail with a contrasting yellow throat and breast. Breeding habitat for the Canada warbler consists of a variety



of landscapes, but commonly comprises of moist to wet forests with a dense deciduous shrub layer. Nests may be built on or near the ground on raised hummocks, within root masses, rotting tree stumps, clumps of grass, rock cavities, dense shrubs, and in regenerating forests (COSEWIC, 2020). Within the PA, forested swamps with a well-developed shrub layer suitable for breeding and nesting was observed scattered throughout the PA. Fifteen Canada warbler individuals were observed during the breeding season and often found within treed swamps with a well-developed shrub layer or in dense upland forest near treed swamps (Figure 6, Appendix A). The treed swamp habitats were dominated by softwoods (i.e. balsam fir and black spruce) often with a prominent shrub layer comprising of speckled alder (*Alnus incana*) or mountain holly (*Ilex mucronata*) and blanketed with *Sphagnum* mosses. The upland forest habitats where Canada warbler were observed were dominated by balsam fir and black spruce, with a well-developed shrub layer of mountain holly. Within the PA, Canada warblers were observed within WL20, 25 and 117.

Evening Grosbeak

Evening grosbeaks are a member of the true finch family (Fringillidae), are a short stocky, vibrant coloured and equipped with a large yellowish-green bill (COSEWIC 2016). This species breeds in Mexico, Canada, and the United States. In the winter months, their range can vary widely depending on the food source available and is often found in backyards feeding off feeders. Breeding habitat is typically in open, mature mixedwood upland forests often dominated by balsam fir and white spruce and where their main food source, the spruce budworm (*Choristoneura* spp.) is present (COSEWIC 2016). Softwood and mixedwood stands are present within the PA and do provide suitable breeding habitat for evening grosbeak, however, this species was only observed in the migration seasons and as a flyover. There was no evidence of evening grosbeak using the PA for breeding but may be using the area as a stop over and foraging. Four observations totalling twenty individuals were made of evening grosbeak during spring migration and incidentally during 2021 (Figure 6, Appendix A).

Olive-sided Flycatcher

The olive-sided flycatcher is a small insectivore belonging to the “tyrant flycatchers” (*Tyrannidae*) family, with plumage with deep brownish olive grey above and whitish breast and throat (COSEWIC 2018). Although members of this family can be strikingly similar, the distinctive three-note song reminiscent of the phrase “quick, three-beers” is often diagnostic (COSEWIC, 2018). The olive-sided flycatcher is a widespread migratory species, with 53% of its breeding range being encompassed in forested areas in Canada. Olive-sided flycatchers are often found on edges of coniferous or mixed forests with tall trees and snags, along open areas, or in burned forests with standing trees and snags (COSEWIC, 2018). Within the PA, two observations of olive-sided flycatcher were observed in softwood swamps (WL 17 and WL 42) adjacent to cutovers (Figure 6, Appendix A). The abundance of conifer dominant swamps, forested uplands and edge habitats from forestry activities (cutovers) within the PA provides suitable breeding habitat for olive-sided flycatcher and is widespread throughout the PA and surrounding area.



Wood Thrush

The wood thrush is a medium sized bird, which is generally rusty-brown on the upperparts with white underparts and large blackish spots on the breast and flanks. The wood thrush nests mainly in second-growth and mature deciduous and mixedwood forests. Wood thrush generally prefer large forest mosaics but can also be found in small forest fragments (COSEWIC, 2012). Forested communities in the PA are predominately softwood and heavily fragmented due to historical and on-going forestry activities. Large contiguous forest mosaics are scarce within the PA and therefore, suitable habitat for wood thrushes is limited. One observation of wood thrush was observed outside the PA in the breeding season in 2021 in mixedwood upland forests (Figure 6, Appendix A).

3.4 Species of Conservation Interest (SOI) Observed

Across all survey seasons, a total of 24 SOI species were observed (Figure 7; Appendix A). The species and the survey season and type when they were observed are as follows:

- American kestrel (*Falco sparverius*, fall 2021, incidental);
- Bay-breasted warbler (*Dendroica castanea*; fall 2021);
- Black-backed woodpecker (*Picoides arcticus*; spring 2019, incidental);
- Blackpoll warbler (*Dendroica striata*, spring 2021)
- Boreal chickadee (*Poecile hudsonica*; spring 2021, breeding 2017, breeding 2019, breeding 2021, fall 2018, fall 2021, incidental);
- Canada jay (*Perisoreus canadensis*; spring 2019, spring 2021, breeding 2021, fall 2021, incidental);
- Fox sparrow (*Passerella iliaca*, breeding 2017);
- Gray catbird (*Dumetella carolinensis*, fall 2021, incidental);
- Greater yellowlegs (*Tringa melanoleuca*, spring 2021, incidental);
- Northern harrier (*Circus cyaneus*, breeding 2021, incidental);
- Pine grosbeak (*Pinicola enucleator*, incidental);
- Pine siskin (*Carduelis pinus*, spring 2019);
- Red crossbill (*Loxia curvirostra*, incidental)
- Red-breasted nuthatch (*Sitta canadensis*; spring 2019, Breeding 2017, breeding 2019, breeding 2021, fall 2018, incidental);
- Rough-legged hawk (*Buteo lagopus*, incidental)
- Ruby-crowned kinglet (*Regulus calendula*; spring 2019, spring 2021, breeding 2017, breeding 2019, breeding 2021, fall 2021, common nighthawk survey, incidental);
- Solitary sandpiper (*Tringa solitaria*, incidental);
- Spotted sandpiper (*Actitis macularius*, breeding 2017, waterfowl 2021, incidental);
- Swainson's thrush (*Catharus ustulatus*; spring 2021, breeding 2017, breeding 2019);
- Turkey vulture (*Cathartes aura*, fall 2021);
- Willet (*Tringa semipalmata*, spring 2021);
- Wilson's warbler (*Cardellina pusilla*, breeding 2017, breeding 2021, incidental);



- Yellow-bellied flycatcher (*Empidonax flaviventris*; spring 2019, breeding 2017, breeding 2019, breeding 2021, incidental); and,
- Boreal owl (*Aegolius funereus*, S2?B, 2017 nocturnal owl surveys).

4 SUMMARY

Baseline avifauna surveys were completed from April to September between 2017 to 2021, by GEMTEC and MEL biologists. A total of 4,065 minutes (68 hours) of surveys were completed. These surveys resulted in the observation of 3,747 individuals, representing 91 bird species within the PA. The most abundant bird group observed was Group 6 (passerines) accounting for 85.8% of total individuals, followed by Group 4 (diurnal raptors; 5%), Group 3 (other waterbirds; 4.1%), Group 7 (other landbirds; 3%), Group 1 (waterfowl; 1.8%), and Group 2 (shorebirds; 0.2%) of total individuals.

The PA comprises of a mosaic of cutovers, regenerative stands, historical mine workings, roads, trails, and intact, mature conifer and mixedwood stands and open and forested wetlands. Stand heterogeneity and diversity of landscapes observed within the PA provided a range of habitats suitable for a variety of bird species with different habitat requirements. Open habitat such as cutovers, provide suitable hunting habitat for predatory birds such as northern hairier and American kestrel and open water habitats provided foraging and hunting habitat for waterfowl, waterbirds, shorebirds and predatory birds such as Ospreys. Forests with stand heterogeneity (i.e. stands with different height classes) provided suitable habitat for foraging and breeding for many passerine species.

Although suitable breeding habitat for common nighthawk (e.g. clear cuts, ROW clearings, clearings etc.) was widespread throughout the PA, no common nighthawks were observed during the surveys from 2017 – 2021. During the spring, fall and breeding bird surveys, PC locations often associated with wetland habitats (treed swamps and bogs) or upland habitats with stand heterogeneity, had some of the highest species richness and species abundance.

During the nocturnal owl surveys, three owl species were observed in 2017 and 2021 and includes one SOCI species (boreal owl). The species observed during the surveys were northern saw-whet owl (*Aegolius acadicus*), boreal owl (*Aegolius funereus*), and great horned owl (*Bubo virginianus*).

Four SAR avifauna species were observed within and surrounding the PA and include:

- Canada warbler (*Cardellina canadensis*; ACCDC: S3B; SARA: Threatened; NSESA Endangered);
- Evening grosbeak (*Hesperiphona vespertine*, ACCDC: S3S4B, S3N; SARA: Special Concern, NSESA: Vulnerable);
- Olive-sided flycatcher (*Contopus cooperi*, ACCDC: S2B, SARA: Threatened, NSESA: Threatened); and,



- Wood thrush (*Hylocichla mustelina*, ACCDC: SUB, SARA: Threatened).

Breeding habitat for all SAR species were present within the PA, with Canada warbler and olive-sided flycatcher habitat being the most widespread. Although breeding habitat was present within the PA for evening grosbeak, this species was only observed as a flyover during migration, and it is likely this species uses the PA as a stop over site and for foraging. One wood thrush was observed outside the PA during the breeding season and prefers contiguous mixedwood and hardwood forested mosaics. Although this habitat is present within the PA, the observed forested communities are predominately coastal or near-coastal conifer dominant forests and often fragmented.

Across all survey seasons, a total of 28 priority species were observed (Figure 6 & Figure 7; Appendix A). The species and the survey season and type when they were observed are as follows:

- American kestrel (*Falco sparverius*, fall 2021, incidental);
- Bay-breasted warbler (*Dendroica castanea*; fall 2021);
- Black-backed woodpecker (*Picoides arcticus*; spring 2019, incidental);
- Blackpoll warbler (*Dendroica striata*, spring 2021)
- Boreal chickadee (*Poecile hudsonica*; spring 2021, breeding 2017, breeding 2019, breeding 2021, fall 2018, fall 2021, incidental);
- Canada jay (*Perisoreus canadensis*; spring 2019, spring 2021, breeding 2021, fall 2021, incidental);
- Canada warbler (*Cardellina canadensis*; Breeding 2017, Breeding 2019, incidental);
- Evening grosbeak (*Coccothraustes vespertinus*, spring 2019, incidental);
- Fox sparrow (*Passerella iliaca*, breeding 2017);
- Gray catbird (*Dumetella carolinensis*, fall 2021, incidental);
- Greater yellowlegs (*Tringa melanoleuca*, spring 2021, incidental);
- Northern harrier (*Circus cyaneus*, breeding 2021, incidental);
- Olive-sided flycatcher (*Contopus cooperi*, breeding 2021, incidental);
- Pine grosbeak (*Pinicola enucleator*, incidental);
- Pine siskin (*Carduelis pinus*, spring 2019);
- Red crossbill (*Loxia curvirostra*, incidental)
- Red-breasted nuthatch (*Sitta canadensis*; spring 2019, Breeding 2017, breeding 2019, breeding 2021, fall 2018, incidental);
- Rough-legged hawk (*Buteo lagopus*, incidental)
- Ruby-crowned kinglet (*Regulus calendula*; spring 2019, spring 2021, breeding 2017, breeding 2019, breeding 2021, fall 2021, common nighthawk survey, incidental);
- Solitary sandpiper (*Tringa solitaria*, incidental);
- Spotted sandpiper (*Actitis macularius*, breeding 2017, waterfowl 2021, incidental);
- Swainson's thrush (*Catharus ustulatus*; spring 2021, breeding 2017, breeding 2019);
- Turkey vulture (*Cathartes aura*, fall 2021);



- Willet (*Tringa semipalmata*, spring 2021);
- Wilson's warbler (*Cardellina pusilla*, breeding 2017, breeding 2021, incidental);
- Wood thrush (*Hylocichla mustelina*, breeding 2021);
- Yellow-bellied flycatcher (*Empidonax flaviventris*; spring 2019, breeding 2017, breeding 2019, breeding 2021, incidental); and,
- Boreal owl (*Aegolius funereus*, S2?B, 2017 nocturnal owl surveys).

5 LIMITATIONS

Limitations incurred at the time of the assessment include:

- MEL has relied in good faith upon the evaluation and conclusions in all third-party assessments. MEL relies upon these representations and information provided but can make no warranty of its accuracy.
- There are a potentially infinite number of methods in which human activity can influence wildlife behaviors and populations and merely demonstrating that one factor is not operative does not negate the influence of the remainder of possible factors.

General Limitations incurred include:

- All reasonable assessment programs will involve an inherent risk that some conditions will not be detected and all reports summarizing such investigations will be based on assumptions of what characteristics may exist between the sample points.



6 CLOSING

This Report has considered relevant factors and influences pertinent within the scope of the assessment and has completed and provided relevant information in accordance with the methodologies described.

The undersigned has considered relevant factors and influences pertinent within the scope of the assessment and written and combined and referenced the report accordingly.

John Gallop, B.Sc., P.Biol
Intermediate Environmental Scientist
McCallum Environmental Ltd.
587-340-8542
john@mccallumenvironmental.com

Meaghan Quanz, MES.
Junior Environmental Scientist
McCallum Environmental Ltd.
(902) 817-2271
meaghan.q@mccallumenvironmental.com



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APPENDIX A. FIGURES

FIGURE 1

Goldboro EARD Project Area
Desktop Review and
ACCDC Results
Avifauna

Goldboro, NS

● ACCDC Avifauna Species Observations

Significant Habitat

- Deer Wintering
- Migratory Bird
- Species at Risk
- Species of Concern
- Important Bird Areas
- EARD Project Area



Coordinate System: NAD 1983 CSRS UTM Zone 20N
Projection: Transverse Mercator
Datum: North American 1983 CSRS
Units: Meter



0 1,000 2,000 4,000 m

1:80,000 Scale when printed @ 11" x 17"

Drawn By: MQ
Reviewed By: JG

Date: 2022-02-24



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FIGURE 2

**Goldboro EARD Project Area
Avian Baseline Program
Locations: Spring Migration Survey**

Goldboro, NS

- | | | | | | | | | | | | | | | | | | |
|--|--|--|--|--|---------------------------------------|----------------------------------|-------------------|---------|------------------|-------------------|--------|---------------------|--------------------|-------------------|-------------------------|----------------|----------------------|
| May 14, 2019
Point Count
Locations | May 14, 2019
Watch Count
Locations | May 29, 2019
Point Count
Locations | May 29, 2019
Watch Count
Locations | 2021 Spring
Migration
Point Count
Locations | Watercourses
(Field
Delineated) | Graminoid
Dominant
Wetland | Forested
Swamp | Bog/Fen | Cutover
Swamp | Cutover
Upland | Barren | Mixedwood
Forest | Softwood
Forest | Wetlands
(NSE) | Watercourses
(NSECC) | Waterbodies... | EARD
Project Area |
| ● | ★ | ● | ★ | ● | — | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | — | ■ | ■ |



Coordinate System: NAD 1983 CSRS UTM Zone 20N
Projection: Transverse Mercator
Datum: North American 1983 CSRS
Units: Meter



0 237.5 475 950 m

1:20,000 Scale when printed @ 11" x 17"

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Reviewed By: JG

Date: 2022-02-24



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FIGURE 3

**Goldboro EARD Project Area
Avian Baseline Program
Locations: Breeding Bird
Surveys**

Goldboro, NS

- | | | |
|---|---|-------------------------|
| 2019 Breeding
Bird Survey
Locations | 2021 Breeding
Bird Search
Transects | Barren |
| 2021 Breeding
Bird Survey
Locations | Watercourses
(Field
Delineated) | Mixedwood
Forest |
| 2017 Breeding
Bird Survey
Locations | Graminoid
Dominant
Wetland | Softwood
Forest |
| May 29, 2019
Point Count
Locations | Forested
Swamp | Wetlands
(NSECC) |
| May 29, 2019
Watch Count
Locations | Bog/Fen | Watercourses
(NSTDB) |
| | Cutover
Swamp | Waterbodies |
| | Cutover
Upland | EARD
Project Area |



Coordinate System: NAD 1983 CSRS UTM Zone 20N
Projection: Transverse Mercator
Datum: North American 1983 CSRS
Units: Meter



0 237.5 475 950 m

1:20,000 Scale when printed @ 11" x 17"

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Reviewed By: JG

Date: 2022-02-24



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FIGURE 4

**Goldboro EARD Project Area
Avian Baseline Program
Locations: Fall Migration
Surveys**

Goldboro, NS

- | | |
|--------------------------------------|----------------------|
| 2018 Fall Migration Survey Locations | Cutover Swamp |
| 2021 Fall Migration Survey Locations | Cutover Upland |
| Watercourses (Field Delineated) | Barren |
| Graminoid Dominant Wetland | Mixedwood Forest |
| Forested Swamp | Softwood Forest |
| Bog/Fen | Wetlands (NSECC) |
| | Watercourses (NSTDB) |
| | Waterbodies |
| | EARD Project Area |



Coordinate System: NAD 1983 CSRS UTM Zone 20N
Projection: Transverse Mercator
Datum: North American 1983 CSRS
Units: Meter



0 237.5 475 950 m

1:20,000 Scale when printed @ 11" x 17"

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Date: 2022-02-24



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FIGURE 5

**Goldboro EARD Project Area
Avian Baseline Program
Locations: Common Nighthawk,
Owls and Waterfowl Surveys**

- | | |
|---------------------------------------|----------------------|
| ★ 2021 Waterfowl Survey Locations | Forest |
| ★ 2017 Nocturnal Owl Survey Locations | Bog/Fen |
| ● 2021 CONI Survey Locations | Cutover Swamp |
| ● 2021 Nocturnal Owl Survey Locations | Cutover Upland |
| Watercourses (Field Delineated) | Barren |
| Graminoid Dominant Wetland | Mixedwood Forest |
| | Softwood Forest |
| | Wetlands (NSECC) |
| | Watercourses (NSTDB) |
| | Waterbodies |
| | EARD Project Area |



Coordinate System: NAD 1983 CSRS UTM Zone 20N
Projection: Transverse Mercator
Datum: North American 1983 CSRS
Units: Meter



0 290 580 1,160 m

1:25,000 Scale when printed @ 11" x 17"

Drawn By: MQ
Reviewed By: JG
Date: 2022-02-24



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FIGURE 6

**Goldboro EARD Project Area
Avian Baseline Program
Locations: SAR Avifauna
Locations**

Goldboro, NS

- | | |
|--|---|
|  Canada Warbler |  Cutover Swamp |
|  Evening Grosbeak |  Watercourses (Field Delineated) |
|  Olive-sided Flycatcher |  Wetlands (NSECC) |
|  Wood Thrush |  Watercourses (NSTDB) |
|  Graminoid Dominant Wetland |  Waterbodies |
|  Forested Swamp |  EARD Project Area |
|  Bog/Fen | |



Coordinate System: NAD 1983 CSRS UTM Zone 20N
Projection: Transverse Mercator
Datum: North American 1983 CSRS
Units: Meter



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1:25,000 Scale when printed @ 11" x 17"

Drawn By: MQ
Reviewed By: JG

Date: 2022-02-24



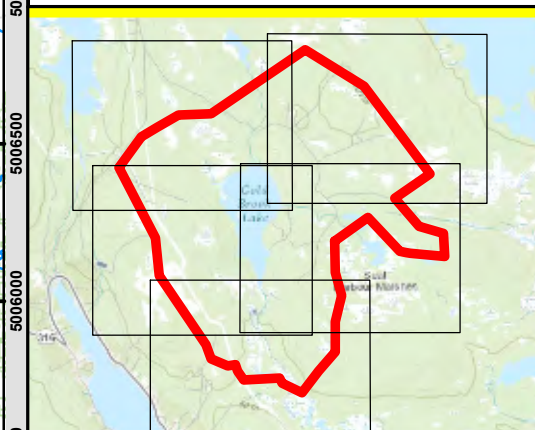
McCallum Environmental Ltd.

FIGURE 7a

**SOCI Avifauna
Observations Overview**

Goldboro, NS

- SOCI Observations
- Waterbody
- Graminoid Dominant Wetland
- Forested Swamp Groups
- Bog/Fen
- Cutover Swamp
- Cutover Upland
- Barren
- Mixedwood Forest
- Softwood Forest
- Wetlands outside PA (NSECC)
- Watercourses (NSTDB)
- Watercourses (Field Delineated)
- EARD Project Area



Coordinate System: NAD 1983 CSRS UTM Zone 20N
Projection: Transverse Mercator
Datum: North American 1983 CSRS
Units: Meter



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1:24,000 Scale when printed @ 11" x 17"

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Reviewed By: LP

Date: 2022-02-24

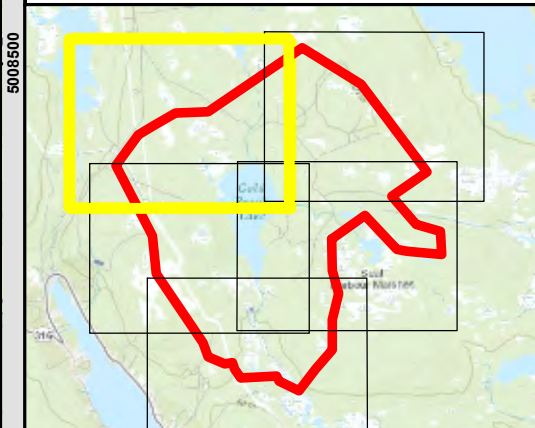


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FIGURE 7b

**SOCI Avifauna
Observations**
Goldboro, NS

- SOCI Observations
- Waterbody
- Roads (NSTDB)
- Graminoid Dominant Wetland
- Forested Swamp Groups
- Bog/Fen
- Cutover Swamp
- Cutover Upland
- Barren
- Mixedwood Forest
- Softwood Forest
- Wetlands outside PA (NSECC)
- Watercourses (NSTDB)
- Watercourses (Field Delineated)
- EARD Project Area



Coordinate System: NAD 1983 CSRS UTM Zone 20N
Projection: Transverse Mercator
Datum: North American 1983 CSRS
Units: Meter



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1:9,000 Scale when printed @ 11" x 17"

Drawn By: MQ
Reviewed By: LP
Date: 2022-02-24



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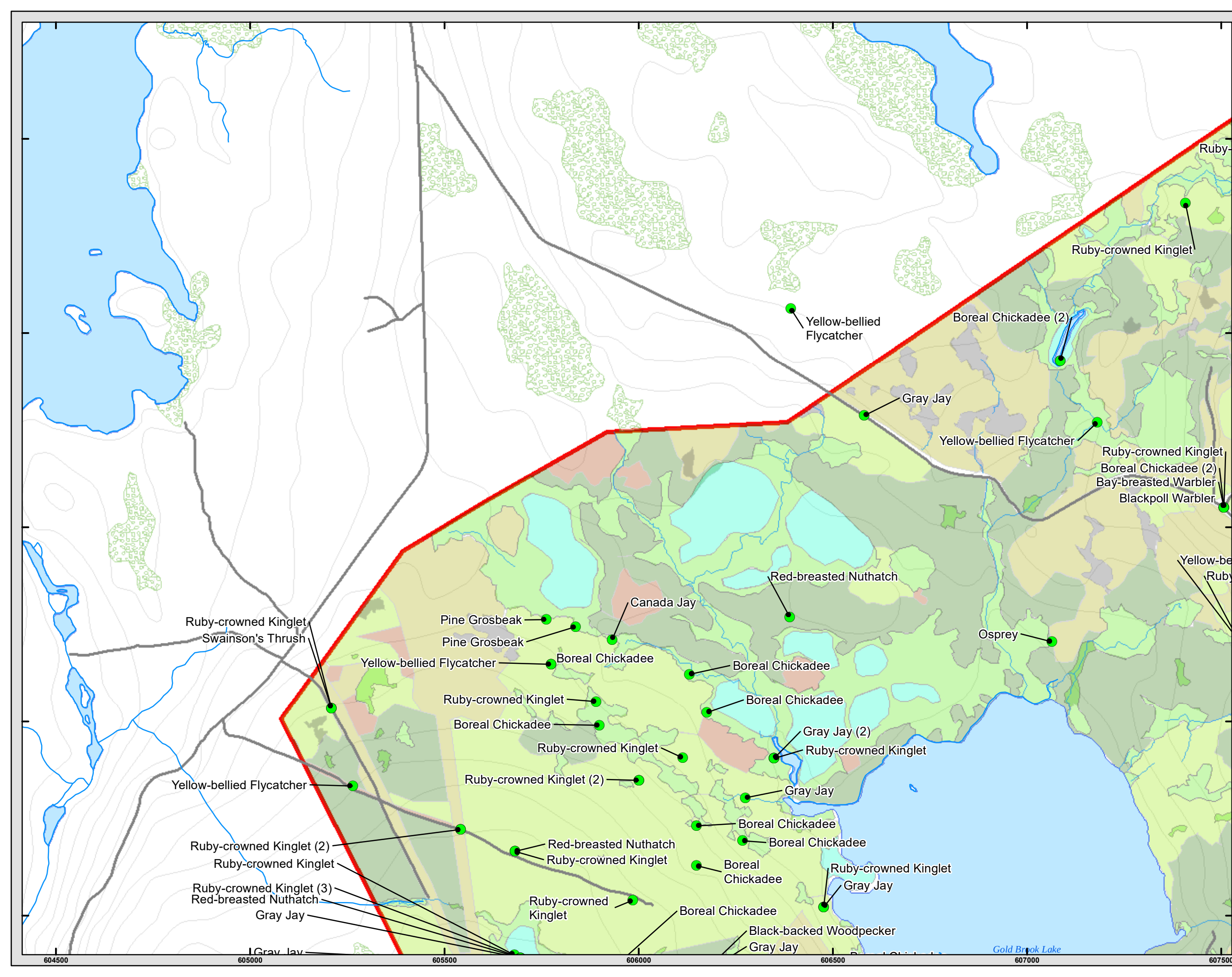
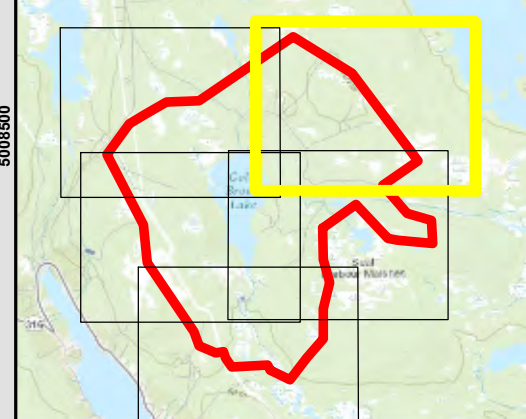


FIGURE 7c

**SOCI Avifauna
Observations**
Goldboro, NS

- SOCI Observations
- Waterbody
- Roads (NSTDB)
- Graminoid Dominant Wetland
- Forested Swamp Groups
- Bog/Fen
- Cutover Swamp
- Cutover Upland
- Barren
- Mixedwood Forest
- Softwood Forest
- Wetlands outside PA (NSECC)
- Watercourses (NSTDB)
- Watercourses (Field Delineated)
- EARD Project Area



Coordinate System: NAD 1983 CSRS UTM Zone 20N
Projection: Transverse Mercator
Datum: North American 1983 CSRS
Units: Meter



0 125 250 500 m

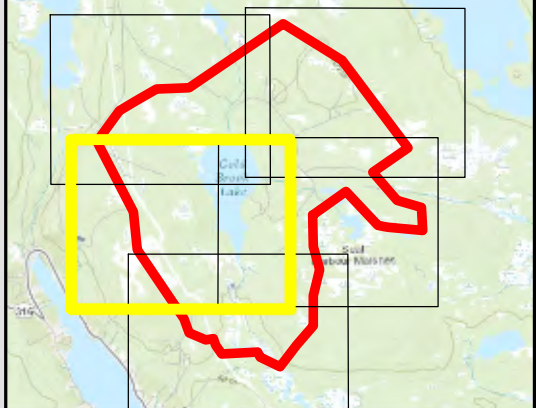
1:9,000 Scale when printed @ 11" x 17"

Drawn By: MQ
Reviewed By: LP
Date: 2022-02-24

FIGURE 7d

**SOCI Avifauna
Observations**
Goldboro, NS

- SOCI Observations
- Waterbody
- Roads (NSTDB)
- Graminoid Dominant Wetland
- Forested Swamp Groups
- Bog/Fen
- Cutover Swamp
- Cutover Upland
- Barren
- Mixedwood Forest
- Softwood Forest
- Wetlands outside PA (NSECC)
- Watercourses (NSTDB)
- Watercourses (Field Delineated)
- EARD Project Area



Coordinate System: NAD 1983 CSRS UTM Zone 20N
Projection: Transverse Mercator
Datum: North American 1983 CSRS
Units: Meter



0 125 250 500 m

1:9,000 Scale when printed @ 11" x 17"

Drawn By: MQ
Reviewed By: LP
Date: 2022-02-24

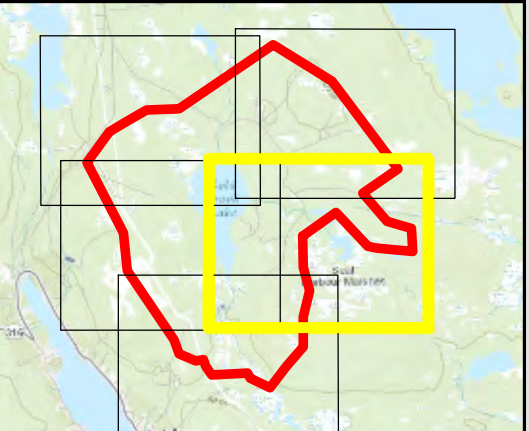


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FIGURE 7e

**SOCI Avifauna
Observations**
Goldboro, NS

- SOCI Observations
- Waterbody
- Roads (NSTDB)
- Graminoid Dominant Wetland
- Forested Swamp Groups
- Bog/Fen
- Cutover Swamp
- Cutover Upland
- Barren
- Mixedwood Forest
- Softwood Forest
- Wetlands outside PA (NSECC)
- Watercourses (NSTDB)
- Watercourses (Field Delineated)
- EARD Project Area



Coordinate System: NAD 1983 CSRS UTM Zone 20N
Projection: Transverse Mercator
Datum: North American 1983 CSRS
Units: Meter

0 125 250 500 m

1:9,000 Scale when printed @ 11" x 17"

Drawn By: MQ
Reviewed By: LP
Date: 2022-02-24



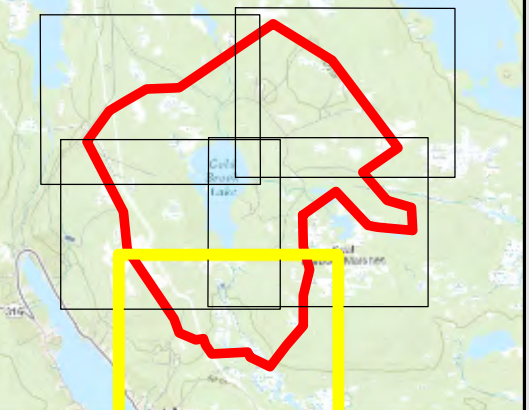
McCallum Environmental Ltd.

FIGURE 7f

SOCI Avifauna Observations

Goldboro, NS

- SOCI Observations
- Waterbody
- Roads (NSTDB)
- Graminoid Dominant Wetland
- Forested Swamp Groups
- Bog/Fen
- Cutover Swamp
- Cutover Upland
- Barren
- Mixedwood Forest
- Softwood Forest
- Wetlands outside PA (NSECC)
- Watercourses (NSTDB)
- Watercourses (Field Delineated)
- EARD Project Area



Coordinate System: NAD 1983 CSRS UTM Zone 20N
Projection: Transverse Mercator
Datum: North American 1983 CSRS
Units: Meter



0 125 250 500 m

1:9,000 Scale when printed @ 11" x 17"

Drawn By: MQ
Reviewed By: LP

Date: 2022-02-24



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APPENDIX B. PRIORITY SPECIES LIST

Goldboro Gold Mine Priority Species List



Scientific Name	Common Name	SRank	COSEWIC	SARA	NSESA	Habitat Description	Reference
Avifauna							
<i>Accipiter cooperii</i>	Cooper's Hawk	S1?B	-	-	-	Not common in Nova Scotia but does breed in the province. Found in mature forest, open woodlands, wood edges and river groves. Nests in coniferous, deciduous and mixed woods, typically those with tall trees and with openings or edge habitat nearby. Also found among trees along rivers through open country, and increasingly in suburbs and cities where tall trees exist for nesting (e.g. parks, open fields and even backyards with feeders). Breeds between April and July (Audubon, 2021; The Cornell Lab, 2021)	Audubon, 2021. Bird Guide. Retrieved from: https://www.audubon.org/bird-guide The Cornell Lab, 2021.- All About Birds. Retrieved from: https://www.allaboutbirds.org
<i>Accipiter gentilis</i>	Northern Goshawk	S3S4	-	-	-	Found in coniferous and mixed forests. Generally restricted to wooded areas (along riparian corridors), but may be in relatively open woods or along edges. Often more common as a breeding bird in mixed woods (e.g. mature and old-growth forests with more than 60% closed canopy). In the East, goshawks seek out nest sites in mixed-hardwood forests where beeches, birch, hemlock and maples dominate. Goshawks often build nests near breaks in the canopy, such as a forest trail, road or opening created by a downed tree and prefer sites with a creek, pond or lake nearby. Breeds between April and July. May mate for life (Audubon, 2021; The Cornell Lab, 2021).	Audubon, 2021. Bird Guide. Retrieved from: https://www.audubon.org/bird-guide The Cornell Lab, 2021.- All About Birds. Retrieved from: https://www.allaboutbirds.org
<i>Actitis macularius</i>	Spotted Sandpiper	S3S4B	-	-	-	Common near fresh and saltwater. Habitat includes pebbly lake shores, ponds and stream sides (and seashores in the winter). Spotted Sandpipers spend the winter along the coasts of North America. During migration and winter, this species is found along the coast on mudflats, beaches and breakwaters (also found in inland habitats such as sewage ponds and irrigation ditches). Breeds near the edge of fresh water in a wide variety of settings, including lakes, ponds, rivers and streams (in either open or wooded country). Breeding territories generally need to have a shoreline, a semi-open area for the nest and patches of dense vegetation to conceal the chicks. Breeds between April and July (Audubon, 2021; The Cornell Lab, 2021).	Audubon, 2021. Bird Guide. Retrieved from: https://www.audubon.org/bird-guide The Cornell Lab, 2021.- All About Birds. Retrieved from: https://www.allaboutbirds.org
<i>Aegolius funereus</i>	Boreal Owl	S2?B	-	-	-	Year-round resident, mainly in Cape Breton (MBBA, as of July 2021). Does not migrate regularly, but is nomadic and moves outside of range when prey is scarce. Boreal Owls occur in stands of spruce, aspen, poplar, birch and fir in the boreal forest (muskeg, mixed-wood and conifer forests). They also occur in high elevation mountains with subalpine forests in Canada. In the winter, they forage in spruce-fir forests where uncrusted snow under the trees facilitates access to prey. In spring, they often forage in clear-cuts and agricultural fields where small mammals are easier to locate. Beginning in late winter or early spring, male sings at night to defend territory and attract a female (Audubon, 2021; The Cornell Lab, 2021).	Audubon, 2021. Bird Guide. Retrieved from: https://www.audubon.org/bird-guide The Cornell Lab, 2021.- All About Birds. Retrieved from: https://www.allaboutbirds.org
<i>Ammospiza nelsoni</i>	Nelson's Sparrow	S3S4B	-	-	-	They spend most of their time on or near the ground in dense marsh vegetation. Nelson's Sparrow breed mainly in fresh and saltwater marshes in the northern Great Plains and along the northern Atlantic Coast. Breeds between April and July (Audubon, 2021; The Cornell Lab, 2021)	Audubon, 2021. Bird Guide. Retrieved from: https://www.audubon.org/bird-guide The Cornell Lab, 2021.- All About Birds. Retrieved from: https://www.allaboutbirds.org
<i>Anas acuta</i>	Northern Pintail	S1B	-	-	-	Found in marshes, prairies, fresh ponds, lakes and salt bays. Summers in wide variety of open habitats, including prairies, farmland, northern tundra and near bodies of water. Breeds in seasonal wetlands, open areas with short vegetation, wet meadows, grasslands and crop fields. During the nonbreeding season they use flooded and dry agricultural fields, lakes, reservoirs, estuaries, saltmarshes, freshwater and brackish wetlands and bays. Pintails also use different habitats depending on time of day (e.g. tend to forage in wetlands during the day). Breeds between April and July (Audubon, 2021; The Cornell Lab, 2021)	Audubon, 2021. Bird Guide. Retrieved from: https://www.audubon.org/bird-guide The Cornell Lab, 2021.- All About Birds. Retrieved from: https://www.allaboutbirds.org
<i>Asio flammeus</i>	Short-eared Owl	S1S2B	T	SC	0	Short-eared Owls breed primarily in well-drained grasslands near coastal wetlands. In areas with extensive coastlines, some caution is warranted in summarizing breeding habitat as inland marshes and bogs are less frequently monitored and thus may be under-represented in assessments of breeding habitat (COSEWIC Assessment and Status Report).	COSEWIC. 2008. COSEWIC assessment and update status report on the Short-eared Owl <i>Asio flammeus</i> in Canada. Committee on the Status of Endangered Wildlife in

Goldboro Gold Mine Priority Species List



Scientific Name	Common Name	SRank	COSEWIC	SARA	NSESA	Habitat Description	Reference
							Canada. Ottawa. vi + 24 pp. (www.sararegistry.gc.ca/status/status_e.cfm).
<i>Asio otus</i>	Long-eared Owl	S2S3	-	-	-	Known to breed throughout Nova Scotia. They occur at elevations ranging from near sea level to above 6,500 feet. May be nomadic at times, moving about in response to changing food supplies. Favored habitat includes dense trees for nesting and roosting and open country (e.g. grasslands and shrublands) for hunting. Inhabits a wide variety of such settings, including forest with extensive meadows to groves of conifers or deciduous trees. Generally avoids unbroken forest. Known to be an early breeder. Breeds between April and July (Audubon, 2021; The Cornell Lab, 2021).	Audubon, 2021. Bird Guide. Retrieved from: https://www.audubon.org/bird-guide The Cornell Lab, 2021.- All About Birds. Retrieved from: https://www.allaboutbirds.org
<i>Botaurus lentiginosus</i>	American Bittern	S3S4B	-	-	-	Found in marshes and reedy lakes. Breeds in freshwater marshes, mainly large, shallow wetlands with a large amount of tall marsh vegetation (cattails, grasses and sedges) and areas of open shallow water. Sometimes feeds in dry grassy fields. They are rarely seen out in the open, prefers vegetation cover. Breeds between April and July (Audubon, 2021; The Cornell Lab, 2021)	Audubon, 2021. Bird Guide. Retrieved from: https://www.audubon.org/bird-guide The Cornell Lab, 2021.- All About Birds. Retrieved from: https://www.allaboutbirds.org
<i>Bucephala albeola</i>	Bufflehead	S3S4N	-	-	-	Mainly stays along the mainland of Nova Scotia during the winter and Cape Breton during migration (migrates relatively late in fall and spring migration is protracted over a long period). Found in lakes, ponds, rivers and sheltered salt bays (avoiding coastlines and open areas). Bufflehead breed near ponds and lakes in boreal and aspen forest. In winter they occur mainly near the coast (although they can be found in smaller numbers inland). During spring migration they spend time on major rivers or valley lakes. Males begin courtship displays by early winter, but most pairs form in spring. Generally, breeds between April and July (Audubon, 2021; The Cornell Lab, 2021)	Audubon, 2021. Bird Guide. Retrieved from: https://www.audubon.org/bird-guide The Cornell Lab, 2021.- All About Birds. Retrieved from: https://www.allaboutbirds.org
<i>Buteo lagopus</i>	Rough-legged Hawk	S3N	-	-	-	Common across Nova Scotia during nonbreeding (winter). Spends the winter in open country, including grasslands, coastal prairies, marshes, farmland and dunes. In tree-covered areas they hunt over open bogs and other clearings. Breeds mostly on tundra, in areas having cliffs for nest sites; some breed along northern edge of coniferous forest zone. Rough-legged Hawks breed in open country of the arctic, both in North America and Eurasia. Breeds between April and July. May mate for life (Audubon, 2021; The Cornell Lab, 2021).	Audubon, 2021. Bird Guide. Retrieved from: https://www.audubon.org/bird-guide The Cornell Lab, 2021.- All About Birds. Retrieved from: https://www.allaboutbirds.org
<i>Cardellina canadensis</i>	Canada Warbler	S3B	SC	T	E	Forest undergrowth, shady thickets. Breeds in mature mixed hardwoods of extensive forests and streamside thickets. Prefers to nest in moist habitat: in luxuriant undergrowth, near swamps, on stream banks, in rhododendron thickets, in deep, rocky ravines and in moist deciduous second-growth (Nova Scotia L& F, 2021).	Nova Scotia Department of Lands and Forestry. 2021. Recovery Plan for the Canada Warbler (Cardellina canadensis) in Nova Scotia [Final]. Nova Scotia Endangered Species Act Recovery Plan Series.
<i>Cardellina pusilla</i>	Wilson's Warbler	S3B	-	-	-	Found in thickets along wooded streams, moist tangles, low shrubs, willows, alders. Breeds in thickets, second-growth, bogs, or in alder and willow groves near streams and ponds. In migration and winter, occurs from hot lowland thickets up to cool mountain woods; always in scrubby overgrown clearings and thin woods, not in the interior of dense forest. Breeds between April and July (Cornell Lab, Audubon).	Audubon, 2021. Bird Guide. Retrieved from: https://www.audubon.org/bird-guide The Cornell Lab, 2021.- All About Birds. Retrieved from: https://www.allaboutbirds.org
<i>Cathartes aura</i>	Turkey Vulture	S2S3B	-	-	-	In past was not surveyed/very rare to see Turkey Vultures in Nova Scotia, but as the climate warms they are now sighted across the province (MBBA and Nova Scotia Bird Society). Look for Turkey Vultures as they soar high over open areas. They are particularly noticeable along roadsides and at landfills. At night, they roost in trees, on rocks and other high secluded spots. Most common over open or semi-open country (including mixed farmland, forest, rangeland and even small	Audubon, 2021. Bird Guide. Retrieved from: https://www.audubon.org/bird-guide

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Scientific Name	Common Name	SRank	COSEWIC	SARA	NSESA	Habitat Description	Reference
						offshore islands), especially within a few miles of rocky or wooded areas providing secure nesting sites. Generally avoids densely forested regions. Breeds between April and July (Audubon, 2021; The Cornell Lab, 2021)	The Cornell Lab, 2021.- All About Birds. Retrieved from: https://www.allaboutbirds.org
<i>Catharus fuscescens</i>	Veery	S3S4B	-	-	-	Breeds across Nova Scotia, but more common on the mainland (especially Southern Nova Scotia). Migrates mostly at night. During spring and fall migration, they favour mainly deciduous forest edges and second-growth woodlands. Males tend to arrive on breeding grounds first. Veeries breed in dense, damp, mostly deciduous woodlands, often near rivers, streams and swampy areas (trees include oak, maple, cherry, aspen, birch, alder, spruce and fir, among other trees and shrubs). Veeries gravitate toward disturbed forests, where dense understory provides protected nest sites (but generally along streams and other openings). Breeds between April and July (Audubon, 2021; The Cornell Lab, 2021).	Audubon, 2021. Bird Guide. Retrieved from: https://www.audubon.org/bird-guide The Cornell Lab, 2021.- All About Birds. Retrieved from: https://www.allaboutbirds.org
<i>Catharus ustulatus</i>	Swainson's Thrush	S3S4B	-	-	-	Breeds throughout Nova Scotia. Spring migration relatively late and spread over a long period (sometimes still migrating at the beginning of June). Breed mainly in coniferous forests, deciduous streamside woodlands, alder or willow thickets and occasionally in coastal scrub. These birds range from sea level up to about 8,500 feet in elevation. During migration, Swainson's Thrushes occupy a wide variety of habitats, seeking mainly areas with dense undergrowth. Look for migrants especially in forests (various types), canyon bottoms, young woodland, swamp forests, lake edges and parks. Breeds between April and July (Audubon, 2021; The Cornell Lab, 2021).	Audubon, 2021. Bird Guide. Retrieved from: https://www.audubon.org/bird-guide The Cornell Lab, 2021.- All About Birds. Retrieved from: https://www.allaboutbirds.org
<i>Charadrius vociferus</i>	Killdeer	S3B	-	-	-	Favours fields, sandbars, lawns, river banks, coastal estuaries, mudflats and shores. Often found on open ground, such as pastures, plowed fields and large lawns, even at a great distance from water. This species does well in areas disturbed by humans and is commonly spotted on roads, lawns, airports, parking lots, golf courses, fields and in gravel areas. Most successful nesting areas have some shallow water close by or other good feeding area for the chicks. Generally the vegetation in fields inhabited by Killdeer is no taller than one inch. You can find Killdeer near water, but unlike many other shorebirds, they are also common in dry areas. Spring migration is very early, returning to some northern areas in February or March. Breeds between March and July (Audubon, 2021; The Cornell Lab, 2021).	Audubon, 2021. Bird Guide. Retrieved from: https://www.audubon.org/bird-guide The Cornell Lab, 2021.- All About Birds. Retrieved from: https://www.allaboutbirds.org
<i>Chordeiles minor</i>	Common Nighthawk	S2B	SC	T	T	Common Nighthawk breeds in a range of open and partially open habitats, including forest openings and post-fire habitats, prairies, bogs, and rocky or sandy natural habitats, as well as disturbed areas. It is also found in settled areas that meet its habitat needs, those with open areas for foraging and bare or short-cropped surfaces for nesting. The species use of a wide range of habitats makes it difficult to estimate trends in habitat availability, except in urban habitats, where their main nesting sites – flat graveled roofs – are disappearing (COSEWIC, 2018)	COSEWIC, 2018. Status Report on the Common Nighthawk. Retrieved from https://www.canada.ca/en/environment-climate-change/services/species-risk-public-registry/cosewic-assessments-status-reports/common-nighthawk-2018.html
<i>Circus hudsonius</i>	Northern Harrier	S3S4B	-	-	-	Breeds in Nova Scotia but also can be a permanent resident. Breeding Northern Harriers are most common in large, undisturbed tracts of freshwater or brackish wetlands, riverside woodlands and grasslands with low, thick vegetation. During winter they use a range of habitats with low vegetation, including deserts, coastal sand dunes, pasturelands, croplands, dry plains, grasslands, old fields, estuaries, open floodplains and marshes. At least in North America, always migrates singly. Breeds between April and July (Audubon, 2021; The Cornell Lab, 2021).	Audubon, 2021. Bird Guide. Retrieved from: https://www.audubon.org/bird-guide The Cornell Lab, 2021.- All About Birds. Retrieved from: https://www.allaboutbirds.org
<i>Coccothraustes vespertinus</i>	Evening Grosbeak	S3S4B,S3N	SC	SC	V	Evening Grosbeak breeding habitat generally includes open, mature mixedwood forests, where fir species and/or White Spruce are dominant, and Spruce Budworm is abundant. Outside the breeding season, the species seems to depend largely on seed crops from various trees such as firs and spruces in the boreal forest, but is also attracted to ornamental trees that produce seeds or fruit, and bird feeders stocked with sunflower seeds (COSEWIC, 2018)	COSEWIC, 2018. Summary of Terrestrial Species. Retrieved from Species at Risk Public Registry - The COSEWIC Summaries of Terrestrial Species Eligible for Addition or Reclassification on Schedule 1 - January 2018 (sararegistry.gc.ca).

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Scientific Name	Common Name	SRank	COSEWIC	SARA	NSESA	Habitat Description	Reference
<i>Coccyzus erythrophthalmus</i>	Black-billed Cuckoo	S3B	-	-	-	Black-billed Cuckoos are birds of woodlands and thickets, including aspen, poplar, birch, sugar maple, hickory, hawthorn and willow. They tend to occur more frequently in larger and denser woodlands than the Yellow-billed Cuckoo. On their wintering grounds, they live in forest, woodlands and scrub. A long-distance migrant, going to South America for the winter. Migrates at night; sometimes heard calling in flight overhead at night during the spring. During migration, they seek any kind of dense vegetation cover (e.g. young trees or tall shrubs). Common breeder in Nova Scotia. Breeds mostly in deciduous thickets and shrubby places, often on the edges of woodland or around marshes. Also in second growth of mixed deciduous-coniferous woods, or along their brushy edges. Breeds between April and July (Audubon, 2021; The Cornell Lab, 2021).	Audubon, 2021. Bird Guide. Retrieved from: https://www.audubon.org/bird-guide The Cornell Lab, 2021.- All About Birds. Retrieved from: https://www.allaboutbirds.org
<i>Contopus cooperi</i>	Olive-sided Flycatcher	S2B	SC	T	T	Olive-sided Flycatcher has been widely observed in open coniferous or mixed coniferous forests, often located near water or wetlands with the presence of tall snags or trees from which the species sallies for prey and advertises its territory. Mature conifer stands within patchy landscapes influenced by natural disturbance (e.g., recent burns) support the highest densities of Olive-sided Flycatcher. Nests are generally placed toward the tip of coniferous branches (although other tree types have been used) (Nova Scotia L&F, 2021).	Nova Scotia Department of Lands and Forestry, 2021. Recovery Plan for the Olive-sided Flycatcher (<i>Contopus cooperi</i>) in Nova Scotia.
<i>Contopus virens</i>	Eastern Wood-Pewee	S3S4B	SC	SC	V	The Eastern Wood-pewee is mostly associated with the mid-canopy layer of forest clearings and edges of deciduous and mixed forests. It is most abundant in forest stands of intermediate age and in mature stands with little understory vegetation. During migration, a variety of habitats are used, including forest edges, early and successional clearings (SARA, 2017).	SARA, 2017. Species Profile (Eastern Wood-pewee). Retrieved from https://wildlife-species.canada.ca/species-risk-registry/species/speciesDetails_e.cfm?sid=1198
<i>Coturnicops noveboracensis</i>	Yellow Rail	SUB	SC	SC	-	Yellow rail is distributed along northern Nova Scotia. Nesting Yellow Rails are typically found in marshes dominated by sedges, true grasses, and rushes, where there is little or no standing water (generally 0-12 cm water dept), and where the substrate remains saturated throughout the summer. They can be found in damp fields and meadows, on the floodplains of rivers and streams, in the herbaceous vegetation of bogs, and at the upper levels (drier margins) of estuarine and salt marshes. Nesting habitats usually have a dry mat of dead vegetation from previous growing seasons. A greater diversity of habitat types is used during migration and winter than during the breeding season. In winter, the rails are known to use coastal wetlands and rice fields. (SARA, 2011).	SARA, 2011. Species Profile (Yellow Rail). Retrieved from https://wildlife-species.canada.ca/species-risk-registry/species/speciesDetails_e.cfm?sid=574
<i>Dumetella carolinensis</i>	Gray Catbird	S3B	-	-	-	Known to breed all through Nova Scotia but seems to be more common in the Southern counties. Gray Catbirds live amid dense undergrowth, shrubs, vine tangles and thickets of young trees in shrubby swamps and along forests and streams in both summer and winter (dense, low growth). Human disturbance and development often create these habitats in the form of suburban gardens, clearings, roadsides, fencerows, abandoned farmland and residential areas. Avoids unbroken forest and coniferous woods. Breeds between April and July (Audubon, 2021; The Cornell Lab, 2021).	Audubon, 2021. Bird Guide. Retrieved from: https://www.audubon.org/bird-guide The Cornell Lab, 2021.- All About Birds. Retrieved from: https://www.allaboutbirds.org
<i>Empidonax flaviventris</i>	Yellow-bellied Flycatcher	S3S4B	-	-	-	Common breeder throughout Nova Scotia. Yellow-bellied Flycatchers breed in boreal coniferous forests, bogs, swamps, and peatlands with a thick cover of moss and an understory of shrubs and saplings (e.g. muskegs). In Canada they frequent stands of black spruce with heath, blueberries, laurel and Labrador tea in the understory, but they also use wet boreal forests and deciduous patches near streams. During migration they use deciduous forests, thickets and forest edges. Spring migration is notably late, with most northbound migrants passing through in mid to late May. Almost all migration is through the east. Breeds between April and July (Audubon, 2021; The Cornell Lab, 2021).	Audubon, 2021. Bird Guide. Retrieved from: https://www.audubon.org/bird-guide The Cornell Lab, 2021.- All About Birds. Retrieved from: https://www.allaboutbirds.org
<i>Empidonax traillii</i>	Willow Flycatcher	S2B	-	-	-	Uncommon breeder throughout mainland Nova Scotia, not Cape Breton (MBBA, as of July 2021). In winter, they use shrubby clearings, pastures and woodland edges often near water. Migrates relatively late in spring and early in fall. Breeds in thickets of deciduous trees and shrubs, especially willows, or along woodland edges. Often near streams or marshes and may be found in drier habitats than the Alder Flycatcher. Breeds between April and July (Audubon, 2021; The Cornell Lab, 2021).	Audubon, 2021. Bird Guide. Retrieved from: https://www.audubon.org/bird-guide The Cornell Lab, 2021.- All About Birds. Retrieved from: https://www.allaboutbirds.org

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Scientific Name	Common Name	SRank	COSEWIC	SARA	NSESA	Habitat Description	Reference
<i>Euphagus carolinus</i>	Rusty Blackbird	S2B	SC	SC	E	Breeding habitat is characterized by coniferous-dominated forests adjacent to wetlands, such as slow-moving streams, peat bogs, sedge meadows, marshes, swamps and beaver ponds. On migration, the Rusty Blackbird is primarily associated with wooded wetlands. In winter, it occurs primarily in lowland forested wetlands, cultivated fields and pecan groves. Suitable habitat for the species appears to be decreasing on its breeding range and wintering grounds, due mainly to the loss and degradation of wetlands by human activities (COSEWIC, 2018)	COSEWIC, 2018. COSEWIC Assessment and status report on the Rusty Blackbird (<i>Euphagus carolinus</i>) in Canada. Retrieved from: https://species-registry.canada.ca/index-en.html#/consultations/3302
<i>Falco sparverius</i>	American Kestrel	S3B	-	-	-	Breeds in Nova Scotia but also can be a permanent resident. American Kestrels favor open areas with short ground vegetation and sparse trees (e.g. meadows, wood edges, grasslands, deserts, parks, farm fields, cities and suburbs). When breeding, kestrels need access to at least a few trees or structures that provide appropriate nesting cavities. American Kestrels are attracted to many habitats modified by humans, including pastures and parkland, and are often found near areas of human activity including towns and cities. In winter, females may occupy open habitats more so than males. Breeds between April and July (Audubon, 2021; The Cornell Lab, 2021).	Audubon, 2021. Bird Guide. Retrieved from: https://www.audubon.org/bird-guide The Cornell Lab, 2021.- All About Birds. Retrieved from: https://www.allaboutbirds.org
<i>Gallinago delicata</i>	Wilson's Snipe	S3B	-	-	-	Common across Nova Scotia during breeding and also known as a permanent resident in the southern areas of the province. Wilson's Snipes can be found in all types of wet, marshy settings, including wet fields, bogs, fens, swamps, wet meadows and along muddy edges of rivers and ponds. They avoid areas with tall, dense vegetation, but need patches of cover to hide in and to provide a safe lookout for predators. During the breeding season they are mainly found around fresh marshes and bogs, shrubby stream sides and northern tundra. Breeds between April and July (Audubon, 2021; The Cornell Lab, 2021).	Audubon, 2021. Bird Guide. Retrieved from: https://www.audubon.org/bird-guide The Cornell Lab, 2021.- All About Birds. Retrieved from: https://www.allaboutbirds.org
<i>Haemorhous purpureus</i>	Purple Finch	S3S4N,S4S5B	-	-	-	Found throughout the entire province year-round. Purple finches can be found in woods, groves, suburbs. Breeds mostly in coniferous and mixed woods, both in forest interior and along edges. In migration and winter, found in a wide variety of wooded and semi-open areas, including forest, suburbs, swamps, and overgrown fields. Breeding occurs from April to July (Audubon, 2021; The Cornell Lab, 2021)	Audubon, 2021. Bird Guide. Retrieved from: https://www.audubon.org/bird-guide The Cornell Lab, 2021.- All About Birds. Retrieved from: https://www.allaboutbirds.org
<i>Hirundo rustica</i>	Barn Swallow	S2S3B	SC	T	E	Barn Swallows forage over a wide range of open and semi-open habitats including natural and anthropogenic grasslands, other farmland, open wetlands, open water, savannah, tundra, highways and other cleared right-of-ways, and cities and towns. They avoid forested regions and high mountains. Barn Swallows throughout the world have adapted to nesting in or on human structures, including buildings, barns, bridges, culverts, wells and mine shafts. Use of natural nest sites such as caves or rock cliffs with crevices or ledges protected by overhangs is rarely reported. Nocturnal roosts are typically in reed or cane beds or other dense vegetation, usually in or near water.	
<i>Icterus galbula</i>	Baltimore Oriole	S2S3B	-	-	-	Baltimore Orioles are often very common in open woods and groves in summer. Found in open woods, riverside groves, elms, shade trees. Breeds in deciduous or mixed woodland, generally in open woods or edges rather than interior of dense forest. May be common in trees in towns (Audubon). Breeds between April and July (Audubon, 2021; The Cornell Lab, 2021).	Audubon, 2021. Bird Guide. Retrieved from: https://www.audubon.org/bird-guide The Cornell Lab, 2021.- All About Birds. Retrieved from: https://www.allaboutbirds.org
<i>Ixobrychus exilis</i>	Least Bittern	SUB	T	T	0	The Least bittern has been observed in every Province in Canada. However, it is only probable to be located in Nova Scotia. The Least Bittern breeds strictly in marshes dominated by emergent vegetation surrounded by areas of open water. Most breeding grounds in Canada are dominated by cattails, but breeding also occurs in areas with other robust emergent plants and in shrubby swamps. The presence of stands of dense vegetation is essential for nesting because the nests of Least Bittern sit on platforms of stiff stems. The nests are almost always within 10 m of open water. This small heron prefers large marshes that have relatively stable water levels throughout the nesting period. Needs for wintering habitat are less specific, and appear to be met by a wide variety of wetlands—not only emergent	

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						marshes like those used for breeding, but also brackish and saline swamps (Environment Canada Recovery Strategy)	
<i>Lanius borealis</i>	Northern Shrike	S3S4N	-	-	-	They occur in open but brushy habitats, and on calm, sunny days they may sit up on utility wires, bushes, and trees (Cornell Lab).Nests are usually placed in a low tree or large shrub, often in spruce or willow, usually 6-15' above the ground. Breeds between April and July (Audubon, 2021; The Cornell Lab, 2021).	Audubon, 2021. Bird Guide. Retrieved from: https://www.audubon.org/bird-guide The Cornell Lab, 2021.- All About Birds. Retrieved from: https://www.allaboutbirds.org
<i>Limosa haemastica</i>	Hudsonian Godwit	S1S2M	T	Not on Schedule 1	-	Hudsonian Godwit occurs regularly during breeding or migration in all three territories and in provinces from British Columbia to Québec, as well as occasionally in the fall in all of the Atlantic provinces. Hudsonian Godwit breeds in wetland habitats (sedge meadows and muskeg) in sub-Arctic and Boreal regions. It uses a wide variety of habitats on migration, including freshwater marshes, saline lakes, flooded fields, shallow ponds, coastal wetlands and mudflats (COSEWIC Assessment and Status Report).	
<i>Loxia curvirostra</i>	Red Crossbill	S3S4	-	-	-	Found throughout the entire province year-round. Red Crossbills can be found in conifer forests and groves, and breeds in pines (predominately), spruce, hemlock, Douglas-fir, or other evergreens. Breeding occurs from April to July (Audubon, 2021; The Cornell Lab, 2021)	Audubon, 2021. Bird Guide. Retrieved from: https://www.audubon.org/bird-guide The Cornell Lab, 2021.- All About Birds. Retrieved from: https://www.allaboutbirds.org
<i>Mimus polyglottos</i>	Northern Mockingbird	S1B	-	-	-	Year-round resident throughout Nova Scotia, less common in Cape Breton. Found year-round in areas with open ground and shrubby vegetation (e.g. dense, low shrubs - hedges, fruiting bushes and thickets). When foraging on the ground, it prefers grassy areas, rather than bare spots. Common places include roadsides, parkland, cultivated land, suburban areas, woodland edges and in second-growth habitat at low elevations. Breeds between April and July (Audubon, 2021; The Cornell Lab, 2021).	Audubon, 2021. Bird Guide. Retrieved from: https://www.audubon.org/bird-guide The Cornell Lab, 2021.- All About Birds. Retrieved from: https://www.allaboutbirds.org
<i>Myiarchus crinitus</i>	Great Crested Flycatcher	S1B	-	-	-	Uncommon breeder throughout mainland Nova Scotia, not Cape Breton (MBBA, as of July 2021). Migrates mostly at night. Breeds mainly in deciduous forest or mixed forest, but avoids pure stands of conifers. May be found in either continuous deep forest or in more open wooded areas, around edges of clearings or abandoned orchards. Dead snags and dying trees are important sources of the cavities they need for nesting (will even search out cavities in old orchards and in woody urban areas like parks, cemeteries and golf courses). If there are enough trees, they will claim territories in pastures, along streams and rivers, and in swamps and wetlands. Breeds between April and July (Audubon, 2021; The Cornell Lab, 2021).	Audubon, 2021. Bird Guide. Retrieved from: https://www.audubon.org/bird-guide The Cornell Lab, 2021.- All About Birds. Retrieved from: https://www.allaboutbirds.org
<i>Oreothlypis peregrina</i>	Tennessee Warbler	S3S4B	-	-	-	Found in deciduous and mixed forests; in migration, groves, brush. Breeds in bogs, swamps, and forests. Prefers openings in second growth balsam-tamarack bogs, or aspen and pine woods, or edges of dense spruce forest, but can be found in many types of wooded habitats in eastern North America. Nests near slight depressions of boggy ground. Breeds between April and July (Audubon, 2021; The Cornell Lab, 2021).	Audubon, 2021. Bird Guide. Retrieved from: https://www.audubon.org/bird-guide The Cornell Lab, 2021.- All About Birds. Retrieved from: https://www.allaboutbirds.org
<i>Passerella iliaca</i>	Fox Sparrow	S3S4B	-	-	-	Found year round in Cape Breton, and throughout the migration season (late March and early November) in the rest of the province. Migrates at night. Found in wooded areas, undergrowth, brush. Breeds in brushy areas including woodland edges and clearings, streamside thickets, scrubby second growth, stunted coastal forest. Winters in similar habitats, also in brushy fields, chaparral, well-vegetated suburbs and parks. Breeds from April to July (Audubon, 2021; The Cornell Lab, 2021)	Audubon, 2021. Bird Guide. Retrieved from: https://www.audubon.org/bird-guide The Cornell Lab, 2021.- All About Birds. Retrieved from: https://www.allaboutbirds.org

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<i>Passerina cyanea</i>	Indigo Bunting	S1?B	-	-	-	This species favors brushy edges rather than unbroken forest. Indigo Buntings breed in brushy and weedy areas. They're common on the edges of woods and fields; along roads, streams, rivers, and powerline cuts; in logged forest plots, brushy canyons, and abandoned fields where shrubby growth is returning. They are also in clearings within deciduous woods, edges of swamps. Breeds between April and July (Audubon, 2021; The Cornell Lab, 2021).	Audubon, 2021. Bird Guide. Retrieved from: https://www.audubon.org/bird-guide The Cornell Lab, 2021.- All About Birds. Retrieved from: https://www.allaboutbirds.org
<i>Perisoreus canadensis</i>	Canada Jay	S3	-	-	-	Year-round resident throughout Nova Scotia and commonly referred to as the Gray Jay. No regular migration. On rare occasions, small invasions of Canada Jays will move a short distance out of boreal forest in winter. Prefers boreal and subalpine forests across northern North America, usually where black or white spruce trees are common (also aspen, white birch, balsam fir, sugar maple, jack pine, red spruce, eastern white cedar, etc.). Found in various kinds of coniferous and mixed forest, but rarely occurs where there are no spruce trees. Mated pairs stay together all year and defend permanent territories. Breeding and nesting for this species begins very early, during late winter, with breeding grounds still snow-covered. Breeds until, approximately, July (Audubon, 2021; The Cornell Lab, 2021).	Audubon, 2021. Bird Guide. Retrieved from: https://www.audubon.org/bird-guide The Cornell Lab, 2021.- All About Birds. Retrieved from: https://www.allaboutbirds.org
<i>Petrochelidon pyrrhonota</i>	Cliff Swallow	S2S3B	-	-	-	Breeds throughout Nova Scotia. A long-distance migrant that migrates in flocks, traveling by day. Typically nests in colonies, sometimes with hundreds of nests crowded close together. These colonies are close to a water source, open fields or pastures for foraging, and a source of mud for nest building. Nest site is usually on vertical surface with some overhead shelter. Natural sites were on cliffs. Most sites today are on the sides of buildings, under bridges, in culverts or similar places. They now live in grasslands, towns, broken forest and river edges, but avoid heavy forest and deserts (e.g. open to semi-open land, farms, river bluffs and lakes). Still unaccountably scarce or missing in some seemingly suitable areas. Breeds between April and July (Audubon, 2021; The Cornell Lab, 2021).	Audubon, 2021. Bird Guide. Retrieved from: https://www.audubon.org/bird-guide The Cornell Lab, 2021.- All About Birds. Retrieved from: https://www.allaboutbirds.org
<i>Pheucticus ludovicianus</i>	Rose-breasted Grosbeak	S2S3B	-	-	-	Look for these birds in forest edges and woodlands. Rose-breasted Grosbeaks breed in moist deciduous forests, deciduous-coniferous forests, thickets, and semi open habitats. They gravitate toward second-growth woods, suburban areas, parks, gardens, and orchards, as well as shrubby forest edges next to streams, ponds, marshes, roads, or pastures. They favor edges or openings with combination of shrubs and tall trees, rather than unbroken forest. Breeds from April to July (Audubon, 2021; The Cornell Lab, 2021)	Audubon, 2021. Bird Guide. Retrieved from: https://www.audubon.org/bird-guide The Cornell Lab, 2021.- All About Birds. Retrieved from: https://www.allaboutbirds.org
<i>Picoides arcticus</i>	Black-backed Woodpecker	S3S4	-	-	-	Known throughout Nova Scotia year-round. Not strictly migratory, but may move around in response to changing conditions (e.g. destruction of habitat). Eastern birds occasionally stage southward irruptions in winter, with scattered individuals showing up well south of breeding range. Habitat includes boreal forests of firs and spruces (pine, Douglas-fir, hemlock, tamarack and spruce, especially spruce bogs). Favours areas of dead or dying trees (coniferous and deciduous), and may concentrate at burned or flooded areas with many standing dead trees. Frequents lowlands in the North and mountains in the West. Breeds between April and July (Audubon, 2021; The Cornell Lab, 2021).	Audubon, 2021. Bird Guide. Retrieved from: https://www.audubon.org/bird-guide The Cornell Lab, 2021.- All About Birds. Retrieved from: https://www.allaboutbirds.org
<i>Picoides dorsalis</i>	American Three-toed Woodpecker	S1?	-	-	-	Not common in Nova Scotia, but has been known to be a year-round resident in the Northern counties (MBBA, as of July 2021). Irregularly may stage southward irruptions in winter, with a few moving well south of breeding range. Prefers conifer forests (spruce, pine, fir, tamarack, sometimes mixed with deciduous trees such as aspen or willow). Favors areas of old growth, mature forest with many standing dead trees (e.g. after a fire or flood or even a bog with dead or stunted trees). May concentrate in areas with big infestations of wood-boring insects. The species is very scarce or absent in logged areas. Breeds between April and July. Some pairs will be together for more than one season (Audubon, 2021; The Cornell Lab, 2021).	Audubon, 2021. Bird Guide. Retrieved from: https://www.audubon.org/bird-guide The Cornell Lab, 2021.- All About Birds. Retrieved from: https://www.allaboutbirds.org
<i>Pinicola enucleator</i>	Pine Grosbeak	S2S3B,S5N	-	-	-	Found throughout the province year-round. Pine grosbeaks can be found in conifers; in winter, other trees. Breeds in open coniferous forest, especially of spruce and fir. In winter often found in deciduous trees (especially fruiting trees),	Audubon, 2021. Bird Guide. Retrieved from: https://www.audubon.org/bird-guide

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						also in groves of pines and other conifers. Breeding occurs from April to July (Audubon, 2021; The Cornell Lab, 2021).	The Cornell Lab, 2021.- All About Birds. Retrieved from: https://www.allaboutbirds.org
<i>Piranga olivacea</i>	Scarlet Tanager	S2B	-	-	-	These birds can be found in oak forests in summer, but they often remain out of sight as they forage in the leafy upper branches. Nest site is in tree (usually deciduous), typically 20-30' above ground. Found in forests and shade trees (especially oaks). Breeds mostly in deciduous forest, predominately oaks but also in maple, beech, mixed pine-oak woods, and coniferous woods dominated by pine or hemlock. Breeding Scarlet Tanagers prefer large forest tracts with large trees. During spring and fall they use similar forest habitats as well as open spaces such as parks and gardens. Breeds between April and July (Audubon, 2021; The Cornell Lab, 2021)	Audubon, 2021. Bird Guide. Retrieved from: https://www.audubon.org/bird-guide The Cornell Lab, 2021.- All About Birds. Retrieved from: https://www.allaboutbirds.org
<i>Podiceps auritus pop. 2</i>	Horned Grebe - Western pop.	S4N	SC	SC	-	The Horned Grebe winters on the coast of Nova Scotia. It has been observed on lakes, rivers and marshes. Some birds follow coastlines as part of their migration. Horned Grebes generally winter in marine habitats, mainly estuaries and bays. Birds are found in greatest numbers in coastal habitats, including areas that offer some degree of protection. Some birds winter on inland lakes and rivers in areas where the minimum temperature in January is higher than -1°C (Species at Risk Public Registry)	SARA, 2017. https://wildlife-species.canada.ca/species-risk-registry/species/speciesDetails_e.cfm?sid=1045
<i>Poecile hudsonicus</i>	Boreal Chickadee	S3	-	-	-	Year-round resident throughout Nova Scotia. Occasional small southward invasions in fall, with a few appearing south of breeding range (similar to Black-capped Chickadees invasions). Boreal Chickadees inhabit mostly mature coniferous forests (sometimes mixed forests), usually spruce and balsam fir, often near water. During late fall and winter irruptions, they tend to be found mostly in areas dominated by coniferous trees. Occurs in low stunted spruces as far North as treeline (e.g. spruce bogs). May mate for life, the birds remaining together all year. Nests in a hole in a tree, either a natural cavity or one they created (or from another species). Breeds between April and July (Audubon, 2021; The Cornell Lab, 2021).	Audubon, 2021. Bird Guide. Retrieved from: https://www.audubon.org/bird-guide The Cornell Lab, 2021.- All About Birds. Retrieved from: https://www.allaboutbirds.org
<i>Regulus calendula</i>	Ruby-crowned Kinglet	S3S4B	-	-	-	Breeds throughout Nova Scotia. Migrates a little earlier in fall and later in spring compared to the Golden-crowned Kinglet. In many areas, peak migration periods are October and April. In summer, Ruby-Crowned Kinglets are common in spruce-fir forests (also fir and pine). They also live in mixed woods, isolated trees in meadows, coniferous and deciduous forests, mountain-shrub habitat and floodplain forests of oak, pine, spruce or aspen. These birds nest high in trees, and so prefer older, taller and denser stands. During migration and winter they are common in various woods and thickets (e.g. open deciduous woods, also in coniferous and mixed woods, mesquite brush and streamside thickets). Breeds between April and July (Audubon, 2021; The Cornell Lab, 2021).	Audubon, 2021. Bird Guide. Retrieved from: https://www.audubon.org/bird-guide The Cornell Lab, 2021.- All About Birds. Retrieved from: https://www.allaboutbirds.org
<i>Riparia riparia</i>	Bank Swallow	S2S3B	T	T	E	Bank Swallows live in low areas along rivers, streams, ocean coasts, and reservoirs. Their territories usually include vertical cliffs or banks where they nest in colonies. Most commonly found around natural bluffs or eroding streamside banks, they now often nest in human-made sites, such as sand and gravel quarries or road cuts. They forage in open areas and avoid places with tree cover (The Cornell Lab, 2021).	The Cornell Lab, 2021.- All About Birds. Retrieved from: https://www.allaboutbirds.org
<i>Setophaga castanea</i>	Bay-breasted Warbler	S3S4B	-	-	-	Bay-breasted warblers are found in woodlands, conifers in summer. Usually breeds in northern coniferous forest, in thick stands of spruce and fir. They are predators of spruce budworm, and are abundant in spruce forests during outbreaks. Where spruce is not found, will nest in deciduous or mixed second-growth woods of birches, maples, firs, and pines. Breed from April to July, typically in the latter half of the breeding window (Audubon, 2021; The Cornell Lab, 2021)	Audubon, 2021. Bird Guide. Retrieved from: https://www.audubon.org/bird-guide The Cornell Lab, 2021.- All About Birds. Retrieved from: https://www.allaboutbirds.org
<i>Setophaga pinus</i>	Pine Warbler	S1B	-	-	-	Pine Warblers live in pine or mixed pine-deciduous forest. Also sometimes in cedar or cypress. Various observations throughout Nova Scotia, generally in the southern portion of the province. Breeds April to July (Audubon, 2021; The Cornell Lab, 2021)	Audubon, 2021. Bird Guide. Retrieved from: https://www.audubon.org/bird-guide

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							The Cornell Lab, 2021.- All About Birds. Retrieved from: https://www.allaboutbirds.org
<i>Setophaga striata</i>	Blackpoll Warbler	S3S4B	-	-	-	The blackpoll warbler can be found in conifers; broadleaf trees in migration. Breeds in low northern spruce forest. In migration, moves through forests, parks and gardens, they stop over in scrubby thickets and mature evergreen and deciduous forests. Found in the southern half of Nova Scotia during migration and the northern half during the breeding season. Breeding occurs from April to July (Audubon, 2021; The Cornell Lab, 2021).	Audubon, 2021. Bird Guide. Retrieved from: https://www.audubon.org/bird-guide The Cornell Lab, 2021.- All About Birds. Retrieved from: https://www.allaboutbirds.org
<i>Setophaga tigrina</i>	Cape May Warbler	S2B	-	-	-	The Cape May Warbler can be found in spruce forest; other trees in migration. Breeds in spruce forest, especially during spruce budworm outbreaks, either in pure stands or mixed with firs or other trees, generally in more open woods or near the forest edge. During migration often favors conifers, but also forages in deciduous trees and thickets. Breeding occurs from April to July (Audubon, 2021; The Cornell Lab, 2021)	Audubon, 2021. Bird Guide. Retrieved from: https://www.audubon.org/bird-guide The Cornell Lab, 2021.- All About Birds. Retrieved from: https://www.allaboutbirds.org
<i>Sialia sialis</i>	Eastern Bluebird	S3B	-	-	-	Uncommon breeder throughout Nova Scotia. In the north, arrives quite early in spring, and lingers late in fall. These birds live in semi-open country with scattered trees, but with little understory and sparse ground cover. Original habitats probably included open, frequently burned pine savannas, beaver ponds, mature (but open) woods and forest clearings/openings. Today, they are most common along pastures, roadsides, agricultural fields, suburban parks, backyards and golf courses. Breeds between April and July (Audubon, 2021; The Cornell Lab, 2021).	Audubon, 2021. Bird Guide. Retrieved from: https://www.audubon.org/bird-guide The Cornell Lab, 2021.- All About Birds. Retrieved from: https://www.allaboutbirds.org
<i>Sitta canadensis</i>	Red-breasted Nuthatch	S3	-	-	-	Year-round resident throughout Nova Scotia. Red-breasted Nuthatches live mainly in coniferous forests of spruce, fir, pine, hemlock, larch and western red cedar. Eastern populations use more deciduous woods, including aspen, birch, poplar, oak and maple. During irruptive winters, nuthatches may use habitats such as orchards, scrub, parks, plantations and shade trees. Winter range varies from year to year, especially in the East (but conifers always chosen if available). Big Southward invasions occur in fall of some years, perhaps mainly when cone crops are poor in the North (but will remain year-round on nesting territory during years with good food supply). Nesting habitat almost always has many conifers, such as spruce, fir and hemlock, either in pure stands or mixed with deciduous trees. Mature forest preferred, due to old decaying wood for nest sites. Breeds between April and July (Audubon, 2021; The Cornell Lab, 2021).	Audubon, 2021. Bird Guide. Retrieved from: https://www.audubon.org/bird-guide The Cornell Lab, 2021.- All About Birds. Retrieved from: https://www.allaboutbirds.org
<i>Spatula clypeata</i>	Northern Shoveler	S2B	-	-	-	Migrates through all parts of Nova Scotia, except Cape Breton (uncommon for this species to breed in Nova Scotia). Migratory period is quite prolonged in both spring and fall, with many birds moving late in spring and early in fall. Northern Shovelers use shallow wetlands with submerged vegetation during the breeding season, nesting along the margins and in the neighboring grassy fields. Outside of the breeding season they forage in saltmarshes, estuaries, lakes, flooded fields, wetlands, agricultural ponds and wastewater ponds (and fields in vicinity of shallow water) with extensive muddy margins, including stagnant or polluted waters not much favored by other ducks. Pair formation begins in winter and continues during spring migration. Breeds between April and July (Audubon, 2021; The Cornell Lab, 2021)	Audubon, 2021. Bird Guide. Retrieved from: https://www.audubon.org/bird-guide The Cornell Lab, 2021.- All About Birds. Retrieved from: https://www.allaboutbirds.org
<i>Spatula discors</i>	Blue-winged Teal	S3S4B	-	-	-	Found mainly in fresh ponds and marshes. In summer they use shallow freshwater marshes and ponds in open country, as well as brackish marshes near coast. In migration and winter they forage and stop in any kind of shallow waters, whether inland or coastal. Flocks in migration are sometimes seen over ocean, many miles offshore. They are flightless during their late summer molt, and they spend this time in prairie potholes or large marshes. Blue-winged Teal nest among grasses or herbaceous vegetation. Pair formation begins in early winter and continues during spring migration. Breeds between April and July (Audubon, 2021; The Cornell Lab, 2021)	Audubon, 2021. Bird Guide. Retrieved from: https://www.audubon.org/bird-guide The Cornell Lab, 2021.- All About Birds. Retrieved from: https://www.allaboutbirds.org

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<i>Spinus pinus</i>	Pine Siskin	S2S3	-	-	-	Found throughout the province year-round. Pine Siskins can be found in conifers, mixed woods, alders, weedy areas. Breeds mostly in coniferous and mixed woods, often around edges or clearings; sometimes in deciduous woods, isolated conifer groves. In migration and winter occurs in many kinds of semi-open areas, woodland edges, weedy fields. Breeding occurs from April to July (Audubon, 2021; The Cornell Lab, 2021)	Audubon, 2021. Bird Guide. Retrieved from: https://www.audubon.org/bird-guide The Cornell Lab, 2021.- All About Birds. Retrieved from: https://www.allaboutbirds.org
<i>Toxostoma rufum</i>	Brown Thrasher	S1B	-	-	-	Not common and rarely seen in Nova Scotia, with no recorded sightings in Cape Breton (MBBA, as of July 2021). In eastern North America, Brown Thrashers nest in thickets, brush, shrubbery, hedgerows, forest edges and overgrown clearings in deciduous forest. On rare occasions they breed in backyards and gardens with shrubs and hedges (but in general - areas of dense low growth, especially thickets around edges of deciduous or mixed woods, shrubby edges of swamps or undergrowth in open pine woods). Breeds between April and July (Audubon, 2021; The Cornell Lab, 2021).	Audubon, 2021. Bird Guide. Retrieved from: https://www.audubon.org/bird-guide The Cornell Lab, 2021.- All About Birds. Retrieved from: https://www.allaboutbirds.org
<i>Tringa flavipes</i>	Lesser Yellowlegs	S3M	T	No Status	-	Common migrant throughout Nova Scotia. Occurs widely in migration, including coastal estuaries, salt and fresh marshes, mudflats, shores/edges of lakes and ponds; typically more common on freshwater habitats. Often in same places as Greater Yellowlegs, but may be less frequent on tidal flats. Wetland habitats ranging from tidal flats to sewage ponds to flooded fields; often in the company of other shorebird species. Breeds in open boreal forests and meadows interspersed with marshes and bogs. Breeds between April and July (Audubon, 2021; The Cornell Lab, 2021).	Audubon, 2021. Bird Guide. Retrieved from: https://www.audubon.org/bird-guide The Cornell Lab, 2021.- All About Birds. Retrieved from: https://www.allaboutbirds.org
<i>Tringa melanoleuca</i>	Greater Yellowlegs	S3B,S3S4M	-	-	-	Common migrant in Nova Scotia (migrates in flocks). During migration and throughout the winter, Greater Yellowlegs use a wide variety of fresh and brackish wetlands, including mudflats, estuaries, beaches, marshes, lake and pond edges, wet meadows, sewage ponds and flooded agricultural fields. Breeds in boggy and marshes places within northern coniferous forest. Breeds between April and July (Audubon, 2021; The Cornell Lab, 2021).	Audubon, 2021. Bird Guide. Retrieved from: https://www.audubon.org/bird-guide The Cornell Lab, 2021.- All About Birds. Retrieved from: https://www.allaboutbirds.org
<i>Tringa semipalmata</i>	Willet	S2S3B	-	-	-	Willetts inhabit open beaches, wet meadows, bay shores, marshes, mudflats and rocky coastal zones. During the breeding season, these birds seek saltmarshes, barrier islands and barrier beaches for breeding. Often nests in colonies, especially along Atlantic Coast (prefers to nest in extensive salt marsh habitat). Breeds between April and July (Audubon, 2021; The Cornell Lab, 2021).	Audubon, 2021. Bird Guide. Retrieved from: https://www.audubon.org/bird-guide The Cornell Lab, 2021.- All About Birds. Retrieved from: https://www.allaboutbirds.org
<i>Tringa solitaria</i>	Solitary Sandpiper	S3S4M,SUB,	-	-	-	Common migrant in Nova Scotia. A long-distance migrant that mostly migrates alone and at night. They are rarely seen on mudflats or saltmarshes with other shorebirds and will frequent areas with little water in almost any setting, from inner city to forest interior (e.g. fields, ditches, swamps, wooded wetlands at higher elevation, etc.). This bird often stops at lakes, ponds, or streams similar to their nesting habitat (areas with bog habitat and spruce trees), especially where there are extensive muddy margins. Breeds between April and July (Audubon, 2021; The Cornell Lab, 2021).	Audubon, 2021. Bird Guide. Retrieved from: https://www.audubon.org/bird-guide The Cornell Lab, 2021.- All About Birds. Retrieved from: https://www.allaboutbirds.org
<i>Turdus migratorius</i>	American Robin	S3N,S5B,	-	-	-	Common in most of Nova Scotia as a year-round resident and for breeding in the very Northern part of the province (mainly Cape Breton). This species occupies many habitat types, such as lawns, farmland, fields and city parks, as well as in more wild places like woodlands, forests, mountains up to near treeline, recently burned forests and tundra. During winter many robins move to moist woods where berry-producing trees and shrubs are common. Males arrive first in the breeding season. Nests where there are trees and mud for nest-making material. Breeds between April and July (Audubon, 2021; The Cornell Lab, 2021).	Audubon, 2021. Bird Guide. Retrieved from: https://www.audubon.org/bird-guide The Cornell Lab, 2021.- All About Birds. Retrieved from: https://www.allaboutbirds.org
<i>Tyrannus tyrannus</i>	Eastern Kingbird	S3B	-	-	-	Common breeder throughout Nova Scotia. A long-distance migrant that uses many habitats and migrates in flocks. Unlike many of the migratory songbirds, kingbirds may travel mostly by day. The Eastern Kingbird usually breeds in fields with	Audubon, 2021. Bird Guide. Retrieved from:

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						scattered shrubs and trees, in orchards and along forest edges (also clearings, roadsides, parks, newly burned forest, beaver ponds, golf courses and urban environments with tall trees and scattered open spaces). It is drawn to water, often nesting densely in trees that overhang rivers or lakes. In summer, requires open space for hunting. Often common around edges of marshes, farmland and native tallgrass prairie. Breeds between April and July (Audubon, 2021; The Cornell Lab, 2021).	https://www.audubon.org/bird-guide The Cornell Lab, 2021.- All About Birds. Retrieved from: https://www.allaboutbirds.org
<i>Vireo gilvus</i>	Warbling Vireo	S1B	-	-	-	Occurs in deciduous and mixed woods, aspen groves, poplars, shade trees. Breeds in open deciduous or mixed woodland; also in orchards, shade trees of towns (Audubon). They stay high in deciduous treetops (Cornell Lab). Breeds between April and July (Audubon, 2021; The Cornell Lab, 2021).	Audubon, 2021. Bird Guide. Retrieved from: https://www.audubon.org/bird-guide The Cornell Lab, 2021.- All About Birds. Retrieved from: https://www.allaboutbirds.org
<i>Vireo philadelphus</i>	Philadelphia Vireo	S2?B	-	-	-	Occurs in second growth; poplars, willows, alders. Breeds in deciduous and mixed woodlands, especially near their edges, or in the young growth of overgrown pastures. Also nests in willows and alders along streams, lakes, and ponds. Breeds between April and July (Audubon).	Audubon, 2021. Bird Guide. Retrieved from: https://www.audubon.org/bird-guide
Fish							
<i>Anguilla rostrata</i>	American Eel	S2	T	Not on Schedule 1	-	In freshwater habitats, preferred habitat can be found in both lentic and lotic waters including all waters extending from the high-water mark down to at least 10 m depth for all reaches currently or formerly used by the American Eel. During their oceanic migrations, eels occupy salt water and in their continental phase (growth in continental waters), they use all salinity zones (COSEWIC Assessment and Status Report, 2012).	COSEWIC, 2012. COSEWIC assessment and status report on the American Eel <i>Anguilla rostrata</i> in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa. xii + 109 pp.
<i>Couesius plumbeus</i>	Lake Chub	S5	T	No Status	-	Lake Chub appear to prefer lakes but can also occupy streams, particularly towards the northern extent of their range, existing in both clear and muddy waters. However, it is apparent that they prefer clear, cool water with clean cobble or gravel substrate. Lake Chub were most common in the shallow water of lakes at the mouths of tributary rivers and were rarely collected in deep water or very far from the river mouth. Lake Chub appears to be the most cold-adapted of the minnows in North America. It apparently requires low winter temperatures (COSEWIC Assessment and Status Report, 2018).	COSEWIC. 2018. COSEWIC assessment and status report on the Lake Chub <i>Couesius plumbeus</i> , Liard Hot Springs populations and Atlin Warm Springs populations,in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa. xiv + 50 pp. (Species at Risk Public Registry).
<i>Culaea inconstans</i>	Brook Stickleback	S3	-	-	-	Inhabits clear, cold, densely vegetated waters of small streams and spring-fed ponds, and is found along the swampy margins of beach ponds of larger lakes. They are tolerant of salt water for short periods of time. Spawning occurs in shallow water from late April to July, depending on the water temperature (Scott and Crossman, 1973)	Scott and Crossman, 1973. Freshwater fishes of Canada
<i>Margariscus nachtriebi</i>	Northern Pearl Dace	S3	-	-	-	Cool, clear headwater streams in the south, bog drainage streams, ponds and small lakes in the north, and in stained, peaty waters of beaver ponds.. Spawning occurs in clear water over sand or gravel in weak or moderate current (Scott and Crossman 1973).	Scott and Crossman, 1973. Freshwater fishes of Canada
<i>Salvelinus fontinalis</i>	Brook Trout	S3	-	-	-	Most common in cool well-oxygenated waters of lakes and streams. In autumn, brook trout move into smaller, shallower streams and require free passage along streams to move between areas of use. Spawning occurs from October - early December (Gilhen, 1974)	Gilhen, J. 1974. The fishes of Nova Scotia's lakes and streams
Herpetofauna							
<i>Chelydra serpentina</i>	Snapping Turtle	S3	SC	SC	V	They are common in southwestern Nova Scotia and less common on the northeastern mainland. Although Snapping Turtles occupy a wide variety of habitats, the preferred habitat for this species is characterized by slow-moving water with a soft mud bottom and dense aquatic vegetation. Established populations are most often found in ponds, marshes, swamps, peat bogs, shallow bays, river and lake edges, and slow-moving streams. turtles appear to prefer the	Environment and Climate Change Canada. 2016. Management Plan for the Snapping Turtle (<i>Chelydra serpentina</i>) in Canada [Proposed]. Species at Risk Act

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						following characteristics for their hibernacula: water shallow enough to let the turtle reach the surface to breathe, but deep enough so the water will not freeze to the bottom; a location that is likely to freeze over later in the season and thaw earlier in the spring; a thick layer of mud in which the turtle can bury itself; and additional submerged cover, such as a floating mat of vegetation, roots, stumps, branches or logs, a muskrat dwelling or an overhanging bank.	Management Plan Series. Ottawa, Environment and Climate Change Canada, Ottawa, iv + 39 p
<i>Chrysemys picta picta</i>	Eastern Painted Turtle	S4S5	SC	SC	-	Eastern Painted Turtle is found in New Brunswick, Nova Scotia, and the Atlantic coastal states east of the Appalachian Mountains. Painted Turtles occupy slow moving, relatively shallow and well-vegetated wetlands (e.g., swamps, marshes, ponds, fens, bogs, and oxbows) and water bodies (e.g., lakes, rivers, creeks, and streams) with abundant basking sites and organic substrate. These turtles are found in association with submergent aquatic plants, which are used for cover and feeding. The species is semi-tolerant of human-altered landscapes and may occasionally be found occupying urban ponds and lands subject to anthropogenic disturbance (e.g., farm ponds, impoundments, water treatment facilities). Suitable nesting habitat includes open, often south-facing, and sloped areas with sandy-loamy and/or gravel substrate usually within 1200 m of aquatic active season habitats. Painted Turtles overwinter in shallow water with deep sediment (COSEWIC Assessment and Status Report).	COSEWIC. 2018. COSEWIC assessment and status report on the Midland Painted Turtle <i>Chrysemys picta marginata</i> and the Eastern Painted Turtle <i>Chrysemys picta picta</i> in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa. xvi + 107 pp. (http://www.registrelep.sararegistry.gc.ca/default.asp?lang=en&n=24F7211B-1).
<i>Glyptemys insculpta</i>	Wood Turtle	S2	T	T	T	Wood Turtles are strongly associated with meandering, shallow rivers with sand, gravel, and/or cobble bottoms; these rivers are typically clear, with moderate current and frequent oxbows. Wood Turtles hibernate aquatically in streams and rivers (October to April, depending on location). Overwintering sites are usually on the bottom of deep pools, often with fallen debris that provides structure and prevents dislodging during high flow events. Found throughout the Province with concentrations in Guysborough and Annapolis Counties. Local plants include alders, chokecherry, hawthorn and mixed wood stands of deciduous and coniferous trees. Females lay their eggs in sandy bars along rivers and other gravel areas (driveways, roadsides, borrow pits) in June.	Species at Risk in Nova Scotia: Identification & Information Guide
<i>Hemidactylum scutatum</i>	Four-toed Salamander	S3	-	-	-	Four-toed salamanders have specialized habitat requirements which require suitable breeding wetlands within or adjacent to mature forests. They prefer mature, mesic forests with dense canopy cover to preserve body moisture, an abundance of downed woody debris for cover and foraging opportunities, and vernal pools, ponds, bogs, shallow marshes, or other fishless bodies of water for nesting and larval success. Wooded wetlands such as seepage swamps or cedar swamps with many moss mats are ideal. Male adults can be located under leaves, bark, and logs in the upland forest, while females are most often found during the breeding season nesting in moss mats which overhang pools of water. (Harding 1997).	Harding, J. 1997. <i>Amphibians and Reptiles of the Great Lakes Region</i> . Ann Arbor, Michigan: University of Michigan Press. [online] https://animaldiversity.org/accounts/Hemidactylum_scutatum/
Invertebrate							
<i>Bombus suckleyi</i>	Suckley's Cuckoo Bumble Bee	SNR	T	Not on Schedule 1	-	Suckley’s Cuckoo Bumble Bee occurs in most Canadian ecozone including the Atlantic Maritimes. Suckley’s Cuckoo Bumble Bee occurs in diverse habitats including open meadows and prairies, farms and croplands, urban areas, boreal forest, and montane meadows. Records are from sea level to 1200 m although the species could potentially occur at higher elevations where its host(s) occur. In the early spring, hosts typically establish nests in abandoned underground rodent burrows or other dry natural hollows; because Suckley’s Cuckoo Bumble Bee is a nest parasite these same host residence sites also serve as its habitat. Adults have been recorded feeding on pollen and nectar from many flowers (COSEWIC Assessment and Status Report).	COSEWIC. 2019. COSEWIC assessment and status report on the Suckley’s Cuckoo Bumble Bee <i>Bombus suckleyi</i> in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa. xi + 70 pp. (Species at risk public registry).
<i>Bombus terricola</i>	Yellow-banded Bumblebee	S3	SC	SC	V	Habitat generalist within open coniferous, deciduous and mixed-wood forests, wet and dry meadows and prairie grasslands, meadows bordering riparian zones, and along roadsides, urban parks, gardens and agricultural areas, subalpine habitats and more isolated natural areas (COSEWIC, 2015).	COSEWIC. 2015. COSEWIC assessment and status report on the Yellow-banded Bumble Bee <i>Bombus terricola</i> in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa. ix + 60 pp. (www.registrelep-

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							sararegistry.gc.ca/default_e.cfm).
<i>Coccinella transversoguttata</i>	Transverse Ladybird Beetle	SH	SC	SC	E	The Transverse Lady Beetle is reported to be a habitat generalist occurring within agricultural areas, suburban gardens, parks, coniferous forests, deciduous forests, prairie grasslands, meadows, sand dune edges and riparian area (NS L&F, 2020).	Nova Scotia Department of Lands and Forestry. 2020. Recovery Plan for the Transverse Lady Beetle (<i>Coccinella transversoguttata</i>) in Nova Scotia [Final]. Nova Scotia Endangered Species Act Recovery Plan Series.
<i>Coccinella transversoguttata richardsoni</i>	Transverse Lady Beetle	SH	SC	No Status	-	The Canadian range of the Transverse Lady Beetle stretches from St. John’s, Newfoundland and Labrador, west to Vancouver Island. The Transverse Lady Beetle is a habitat generalist and known to occur within agricultural areas, suburban gardens, parks, coniferous forests, deciduous forests, prairie grasslands, meadows, and riparian areas. The Transverse Lady Beetle can also be found in a wide variety of non-agricultural vegetation including birch, pine, spruce, maple, mountain ash, poplar, willow, sage, cherry, alder, thistles, grasslands, and scruff pea plants along the edge of sand dunes. Overwintering adults tend to aggregate in well ventilated microhabitats such as under stones, rock crevices, in grass tussocks, in leaf litter, or in tree bark (Nova Scotia L&F, 2020).	Nova Scotia Department of Lands and Forestry. 2020. Recovery Plan for the Transverse Lady Beetle (<i>Coccinella transversoguttata</i>) in Nova Scotia [Final]. Nova Scotia Endangered Species Act Recovery Plan Series.
<i>Danaus plexippus plexippus</i>	Monarch	S2B	E	SC	E	The breeding habitat of the Eastern and Western populations in Canada is confined to where milkweeds grow, since leaves of these plants are the sole food of the caterpillars. The different species of milkweeds grow in a variety of environments, including meadows in farmlands, along roadsides and in ditches, open wetlands, dry sandy areas, short and tall grass prairie, river banks, irrigation ditches, arid valleys, and south-facing hillsides. Milkweeds are also often planted in gardens. The Monarch is known to breed on native milkweeds within their natural ranges. The most commonly used other sources of nectar are goldenrods (<i>Solidago</i> spp.), asters (<i>Doellingeria</i> , <i>Eurybia</i> , <i>Oclemena</i> , <i>Symphotrichum</i> and <i>Virgulus</i>), the introduced Purple Loosestrife (<i>Lythrum salicaria</i>), and various clovers (<i>Trifolium</i> spp. and <i>Melilotus</i> spp.) (SARA, 2010)	Sara, 2010. https://www.sararegistry.gc.ca/virtual_sara/files/cosewic/sr_Monarch_0810_e.pdf
<i>Gomphus ventricose</i>	Skillet Clubtail	S1	E	E	-	In Nova Scotia there are only two historical records of collection of this species. One from Mount Uniacke in Hants County and the second from Shubenacadie River in Halifax County. the fact that specimens are not available to verify the Nova Scotia reports, appears to be a satisfactory reason to exclude these from range calculations. Small to large turbid rivers with at least a partly muddy bottom but good water quality. Sometimes clean lakes with sand or sand-marl (calcium-rich) bottoms (COSEWIC Assessment and Status Report)	COSEWIC. 2010. COSEWIC assessment and status report on the Skillet Clubtail <i>Gomphus ventricosus</i> in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa. x + 32 pp. (www.sararegistry.gc.ca/status/status_e.cfm).
Lichen							
<i>Anzia colpodes</i>	Black-foam Lichen	S3	T	T	T	<i>Anzia colpodes</i> requires mature deciduous tree habitats with high humidity and high light levels. The required humidity is supplied by wetlands, nearby brooks, lakes or by the host’s position on upland slopes above a water body. Host tree trunks are usually free of dense undergrowth and the lichen usually occurs at or above the height of the undergrowth (in swamps and fens). A few of the <i>Anzia</i> collections from are reported to be from the canopy of Red Maple trees. Recent searches have found that <i>A. colpodes</i> occurs from 20 cm above the ground to 2 m up the tree trunks.	COSEWIC. 2015. COSEWIC assessment and status report on the Black-foam Lichen <i>Anzia colpodes</i> in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa. x + 47 pp. (www.registrelep-sararegistry.gc.ca/default_e.cfm).
<i>Erioderma mollissimum</i>	Graceful Felt Lichen	S1S2	E	E	E	As of January 2012, Vole Ears Lichen was known from two populations at 29 sites along the Atlantic Coast of Nova Scotia totaling 153 adults and 23 juveniles. Vole Ears Lichen is often found in, or very near to, wetlands. It is found at the following specific sites: Blandford, Bon Mature Lake, Canada Hill/Mackenzies Barren, Clyde River Road1, Clyde River Road2, Duck Hole, Four Mile Brook, Fresh Water Brook, Haley Lake, Johnstons Pond, Jones Harbour, Jordan River, Lake John	Environment Canada. 2014. Recovery Strategy for the Vole Ears Lichen (<i>Erioderma mollissimum</i>) in Canada [Proposed]. Species at Risk Act Recovery Strategy Series.

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						Road, Martin Brook, Misery Lake, Misery Lake Brook, Oakhill, Port L'Herbert, Pumpkinvine Brook, Robarts Pond, Robs Lake, Thomas Radall, Provincial Park, and Tidney.	Environment Canada, Ottawa. v + 27 pp.
<i>Erioderma pedicellatum</i> (Atlantic pop.)	Boreal Felt Lichen - Atlantic pop.	S1	E	E	E	The existing boreal felt lichen occurs within 25 km of the sea coast at an elevation of up to 300 m above sea level and they are found in forested habitats with low open crown closure. Boreal Felt Lichens are typically found in balsam fir stands, on north-facing trunks of mature and overmature trees. Habitat preference for boreal felt lichen is cool and moist and remains relatively constant throughout the year. They are often located on or at the base of slopes with northern or northeastern exposure (Nova Scotia L&F, 2020).	Nova Scotia Department of Lands and Forestry. 2020. Recovery Plan for Boreal Felt Lichen (<i>Erioderma pedicellatum</i>) in Nova Scotia [Final]. Nova Scotia Endangered Species Act Recovery Plan Series.
<i>Fuscopannaria leucosticta</i>	White-rimmed Shingle Lichen	S2S3	T	Not on Schedule 1	-	The second subpopulation in Nova Scotia occurs mainly on the east coast of southwestern Nova Scotia (in Shelburne and Queens counties), with sporadic sites throughout the eastern mainland. Common understorey associates of <i>Fuscopannaria leucosticta</i> include ferns in the genus <i>Osmunda</i> strum, hollies, and ash, with peat mosses dominating the ground cover in depressions and feathermosses dominating on hummocks. <i>Fuscopannaria leucosticta</i> grows on the bark of Red Maple trees in Nova Scotia (COSEWIC Assessment and Status Report, 2019).	COSEWIC. 2019. COSEWIC assessment and status report on the White-rimmed Shingle Lichen <i>Fuscopannaria leucosticta</i> in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa. xi + 85 pp. (Species at Risk Public Registry).
<i>Pectenia plumbea</i>	Blue Felt Lichen	S3	SC	SC	V	The Blue Felt Lichen is usually found on the trunks of old broad-leaved trees growing in moist habitats or close to streams and lake margins. This lichen occurs in coastal suboceanic areas but also some distance inland in damp valleys. It prefers cool, humid woodlands that may be mixed coniferous/hardwood or dominated by deciduous trees. The Blue Felt Lichen seems to prefer mature deciduous trees, particularly maple, ash and yellow birch. At its northerly limit of distribution in Nova Scotia, the Blue Felt Lichen has once been found on moss-covered rocks.	SARA, 2017. Species Profile (Blue Felt Lichen) - Species at Risk Public Registry (canada.ca)
<i>Peltigera hydrothyria</i>	Eastern Waterfan	S1	T	T	T	Eastern Waterfan grows attached to rocks at or below water level in clear, cool, partially shaded streams. Small waterfalls, exposed boulders and sinuous stream configurations create quiet or protected backwaters where the lichen grows outside the main current. In summer, this lichen is often partially or completely exposed during low water flow periods. Partial shade may be needed to help keep humidity high and temperatures low during summer months (SARA)..	SARA. Species Profile (Eastern Waterfan) - Species at Risk Public Registry (canada.ca)
Mammal							
<i>Alces americanus</i>	Moose	S1	-	-	E	Moose are herbivores who live in boreal and mixed-wood forests. They are often found where there is an abundance of food (twigs, stems, and foliage of young deciduous trees and shrubs). In spring, islands and peninsulas are often used by cows when giving birth. In summer, access to wetlands (and aquatic vegetation) is important (MTRI, 2008).	MTRI, 2008. Species at Risk in Nova Scotia: Identification & Information Guide. http://www.speciesatrisk.ca/SARGuide/download/SAR%20Guide.pdf
<i>Lasionycteris noctivagans</i>	Silver-haired Bat	S1M,SUB	-	-	-	Most commonly found in boreal or coniferous and deciduous forests near bodies of water. Summer day roosts are typically under loose bark in trees such as, willows, maple, ash and dead trees. Maternity colonies can be found in cavities in these trees. Uncommonly, they use human structures (garages, sheds, etc.). During the winter, these bats have been found in caves and other rocky areas that provide shelter, in tree cavities, and in buildings (Animal Diversity, nd).	Animal Diversity Web: https://animaldiversity.org/accounts/Lasionycteris_noctivagans/
<i>Lasiurus borealis</i>	Eastern Red Bat	S1S2B,S1M	-	-	-	Lives in forests, forest edges, and hedgerows. It roosts among foliage, usually in deciduous trees, but sometimes roosts in coniferous trees. Rare in heavily urbanized area (Nature Works, nd)	Nature Works: https://nhpbs.org/natureworks/redbat.htm Animal Diverity: https://animaldiversity.org/accounts/Lasiurus_borealis/

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<i>Lasiurus cinereus</i>	Hoary Bat	S1S2B,S1M	-	-	-	They prefer deciduous and coniferous trees at the edge of clearings, but have been found in trees in heavy forests, open wooded glades, and shade trees along urban streets and in city park (Animal Diversity, nd)	Animal Diversity Web: https://animaldiversity.org/accounts/Lasionycteris_noctivagans/
<i>Myotis lucifugus</i>	Little Brown Myotis	S1	E	E	E	Little Brown Myotis is one of the few bat species that uses buildings and other anthropogenic structures (e.g., bat boxes, bridges, and barns) to roost (particularly for maternity roosting), but it will also use cavities of canopy trees, foliage, tree bark, crevices on cliffs, and other structures (Nova Scotia L&F, 2020).	Nova Scotia Department of Lands and Forestry. 2020. Recovery Plan for Little brown myotis (<i>Myotis lucifugus</i>) in Nova Scotia [Final]. Nova Scotia Endangered Species Act Recovery Plan Series.
<i>Myotis septentrionalis</i>	Northern Long-eared Myotis	S1	E	E	E	Northern Myotis may hibernate in cooler sections of a cave. Northern Myotis will generally return to the same hibernaculum, but not always in consecutive years. Northern Myotis roost singly or in small groups and favour tree roosts (under raised bark and in tree cavities and crevices), but they can also be found in anthropogenic structures (e.g., under shingles). Northern Myotis' maternity roosts are strongly associated with forest cover, streams, and tree characteristics (e.g., species, height, diameter, age, and decay). Females prefer to roost in tall, large diameter trees in early- to mid-stages of decay. Maternity colonies in Nova Scotia were generally in larger-than-average trees. Males generally roost alone under raised bark or within cavities of trees in mid-stages of decay.	Nova Scotia Department of Lands and Forestry. 2020. Recovery Plan for Northern Myotis (<i>Myotis septentrionalis</i>) in Nova Scotia [Final]. Nova Scotia Endangered Species Act Recovery Plan Series.
<i>Pekania pennanti</i>	Fisher	S3	-	-	-	They are often found in deciduous and mixed wood forest stands in the forested region. They can also be found in wetland vegetation types including shrubby swamps, shrubby bogs, and marshes. There is a higher likelihood to find them in harvested stands compared to naturally regenerating stands of similar age (ABMI)	Alberta Biodiveristy Monitoring Institute: https://abmi.ca/home/data-analytics/biobrowser-home/species-profile?tsn=99007289
<i>Sorex maritimensis</i>	Maritime Shrew	S3	-	-	-	Often found in marshes and wet meadows The most favoured habitat is the edges of freshwater swamps and marshes which have become overgrown with tangled grass and rushe (CWF, McAlpine, 2012)	Canadian Wildlife Federation: https://cwfcf.org/en/news/articles/the-tracking-of-the-shrew.html , Biogeographic and Conservation Significance of the Occurrence of the Canadian Endemic <i>Sorex maritimensis</i> (Maritime Shrew) in Northern New Brunswick (D. McAlpine)
<i>Sorex palustris</i>	American Water Shrew	S3S4	-	-	-	Mostly aquatic, the water shrew lives beneath the overhanging banks and in rock crevices along the edges of swiftly flowing mountain streams. Rhododendron and yellow birch are usually the dominant vegetation in these area (Discover Life, nd)	Discover Life: https://www.discoverlife.org/nh/tx/Vertebrata/Mammalia/Soricidae/Sorex/palustris/
<i>Synaptomys cooperi</i>	Southern Bog Lemming	S3	-	-	-	They are often found in sphagnum bogs and low moist places, but they are also found in grasslands, mixed deciduous/coniferous forests, spruce-fir forests, freshwater wetlands, marshes, and meadows. They prefer areas with a thick mat of herbaceous and shrubby vegetation (Animal Diversity, nd).	Animal Diversity: https://animaldiversity.org/accounts/Synaptomys_cooperi/
Mollusc							
<i>Alasmidonta undulata</i>	Triangle Floater	S2S3	-	-	-	They prefer small, steady-flowing streams close to headwaters. It is sometimes found in lakes or ponds, and most often found in gravelly sand, mud, or between large stones. (Vermont Atlas, 2021a)	Vermont Atlas of Life, 2021a. Accessed at: https://val.vtecostudies.org/projects/vermont-freshwater-mussel-atlas/alasmidonta-undulata/

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<i>Alasmidonta varicosa</i>	Brook Floater	S1S2	SC	SC	T	Found in rivers, streams, and lakes. They prefer watercourses with a moderate to high water flow with rocks, cobble and sand-pocket areas and may also be found in certain lakes in Nova Scotia. They are typically found clustered in sand-pocket areas behind boulders and stream banks, likely as a means of protection in high-flow velocity. The Brook Floater occurs in a relatively small number of rivers, including the Annapolis, LaHave, Gays, Wallace, East St. Marys and Salmon Rivers in Nova Scotia.	DFO, nd. Accessed at https://www.dfo-mpo.gc.ca/species-especes/profiles-profils/brookfloater-alasmidonte-eng.html
<i>Lampsilis radiata</i>	Eastern Lampmussel	S3S4	0	0	0	They can be found in sand and gravel substrates of rivers, streams, lakes, and ponds in cool or warmwater habitats. Rarely found in small, cold water streams. (Vermont Atlas, 2021b)	Vermont Atlas of Life, 2021b. Access at: https://val.vtecostudies.org/projects/vermont-freshwater-mussel-atlas/lampsilis-radiata/
<i>Margaritifera margaritifera</i>	Eastern Pearlshell	S2	-	-	-	The mussels live buried or partly buried in coarse sand and fine gravel in clean, oligotrophic, fast-flowing and unpolluted rivers and streams (Skinner et al., 2003).	Skinner,A,Young M & Hastie L (2003). Ecology of the Freshwater Pearl Mussel. Conserving Natura 2000 Rivers Ecology Series No. 2 English Nature, Peterborough.mussel[1].pdf
<i>Strophitus undulatus</i>	Creeper	S1	-	-	-	Shallow freshwater. Riffles, moderate-low gradient, creek, pool (Nature Serve Explorer, 2021).	Nature Serve Explorer, 2021. Accessed at: https://explorer.natureserve.org/Taxon/ELEMENT_GLOBAL.2.107752/Strophitus_undulatus
Vascular Plants							
<i>Acer saccharinum</i>	Silver Maple	S1	-	-	-	Generally found near flowing water and in wetlands. In Nova Scotia, it has been found along the Cornwallis River, Kings Co. (Munro, Newell & Hill, 2014).	Nova Scotia Plants by Munro, Newell & Hill (2014).
<i>Agalinis purpurea</i>	Purple False-Foxglove	S1	-	-	-	Bogs, calcareous and mafic fens, open floodplain swamps, depression ponds, interdune swales, tidal freshwater marshes and swamps; more numerous in a variety of wet to mesic, open, disturbed habitats, including old fields, clearings, and roadsides. Flowers in late summer to early fall (Digital Atlas of Virginia Forest, nd).	Digital Atlas of Virginia Flora, nd. Retrieved from: http://vaplantatlas.org/index.php?do=plant&plant=617
<i>Agalinis purpurea</i> var. <i>parviflora</i>	Small-flowered Purple False Foxglove	S1	-	-	-	Sandy soils of stream and lake margins, bogs, and barren (NatureServe, 2021)	Nature Serve Explorer, 2021. Retrieved from https://explorer.natureserve.org/Taxon/
<i>Ageratina altissima</i>	White Snakeroot	S1	-	-	-	Grows in moist soils at the edge of fields and forests. Flowers late summer, August and September. Known from Mill Brook, McGahey Brook and a brook near Refugee Cove, all in Cape Chignecto Provincial Park; older collection from Antigonish County. (Munro, Newell and Hill, 2014)	Nova Scotia Plants by Munro, Newell & Hill (2014).
<i>Ageratina altissima</i> var. <i>altissima</i>	White Snakeroot	S1	-	-	-	Grows in moist soils at the edge of fields and forests. Flowers late summer, August and September. Known from Mill Brook, McGahey Brook and a brook near Refugee Cove, all in Cape Chignecto Provincial Park; older collection from Antigonish County. (Munro, Newell and Hill, 2014)	Nova Scotia Plants by Munro, Newell & Hill (2014).
<i>Allium schoenoprasum</i>	Wild Chives	S2	-	-	-	Wet meadows, rocky or gravelly stream banks and lake shores. Flowering June to August (Flora North America).	Flora of North America, nd. Retrieved from http://www.efloras.org
<i>Allium schoenoprasum</i> var. <i>sibiricum</i>	Wild Chives	S2	-	-	-	Wet meadows, rocky or gravelly stream banks and lake shores. Flowering June to August (Flora North America).	Flora of North America, nd. Retrieved from http://www.efloras.org
<i>Allium tricoccum</i> var. <i>burdickii</i>	Narrow-leaved Wild Leek	S1?	-	-	-	DISTRIBUTION NOT KNOWN IN NS. Dry soil in upland woods. Flowering early June (Flora North America).	Flora of North America, nd. Retrieved from http://www.efloras.org
<i>Amelanchier fernaldii</i>	Fernald's Serviceberry	S2S3	-	-	-	Thickets, open barrens, shores, and ravines. Occurs mostly in calcareous areas. Grows in riparian and shrub wetlands (Nature Serve Explorer, nd). Flowers June - August (Munro, Newell & Hill, 2014).	Nova Scotia Plants by Munro, Newell & Hill (2014).

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<i>Amelanchier spicata</i>	Running Serviceberry	S3	-	-	-	Man-made or disturbed habitats, cliffs, balds, ledges, forest edges, grassland, meadows and fields, woodlands (GoBotany, nd). Flowers in the spring (NC State Extension, nd)	GoBotany, nd. Retrieved from https://gobotany.nativeplanttrus t.org North Carolina Extension, nd Retrieved from: https://plants.ces.ncsu.edu/plant s/amelanchier-spicata/
<i>Andersonglossum boreale</i>	Northern Wild Comfrey	S1	-	-	-	A generalist. along the borders of woods and thickets, along trails and pathways through woods, and within upland deciduous woods. It appears to prefer circumneutral or even calcareous areas. The soils are usually sandy or rocky (New York Natural Heritage Program 2005).	New York Natural Heritage Program, 2005. https://guides.nynhp.org/northe rn-wild-comfrey/#habitat
<i>Angelica atropurpurea</i>	Purple-stemmed Angelica	S3	-	-	-	Grows in swamps, meadows, in ditches and along streams. Flowers late May until September. Very abundant in northern Cape Breton (Munro, Newell & Hill, 2014)	Nova Scotia Plants by Munro, Newell & Hill (2014).
<i>Antennaria rosea</i>	Rosy Pussytoes	S1	-	-	-	The rosy-coloured flowers are distinctive and like no others of the genus in NS. It has very recently been confirmed at Cape d’Or (Munro, Newell and Hill, 2014).	Nova Scotia Plants by Munro, Newell & Hill (2014).
<i>Antennaria rosea ssp. arida</i>	Rosy Pussytoes	S1	-	-	-	The rosy-coloured flowers are distinctive and like no others of the genus in NS. It has very recently been confirmed at Cape d’Or (Munro, Newell and Hill, 2014)	Nova Scotia Plants by Munro, Newell & Hill (2014).
<i>Asplenium viride</i>	Green Spleenwort	S3	-	-	-	Limestone and other basic rocks (Flora of North America).	Flora of North America, nd. Retrieved from http://www.efloras.org
<i>Bartonia virginica</i>	Yellow Bartonia	S3	-	-	-	Flowers July to September. Dry barrens, sandy or peaty soils, bogs, lakeshores. Common in the southwestern counties becoming scarcer east to Annapolis and Halifax; St. Peter’s area of Cape Breton (Munro, Newell & Hill, 2014)	Nova Scotia Plants by Munro, Newell & Hill (2014).
<i>Betula michauxii</i>	Michaux's Dwarf Birch	S2S3	-	-	-	Limited to peat bogs. It flowers later than many, in July and August. Scattered localities from Brier Island, Digby Co., east to Guysborough, Cape Breton and Inverness counties (Munro, Newell & Hill, 2014).	Nova Scotia Plants by Munro, Newell & Hill (2014).
<i>Bidens beckii</i>	Water Beggarticks	S3	-	-	-	Found in shallows of sluggish streams and ponds. Flowers during August and September. Scattered throughout but more abundant from Pictou northward. (Munro, Newell and Hill, 2014).	Nova Scotia Plants by Munro, Newell & Hill (2014).
<i>Botrychium lanceolatum</i>	Triangle Moonwort	S2S3	-	-	-	Kentville Ravine (Kings County); Colchester, Cumberland and a few sites in western Cape Breton. Rare where found and of limited distribution in the Northern counties. Found where there are fertile soils on wooded hillsides. Bogs, fens, forests, meadows, fields, swamps and edges of wetlands. This species releases its spores later than most moonworts (July to August) (Minnesota Wildflowers, nd, Go Botany, nd., and Munro et al., 2014).	Nova Scotia Plants - Munro et al., 2014, Minnesota Wildflowers, nd. Retrieved from https://www.minnesotawildflo wers.info/ , Go Botany, nd. Retrieved from https://gobotany.nativeplanttrus t.org/
<i>Botrychium lanceolatum ssp. angustisegmentum</i>	Narrow Triangle Moonwort	S2S3	-	-	-	Kentville Ravine (Kings County); Colchester, Cumberland and a few sites in western Cape Breton. Rare where found and of limited distribution in the Northern counties. Found where there are fertile soils on wooded hillsides. Bogs, fens, forests, meadows, fields, swamps and edges of wetlands. This species releases its spores later than most moonworts (July to August) (Munro et al., 2014).	Nova Scotia Plants by Munro, Newell & Hill (2014).
<i>Botrychium lunaria</i>	Common Moonwort	S1	-	-	-	Known from Conrad’s Beach, Halifax County and from New Campbellton and Indian Brook in northern Cape Breton. Found on open slopes, sand or gravel; shores and meadows. Basic soils. Anthropogenic habitats (man-made or disturbed habitats), fields and edges of wetlands. Spores are produced throughout the summer (Go Botany, nd., and Munro et al., 2014).	Nova Scotia Plants by Munro, Newell & Hill (2014).
<i>Botrychium simplex</i>	Least Moonwort	S2S3	-	-	-	Scattered locations from Yarmouth County to Cape Breton: Cedar Lake (Digby-Yarmouth border), West Berlin (Queens County), Petpeswick and in Antigonish, Victoria and Inverness Counties. Reported from various habitats, usually involving damp or mossy streambanks or lakeshores. Also anthropogenic habitats (man-made or disturbed habitats), meadows and fields.	Nova Scotia Plants by Munro, Newell & Hill (2014).

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						Subspecies: occurs primarily in open sites, including prairies, wetlands, and abandoned mine sites. Spores produced in late May and June (Munro et al., 2014).	
<i>Botrychium simplex</i> var. <i>simplex</i>	Least Moonwort	S2S3	-	-	-	Scattered locations from Yarmouth County to Cape Breton: Cedar Lake (Digby-Yarmouth border), West Berlin (Queens County), Petpeswick and in Antigonish, Victoria and Inverness Counties. Reported from various habitats, usually involving damp or mossy streambanks or lakeshores. Also anthropogenic habitats (man-made or disturbed habitats), meadows and fields. Subspecies: occurs primarily in open sites, including prairies, wetlands, and abandoned mine sites. Spores produced in late May and June (Minnesota DNR, Go Botany, nd., and Munro et al., 2014).	Nova Scotia Plants - Munro et al., 2014, Go Botany, nd. https://gobotany.nativeplanttrus t.org/ , Minnesota DNR, nd. https://www.dnr.state.mn.us/
<i>Bromus latiglumis</i>	Broad-Glumed Brome	S1	-	-	-	Floodplain (River or stream floodplains), forest, shores of rivers or lakes (Go Botany, nd.)	Go Botany, nd.,: https://gobotany.nativeplanttrus t.org
<i>Cardamine dentata</i>	Toothed Bittercress	S1	-	-	-	rare species of calcareous swamps and fens (GoBotany, nd)	Go Botany, nd.,: https://gobotany.nativeplanttrus t.org
<i>Cardamine maxima</i>	Large Toothwort	S1S2	-	-	-	rich, moist forests. Floodplain (river or stream floodplains), forests, talus and rocky slopes (GoBotany, nd)	Go Botany, nd.,: https://gobotany.nativeplanttrus t.org
<i>Carex foenea</i>	Fernald's Hay Sedge	S3	-	-	-	dry, sandy rocky soils as on barrens. Scattered distribution across province. Flowers late spring to mid-summer (Minnesota Wildflowers, nd)	Minnesota Wildflowers, nd. Retrieved froim https://www.minnesotawildflo wers.info/
<i>Carex grisea</i>	Inflated Narrow-leaved Sedge	S1	-	-	-	floodplain forest and deciduous woods (Munro, Newell & Hill, 2014)	Nova Scotia Plants by Munro, Newell & Hill (2014).
<i>Carex houghtoniana</i>	Houghton's Sedge	S2S3	-	-	-	sandy soils, along roadsides. Sandy disturbed area.	
<i>Carex lapponica</i>	Lapland Sedge	S1?	-	-	-	Sphagnum bogs, wet, nutrient-poor areas, mostly lowlands. Fruiting early summer. (Munro, Newell & Hill, 2014)	Nova Scotia Plants by Munro, Newell & Hill (2014).
<i>Carex normalis</i>	a Sedge	S1	-	-	-	Open, often wet, woods, thickets, meadows and roadsides. Fruiting early summer (Flora of North America, nd)	Flora of North America, nd. Retrieved from http://www.efloras.org
<i>Carex pensylvanica</i>	Pennsylvania Sedge	S1?	-	-	-	Grows in dry, rocky soils as in dry open woodlands. Flowers and fruits produced early to mid-May (Munro, Newell & Hill 2014)	Nova Scotia Plants by Munro, Newell & Hill (2014).
<i>Carex plantaginea</i>	Plantain-Leaved Sedge	S1	-	-	-	Rich, moist, deciduous or mixed deciduous-evergreen forests, on slopes along streams or along edges of moist depressions, southward in mountain gorges. Fruiting in spring (Flora of North America, nd)	Flora of North America, nd. Retrieved from http://www.efloras.org
<i>Carex rosea</i>	Rosy Sedge	S3	-	-	-	Grows in dry soils beneath deciduous forests and thickets. Flowers from May to early July.	
<i>Carex tenera</i>	Tender Sedge	S2	-	-	-	Found in meadows, forests, moist or dry clearings, woodland vernal pools. Flowering from May - August (Munro, Newell & Hill 2014)	Nova Scotia Plants by Munro, Newell & Hill (2014).
<i>Carex viridula</i> ssp. <i>brachyrrhyncha</i>	Greenish Sedge	S1	-	-	-	Found along river and lake shores (Go Botany, nd.,).	Go Botany, nd., Retrieved from https://gobotany.nativeplanttrus t.org
<i>Cerastium arvense</i> ssp. <i>strictum</i>	Mouse-ear Chickweed	S1?	-	-	-	flowers May until frost. Cliffs, talus slopes, quarries, rocky beaches, coastal headlands, and in high-pH and serpentine communities. Compacted soils, especially on moist lawns and other arable land (GoBotany, nd)	Go Botany, nd.,: https://gobotany.nativeplanttrus t.org
<i>Ceratophyllum echinatum</i>	Prickly Hornwort	S2S3	-	-	-	Marshes. A plant more typical of the shallows of acidic water bodies than its congener (GoBotany, nd)	Go Botany, nd.,: https://gobotany.nativeplanttrus t.org
<i>Coleataenia longifolia</i>	Long-leaved Panicgrass	S3	-	-	-	Marshes, meadows and fields, shores of rivers or lakes (GoBotany).	Go Botany, nd., Retrieved from https://gobotany.nativeplanttrus t.org

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<i>Coleataenia longifolia</i> ssp. <i>longifolia</i>	Coastal Plain Panicgrass	S3	-	-	-	Marshes, meadows and fields, shores of rivers or lakes (GoBotany).	Go Botany, nd., Retrieved from https://gobotany.nativeplanttrus t.org
<i>Comandra umbellata</i> ssp. <i>umbellata</i>	Bastard's Toadflax	S2	-	-	-	Found in swamps and bogs, rich mesic sites, dry, sandy or rocky soils, savannas, early successional forests. Flowers March - August (Flora of North America, nd)	Flora of North America, nd. Retrieved from http://www.efloras.org
<i>Conioselinum chinense</i>	Chinese Hemlock-parsley	S2	-	-	-	Found in treed swamps, mossy coniferous forest, seepy coastal slopes. Flowers from August to October. Common on Saint Paul Island and infrequent elsewhere (Munro, Newell & Hill, 2014).	Nova Scotia Plants by Munro, Newell & Hill (2014).
<i>Crataegus submollis</i>	Quebec Hawthorn	S2?	-	-	-	Anthropogenic (man-made or disturbed habitats), forest edges, meadows and fields, shrublands or thickets. Flowers in June (GoBotany, nd).	Go Botany, nd., Retrieved from https://gobotany.nativeplanttrus t.org
<i>Crataegus succulenta</i>	Fleshy Hawthorn	S3S4	-	-	-	Forest edges, forests, meadows and fields. Also found in abandoned farmland, along streams and in forest openings. Flowers in late spring (Natural Resources Canada, nd).	Natural Resources Canada: Retrieved from https://tidcf.nrcan.gc.ca/en/trees /factsheet/427
<i>Crataegus succulenta</i> var. <i>succulenta</i>	Fleshy Hawthorn	S3S4	-	-	-	Forest edges, forests, meadows and fields. Also found in abandoned farmland, along streams and in forest openings. Flowers in late spring (Natural Resources Canada, nd).	Natural Resources Canada: Retrieved from https://tidcf.nrcan.gc.ca/en/trees /factsheet/427
<i>Cyperus lupulinus</i> ssp. <i>macilentus</i>	Hop Flatsedge	S1	-	-	-	Various well-drained, open places. Fruiting summer (Flora North America).	Flora of North America, nd. Retrieved from http://www.efloras.org
<i>Cypripedium parviflorum</i> var. <i>makasin</i>	Small Yellow Lady's-Slipper	S2	-	-	-	Mesic to wet fens, prairies, meadows, thickets, open coniferous, and mixed forest. Flowering in May to August (Flora of North America).	Flora of North America, nd. Retrieved from http://www.efloras.org
<i>Cystopteris bulbifera</i>	Bulblet Bladder Fern	S3S4	-	-	-	Specifically in Kings and Cumberland counties to eastern Cape Breton. Found in fertile or calcareous soils, where it forms dense colonies in forested gypsum sinkholes. Spores produced from June to September (Munro et al., 2014).	Nova Scotia Plants by Munro, Newell & Hill (2014).
<i>Dichanthelium clandestinum</i>	Deer-tongue Panic Grass	S3	-	-	-	Found in open areas of alluvial soil. Flowering and fruiting from July to November (Munro, et al., 2014).	Nova Scotia Plants by Munro, Newell & Hill (2014).
<i>Dichanthelium lindheimeri</i>	Lindheimer's Panicgrass	S1?	-	-	-	It is most commonly associated with sandy, ephemerally wet soils. Typical habitat include prairies, glades, streambanks, floodplains, and lake shores. Fruits from May to November (Royal Botanic Gardens).	Dichanthelium lindheimeri (Nash) Gould Plants of the World Online Kew Science
<i>Diphasiastrum complanatum</i>	Northern Ground-cedar	S3S4	-	-	-	Infrequent, scattered through the Cobequid hills southwest to the Annapolis Valley and east to Cape Breton. Deciduous forests and brushy hillsides spreading out into abandoned fields. Anthropogenic (man-made or disturbed habitats) habitats, forest edges, forests, meadows and fields. Flowers from July to October (Munro et al., 2014).	Nova Scotia Plants by Munro, Newell & Hill (2014).
<i>Eleocharis erythropoda</i>	Red-stemmed Spikerush	S1	-	-	-	Non-calcareous or calcareous fresh or brackish shores. Fruiting occurs in the summer (Flora North America).	Flora of North America, nd. Retrieved from http://www.efloras.org
<i>Eleocharis flavescens</i> var. <i>olivacea</i>	Bright-green Spikerush	S2S3	-	-	-	Bogs, cold springs, dry stream banks, lake and pond margins, maritime mud flats, marshes, moist meadows, swamps. Fruiting summer-winter (June-November) (Flora North America).	Flora of North America, nd. Retrieved from http://www.efloras.org
<i>Epilobium coloratum</i>	Purple-veined Willowherb	S2?	-	-	-	Scattered from Digby to Guysborough counties - Found in low grounds and seepy soils - Flowers from July through October (Munro, Newell & Hill, 2014)	Nova Scotia Plants by Munro, Newell & Hill (2014).
<i>Epilobium strictum</i>	Downy Willowherb	S3	-	-	-	Scattered through throughout Cape Breton Island, infrequently elsewhere - Found in bogs and other peatlands - Flowers July to September (Munro, Newell & Hill, 2014)	Nova Scotia Plants by Munro, Newell & Hill (2014).
<i>Equisetum hyemale</i>	Common Scouring-rush	S3S4	-	-	-	Scattered, mostly from Digby County, through the Annapolis Valley, northward to Cape Breton. Grows in sandy, gravelly soil, on banks or in low areas; often in calcareous regions. Anthropogenic habitats (man-made or disturbed habitats such a ditches), swamps, floodplains shores of rivers or lakes (subspecies: similar - sandy slopes and roadsides, riverbanks, and borrow pits). No sources that state specific	Nova Scotia Plants by Munro, Newell & Hill (2014).

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						spore production time, most likely during the general growing season in Nova Scotia: June to September (Go Botany, nd., and Munro et al., 2014).	
<i>Equisetum hyemale ssp. affine</i>	Common Scouring-rush	S3S4	-	-	-	Scattered, mostly from Digby County, through the Annapolis Valley, northward to Cape Breton. Grows in sandy, gravelly soil, on banks or in low areas; often in calcareous regions. Anthropogenic habitats (man-made or disturbed habitats such a ditches), swamps, floodplains shores of rivers or lakes (subspecies: similar - sandy slopes and roadsides, riverbanks, and borrow pits). No sources that state specific spore production time, most likely during the general growing season in Nova Scotia: June to September (Go Botany, nd., and Munro et al., 2014).	Nova Scotia Plants by Munro, Newell & Hill (2014).
<i>Equisetum pratense</i>	Meadow Horsetail	S3	-	-	-	Known to be in several streams in Hants, Colchester and Cumberland counties, in addition to Victoria and Inverness Counties. Uncommon and limited to alluvial thickets, pastures and treed streamsides, including gravelly bars. Flowers mid to late spring (Minnesota Environment and Natural Resources Trust Fund and Munro et al., 2014).	Nova Scotia Plants by Munro, Newell & Hill (2014).
<i>Equisetum scirpoides</i>	Dwarf Scouring-Rush	S3S4	-	-	-	Not often seen in the Atlantic counties. Annapolis County to Cumberland County and northern Cape Breton. Wooded banks and mossy slopes. Typical of alkaline habitats and often overlooked. Forests, shores of rivers or lakes, swamps and edges of wetlands. Flowers in summer (Minnesota Environment and Natural Resources Trust Fund, Go Botany, nd., and Munro et al., 2014).	Nova Scotia Plants by Munro, Newell & Hill (2014).
<i>Equisetum variegatum</i>	Variegated Horsetail	S3	-	-	-	Wide-ranging in NS, with disjunct localities: Halifax County, Cumberland County and Victoria County. Found in wetlands or wet seeps. Anthropogenic habitats (man-made or disturbed habitats), shores of rivers or lakes. Flowers in summer (Minnesota Environment and Natural Resources Trust Fund, Go Botany, nd., and Munro et al., 2014).	Nova Scotia Plants by Munro, Newell & Hill (2014).
<i>Equisetum variegatum ssp. variegatum</i>	Variegated Scouring-rush	S3	-	-	-	Wide-ranging in NS, with disjunct localities: Halifax County, Cumberland County and Victoria County. Found in wetlands or wet seeps. Anthropogenic habitats (man-made or disturbed habitats), shores of rivers or lakes. Flowers in summer (Minnesota Environment and Natural Resources Trust Fund, Go Botany, nd., and Munro et al., 2014).	Nova Scotia Plants by Munro, Newell & Hill (2014).
<i>Eriophorum gracile</i>	Slender Cottongrass	S2S3	-	-	-	Grows in wet peat and inundated shores. Flowers and fruits during early summer. (Munro, et al. 2014).	Nova Scotia Plants by Munro, Newell & Hill (2014).
<i>Eriophorum gracile ssp. gracile</i>	slender cottongrass	S2S3	-	-	-	Grows in wet peat and inundated shores. Flowers and fruits during early summer. (Munro, et al. 2014).	Nova Scotia Plants by Munro, Newell & Hill (2014).
<i>Fallopia scandens</i>	Climbing False Buckwheat	S3	-	-	-	Uncommon and local, from Digby to Richmond counties on the northern side of the province - Grows on low ground in riparian zones - Flowers mid-August to October (Munro, Newell & Hill, 2014)	Nova Scotia Plants by Munro, Newell & Hill (2014).
<i>Fimbristylis autumnalis</i>	Slender Fimbry	S1	-	-	-	Moist to wet sands, peats, slits, or clays primarily of disturbed, sunny ground such as seeps, ditches, savanna, stream banks, reservoir drawdowns, and pond shores (Flora of North America)	Flora of North America, nd. Retrieved from http://www.efloras.org
<i>Fragaria vesca</i>	Woodland Strawberry	S3S4	-	-	-	Forming dense patches in shady forests, ravines. Flowers in June. A white-berried form of this species persists in a number of locations within the province: White Rock, Wolfville, Grand Pré and Barrington. (Munro, Newell & Hill, 2014).	Nova Scotia Plants by Munro, Newell & Hill (2014).
<i>Fragaria vesca ssp. americana</i>	Woodland Strawberry	S3S4	-	-	-	Forming dense patches in shady forests, ravines. Flowers in June. A white-berried form of this species persists in a number of locations within the province: White Rock, Wolfville, Grand Pré and Barrington. (Munro, Newell & Hill, 2014).	Nova Scotia Plants by Munro, Newell & Hill (2014).
<i>Fraxinus nigra</i>	Black Ash	S1S2	T	Not on Schedule 1	T	Black ash is typically found in poorly drained areas that are often seasonally flooded. It is most common on peat and muck soils, but also grows on fine sands over sands and loams. Although this species can tolerate still semi-stagnant conditions, there is a preference for swampy woodland stream and river banks with moving water. It is often associated with species such as Red maple, Speckled alder, Balsam poplar, and Black spruce. The species is shade intolerant, and seedlings, saplings and sprouts tend to regenerates only in partially opened forest canopies.	Recovery and Action Plan for Black ash (<i>Fraxinus nigra</i>) in Nova Scotia.
<i>Fraxinus pennsylvanica</i>	Red Ash	S1	-	-	-	Flowers May - June. Found in riparian and upland forest and shelter belts (Minnesota Wildflowers, nd)	Minnesota Wildflowers, nd. Retrieved froim https://www.minnesotawildflowers.info/

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<i>Galium aparine</i>	Common Bedstraw	S2S3	-	-	-	Composts, ballast and waste soils. Flowers from May until July (Munro, Newell & Hill, 2014)	Nova Scotia Plants by Munro, Newell & Hill (2014).
<i>Gentianella amarella</i> ssp. <i>acuta</i>	Northern Gentian	S1	-	-	-	Open and forested river banks, subalpine gullies and brook sides, occurring in regions of high-pH bedrock and/or till (Munro, Newell & Hill, 2014)	Nova Scotia Plants by Munro, Newell & Hill (2014).
<i>Goodyera repens</i>	Lesser Rattlesnake-plantain	S3	-	-	-	Shady, moist, coniferous or mixed woods, on mossy or humus-covered ground. Sometimes it is found in bogs or cedar swamps. Flowering early July-early September (Flora North America).	Flora of North America, nd. Retrieved from http://www.efloras.org
<i>Halenia deflexa</i>	Spurred Gentian	S2S3	-	-	-	Exposed shorelines and headlands along the coast. Rare and local on the mainland: Hall’s Harbour, Kings Co.; Sherbrooke, Guysborough Co. Common in northern Cape Breton, and eastward to Scatarie Island. Flowers from July to September	Nova Scotia Plants by Munro, Newell & Hill (2014).
<i>Hordeum brachyantherum</i>	Meadow Barley	S1	-	-	-	Grows in pastures and along streams and lake shores (Flora of North America).	Flora of North America, nd. Retrieved from http://www.efloras.org
<i>Hordeum brachyantherum</i> ssp. <i>brachyantherum</i>	Meadow Barley	S1	-	-	-	Grows in pastures and along streams and lake shores (Flora of North America).	Flora of North America, nd. Retrieved from http://www.efloras.org
<i>Humulus lupulus</i> var. <i>lupuloides</i>	Common Hop	S1?	-	-	-	Anthropogenic (man-made or disturbed habitats), floodplain (river or stream floodplains), forests, shrublands or thickets	Nova Scotia Plants by Munro, Newell & Hill (2014).
<i>Hypericum x dissimulatum</i>	Disguised St. John's-wort	S2S3	-	-	-	Wet mucky soils in lacustrine habitats. Historically collected from Digby to Halifax Co. with a single specimen from each of Pictou and Guysborough counties (Munro, Newell & Hill, 2014).	Nova Scotia Plants by Munro, Newell & Hill (2014).
<i>Impatiens pallida</i>	Pale Jewelweed	S2	-	-	-	Alluvial soils as along intervalles and in thickets. Flowers during July and August. More frequent in the eastern portion of the province (Munro, Newell & Hill, 2014).	Nova Scotia Plants by Munro, Newell & Hill (2014).
<i>Isoetes tuckermanii</i> ssp. <i>acadiensis</i>	Acadian Quillwort	S3	-	-	-	Scattered from Yarmouth County to northern Cape Breton. Very common in Lake Kejimikujik, near exit of Grafton Brook. In water up to depth of 1m, bordering lakes, ponds or along rivers. No sources that state specific flowering time, most likely during the general growing season in Nova Scotia: June to September (Go Botany, nd., and Munro et al., 2014).	Nova Scotia Plants by Munro, Newell & Hill (2014).
<i>Juncus antheratus</i>	Greater Poverty Rush	S1?	-	-	-	Exposed or partially shaded sites in moist or seasonally wet sandy or clay soils. Flowering and fruiting in spring (Flora North America).	Flora of North America, nd. Retrieved from http://www.efloras.org
<i>Juncus stygius</i> ssp. <i>americanus</i>	Moor Rush	S2	-	-	-	Wet moss, bogs and bog-pools. Flowering and fruiting in mid to late summer (Go Botnay, nd).	Go Botany, nd., Retrieved from https://gobotany.nativeplanttrus t.org
<i>Liparis loeselii</i>	Loesel's Twayblade	S3S4	-	-	-	Cool, moist ravines, bogs, or fens, wet peaty or sandy meadows, and exposed sand along edges of lakes, often colonizing previously open and disturbed habitats during early and middle stages of reforestation. Flowering May-August (Go Botany, nd.,).	Go Botany, nd., Retrieved from https://gobotany.nativeplanttrus t.org
<i>Lobelia kalmii</i>	Brook Lobelia	S2	-	-	-	Flowers from July through September. Limited to dripping cliffs, meadows and bogs in calcareous soils. fens, wet meadows, shores	Go Botany, nd., Retrieved from https://gobotany.nativeplanttrus t.org
<i>Lorinseria areolata</i>	netted chain fern	S3	-	-	-	Bogs, meadows and fields, swamps, wetland margins (edges of wetlands) (Go Botany, nd.,).	Go Botany, nd., Retrieved from https://gobotany.nativeplanttrus t.org
<i>Luzula parviflora</i> ssp. <i>melanocarpa</i>	Black-fruited Woodrush	S3S4	-	-	-	uncommon in damp coniferous or mixed woods, cool ravines and banks (Hinds, 2000)	Hinds H.R. 2000. Flora of New Brunswick: Second Edition. Biology Department University of New Brunswick.
<i>Lysimachia quadrifolia</i>	Whorled Yellow Loosestrife	S1	-	-	-	Anthropogenic (man-made or disturbed habitats), grassland, woodlands, fens, moist prairies (GoBotany, n.d.). Flowers from July - August (LBJ Wildflower Centre, nd).	Go Botany, nd., Retrieved from https://gobotany.nativeplanttrus t.org

Goldboro Gold Mine Priority Species List



Scientific Name	Common Name	SRank	COSEWIC	SARA	NSESA	Habitat Description	Reference
							Lady Bird Johnson Wildflower Center https://www.wildflower.org/plants/result.php?id_plant=LYQU2
<i>Malaxis monophyllos</i>	White Adder's-mouth	S1	-	-	-	Found in Fens, ridges or ledges, swamps with northern white-cedar. Flowering in summer (GoBotany).	Go Botany, nd., Retrieved from https://gobotany.nativeplanttrust.org
<i>Malaxis monophyllos</i> var. <i>brachypoda</i>	North American White Adder's-mouth	S1	-	-	-	Found in swamps and bogs. Flower in summer (Flora of North America).	Flora of North America, nd. Retrieved from http://www.efloras.org
<i>Nabalus racemosus</i>	Glaucous Rattlesnakeroot	S1	-	-	-	Favours calcareous riverbanks, shores and damp prairies (Maine Department of Agriculture, Conservation & Forestry, nd).	Maine Department of Agriculture, Conservation & Forestry: https://www.maine.gov/dacf/nap/features/nabrac.html .
<i>Neottia bifolia</i>	Southern Twayblade	S3	-	-	-	Bogs and swamps (Go Botany, nd.,)	Go Botany, nd., Retrieved from https://gobotany.nativeplanttrust.org
<i>Nuphar microphylla</i>	Small Yellow Pond-lily	S3S4	-	-	-	Ponds, lakes, sluggish streams, sloughs, ditches and occasionally tidal waters. Flowers summer - early fall (Flora of North America, nd)	Flora of North America, nd. Retrieved from http://www.efloras.org
<i>Oenothera fruticosa</i>	Narrow-leaved Evening Primrose	S2	-	-	-	Scattered from Yarmouth to the Northumberland Strait - Found in dry open soil habitats such as old fields, edges of thickets and roadsides - Flowers from June to August (Munro, Newell & Hill, 2014)	Nova Scotia Plants by Munro, Newell & Hill (2014).
<i>Oenothera fruticosa</i> ssp. <i>tetragona</i>	Narrow-leaved Evening Primrose	S2	-	-	-	Scattered from Yarmouth to the Northumberland Strait - Found in dry open soil habitats such as old fields, edges of thickets and roadsides - Flowers from June to August (Munro, Newell & Hill, 2014)	Nova Scotia Plants by Munro, Newell & Hill (2014).
<i>Ophioglossum pusillum</i>	Northern Adder's-tongue	S2S3	-	-	-	Known from Yarmouth and Digby Counties; scattered east to Halifax and Amherst; a single Cape Breton record from George River. Found in sterile soils, swamps and sandy or cobbly lakeshores. Anthropogenic habitats (man-made or disturbed habitats), marshes, meadows, fields and edges of wetland margins. Spores produced May to August (Go Botany, nd., and Munro et al., 2014).	Nova Scotia Plants by Munro, Newell & Hill (2014).
<i>Osmorhiza longistylis</i>	Smooth Sweet Cicely	S2	-	-	-	Intervale soils where fertility is high; deciduous forests. Flowers Late June to July. Scattered along the North Mountain in Annapolis and Kings counties to Cumberland Cobequids, infrequent in Cape Breton (Munro, Newell and Hill, 2014)	Nova Scotia Plants by Munro, Newell & Hill (2014).
<i>Panicum dichotomiflorum</i> ssp. <i>puritanorum</i>	Spreading Panicgrass	S1?	-	-	-	Flowering and fruiting from June through October (GoBotany, nd)	Go Botany, nd., Retrieved from https://gobotany.nativeplanttrust.org
<i>Parnassia parviflora</i>	Small-flowered Grass-of-Parnassus	S1S2	-	-	-	Rocky seeps. Flowers August to September (Jepson Herbarium, 2021)	The Jepson Herbarium: https://ucjeps.berkeley.edu/eflora
<i>Pedicularis palustris</i>	Marsh Lousewort	S1	-	-	-	Wet substrates as in marshes or meadows. Flowers in July. Rare and local: Bay St. Lawrence, Baleine and Sydney area. Reported from Guysborough Co. (Munro, Newell & Hill, 2014)	Nova Scotia Plants by Munro, Newell & Hill (2014).
<i>Pedicularis palustris</i> ssp. <i>palustris</i>	Marsh Lousewort	S1	-	-	-	Wet substrates as in marshes or meadows. Flowers in July. Rare and local: Bay St. Lawrence, Baleine and Sydney area. Reported from Guysborough Co. (Munro, Newell & Hill, 2014)	Nova Scotia Plants by Munro, Newell & Hill (2014).
<i>Persicaria amphibia</i> var. <i>emersa</i>	Long-root Smartweed	S3?	-	-	-	Bloom on moist soil and are terrestrial-adapted. Flower June - September (Flora of North America)	Flora of North America, nd. Retrieved from http://www.efloras.org
<i>Persicaria arifolia</i>	Halberd-leaved Tearthumb	S2	-	-	-	Found inf shaded swamps, ponds, tidal marshes along rivers, wet ravine in forests. Flowers July - October (Flora of North America, nd)	Flora of North America, nd. Retrieved from http://www.efloras.org

Goldboro Gold Mine Priority Species List



Scientific Name	Common Name	SRank	COSEWIC	SARA	NSESA	Habitat Description	Reference
<i>Persicaria careyi</i>	Carey's Smartweed	S1	-	-	-	Low thickets, swamps, bogs, moist shorelines, clearings, recent burns, cultivated ground. Flowering July - October (Flora of North America, nd)	Flora of North America, nd. Retrieved from http://www.efloras.org
<i>Persicaria pensylvanica</i>	Pennsylvania Smartweed	S3	-	-	-	Moist, disturbed places, ditches, riverbanks, cultivated fields, shorelines of ponds and reservoirs. Flowers May - December (Flora of North America, nd)	Flora of North America, nd. Retrieved from http://www.efloras.org
<i>Plantago rugelii</i>	Rugel's Plantain	S3	-	-	-	Grows in anthropogenic (man-made or disturbed habitat), grassland, meadows, fields (GoBotany, nd)	Go Botany, nd., Retrieved from https://gobotany.nativeplanttrust.org
<i>Platanthera flava</i> var. <i>herbiola</i>	Pale Green Orchid	S2	-	-	-	Known from a variety of habitats: sandy, gravelly or peaty shorelines of lakes or streams; bogs, swamps and meadows. Found along the Tusket River, Yarmouth Co., Medway River, Queens County and north to Kings and Colchester Co. (Kemptown) (Munro, Newell & Hill, 2014).	Nova Scotia Plants by Munro, Newell & Hill (2014).
<i>Platanthera hookeri</i>	Hooker's Orchid	S3	-	-	-	Scattered in most of the province, local in the southwestern counties. So far absent from the eastern shore. Grows in open dry forests of mixed conifers. Flower appear from May to August (Munro, et al., 2014).	Nova Scotia Plants by Munro, Newell & Hill (2014).
<i>Platanthera huronensis</i>	Fragrant Green Orchid	S1S2	-	-	-	No good record found. Habitat are known from streamsides, in wetlands, even forests. Flowers throughout the summer (Munro, et al., 2014).	Nova Scotia Plants by Munro, Newell & Hill (2014).
<i>Podostemum ceratophyllum</i>	Horn-leaved Riverweed	S1	-	-	-	Medium to fast flowing river bottoms with ledge, cobble or sand substrate (GoBotany, nd)	Go Botany, nd., Retrieved from https://gobotany.nativeplanttrust.org
<i>Polygonum aviculare</i> ssp. <i>neglectum</i>	Narrow-leaved Knotweed	S3?	-	-	-	Found in disturbed areas. Flowers June - November (Flora of North America, nd)	Flora of North America, nd. Retrieved from http://www.efloras.org
<i>Proserpinaca palustris</i>	Marsh Mermaidweed	S3	-	-	-	Found in lakeshore fens and streamsides. It is only known in Lunenburg and Yarmouth counties, but it may be more widespread. The variation creba is abundant from southwestern NS to Cumberland, and less frequent in Cape Breton. Flowers July to September	Nova Scotia Plants by Munro, Newell & Hill (2014).
<i>Ranunculus gmelinii</i>	Gmelin's Water Buttercup	S3	-	-	-	Riverine (in rivers or streams), swamps, slow streams, evergreen swamps and ditches in areas of high-pH bedrock (GoBotany, n.d.). Flowers July - August (Minnesota Wildflowers, n.d.)	Go Botany, nd., Retrieved from https://gobotany.nativeplanttrust.org
<i>Ranunculus pensylvanicus</i>	Pennsylvania Buttercup	S1	-	-	-	Found in wet fields, ditches, marshes, along shores. Flowers June - August (Minnesota Wildflowers, nd)	Minnesota Wildflowers, nd. Retrieved from https://www.minnesotawildflowers.info/
<i>Ranunculus sceleratus</i>	Cursed Buttercup	S1S2	-	-	-	Anthropogenic (man-made or disturbed habitats), fresh tidal marshes or flats, marshes, swamps (GoBotany, n.d.). Flowers May - September (Minnesota Wildflowers, nd)	Go Botany, nd., Retrieved from https://gobotany.nativeplanttrust.org
<i>Ranunculus sceleratus</i> var. <i>sceleratus</i>	Cursed Buttercup	S1S2	-	-	-	Ponds, riverbanks. Flowers from April - June, October (Jepson Herbarium, 2021)	The Jepson Herbarium: https://ucjeps.berkeley.edu/eflora/
<i>Rosa acicularis</i> ssp. <i>sayi</i>	Prickly Rose	S1	-	-	-	Across its range, it grows in a wide variety of forested and open habitats, with a wide variety of soil and moisture conditions. Flowers in the spring (Schori, 2003)	Schori, A. (2003). <i>Rosa acicularis</i> Lindley ssp. <i>sayi</i> (Schwein.) W. H. Lewis Bristly, Needle-spine, or Prickly Rose file:///C:/Users/Andy%20Walter/Downloads/Rosaacicularis%20(1).PDF
<i>Rudbeckia laciniata</i>	Cut-Leaved Coneflower	S1S2	-	-	-	Grows in wet fertile soils along the edge of swamps, swales or streams. Often colonial. Flowers in August. Common in Kings Co., isolated colonies from Annapolis and Cumberland counties to Guysborough (Munro, Newell & Hill, 2014).	Nova Scotia Plants by Munro, Newell & Hill (2014).

Goldboro Gold Mine Priority Species List



Scientific Name	Common Name	SRank	COSEWIC	SARA	NSESA	Habitat Description	Reference
<i>Rumex fueginus</i>	Tierra del Fuego Dock	S3S4	-	-	-	Alluvial, riparian, and ruderal habitats, shores, marshes, bogs, wet meadows, dry streambeds. Flowering late spring - early fall (Flora of North America, nd)	Flora of North America, nd. Retrieved from http://www.efloras.org
<i>Rumex triangulivalvis</i>	Triangular-valve Dock	S2	-	-	-	Grows in moist areas and disturbed habitats, meadows and fields (GoBotany, nd)	Go Botany, nd., Retrieved from https://gobotany.nativeplanttrus t.org
<i>Sanguinaria canadensis</i>	Bloodroot	S3S4	-	-	-	Rare in Kings and Hants, common in Colchester, and scattered from Cumberland to Cape Breton - Found streamside or on alluvial terraces, in the shade, just above high water - Flowers in early May (Munro, Newell & Hill, 2014)	Nova Scotia Plants by Munro, Newell & Hill (2014).
<i>Saxifraga cernua</i>	Nodding Saxifrage	S1	-	-	-	Imperfectly drained moist areas (near creeks and lakeshores, on moist ledges and in exposed dry sites); acidic, or calcareous, or nitrophilous (often near Thule sites and human habitation), or circum-neutral. Spring to summer flowering time (Aiken et al. 2007)	Flora of the Canadian Arctic Archipelago, S.G. Aiken, M.J. Dallwitz, L.L. Consaul, C.L. McJannet, R.L. Boles, G.W. Argus, J.M. Gillett, P.J. Scott, R. Elven, M.C. LeBlanc, L.J. Gillespie, A.K. Brysting, H. Solstad, and J.G. Harris.. https://nature.ca/aafloa/data/www/sxsxcn.htm
<i>Schizaea pusilla</i>	Little Curlygrass Fern	S3S4	-	-	-	Scattered throughout the Atlantic counties and frequent in the northern plateau of Cape Breton. Found in sphagnum wet areas, upper peaty lakeshores and undrained depressions. Spores produced throughout the summer, from July (Munro et al., 2014).	Nova Scotia Plants by Munro, Newell & Hill (2014).
<i>Scrophularia lanceolata</i>	Lance-leaved Figwort	S1	-	-	-	Limited to open forest and thickets, dryish soils. Rare and known only from Harmony, Kings Co.; Boylston, Guysborough Co. and Baddeck, Victoria Co. Flowers June and July (Munro, Newell & Hill, 2014)	Nova Scotia Plants by Munro, Newell & Hill (2014).
<i>Solidago latissimifolia</i>	Elliott's Goldenrod	S3S4	-	-	-	Favours clearings, thickets and bogs, swales and lakeshores. Flowers in August and September. Common in Yarmouth Co., east to Halifax Co. (Munro, Newell & Hill, 2014).	Nova Scotia Plants by Munro, Newell & Hill (2014).
<i>Sparganium androcladum</i>	Branching Bur-Reed	S1	-	-	-	Found in lakes, ponds, rivers or streams or the shore of rivers or lakes (Go Botany, nd.,).	Go Botany, nd., Retrieved from https://gobotany.nativeplanttrus t.org
<i>Sparganium hyperboreum</i>	Northern Burreed	S1S2	-	-	-	Rare in CB. On the mainland, collected from Drumhead and New Harbour, Guysborough Co. Peaty Pools (Munro, et al., 2014).	Nova Scotia Plants by Munro, Newell & Hill (2014).
<i>Symphyotrichum boreale</i>	Boreal Aster	S2?	-	-	-	Favours lacustrine gravels, streambanks and edges of peatlands. Flowers during August and September . Scattered from Yarmouth to Cape Breton uncommon (Munro, Newell & Hill, 2014).	Nova Scotia Plants by Munro, Newell & Hill (2014).
<i>Toxicodendron vernix</i>	Poison Sumac	S1	-	-	-	Usually found in swamps or marshes. Flowers from May to July. Only known in Telfer Lake and Apple Tree Lake in Queens county (Munro, Newell & Hill, 2014)	Nova Scotia Plants by Munro, Newell & Hill (2014).
<i>Triosteum aurantiacum</i> var. <i>aurantiacum</i>	Orange-fruited Tinker's Weed	S2S3	-	-	-	Dry-mesic to mesic forests, woodlands, and forest borders	Go Botany, nd., Retrieved from https://gobotany.nativeplanttrus t.org
<i>Utricularia ochroleuca</i>	Yellowish-white Bladderwort	S1	-	-	-	Shallow (generally <30cm) acidic waters. Flowers June - September (Jepson Herbarium, 2021)	Jepson Herbarium, 2021. https://ucjeps.berkeley.edu/eflora/
<i>Vaccinium ovalifolium</i>	Oval-leaved Bilberry	S1	-	-	-	Flowers late, from July to September. Habitat preferences include coniferous woods from sea-level to 2100msl, throughout its range. Moist or mesic coniferous woods, transitional habitats adjacent to these coniferous stands, cut-over coniferous woods, verges of road cuts, margins of coniferous woods, peaty slopes	Go Botany, nd., Retrieved from https://gobotany.nativeplanttrus t.org
<i>Verbena hastata</i>	Blue Vervain	S3	-	-	-	Limited to mucky fertile soils, as along floodplains. Flowers during August - September (Munro, Newell & Hill, 2014)	Nova Scotia Plants by Munro, Newell & Hill (2014).
<i>Veronica catenata</i>	Pink Water-Speedwell	S1	-	-	-	Shores of rivers or lakes, wetland margins (edges of wetlands) (GoBotany, nd). Flowers May - September (Minnesota Wildflowers, nd)	Go Botany, nd, https://gobotany.nativeplanttrus t.org

Goldboro Gold Mine Priority Species List



Scientific Name	Common Name	SRank	COSEWIC	SARA	NSESA	Habitat Description	Reference
							Minnesota Wildflowers, nd. Retrieved froim https://www.minnesotawildflowers.info/
<i>Viola sagittata</i> var. <i>ovata</i>	Arrow-Leaved Violet	S3S4	-	-	-	Open woods and thickets, disturbed ground, roadsides, powerline rights-of-way. Flowers April - June (Flora of North America, nd)	Flora of North America, nd. Retrieved from http://www.efloras.org
<i>Zizia aurea</i>	Golden Alexanders	S1	-	-	-	Found in meadows, shores, thickets and wooded swamps. Flowers May and June. Occasionally reported in: Pomquet and South River, Antigonish County, Upper Musquodoboit, Halifax County (Munro, Newell and Hill, 2014).	Nova Scotia Plants by Munro, Newell & Hill (2014).



GOLDBORO GOLD PROJECT

APPENDIX C. ACCDC REPORT

DATA REPORT 6802: Goldboro, NS

Prepared 23 February 2021
by C. Robicheau, Data Manager

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3.2 Significant Areas

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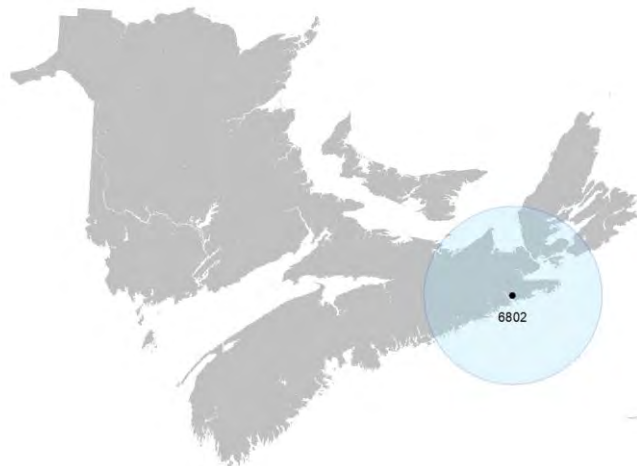
4.2 Flora

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4.4 Source Bibliography

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5.1 Source Bibliography



Map 1. A 100 km buffer around the study area

1.0 PREFACE

The Atlantic Canada Conservation Data Centre (AC CDC; www.accdc.com) is part of a network of NatureServe data centres and heritage programs serving 50 states in the U.S.A, 10 provinces and 1 territory in Canada, plus several Central and South American countries. The NatureServe network is more than 30 years old and shares a common conservation data methodology. The AC CDC was founded in 1997, and maintains data for the jurisdictions of New Brunswick, Nova Scotia, Prince Edward Island, and Newfoundland and Labrador. Although a non-governmental agency, the AC CDC is supported by 6 federal agencies and 4 provincial governments, as well as through outside grants and data processing fees.

Upon request and for a fee, the AC CDC queries its database and produces customized reports of the rare and endangered flora and fauna known to occur in or near a specified study area. As a supplement to that data, the AC CDC includes locations of managed areas with some level of protection, and known sites of ecological interest or sensitivity.

1.1 DATA LIST

Included datasets:

Filename

GoldboroNS_6802ob.xls

GoldboroNS_6802ob100km.xls

GoldboroNS_6802ff_py.xls

Contents

Rare or legally-protected Flora and Fauna in your study area

A list of Rare and legally protected Flora and Fauna within 100 km of your study area

Rare Freshwater Fish in your study area (DFO database)

1.2 RESTRICTIONS

The AC CDC makes a strong effort to verify the accuracy of all the data that it manages, but it shall not be held responsible for any inaccuracies in data that it provides. By accepting AC CDC data, recipients assent to the following limits of use:

- a) Data is restricted to use by trained personnel who are sensitive to landowner interests and to potential threats to rare and/or endangered flora and fauna posed by the information provided.
- b) Data is restricted to use by the specified Data User; any third party requiring data must make its own data request.
- c) The AC CDC requires Data Users to cease using and delete data 12 months after receipt, and to make a new request for updated data if necessary at that time.
- d) AC CDC data responses are restricted to the data in our Data System at the time of the data request.
- e) Each record has an estimate of locational uncertainty, which must be referenced in order to understand the record's relevance to a particular location. Please see attached Data Dictionary for details.
- f) AC CDC data responses are not to be construed as exhaustive inventories of taxa in an area.
- g) The absence of a taxon cannot be inferred by its absence in an AC CDC data response.

1.3 ADDITIONAL INFORMATION

The accompanying Data Dictionary provides metadata for the data provided.

Please direct any additional questions about AC CDC data to the following individuals:

Plants, Lichens, Ranking Methods, All other Inquiries

Sean Blaney, Senior Scientist, Executive Director

Tel: (506) 364-2658

sean.blaney@accdc.ca

Animals (Fauna)

John Klymko, Zoologist

Tel: (506) 364-2660

john.klymko@accdc.ca

Plant Communities

Sarah Robinson, Community Ecologist

Tel: (506) 364-2664

sarah.robinson@accdc.ca

Data Management, GIS

James Churchill, Data Manager

Tel: (902) 679-6146

james.churchill@accdc.ca

Billing

Jean Breau

Tel: (506) 364-2657

jean.breau@accdc.ca

Questions on the biology of Federal Species at Risk can be directed to AC CDC: (506) 364-2658, with questions on Species at Risk regulations to: Samara Eaton, Canadian Wildlife Service (NB and PE): (506) 364-5060 or Julie McKnight, Canadian Wildlife Service (NS): (902) 426-4196.

For provincial information about rare taxa and protected areas, or information about game animals, deer yards, old growth forests, archeological sites, fish habitat etc., in New Brunswick, please contact Hubert Askanas, Energy and Resource Development: (506) 453-5873.

For provincial information about rare taxa and protected areas, or information about game animals, deer yards, old growth forests, archeological sites, fish habitat etc., in Nova Scotia, please contact Donna Hurlburt, NS DLF: (902) 679-6886. To determine if location-sensitive species (section 4.3) occur near your study site please contact a NS DLF Regional Biologist:

Western: Emma Vost

(902) 670-8187

Emma.Vost@novascotia.ca

Western: Sarah Spencer

(902) 541-0081

Sarah.Spencer@novascotia.ca

Central: Shavonne Meyer

(902) 893-0816

Shavonne.Meyer@novascotia.ca

Central: Kimberly George

(902) 890-1046

Kimberly.George@novascotia.ca

Eastern: Harrison Moore

(902) 497-4119

Harrison.Moore@novascotia.ca

Eastern: Maureen Cameron-MacMillan

(902) 295-2554

Maureen.Cameron-MacMillan@novascotia.ca

Eastern: Elizabeth Walsh

(902) 563-3370

Elizabeth.Walsh@novascotia.ca

For provincial information about rare taxa and protected areas, or information about game animals, fish habitat etc., in Prince Edward Island, please contact Garry Gregory, PEI Dept. of Communities, Land and Environment: (902) 569-7595.

2.0 RARE AND ENDANGERED SPECIES

2.1 FLORA

The study area contains 13 records of 4 vascular and 25 records of 8 nonvascular flora (Map 2 and attached: *ob.xls).

2.2 FAUNA

The study area contains 81 records of 30 vertebrate and 2 records of 2 invertebrate fauna (Map 2 and attached data files - see 1.1 Data List). Please see section 4.3 to determine if “location-sensitive” species occur near your study site.

Map 2: Known observations of rare and/or protected flora and fauna within the study area.



RESOLUTION

- 4.7 within 50s of kilometers
- ▣ 4.0 within 10s of kilometers
- ▢ 3.7 within 5s of kilometers
- △ 3.0 within kilometers
- ▲ 2.7 within 500s of meters
- ◇ 2.0 within 100s of meters
- ◆ 1.7 within 10s of meters

HIGHER TAXON

- vertebrate fauna
- invertebrate fauna
- vascular flora
- nonvascular flora

3.0 SPECIAL AREAS

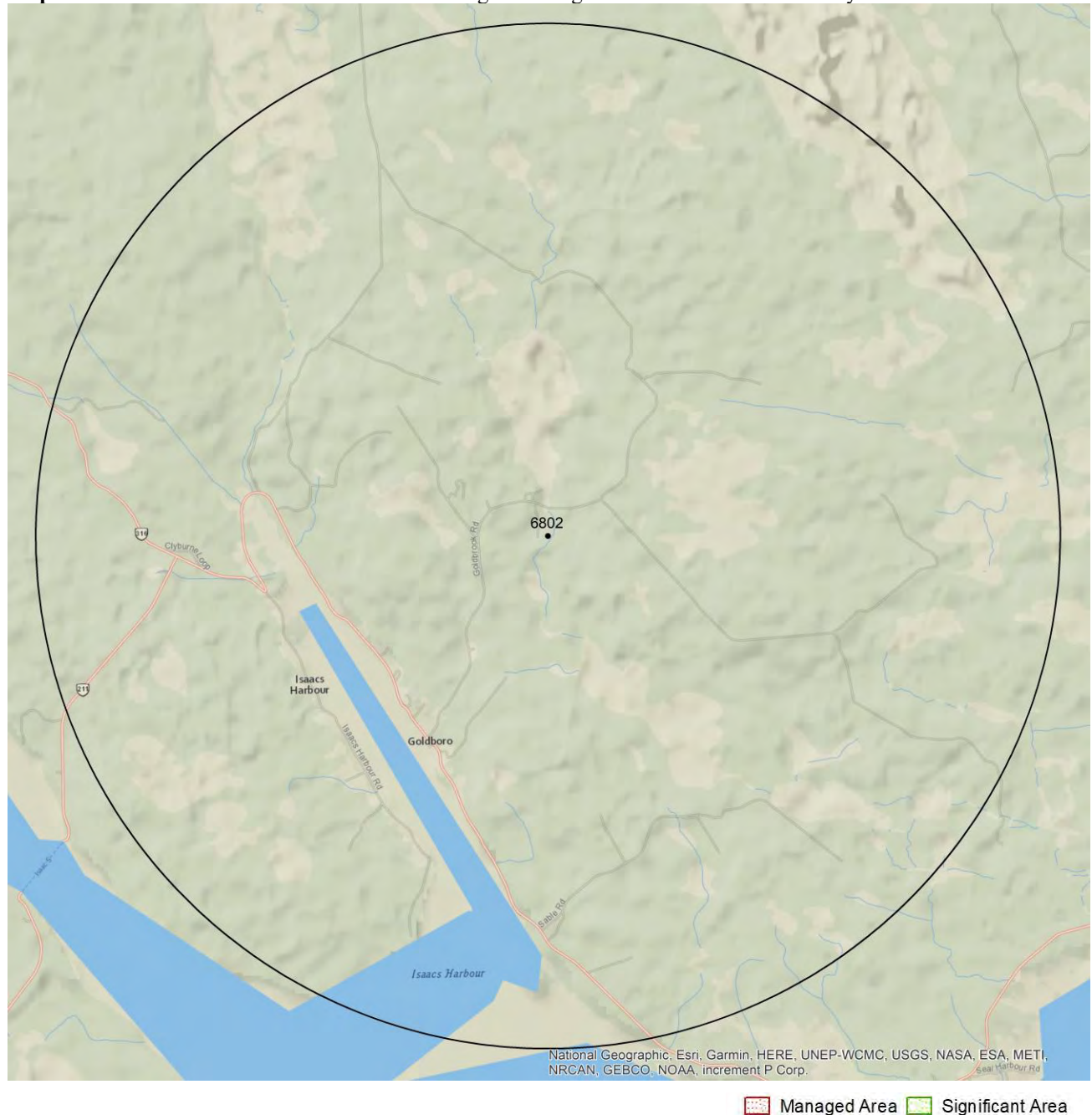
3.1 MANAGED AREAS

The GIS scan identified no managed areas in the vicinity of the study area (Map 3 and attached file: *msa.xls).

3.2 SIGNIFICANT AREAS

The GIS scan identified no biologically significant sites in the vicinity of the study area (Map 3 and attached file: *msa.xls).

Map 3: Boundaries and/or locations of known Managed and Significant Areas within the study area.



4.0 RARE SPECIES LISTS

Rare and/or endangered taxa (excluding “location-sensitive” species, section 4.3) within the study area listed in order of concern, beginning with legally listed taxa, with the number of observations per taxon and the distance in kilometers from study area centroid to the closest observation ($\pm$ the precision, in km, of the record). [P] = vascular plant, [N] = nonvascular plant, [A] = vertebrate animal, [I] = invertebrate animal, [C] = community. Note: records are from attached files *ob.xls/*ob.shp only.

4.1 FLORA

	Scientific Name	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	# recs	Distance (km)
N	<i>Erioderma pedicellatum</i> (Atlantic pop.)	Boreal Felt Lichen - Atlantic pop.	Endangered	Endangered	Endangered	S1	3	4.4 $\pm$ 0.0
N	<i>Pectenota plumbea</i>	Blue Felt Lichen	Special Concern	Special Concern	Vulnerable	S3	6	0.5 $\pm$ 0.0
N	<i>Peltigera collina</i>	Tree Pelt Lichen				S2?	2	1.6 $\pm$ 4.0
N	<i>Usnea rubicunda</i>	Red Beard Lichen				S2S3	1	3.1 $\pm$ 0.0
N	<i>Fuscopannaria ahlneri</i>	Corrugated Shingles Lichen				S3	1	4.5 $\pm$ 0.0
N	<i>Moelleropsis nebulosa</i>	Blue-gray Moss Shingle Lichen				S3	1	4.4 $\pm$ 0.0
N	<i>Fuscopannaria sorediata</i>	a Lichen				S3	3	0.3 $\pm$ 0.0
N	<i>Coccocarpia palmicola</i>	Salted Shell Lichen				S3S4	8	3.1 $\pm$ 0.0
P	<i>Sparganium hyperboreum</i>	Northern Burreed				S1S2	1	4.2 $\pm$ 0.0
P	<i>Betula michauxii</i>	Michaux's Dwarf Birch				S2S3	8	2.5 $\pm$ 0.0
P	<i>Geocaulon lividum</i>	Northern Comandra				S3	2	1.3 $\pm$ 0.0
P	<i>Agalinis neoscotica</i>	Nova Scotia Agalinis				S3S4	2	0.7 $\pm$ 4.0

4.2 FAUNA

	Scientific Name	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	# recs	Distance (km)
A	<i>Salmo salar</i> pop. 6	Atlantic Salmon - Nova Scotia Southern Upland pop.	Endangered			S1	2	2.5 $\pm$ 1.0
A	<i>Riparia riparia</i>	Bank Swallow	Threatened	Threatened	Endangered	S2S3B	1	2.3 $\pm$ 7.0
A	<i>Hirundo rustica</i>	Barn Swallow	Threatened	Threatened	Endangered	S2S3B	1	2.3 $\pm$ 7.0
A	<i>Cardellina canadensis</i>	Canada Warbler	Threatened	Threatened	Endangered	S3B	1	2.3 $\pm$ 7.0
A	<i>Asio flammeus</i>	Short-eared Owl	Special Concern	Special Concern		S1S2B	2	2.3 $\pm$ 7.0
A	<i>Chordeiles minor</i>	Common Nighthawk	Special Concern	Threatened	Threatened	S2B	1	2.3 $\pm$ 7.0
A	<i>Contopus cooperi</i>	Olive-sided Flycatcher	Special Concern	Threatened	Threatened	S2B	2	0.7 $\pm$ 0.0
A	<i>Coccothraustes vespertinus</i>	Evening Grosbeak	Special Concern	Special Concern	Vulnerable	S3S4B,S3N	1	2.3 $\pm$ 7.0
A	<i>Circus hudsonius</i>	Northern Harrier	Not At Risk			S3S4B	2	1.3 $\pm$ 0.0
A	<i>Alces americanus</i>	Moose			Endangered	S1	3	3.4 $\pm$ 0.0
A	<i>Setophaga tigrina</i>	Cape May Warbler				S2B	1	3.9 $\pm$ 0.0
A	<i>Asio otus</i>	Long-eared Owl				S2S3	2	2.3 $\pm$ 7.0
A	<i>Perisoreus canadensis</i>	Canada Jay				S3	2	3.9 $\pm$ 0.0
A	<i>Poecile hudsonicus</i>	Boreal Chickadee				S3	3	2.3 $\pm$ 7.0
A	<i>Sitta canadensis</i>	Red-breasted Nuthatch				S3	1	2.3 $\pm$ 7.0
A	<i>Salvelinus fontinalis</i>	Brook Trout				S3	1	2.5 $\pm$ 1.0
A	<i>Dumetella carolinensis</i>	Gray Catbird				S3B	1	2.3 $\pm$ 7.0
A	<i>Cardellina pusilla</i>	Wilson's Warbler				S3B	6	0.7 $\pm$ 0.0
A	<i>Tringa melanoleuca</i>	Greater Yellowlegs				S3B,S3S4M	1	2.3 $\pm$ 7.0
A	<i>Somateria mollissima</i>	Common Eider				S3S4	4	2.1 $\pm$ 0.0
A	<i>Actitis macularia</i>	Spotted Sandpiper				S3S4B	2	2.3 $\pm$ 7.0
A	<i>Empidonax flaviventris</i>	Yellow-bellied Flycatcher				S3S4B	7	1.3 $\pm$ 0.0
A	<i>Regulus calendula</i>	Ruby-crowned Kinglet				S3S4B	13	0.7 $\pm$ 0.0
A	<i>Catharus fuscescens</i>	Veery				S3S4B	1	2.3 $\pm$ 7.0
A	<i>Catharus ustulatus</i>	Swainson's Thrush				S3S4B	10	2.2 $\pm$ 0.0
A	<i>Oreothlypis peregrina</i>	Tennessee Warbler				S3S4B	2	2.3 $\pm$ 7.0
A	<i>Setophaga castanea</i>	Bay-breasted Warbler				S3S4B	3	2.3 $\pm$ 7.0
A	<i>Setophaga striata</i>	Blackpoll Warbler				S3S4B	2	2.3 $\pm$ 7.0
A	<i>Passerella iliaca</i>	Fox Sparrow				S3S4B	2	2.3 $\pm$ 7.0

	Scientific Name	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	# recs	Distance (km)
A	<i>Mergus serrator</i>	Red-breasted Merganser				S3S4B,S5N	1	2.3 ± 7.0
I	<i>Callophrys henrici</i>	Henry's Elfin				S3	1	2.9 ± 0.0
I	<i>Amblyscirtes vialis</i>	Common Roadside-Skipper				S3S4	1	2.9 ± 0.0

4.3 LOCATION SENSITIVE SPECIES

The Department of Natural Resources in each Maritimes province considers a number of species “location sensitive”. Concern about exploitation of location-sensitive species precludes inclusion of precise coordinates in this report. Those intersecting your study area are indicated below with “YES”.

Nova Scotia

Scientific Name	Common Name	SARA	Prov Legal Prot	Known within the Study Site?
<i>Fraxinus nigra</i>	Black Ash		Threatened	No
<i>Emydoidea blandingii</i>	Blanding's Turtle - Nova Scotia pop.	Endangered	Vulnerable	No
<i>Glyptemys insculpta</i>	Wood Turtle	Threatened	Threatened	No
<i>Falco peregrinus</i> pop. 1	Peregrine Falcon - anatum/tundrius pop.	Special Concern	Vulnerable	No
Bat hibernaculum or bat species occurrence		[Endangered]¹	[Endangered]¹	YES

¹ *Myotis lucifugus* (Little Brown Myotis), *Myotis septentrionalis* (Long-eared Myotis), and *Perimyotis subflavus* (Tri-colored Bat or Eastern Pipistrelle) are all Endangered under the Federal Species at Risk Act and the NS Endangered Species Act.

4.4 SOURCE BIBLIOGRAPHY

The recipient of these data shall acknowledge the AC CDC and the data sources listed below in any documents, reports, publications or presentations, in which this dataset makes a significant contribution.

# recs	CITATION
43	Bell, G. 2018. Moose, bat and bird records from Goldboro LNG Project, NS, Environmental Assessment. Amec Foster Wheeler.
34	Lepage, D. 2014. Maritime Breeding Bird Atlas Database. Bird Studies Canada, Sackville NB, 407,838 recs.
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11	LaPaix, R.W.; Crowell, M.J.; MacDonald, M.; Neily, T.D.; Quinn, G. 2017. Stantec Nova Scotia rare plant records, 2012-2016. Stantec Consulting.
8	iNaturalist. 2020. iNaturalist Data Export 2020. iNaturalist.org and iNaturalist.ca, Web site: 128728 recs.
4	Benjamin, L.K. (compiler). 2007. Significant Habitat & Species Database. Nova Scotia Dept Natural Resources, 8439 recs.
2	Klymko, J. 2018. Maritimes Butterfly Atlas database. Atlantic Canada Conservation Data Centre.
1	Cameron, R.P. 2009. Erioderma pedicellatum database, 1979-2008. Dept Environment & Labour, 103 recs.
1	Munro, Marian K. Nova Scotia Provincial Museum of Natural History Herbarium Database. Nova Scotia Provincial Museum of Natural History, Halifax, Nova Scotia. 2014.
1	Munro, Marian K. Tracked lichen specimens, Nova Scotia Provincial Museum of Natural History Herbarium. Atlantic Canada Conservation Data Centre. 2019.
1	Neily, T.H. & Pepper, C.; Toms, B. 2013. Nova Scotia lichen location database. Mersey Tobeatic Research Institute, 1301 records.
1	Neily, T.H. & Pepper, C.; Toms, B. 2020. Nova Scotia lichen database [as of 2020-03-18]. Mersey Tobeatic Research Institute.
1	Neily, T.H. 2010. Erioderma Pedicellatum records 2005-09. Mersey Tobatic Research Institute, 67 recs.
1	Newell, R.E. 2000. E.C. Smith Herbarium Database. Acadia University, Wolfville NS, 7139 recs.

5.0 RARE SPECIES WITHIN 100 KM

A 100 km buffer around the study area contains 20,364 records of 143 vertebrate and 435 records of 47 invertebrate fauna; 3536 records of 227 vascular and 1819 records of 91 nonvascular flora (attached: *ob100km.xls).

Taxa within 100 km of the study site that are rare and/or endangered in the province in which the study site occurs (including “location-sensitive” species). All ranks correspond to the province in which the study site falls, even for out-of-province records. Taxa are listed in order of concern, beginning with legally listed taxa, with the number of observations per taxon and the distance in kilometers from study area centroid to the closest observation (± the precision, in km, of the record).

Taxonomic Group	Scientific Name	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	# recs	Distance (km)	Prov
A	<i>Myotis lucifugus</i>	Little Brown Myotis	Endangered	Endangered	Endangered	S1	42	27.7 ± 0.0	NS
A	<i>Salmo salar pop. 1</i>	Atlantic Salmon - Inner Bay of Fundy pop.	Endangered	Endangered		S1	1	95.9 ± 0.0	NS
A	<i>Salmo salar pop. 4</i>	Atlantic Salmon - Eastern Cape Breton pop.	Endangered			S1	10	55.7 ± 0.0	NS
A	<i>Salmo salar pop. 6</i>	Atlantic Salmon - Nova Scotia Southern Upland pop.	Endangered			S1	35	2.5 ± 1.0	NS
A	<i>Charadrius melodus melodus</i>	Piping Plover melodus ssp	Endangered	Endangered	Endangered	S1B	728	18.0 ± 7.0	NS
A	<i>Sterna dougallii</i>	Roseate Tern	Endangered	Endangered	Endangered	S1B	76	10.5 ± 0.0	NS
A	<i>Dermochelys coriacea (Atlantic pop.)</i>	Leatherback Sea Turtle - Atlantic pop.	Endangered	Endangered		S1S2N	2	51.9 ± 0.0	NS
A	<i>Calidris canutus rufa</i>	Red Knot rufa ssp	Endangered	Endangered	Endangered	S2M	17	13.1 ± 0.0	NS
A	<i>Pagophila eburnea</i>	Ivory Gull	Endangered	Endangered		SNA	1	82.4 ± 0.0	NS
A	<i>Anthus vociferus</i>	Eastern Whip-Poor-Will	Threatened	Threatened	Threatened	S1?B	2	58.5 ± 7.0	NS
A	<i>Catharus bicknelli</i>	Bicknell's Thrush	Threatened	Threatened	Endangered	S1S2B	1	75.8 ± 7.0	NS
A	<i>Limosa haemastica</i>	Hudsonian Godwit	Threatened			S1S2M	5	54.6 ± 0.0	NS
A	<i>Glyptemys insculpta</i>	Wood Turtle	Threatened	Threatened	Threatened	S2	3865	22.1 ± 10.0	NS
A	<i>Anguilla rostrata</i>	American Eel	Threatened			S2	3	81.9 ± 0.0	NS
A	<i>Chaetura pelagica</i>	Chimney Swift	Threatened	Threatened	Endangered	S2B,S1M	155	20.5 ± 7.0	NS
A	<i>Riparia riparia</i>	Bank Swallow	Threatened	Threatened	Endangered	S2S3B	566	2.3 ± 7.0	NS
A	<i>Hirundo rustica</i>	Barn Swallow	Threatened	Threatened	Endangered	S2S3B	448	2.3 ± 7.0	NS
A	<i>Cardellina canadensis</i>	Canada Warbler	Threatened	Threatened	Endangered	S3B	400	2.3 ± 7.0	NS
A	<i>Dolichonyx oryzivorus</i>	Bobolink	Threatened	Threatened	Vulnerable	S3S4B	197	16.4 ± 7.0	NS
A	<i>Sturnella magna</i>	Eastern Meadowlark	Threatened	Threatened		SHB	2	24.3 ± 0.0	NS
A	<i>Hylocichla mustelina</i>	Wood Thrush	Threatened	Threatened		SUB	8	12.0 ± 7.0	NS
A	<i>Salmo salar pop. 12</i>	Atlantic Salmon - Gaspé - Southern Gulf of St Lawrence pop.	Special Concern			S1	23	43.5 ± 50.0	NS
A	<i>Passerculus sandwichensis princeps</i>	Savannah Sparrow princeps ssp	Special Concern	Special Concern		S1B	3	16.4 ± 7.0	NS
A	<i>Bucephala islandica (Eastern pop.)</i>	Barrow's Goldeneye - Eastern pop.	Special Concern	Special Concern		S1N	2	90.7 ± 0.0	NS
A	<i>Asio flammeus</i>	Short-eared Owl	Special Concern	Special Concern		S1S2B	4	2.3 ± 7.0	NS
A	<i>Euphagus carolinus</i>	Rusty Blackbird	Special Concern	Special Concern	Endangered	S2B	174	17.2 ± 0.0	NS
A	<i>Chordeiles minor</i>	Common Nighthawk	Special Concern	Threatened	Threatened	S2B	199	2.3 ± 7.0	NS
A	<i>Contopus cooperi</i>	Olive-sided Flycatcher	Special Concern	Threatened	Threatened	S2B	619	0.7 ± 0.0	NS
A	<i>Histrionicus histrionicus pop. 1</i>	Harlequin Duck - Eastern pop.	Special Concern	Special Concern	Endangered	S2N	37	13.1 ± 0.0	NS
A	<i>Balaenoptera physalus</i>	Fin Whale	Special Concern	Special Concern		S2S3	2	100.0 ± 0.0	NS
A	<i>Morone saxatilis pop. 1</i>	Striped Bass- Southern Gulf of St Lawrence pop.	Special Concern			S2S3N	1	53.1 ± 1.0	NS
A	<i>Chelydra serpentina</i>	Snapping Turtle	Special Concern	Special Concern	Vulnerable	S3	31	28.8 ± 0.0	NS
A	<i>Contopus virens</i>	Eastern Wood-Pewee	Special Concern	Special Concern	Vulnerable	S3S4B	229	12.0 ± 7.0	NS
A	<i>Coccythraustes vespertinus</i>	Evening Grosbeak	Special Concern	Special Concern	Vulnerable	S3S4B,S3N	246	2.3 ± 7.0	NS
A	<i>Phocoena phocoena pop. 1</i>	Harbour Porpoise - Northwest Atlantic pop.	Special Concern			S4	1	52.2 ± 0.0	NS
A	<i>Podiceps auritus</i>	Horned Grebe	Special Concern	Special Concern		S4N	6	51.4 ± 0.0	NS
A	<i>Chrysemys picta picta</i>	Eastern Painted Turtle	Special Concern			S4S5	2	45.3 ± 1.0	NS
A	<i>Calidris subruficollis</i>	Buff-breasted Sandpiper	Special Concern	Special Concern		SNA	1	85.2 ± 0.0	NS
A	<i>Lynx canadensis</i>	Canadian Lynx	Not At Risk		Endangered	S1	6	68.2 ± 1.0	NS
A	<i>Accipiter cooperii</i>	Cooper's Hawk	Not At Risk			S1?B	2	98.2 ± 0.0	NS
A	<i>Chlidonias niger</i>	Black Tern	Not At Risk			S1B	3	13.1 ± 0.0	NS
A	<i>Falco peregrinus pop. 1</i>	Peregrine Falcon - anatum/tundrius	Not At Risk	Special Concern	Vulnerable	S1B,SNAM	3	52.1 ± 7.0	NS
A	<i>Aegolius funereus</i>	Boreal Owl	Not At Risk			S2?B	5	31.4 ± 7.0	NS
A	<i>Hemidactylium scutatum</i>	Four-toed Salamander	Not At Risk			S3	11	14.5 ± 0.0	NS
A	<i>Megaptera novaeangliae</i>	Humpback Whale (NW)	Not At Risk			S3	2	52.2 ± 0.0	NS

Taxonomic Group	Scientific Name	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	# recs	Distance (km)	Prov
A	<i>Sterna hirundo</i>	Atlantic pop.) Common Tern	Not At Risk			S3B	387	8.0 ± 7.0	NS
A	<i>Sialia sialis</i>	Eastern Bluebird	Not At Risk			S3B	14	12.1 ± 7.0	NS
A	<i>Buteo lagopus</i>	Rough-legged Hawk	Not At Risk			S3N	5	25.9 ± 6.0	NS
A	<i>Accipiter gentilis</i>	Northern Goshawk	Not At Risk			S3S4	55	18.0 ± 7.0	NS
A	<i>Lagenorhynchus acutus</i>	Atlantic White-sided Dolphin	Not At Risk			S3S4	4	52.3 ± 0.0	NS
A	<i>Circus hudsonius</i>	Northern Harrier	Not At Risk			S3S4B	195	1.3 ± 0.0	NS
A	<i>Ammospiza nelsoni</i>	Nelson's Sparrow	Not At Risk			S3S4B	79	8.0 ± 7.0	NS
A	<i>Morone saxatilis</i>	Striped Bass	E,SC			S2S3	1	57.7 ± 0.0	NS
A	<i>Alces americanus</i>	Moose			Endangered	S1	61	3.4 ± 0.0	NS
A	<i>Picoides dorsalis</i>	American Three-toed Woodpecker				S1?	4	22.5 ± 7.0	NS
A	<i>Passerina cyanea</i>	Indigo Bunting				S1?B	4	38.4 ± 7.0	NS
A	<i>Uria aalge</i>	Common Murre				S1?B,S5N	1	78.3 ± 0.0	NS
A	<i>Nycticorax nycticorax</i>	Black-crowned Night-heron				S1B	1	62.9 ± 7.0	NS
A	<i>Anas acuta</i>	Northern Pintail				S1B	3	38.4 ± 7.0	NS
A	<i>Oxyura jamaicensis</i>	Ruddy Duck				S1B	2	50.5 ± 7.0	NS
A	<i>Haematopus palliatus</i>	American Oystercatcher				S1B	7	51.5 ± 7.0	NS
A	<i>Myiarchus crinitus</i>	Great Crested Flycatcher				S1B	1	100.0 ± 7.0	NS
A	<i>Mimus polyglottos</i>	Northern Mockingbird				S1B	16	13.2 ± 0.0	NS
A	<i>Toxostoma rufum</i>	Brown Thrasher				S1B	4	48.2 ± 0.0	NS
A	<i>Vireo gilvus</i>	Warbling Vireo				S1B	5	53.7 ± 7.0	NS
A	<i>Setophaga pinus</i>	Pine Warbler				S1B	4	51.4 ± 0.0	NS
A	<i>Calidris minutilla</i>	Least Sandpiper				S1B,S3M	147	13.2 ± 0.0	NS
A	<i>Charadrius semipalmatus</i>	Semipalmated Plover				S1B,S3S4M	246	12.5 ± 0.0	NS
A	<i>Vespertilionidae sp.</i>	bat species				S1S2	64	3.2 ± 0.0	NS
A	<i>Pluvialis dominica</i>	American Golden-Plover				S1S2M	22	54.6 ± 0.0	NS
A	<i>Vireo philadelphicus</i>	Philadelphia Vireo				S2?B	16	13.1 ± 0.0	NS
A	<i>Spatula clypeata</i>	Northern Shoveler				S2B	1	93.9 ± 0.0	NS
A	<i>Mareca strepera</i>	Gadwall				S2B	2	49.4 ± 0.0	NS
A	<i>Empidonax traillii</i>	Willow Flycatcher				S2B	4	38.4 ± 7.0	NS
A	<i>Setophaga tigrina</i>	Cape May Warbler				S2B	73	3.9 ± 0.0	NS
A	<i>Piranga olivacea</i>	Scarlet Tanager				S2B	5	51.1 ± 7.0	NS
A	<i>Poocetes gramineus</i>	Vesper Sparrow				S2B	6	22.5 ± 7.0	NS
A	<i>Molothrus ater</i>	Brown-headed Cowbird				S2B	31	20.5 ± 7.0	NS
A	<i>Bucephala clangula</i>	Common Goldeneye				S2B,S5N	111	7.1 ± 12.0	NS
A	<i>Branta bernicla</i>	Brant				S2M	1	36.1 ± 16.0	NS
A	<i>Phalacrocorax carbo</i>	Great Cormorant				S2S3	94	13.1 ± 0.0	NS
A	<i>Asio otus</i>	Long-eared Owl				S2S3	23	2.3 ± 7.0	NS
A	<i>Spinus pinus</i>	Pine Siskin				S2S3	220	8.0 ± 7.0	NS
A	<i>Cathartes aura</i>	Turkey Vulture				S2S3B	2	85.8 ± 0.0	NS
A	<i>Rallus limicola</i>	Virginia Rail				S2S3B	7	39.0 ± 7.0	NS
A	<i>Tringa semipalmata</i>	Willet				S2S3B	537	8.0 ± 7.0	NS
A	<i>Petrochelidon pyrrhonota</i>	Cliff Swallow				S2S3B	101	16.4 ± 7.0	NS
A	<i>Pheucticus ludovicianus</i>	Rose-breasted Grosbeak				S2S3B	161	8.0 ± 7.0	NS
A	<i>Icterus galbula</i>	Baltimore Oriole				S2S3B	22	37.3 ± 7.0	NS
A	<i>Pinicola enucleator</i>	Pine Grosbeak				S2S3B,S5N	78	12.0 ± 7.0	NS
A	<i>Numenius phaeopus hudsonicus</i>	Hudsonian Whimbrel				S2S3M	57	13.1 ± 0.0	NS
A	<i>Calidris melanotos</i>	Pectoral Sandpiper				S2S3M	27	13.2 ± 0.0	NS
A	<i>Perisoreus canadensis</i>	Canada Jay				S3	365	3.9 ± 0.0	NS
A	<i>Poecile hudsonicus</i>	Boreal Chickadee				S3	667	2.3 ± 7.0	NS
A	<i>Sitta canadensis</i>	Red-breasted Nuthatch				S3	486	2.3 ± 7.0	NS
A	<i>Alosa pseudoharengus</i>	Alewife				S3	19	19.1 ± 1.0	NS
A	<i>Salvelinus fontinalis</i>	Brook Trout				S3	43	2.5 ± 1.0	NS
A	<i>Salvelinus namaycush</i>	Lake Trout				S3	1	81.0 ± 0.0	NS
A	<i>Menidia menidia</i>	Atlantic Silverside				S3	2	78.6 ± 0.0	NS
A	<i>Pekania pennanti</i>	Fisher				S3	5	40.1 ± 7.0	NS

Taxonomic Group	Scientific Name	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	# recs	Distance (km)	Prov
A	<i>Calidris maritima</i>	Purple Sandpiper				S3?N	31	13.1 ± 0.0	NS
A	<i>Calcarius lapponicus</i>	Lapland Longspur				S3?N	2	59.7 ± 0.0	NS
A	<i>Falco sparverius</i>	American Kestrel				S3B	227	12.1 ± 7.0	NS
A	<i>Charadrius vociferus</i>	Killdeer				S3B	159	16.4 ± 7.0	NS
A	<i>Gallinago delicata</i>	Wilson's Snipe				S3B	239	8.0 ± 7.0	NS
A	<i>Sterna paradisaea</i>	Arctic Tern				S3B	109	8.0 ± 7.0	NS
A	<i>Coccyzus erythrophthalmus</i>	Black-billed Cuckoo				S3B	44	22.5 ± 7.0	NS
A	<i>Tyrannus tyrannus</i>	Eastern Kingbird				S3B	73	13.1 ± 0.0	NS
A	<i>Dumetella carolinensis</i>	Gray Catbird				S3B	165	2.3 ± 7.0	NS
A	<i>Cardellina pusilla</i>	Wilson's Warbler				S3B	68	0.7 ± 0.0	NS
A	<i>Tringa melanoleuca</i>	Greater Yellowlegs				S3B,S3S4M	304	2.3 ± 7.0	NS
A	<i>Oceanodroma leucorhoa</i>	Leach's Storm-Petrel				S3B,S5M	67	13.1 ± 0.0	NS
A	<i>Rissa tridactyla</i>	Black-legged Kittiwake				S3B,S5N	2	13.4 ± 0.0	NS
A	<i>Fratercula arctica</i>	Atlantic Puffin				S3B,S5N	4	13.1 ± 0.0	NS
A	<i>Pluvialis squatarola</i>	Black-bellied Plover				S3M	190	13.0 ± 0.0	NS
A	<i>Tringa flavipes</i>	Lesser Yellowlegs				S3M	229	13.1 ± 0.0	NS
A	<i>Arenaria interpres</i>	Ruddy Turnstone				S3M	85	13.1 ± 0.0	NS
A	<i>Calidris pusilla</i>	Semipalmated Sandpiper				S3M	194	13.1 ± 0.0	NS
A	<i>Calidris fuscicollis</i>	White-rumped Sandpiper				S3M	58	59.2 ± 0.0	NS
A	<i>Limnodromus griseus</i>	Short-billed Dowitcher				S3M	122	13.1 ± 0.0	NS
A	<i>Calidris alba</i>	Sanderling				S3M,S2N	108	13.1 ± 0.0	NS
A	<i>Chroicocephalus ridibundus</i>	Black-headed Gull				S3N	18	54.2 ± 0.0	NS
A	<i>Somateria mollissima</i>	Common Eider				S3S4	553	2.1 ± 0.0	NS
A	<i>Picoides arcticus</i>	Black-backed Woodpecker				S3S4	91	8.0 ± 7.0	NS
A	<i>Loxia curvirostra</i>	Red Crossbill				S3S4	56	18.0 ± 7.0	NS
A	<i>Botaurus lentiginosus</i>	American Bittern				S3S4B	141	20.6 ± 0.0	NS
A	<i>Spatula discors</i>	Blue-winged Teal				S3S4B	71	19.1 ± 7.0	NS
A	<i>Actitis macularia</i>	Spotted Sandpiper				S3S4B	511	2.3 ± 7.0	NS
A	<i>Empidonax flaviventris</i>	Yellow-bellied Flycatcher				S3S4B	539	1.3 ± 0.0	NS
A	<i>Regulus calendula</i>	Ruby-crowned Kinglet				S3S4B	1221	0.7 ± 0.0	NS
A	<i>Catharus fuscescens</i>	Veery				S3S4B	211	2.3 ± 7.0	NS
A	<i>Catharus ustulatus</i>	Swainson's Thrush				S3S4B	954	2.2 ± 0.0	NS
A	<i>Oreothlypis peregrina</i>	Tennessee Warbler				S3S4B	159	2.3 ± 7.0	NS
A	<i>Setophaga castanea</i>	Bay-breasted Warbler				S3S4B	311	2.3 ± 7.0	NS
A	<i>Setophaga striata</i>	Blackpoll Warbler				S3S4B	89	2.3 ± 7.0	NS
A	<i>Passerella iliaca</i>	Fox Sparrow				S3S4B	87	2.3 ± 7.0	NS
A	<i>Mergus serrator</i>	Red-breasted Merganser				S3S4B,S5N	116	2.3 ± 7.0	NS
A	<i>Bucephala albeola</i>	Bufflehead				S3S4N	38	7.1 ± 12.0	NS
A	<i>Lanius borealis</i>	Northern Shrike				S3S4N	1	78.7 ± 1.0	NS
A	<i>Leucophaeus atricilla</i>	Laughing Gull				SHB	3	13.1 ± 0.0	NS
A	<i>Progne subis</i>	Purple Martin				SHB	4	13.1 ± 0.0	NS
A	<i>Eremophila alpestris</i>	Horned Lark				SHB,S4S5N	1	82.9 ± 7.0	NS
A	<i>Morus bassanus</i>	Northern Gannet				SHB,S5M	34	13.2 ± 0.0	NS
I	<i>Danaus plexippus</i>	Monarch	Endangered	Special Concern	Endangered	S2B	35	13.0 ± 0.0	NS
I	<i>Alasmodonta varicosa</i>	Brook Floater	Special Concern	Special Concern	Threatened	S1S2	8	21.0 ± 0.0	NS
I	<i>Bombus terricola</i>	Yellow-banded Bumblebee	Special Concern	Special Concern	Vulnerable	S3	2	20.4 ± 0.0	NS
I	<i>Neurocordulia michaeli</i>	Broadtailed Shadowdragon				S1	26	27.1 ± 0.0	NS
I	<i>Lycaena dorcas</i>	Dorcas Copper				S1?	19	82.5 ± 0.0	NS
I	<i>Strymon melinus</i>	Grey Hairstreak				S1S2	2	71.3 ± 1.0	NS
I	<i>Nymphalis l-album</i>	Compton Tortoiseshell				S1S2	1	90.3 ± 2.0	NS
I	<i>Haematopota rara</i>	Shy Cleg				S1S3	1	85.3 ± 0.0	NS
I	<i>Lycaena hyllus</i>	Bronze Copper				S2	2	36.1 ± 0.0	NS
I	<i>Lycaena dospassosi</i>	Salt Marsh Copper				S2	1	97.2 ± 0.0	NS
I	<i>Satyrus calanus</i>	Banded Hairstreak				S2	1	89.9 ± 2.0	NS
I	<i>Aglais milberti</i>	Milbert's Tortoiseshell				S2	1	90.3 ± 2.0	NS
I	<i>Margaritifera margaritifera</i>	Eastern Pearlshell				S2	67	20.2 ± 0.0	NS
I	<i>Pantala hymenaea</i>	Spot-Winged Glider				S2?B	1	36.1 ± 1.0	NS
I	<i>Thorybes pylades</i>	Northern Cloudywing				S2S3	19	36.2 ± 0.0	NS

Taxonomic Group	Scientific Name	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	# recs	Distance (km)	Prov
I	<i>Amblyscirtes hegon</i>	Pepper and Salt Skipper				S2S3	5	32.1 ± 0.0	NS
I	<i>Satyrus liparops</i>	Striped Hairstreak				S2S3	4	89.2 ± 1.0	NS
I	<i>Euphydryas phaeton</i>	Baltimore Checkerspot				S2S3	24	24.0 ± 0.0	NS
I	<i>Gomphus desertus</i>	Harpoon Clubtail				S2S3	16	69.0 ± 0.0	NS
I	<i>Ophiogomphus aspersus</i>	Brook Snaketail				S2S3	5	69.0 ± 0.0	NS
I	<i>Ophiogomphus mainensis</i>	Maine Snaketail				S2S3	14	54.0 ± 0.0	NS
I	<i>Ophiogomphus rupinsulensis</i>	Rusty Snaketail				S2S3	36	27.1 ± 0.0	NS
I	<i>Alasmodonta undulata</i>	Triangle Floater				S2S3	7	33.9 ± 0.0	NS
I	<i>Naemia seriata</i>	a Ladybird beetle				S3	1	54.8 ± 0.0	NS
I	<i>Iphthimimus opacus</i>	a Darkling Beetle				S3	1	85.8 ± 0.0	NS
I	<i>Monochamus marmorator</i>	a Longhorned Beetle				S3	2	20.3 ± 0.0	NS
I	<i>Callophrys henrici</i>	Henry's Elfin				S3	2	2.9 ± 0.0	NS
I	<i>Callophrys lanoraieensis</i>	Bog Elfin				S3	1	72.3 ± 1.0	NS
I	<i>Speyeria aphrodite</i>	Aphrodite Fritillary				S3	4	44.7 ± 100.0	NS
I	<i>Polygonia faunus</i>	Green Comma				S3	7	36.1 ± 0.0	NS
I	<i>Megisto cymela</i>	Little Wood-satyr				S3	1	79.5 ± 1.0	NS
I	<i>Oeneis jutta</i>	Jutta Arctic				S3	4	39.7 ± 0.0	NS
I	<i>Aeshna clepsydra</i>	Mottled Darner				S3	3	46.1 ± 1.0	NS
I	<i>Aeshna constricta</i>	Lance-Tipped Darner				S3	1	99.5 ± 1.0	NS
I	<i>Boyeria grafiana</i>	Ocellated Darner				S3	7	27.2 ± 0.0	NS
I	<i>Gomphaeschna furcillata</i>	Harlequin Darner				S3	3	56.6 ± 0.0	NS
I	<i>Nannothemis bella</i>	Elfin Skimmer				S3	3	56.6 ± 0.0	NS
I	<i>Sympetrum danae</i>	Black Meadowhawk				S3	8	7.6 ± 0.0	NS
I	<i>Enallagma vernale</i>	Vernal Bluet				S3	4	64.1 ± 0.0	NS
I	<i>Amphiagrion saucium</i>	Eastern Red Damsel				S3	4	85.3 ± 0.0	NS
I	<i>Cupido comyntas</i>	Eastern Tailed Blue				S3?	1	71.5 ± 0.0	NS
I	<i>Polygonia interrogationis</i>	Question Mark				S3B	18	17.6 ± 0.0	NS
I	<i>Erynnis juvenalis</i>	Juvenal's Duskywing				S3S4	1	51.0 ± 1.0	NS
I	<i>Amblyscirtes vialis</i>	Common Roadside-Skipper				S3S4	16	2.9 ± 0.0	NS
I	<i>Polygonia progne</i>	Grey Comma				S3S4	20	34.0 ± 0.0	NS
I	<i>Lanthus parvulus</i>	Northern Pygmy Clubtail				S3S4	10	28.6 ± 0.0	NS
I	<i>Lampsilis radiata</i>	Eastern Lampmussel				S3S4	16	28.4 ± 0.0	NS
N	<i>Erioderma pedicellatum</i> (Atlantic pop.)	Boreal Felt Lichen - Atlantic pop.	Endangered	Endangered	Endangered	S1	488	4.4 ± 0.0	NS
N	<i>Erioderma mollissimum</i>	Graceful Felt Lichen	Endangered	Endangered	Endangered	S1S2	14	45.1 ± 0.0	NS
N	<i>Peltigera hydrothyrta</i>	Eastern Waterfan	Threatened	Threatened	Threatened	S1	6	49.6 ± 0.0	NS
N	<i>Pannaria lurida</i>	Wrinkled Shingle Lichen	Threatened	Threatened	Threatened	S1S2	1	97.7 ± 0.0	NS
N	<i>Fuscopannaria leucosticta</i>	White-rimmed Shingle Lichen	Threatened			S2S3	5	67.6 ± 0.0	NS
N	<i>Anzia colpodes</i>	Black-foam Lichen	Threatened	Threatened	Threatened	S3	8	50.7 ± 0.0	NS
N	<i>Sclerophora peronella</i> (Atlantic pop.)	Frosted Glass-whiskers (Atlantic population)	Special Concern	Special Concern		S1?	21	11.2 ± 0.0	NS
N	<i>Pectenaria plumbea</i>	Blue Felt Lichen	Special Concern	Special Concern	Vulnerable	S3	146	0.5 ± 0.0	NS
N	<i>Fissidens exilis</i>	Pygmy Pocket Moss	Not At Risk			S1S2	5	42.2 ± 0.0	NS
N	<i>Pseudevernia cladonia</i>	Ghost Antler Lichen	Not At Risk			S2S3	4	10.5 ± 0.0	NS
N	<i>Cinclidium stygium</i>	Sooty Cupola Moss				S1	2	88.0 ± 0.0	NS
N	<i>Cladonia brevis</i>	Short Peg Lichen				S1	1	85.6 ± 0.0	NS
N	<i>Conardia compacta</i>	Coast Creeping Moss				S1?	1	99.8 ± 2.0	NS
N	<i>Oligotrichum hercynicum</i>	Hercynian Hair Moss				S1?	1	98.0 ± 0.0	NS
N	<i>Lichina confinis</i>	Marine Seaweed Lichen				S1?	2	89.1 ± 2.0	NS
N	<i>Polychidium muscicola</i>	Eyed Mossthorns				S1?	2	43.9 ± 0.0	NS
N	<i>Parmeliella parvula</i>	Woollybear Lichen				S1?	6	9.8 ± 0.0	NS
N	<i>Sphagnum platyphyllum</i>	Poor-man's Shingles Lichen				S1S2	4	82.0 ± 0.0	NS
N	<i>Cyrtio-hypnum minutulum</i>	Flat-leaved Peat Moss				S1S2	1	77.0 ± 0.0	NS
N	<i>Hamatocaulis vernicosus</i>	Tiny Cedar Moss				S1S2	1	91.2 ± 0.0	NS
N	<i>Barbilophozia lycopodioides</i>	a Moss				S1S2	1	91.2 ± 0.0	NS
N	<i>Barbilophozia lycopodioides</i>	Greater Pawwort				S1S3	1	98.9 ± 0.0	NS
N	<i>Peltigera neckeri</i>	Black-saddle Pelt Lichen				S1S3	1	52.9 ± 0.0	NS

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N	<i>Riccardia multifida</i>	Delicate Germanderwort				S2?	1	20.3 ± 0.0	NS
N	<i>Anacamptodon splachnoides</i>	a Moss				S2?	1	44.6 ± 0.0	NS
N	<i>Anomodon viticulosus</i>	a Moss				S2?	1	99.4 ± 0.0	NS
N	<i>Atrichum angustatum</i>	Lesser Smoothcap Moss				S2?	1	54.9 ± 3.0	NS
N	<i>Campylium polygamum</i>	a Moss				S2?	2	52.9 ± 0.0	NS
N	<i>Campylium radicale</i>	Long-stalked Fine Wet Moss				S2?	1	83.5 ± 0.0	NS
N	<i>Fissidens taxifolius</i>	Yew-leaved Pocket Moss				S2?	2	99.4 ± 0.0	NS
N	<i>Platydictya jungermannioides</i>	False Willow Moss				S2?	3	59.1 ± 0.0	NS
N	<i>Pohlia sphagnicola</i>	a moss				S2?	1	36.4 ± 0.0	NS
N	<i>Scorpidium scorpioides</i>	Hooked Scorpion Moss				S2?	2	83.4 ± 0.0	NS
N	<i>Sphagnum subnitens</i>	Lustrous Peat Moss				S2?	2	94.3 ± 0.0	NS
N	<i>Tetraplodon angustatus</i>	Toothed-leaved Nitrogen Moss				S2?	3	41.9 ± 0.0	NS
N	<i>Tortella fragilis</i>	Fragile Twisted Moss				S2?	1	98.8 ± 0.0	NS
N	<i>Leptogium teretiusculum</i>	Beaded Jellyskin Lichen				S2?	4	59.1 ± 0.0	NS
N	<i>Cladonia labradorica</i>	Labrador Lichen				S2?	1	11.0 ± 0.0	NS
N	<i>Peltigera collina</i>	Tree Pelt Lichen				S2?	29	1.6 ± 4.0	NS
N	<i>Tetraplodon mnioides</i>	Entire-leaved Nitrogen Moss				S2S3	1	51.6 ± 0.0	NS
N	<i>Limprichtia revolvens</i>	a Moss				S2S3	5	81.6 ± 0.0	NS
N	<i>Collema leptaleum</i>	Crumpled Bat's Wing Lichen				S2S3	1	55.4 ± 0.0	NS
N	<i>Solorina saccata</i>	Woodland Owl Lichen				S2S3	5	53.5 ± 0.0	NS
N	<i>Ahtiana aurescens</i>	Eastern Candlewax Lichen				S2S3	4	68.2 ± 0.0	NS
N	<i>Cetraria muricata</i>	Spiny Heath Lichen				S2S3	2	5.4 ± 1.0	NS
N	<i>Cladonia incrassata</i>	Powder-foot British Soldiers Lichen				S2S3	1	50.5 ± 0.0	NS
N	<i>Leptogium tenuissimum</i>	Birdnest Jellyskin Lichen				S2S3	12	5.2 ± 0.0	NS
N	<i>Parmelia fertilis</i>	Fertile Shield Lichen				S2S3	1	91.3 ± 0.0	NS
N	<i>Usnea mutabilis</i>	Bloody Beard Lichen				S2S3	1	82.8 ± 0.0	NS
N	<i>Usnea rubicunda</i>	Red Beard Lichen				S2S3	2	3.1 ± 0.0	NS
N	<i>Stereocaulon condensatum</i>	Granular Soil Foam Lichen				S2S3	4	61.8 ± 0.0	NS
N	<i>Cladonia coccifera</i>	Eastern Boreal Pixie-cup Lichen				S2S3	3	22.2 ± 0.0	NS
N	<i>Collema tenax</i>	Soil Tarpaper Lichen				S3	1	56.4 ± 0.0	NS
N	<i>Collema nigrescens</i>	Blistered Tarpaper Lichen				S3	4	59.6 ± 0.0	NS
N	<i>Sticta fuliginosa</i>	Peppered Moon Lichen				S3	14	11.1 ± 0.0	NS
N	<i>Leptogium subtile</i>	Appressed Jellyskin Lichen				S3	5	56.4 ± 0.0	NS
N	<i>Fuscopannaria ahlneri</i>	Corrugated Shingles Lichen				S3	38	4.5 ± 0.0	NS
N	<i>Heterodermia speciosa</i>	Powdered Fringe Lichen				S3	7	29.0 ± 0.0	NS
N	<i>Heterodermia squamulosa</i>	Scaly Fringe Lichen				S3	1	46.5 ± 0.0	NS
N	<i>Leptogium corticola</i>	Blistered Jellyskin Lichen				S3	22	45.8 ± 0.0	NS
N	<i>Leptogium lichenoides</i>	Tattered Jellyskin Lichen				S3	10	50.4 ± 0.0	NS
N	<i>Nephroma bellum</i>	Naked Kidney Lichen				S3	4	60.4 ± 0.0	NS
N	<i>Placynthium nigrum</i>	Common Ink Lichen				S3	1	60.7 ± 10.0	NS
N	<i>Platismatia norvegica</i>	Oldgrowth Rag Lichen				S3	2	14.3 ± 0.0	NS
N	<i>Moelleropsis nebulosa</i>	Blue-gray Moss Shingle Lichen				S3	31	4.4 ± 0.0	NS
N	<i>Fuscopannaria soorediata</i>	a Lichen				S3	7	0.3 ± 0.0	NS
N	<i>Ephebe lanata</i>	Waterside Rockshag Lichen				S3	2	37.4 ± 0.0	NS
N	<i>Anomodon tristis</i>	a Moss				S3?	1	55.6 ± 0.0	NS
N	<i>Sphagnum riparium</i>	Streamside Peat Moss				S3?	2	90.8 ± 0.0	NS
N	<i>Phaeophyscia pusilloides</i>	Pompom-tipped Shadow Lichen				S3?	4	60.1 ± 0.0	NS
N	<i>Cladonia stygia</i>	Black-footed Reindeer Lichen				S3?	2	45.1 ± 0.0	NS
N	<i>Dicranella varia</i>	a Moss				S3S4	3	82.9 ± 0.0	NS
N	<i>Dicranum leioneuron</i>	a Dicranum Moss				S3S4	1	57.2 ± 0.0	NS
N	<i>Encalypta procera</i>	Slender Extinguisher Moss				S3S4	5	56.3 ± 0.0	NS

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N	<i>Sphagnum lindbergii</i>	Lindberg's Peat Moss				S3S4	5	36.4 ± 0.0	NS
N	<i>Splachnum ampullaceum</i>	Cruet Dung Moss				S3S4	2	66.5 ± 0.0	NS
N	<i>Schistidium agassizii</i>	Elf Bloom Moss				S3S4	1	27.3 ± 3.0	NS
N	<i>Arctoparmelia incurva</i>	Finger Ring Lichen				S3S4	4	52.1 ± 0.0	NS
N	<i>Hypogymnia vittata</i>	Slender Monk's Hood Lichen				S3S4	123	11.0 ± 0.0	NS
N	<i>Leptogium acadense</i>	Acadian Jellyskin Lichen				S3S4	11	12.0 ± 0.0	NS
N	<i>Cladonia floerkeana</i>	Gritty British Soldiers Lichen				S3S4	1	86.0 ± 0.0	NS
N	<i>Vahlia leucophaea</i>	Shelter Shingle Lichen				S3S4	1	60.5 ± 0.0	NS
N	<i>Melanohalea olivacea</i>	Spotted Camouflage Lichen				S3S4	1	74.8 ± 0.0	NS
N	<i>Parmotrema chinense</i>	Powdered Ruffle Lichen				S3S4	1	46.3 ± 0.0	NS
N	<i>Physconia detera</i>	Bottlebrush Frost Lichen				S3S4	1	50.7 ± 0.0	NS
N	<i>Sphaerophorus fragilis</i>	Fragile Coral Lichen				S3S4	1	52.6 ± 0.0	NS
N	<i>Coccocarpia palmicola</i>	Salted Shell Lichen				S3S4	627	3.1 ± 0.0	NS
N	<i>Physcia tenella</i>	Fringed Rosette Lichen				S3S4	1	45.9 ± 3.0	NS
N	<i>Anaptychia palmulata</i>	Shaggy Fringed Lichen				S3S4	23	10.5 ± 0.0	NS
N	<i>Evernia prunastri</i>	Valley Oakmoss Lichen				S3S4	2	58.8 ± 0.0	NS
N	<i>Dermatocarpon luridum</i>	Brookside Stippleback Lichen				S3S4	7	14.6 ± 8.0	NS
N	<i>Heterodermia neglecta</i>	Fringe Lichen				S3S4	22	14.6 ± 0.0	NS
P	<i>Fraxinus nigra</i>	Black Ash	Threatened		Threatened	S1S2	90	35.0 ± 0.0	NS
P	<i>Bartonia paniculata</i> ssp. <i>paniculata</i>	Branched Bartonia	Threatened	Threatened		SNA	1	92.1 ± 10.0	NS
P	<i>Juncus caesariensis</i>	New Jersey Rush	Special Concern	Special Concern	Vulnerable	S2	71	83.4 ± 0.0	NS
P	<i>Floerkea proserpinacoides</i>	False Mermaidweed	Not At Risk			S2	9	44.1 ± 1.0	NS
P	<i>Thuja occidentalis</i>	Eastern White Cedar			Vulnerable	S1	1	50.2 ± 0.0	NS
P	<i>Sanicula odorata</i>	Clustered Sanicle				S1	3	74.6 ± 0.0	NS
P	<i>Zizia aurea</i>	Golden Alexanders				S1	19	32.3 ± 0.0	NS
P	<i>Arnica lonchophylla</i>	Northern Arnica				S1	1	68.5 ± 7.0	NS
P	<i>Bidens hyperborea</i>	Estuary Beggarticks				S1	1	54.6 ± 1.0	NS
P	<i>Ageratina altissima</i>	White Snakeroot				S1	2	53.7 ± 7.0	NS
P	<i>Cardamine dentata</i>	Toothed Bittercress				S1	1	80.8 ± 0.0	NS
P	<i>Cochlearia tridactylites</i>	Limestone Scurvy-grass				S1	12	28.4 ± 0.0	NS
P	<i>Stellaria crassifolia</i>	Fleshy Stitchwort				S1	1	88.7 ± 2.0	NS
P	<i>Hudsonia tomentosa</i>	Woolly Beach-heath				S1	6	51.5 ± 1.0	NS
P	<i>Desmodium canadense</i>	Canada Tick-trefoil				S1	10	88.2 ± 0.0	NS
P	<i>Fraxinus pennsylvanica</i>	Red Ash				S1	1	51.6 ± 0.0	NS
P	<i>Bistorta vivipara</i>	Alpine Bistort				S1	1	77.2 ± 1.0	NS
P	<i>Montia fontana</i>	Water Blinks				S1	2	51.0 ± 3.0	NS
P	<i>Agalinis purpurea</i> var. <i>parviflora</i>	Small-flowered Purple False Foxglove				S1	2	83.3 ± 0.0	NS
P	<i>Scrophularia lanceolata</i>	Lance-leaved Figwort				S1	1	27.8 ± 1.0	NS
P	<i>Pilea pumila</i>	Dwarf Clearweed				S1	1	74.7 ± 6.0	NS
P	<i>Carex alopecoidea</i>	Foxtail Sedge				S1	2	49.9 ± 0.0	NS
P	<i>Carex granularis</i>	Limestone Meadow Sedge				S1	11	83.7 ± 0.0	NS
P	<i>Carex gynocrates</i>	Northern Bog Sedge				S1	11	84.2 ± 0.0	NS
P	<i>Carex haydenii</i>	Hayden's Sedge				S1	2	62.1 ± 5.0	NS
P	<i>Carex pellita</i>	Woolly Sedge				S1	7	88.3 ± 0.0	NS
P	<i>Carex plantaginea</i>	Plantain-Leaved Sedge				S1	2	96.8 ± 0.0	NS
P	<i>Carex tenuiflora</i>	Sparse-Flowered Sedge				S1	3	20.8 ± 1.0	NS
P	<i>Carex tinctoria</i>	Tinged Sedge				S1	1	49.9 ± 1.0	NS
P	<i>Carex viridula</i> var. <i>saxillitoralis</i>	Greenish Sedge				S1	4	90.9 ± 0.0	NS
P	<i>Carex viridula</i> var. <i>elatio</i>	Greenish Sedge				S1	20	85.3 ± 0.0	NS
P	<i>Carex grisea</i>	Inflated Narrow-leaved Sedge				S1	6	49.4 ± 0.0	NS
P	<i>Cyperus lupulinus</i>	Hop Flatsedge				S1	5	51.0 ± 0.0	NS
P	<i>Cyperus lupulinus</i> ssp. <i>macilentus</i>	Hop Flatsedge				S1	10	51.5 ± 1.0	NS

Taxonomic Group	Scientific Name	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	# recs	Distance (km)	Prov
P	<i>Eleocharis erythropoda</i>	Red-stemmed Spikerush				S1	1	92.4 ± 0.0	NS
P	<i>Iris prismatica</i>	Slender Blue Flag				S1	2	33.3 ± 7.0	NS
P	<i>Luzula spicata</i>	Spiked Woodrush				S1	1	49.8 ± 0.0	NS
P	<i>Malaxis monophyllos</i> var. <i>brachypoda</i>	North American White Adder's-mouth				S1	1	39.7 ± 7.0	NS
P	<i>Bromus latiglumis</i>	Broad-Glumed Brome				S1	15	61.2 ± 0.0	NS
P	<i>Elymus wiegandii</i>	Wiegand's Wild Rye				S1	6	64.2 ± 0.0	NS
P	<i>Elymus hystrix</i>	Spreading Wild Rye				S1	1	78.7 ± 1.0	NS
P	<i>Potamogeton nodosus</i>	Long-leaved Pondweed				S1	1	36.1 ± 5.0	NS
P	<i>Sparganium angrocladum</i>	Branching Bur-Reed				S1	1	51.9 ± 1.0	NS
P	<i>Equisetum palustre</i>	Marsh Horsetail				S1	8	94.7 ± 0.0	NS
P	<i>Solidago hispida</i>	Hairy Goldenrod				S1?	1	72.1 ± 7.0	NS
P	<i>Dichanthelium lindheimeri</i>	Lindheimer's Panicgrass				S1?	1	86.6 ± 0.0	NS
P	<i>Rudbeckia laciniata</i>	Cut-Leaved Coneflower				S1S2	2	37.0 ± 0.0	NS
P	<i>Cornus suecica</i>	Swedish Bunchberry				S1S2	2	53.2 ± 0.0	NS
P	<i>Anemone virginiana</i> var. <i>alba</i>	Virginia Anemone				S1S2	6	95.7 ± 0.0	NS
P	<i>Parnassia parviflora</i>	Small-flowered Grass-of-Parnassus				S1S2	10	74.8 ± 1.0	NS
P	<i>Carex livida</i>	Livid Sedge				S1S2	23	47.8 ± 0.0	NS
P	<i>Juncus greenii</i>	Greene's Rush				S1S2	1	51.6 ± 1.0	NS
P	<i>Juncus alpinoarticulatus</i> ssp. <i>americanus</i>	Northern Green Rush				S1S2	8	51.6 ± 5.0	NS
P	<i>Platanthera huronensis</i>	Fragrant Green Orchid				S1S2	2	57.3 ± 10.0	NS
P	<i>Cinna arundinacea</i>	Sweet Wood Reed Grass				S1S2	24	61.2 ± 0.0	NS
P	<i>Sparganium hyperboreum</i>	Northern Burreed				S1S2	3	4.2 ± 0.0	NS
P	<i>Cryptogramma stelleri</i>	Steller's Rockbrake				S1S2	17	97.1 ± 0.0	NS
P	<i>Selaginella selaginoides</i>	Low Spikemoss				S1S2	2	81.5 ± 0.0	NS
P	<i>Carex vacillans</i>	Estuarine Sedge				S1S3	3	49.9 ± 0.0	NS
P	<i>Osmorhiza longistylis</i>	Smooth Sweet Cicely				S2	16	41.0 ± 0.0	NS
P	<i>Erigeron philadelphicus</i>	Philadelphia Fleabane				S2	4	58.5 ± 7.0	NS
P	<i>Symphyotrichum ciliolatum</i>	Fringed Blue Aster				S2	3	22.4 ± 0.0	NS
P	<i>Impatiens pallida</i>	Pale Jewelweed				S2	7	29.1 ± 7.0	NS
P	<i>Caulophyllum thalictroides</i>	Blue Cohosh				S2	35	40.9 ± 0.0	NS
P	<i>Cardamine parviflora</i>	Small-flowered Bittercress				S2	2	94.9 ± 0.0	NS
P	<i>Draba arabisans</i>	Rock Whitlow-Grass				S2	3	97.8 ± 1.0	NS
P	<i>Lobelia kalmii</i>	Brook Lobelia				S2	72	77.1 ± 0.0	NS
P	<i>Stellaria humifusa</i>	Saltmarsh Starwort				S2	4	36.0 ± 0.0	NS
P	<i>Stellaria longifolia</i>	Long-leaved Starwort				S2	1	64.6 ± 0.0	NS
P	<i>Oxybasis rubra</i>	Red Goosefoot				S2	5	62.9 ± 7.0	NS
P	<i>Crassula aquatica</i>	Water Pygmyweed				S2	2	75.8 ± 7.0	NS
P	<i>Myriophyllum farwellii</i>	Farwell's Water Milfoil				S2	4	23.6 ± 0.0	NS
P	<i>Utricularia resupinata</i>	Inverted Bladderwort				S2	1	99.4 ± 0.0	NS
P	<i>Persicaria arifolia</i>	Halberd-leaved Tearthumb				S2	7	20.9 ± 0.0	NS
P	<i>Rumex triangulivalvis</i>	Triangular-valve Dock				S2	4	60.9 ± 6.0	NS
P	<i>Anemonastrum canadense</i>	Canada Anemone				S2	2	53.8 ± 3.0	NS
P	<i>Anemone quinquefolia</i>	Wood Anemone				S2	5	27.4 ± 0.0	NS
P	<i>Anemone virginiana</i>	Virginia Anemone				S2	31	50.4 ± 0.0	NS
P	<i>Caltha palustris</i>	Yellow Marsh Marigold				S2	3	54.0 ± 0.0	NS
P	<i>Galium labradoricum</i>	Labrador Bedstraw				S2	32	81.0 ± 0.0	NS
P	<i>Salix pedicellaris</i>	Bog Willow				S2	6	82.3 ± 0.0	NS
P	<i>Comandra umbellata</i>	Bastard's Toadflax				S2	30	50.7 ± 0.0	NS
P	<i>Saxifraga paniculata</i> ssp. <i>laestadii</i>	Laestadius' Saxifrage				S2	1	93.2 ± 7.0	NS
P	<i>Tiarella cordifolia</i>	Heart-leaved Foamflower				S2	2	54.2 ± 3.0	NS
P	<i>Viola nephrophylla</i>	Northern Bog Violet				S2	6	65.9 ± 0.0	NS
P	<i>Carex bebbii</i>	Bebb's Sedge				S2	10	44.8 ± 7.0	NS
P	<i>Carex castanea</i>	Chestnut Sedge				S2	15	80.9 ± 0.0	NS

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P	<i>Carex hystericina</i>	Porcupine Sedge				S2	29	50.3 ± 0.0	NS
P	<i>Carex tenera</i>	Tender Sedge				S2	3	50.4 ± 1.0	NS
P	<i>Carex atratiformis</i>	Scabrous Black Sedge				S2	2	96.7 ± 7.0	NS
P	<i>Eleocharis quinqueflora</i>	Few-flowered Spikerush				S2	10	84.8 ± 0.0	NS
P	<i>Juncus stygius</i> ssp. <i>americanus</i>	Moor Rush				S2	27	81.4 ± 1.0	NS
P	<i>Allium schoenoprasum</i> var. <i>sibiricum</i>	Wild Chives				S2	1	61.8 ± 7.0	NS
P	<i>Lilium canadense</i>	Canada Lily				S2	48	27.2 ± 1.0	NS
P	<i>Cypripedium parviflorum</i> var. <i>pubescens</i>	Yellow Lady's-slipper				S2	28	50.5 ± 0.0	NS
P	<i>Cypripedium parviflorum</i> var. <i>makasin</i>	Small Yellow Lady's-Slipper				S2	1	99.4 ± 0.0	NS
P	<i>Cypripedium reginae</i>	Showy Lady's-Slipper				S2	127	53.3 ± 0.0	NS
P	<i>Platanthera flava</i> var. <i>herbiola</i>	Pale Green Orchid				S2	1	29.7 ± 1.0	NS
P	<i>Spiranthes lucida</i>	Shining Ladies'-Tresses				S2	31	78.4 ± 1.0	NS
P	<i>Dichanthelium linearifolium</i>	Narrow-leaved Panic Grass				S2	1	90.8 ± 7.0	NS
P	<i>Potamogeton friesii</i>	Fries' Pondweed				S2	5	65.2 ± 0.0	NS
P	<i>Potamogeton richardsonii</i>	Richardson's Pondweed				S2	6	33.7 ± 0.0	NS
P	<i>Cystopteris laurentiana</i>	Laurentian Bladder Fern				S2	5	96.7 ± 10.0	NS
P	<i>Dryopteris fragrans</i>	Fragrant Wood Fern				S2	3	27.7 ± 0.0	NS
P	<i>Polystichum lonchitis</i>	Northern Holly Fern				S2	5	78.8 ± 5.0	NS
P	<i>Woodsia glabella</i>	Smooth Cliff Fern				S2	2	96.7 ± 7.0	NS
P	<i>Symphyotrichum boreale</i>	Boreal Aster				S2?	52	82.8 ± 0.0	NS
P	<i>Cuscuta cephalanthi</i>	Buttonbush Dodder				S2?	6	49.7 ± 0.0	NS
P	<i>Epilobium coloratum</i>	Purple-veined Willowherb				S2?	3	56.4 ± 0.0	NS
P	<i>Crataegus submollis</i>	Quebec Hawthorn				S2?	2	64.5 ± 7.0	NS
P	<i>Eleocharis ovata</i>	Ovate Spikerush				S2?	1	17.2 ± 0.0	NS
P	<i>Scirpus pedicellatus</i>	Stalked Bulrush				S2?	3	61.7 ± 0.0	NS
P	<i>Senecio pseudoarnica</i>	Seabeach Ragwort				S2S3	18	13.4 ± 0.0	NS
P	<i>Betula michauxii</i>	Michaux's Dwarf Birch				S2S3	19	2.5 ± 0.0	NS
P	<i>Sagina nodosa</i>	Knotted Pearlwort				S2S3	6	36.3 ± 1.0	NS
P	<i>Sagina nodosa</i> ssp. <i>borealis</i>	Knotted Pearlwort				S2S3	2	89.5 ± 0.0	NS
P	<i>Hypericum x dissimulatum</i>	Disguised St. John's-wort				S2S3	1	20.3 ± 1.0	NS
P	<i>Triosteum aurantiacum</i>	Orange-fruited Tinker's Weed				S2S3	151	40.9 ± 0.0	NS
P	<i>Shepherdia canadensis</i>	Soapberry				S2S3	8	94.3 ± 0.0	NS
P	<i>Empetrum atropurpureum</i>	Purple Crowberry				S2S3	1	52.5 ± 3.0	NS
P	<i>Euphorbia polygonifolia</i>	Seaside Spurge				S2S3	11	51.1 ± 0.0	NS
P	<i>Halenia deflexa</i>	Spurred Gentian				S2S3	23	29.1 ± 1.0	NS
P	<i>Hedeoma pulegioides</i>	American False Pennyroyal				S2S3	2	73.6 ± 5.0	NS
P	<i>Polygonum aviculare</i> ssp. <i>buxiforme</i>	Box Knotweed				S2S3	1	90.6 ± 0.0	NS
P	<i>Polygonum oxyspermum</i> ssp. <i>raii</i>	Ray's Knotweed				S2S3	4	22.2 ± 1.0	NS
P	<i>Amelanchier fernaldii</i>	Fernald's Serviceberry				S2S3	1	21.4 ± 1.0	NS
P	<i>Potentilla canadensis</i>	Canada Cinquefoil				S2S3	1	52.2 ± 2.0	NS
P	<i>Galium aparine</i>	Common Bedstraw				S2S3	15	50.1 ± 0.0	NS
P	<i>Salix pellita</i>	Satiny Willow				S2S3	1	47.2 ± 1.0	NS
P	<i>Carex adusta</i>	Lesser Brown Sedge				S2S3	1	41.5 ± 5.0	NS
P	<i>Carex hirtifolia</i>	Pubescent Sedge				S2S3	22	41.0 ± 0.0	NS
P	<i>Eleocharis flavescens</i> var. <i>olivacea</i>	Bright-green Spikerush				S2S3	3	45.0 ± 0.0	NS
P	<i>Eriophorum gracile</i>	Slender Cottongrass				S2S3	8	6.7 ± 1.0	NS
P	<i>Cypripedium parviflorum</i>	Yellow Lady's-slipper				S2S3	54	50.4 ± 0.0	NS
P	<i>Poa glauca</i>	Glaucous Blue Grass				S2S3	8	97.1 ± 0.0	NS
P	<i>Stuckenia filiformis</i>	Thread-leaved Pondweed				S2S3	10	60.9 ± 0.0	NS

Taxonomic Group	Scientific Name	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	# recs	Distance (km)	Prov
P	<i>Botrychium lanceolatum</i> ssp. <i>angustisegmentum</i>	Narrow Triangle Moonwort				S2S3	5	79.8 ± 0.0	NS
P	<i>Botrychium simplex</i>	Least Moonwort				S2S3	3	75.7 ± 1.0	NS
P	<i>Angelica atropurpurea</i>	Purple-stemmed Angelica				S3	11	60.3 ± 0.0	NS
P	<i>Erigeron hyssopifolius</i>	Hyssop-leaved Fleabane				S3	18	50.3 ± 0.0	NS
P	<i>Bidens beckii</i>	Water Beggarticks				S3	6	44.2 ± 0.0	NS
P	<i>Packera paupercula</i>	Balsam Groundsel				S3	59	50.4 ± 0.0	NS
P	<i>Betula pumila</i>	Bog Birch				S3	1	83.0 ± 0.0	NS
P	<i>Campanula aparinoides</i>	Marsh Bellflower				S3	9	35.1 ± 0.0	NS
P	<i>Vaccinium boreale</i>	Northern Blueberry				S3	5	21.4 ± 1.0	NS
P	<i>Vaccinium cespitosum</i>	dwarf bilberry				S3	46	27.0 ± 0.0	NS
P	<i>Bartonia virginica</i>	Yellow Bartonia				S3	1	78.7 ± 0.0	NS
P	<i>Proserpinaca palustris</i>	Marsh Mermaidweed				S3	27	52.8 ± 0.0	NS
P	<i>Proserpinaca pectinata</i>	Comb-leaved Mermaidweed				S3	2	87.8 ± 1.0	NS
P	<i>Teucrium canadense</i>	Canada Germander				S3	41	47.2 ± 0.0	NS
P	<i>Decodon verticillatus</i>	Swamp Loosestrife				S3	1	82.8 ± 7.0	NS
P	<i>Epilobium strictum</i>	Downy Willowherb				S3	6	36.8 ± 0.0	NS
P	<i>Polygala sanguinea</i>	Blood Milkwort				S3	3	7.2 ± 0.0	NS
P	<i>Persicaria pensylvanica</i>	Pennsylvania Smartweed				S3	15	49.6 ± 0.0	NS
P	<i>Fallopia scandens</i>	Climbing False Buckwheat				S3	26	29.2 ± 0.0	NS
P	<i>Plantago rugelii</i>	Rugel's Plantain				S3	2	93.8 ± 0.0	NS
P	<i>Samolus parviflorus</i>	Seaside Brookweed				S3	12	49.7 ± 0.0	NS
P	<i>Pyrola asarifolia</i>	Pink Pyrola				S3	3	84.1 ± 0.0	NS
P	<i>Pyrola minor</i>	Lesser Pyrola				S3	1	97.3 ± 2.0	NS
P	<i>Ranunculus gmelinii</i>	Gmelin's Water Buttercup				S3	46	33.1 ± 2.0	NS
P	<i>Endotropis alnifolia</i>	alder-leaved buckthorn				S3	335	52.2 ± 0.0	NS
P	<i>Agrimonia gryposepala</i>	Hooked Agrimony				S3	197	35.1 ± 0.0	NS
P	<i>Amelanchier spicata</i>	Running Serviceberry				S3	5	14.6 ± 0.0	NS
P	<i>Galium kamtschaticum</i>	Northern Wild Licorice				S3	5	92.1 ± 0.0	NS
P	<i>Geocaulon lividum</i>	Northern Comandra				S3	65	1.3 ± 0.0	NS
P	<i>Limosella australis</i>	Southern Mudwort				S3	3	82.0 ± 5.0	NS
P	<i>Lindernia dubia</i>	Yellow-seeded False Pimperel				S3	11	50.1 ± 0.0	NS
P	<i>Laportea canadensis</i>	Canada Wood Nettle				S3	16	40.8 ± 3.0	NS
P	<i>Verbena hastata</i>	Blue Vervain				S3	48	40.9 ± 0.0	NS
P	<i>Carex cryptolepis</i>	Hidden-scaled Sedge				S3	7	45.9 ± 1.0	NS
P	<i>Carex eburnea</i>	Bristle-leaved Sedge				S3	23	54.7 ± 5.0	NS
P	<i>Carex lupulina</i>	Hop Sedge				S3	11	49.8 ± 6.0	NS
P	<i>Carex rosea</i>	Rosy Sedge				S3	5	35.1 ± 4.0	NS
P	<i>Carex tribuloides</i>	Blunt Broom Sedge				S3	11	17.5 ± 0.0	NS
P	<i>Carex wiegandii</i>	Wiegand's Sedge				S3	2	47.6 ± 0.0	NS
P	<i>Carex foenea</i>	Fernald's Hay Sedge				S3	1	69.5 ± 0.0	NS
P	<i>Schoenoplectus americanus</i>	Olney's Bulrush				S3	1	49.8 ± 0.0	NS
P	<i>Juncus subcaudatus</i>	Woods-Rush				S3	6	13.1 ± 0.0	NS
P	<i>Juncus dudleyi</i>	Dudley's Rush				S3	84	31.3 ± 0.0	NS
P	<i>Goodyera repens</i>	Lesser Rattlesnake-plantain				S3	8	65.8 ± 0.0	NS
P	<i>Neottia bifolia</i>	Southern Twayblade				S3	47	11.2 ± 0.0	NS
P	<i>Platanthera grandiflora</i>	Large Purple Fringed Orchid				S3	50	19.1 ± 10.0	NS
P	<i>Platanthera hookeri</i>	Hooker's Orchid				S3	3	46.7 ± 0.0	NS
P	<i>Platanthera orbiculata</i>	Small Round-leaved Orchid				S3	2	37.5 ± 0.0	NS
P	<i>Spiranthes ochroleuca</i>	Yellow Ladies'-tresses				S3	3	82.8 ± 0.0	NS
P	<i>Alopecurus aequalis</i>	Short-awned Foxtail				S3	5	56.2 ± 1.0	NS
P	<i>Dichanthelium clandestinum</i>	Deer-tongue Panic Grass				S3	81	27.3 ± 0.0	NS
P	<i>Potamogeton obtusifolius</i>	Blunt-leaved Pondweed				S3	11	45.1 ± 1.0	NS
P	<i>Potamogeton praelongus</i>	White-stemmed Pondweed				S3	10	29.1 ± 10.0	NS
P	<i>Potamogeton zosteriformis</i>	Flat-stemmed Pondweed				S3	1	97.2 ± 7.0	NS
P	<i>Sparganium natans</i>	Small Burreed				S3	8	26.0 ± 0.0	NS
P	<i>Asplenium trichomanes</i>	Maidenhair Spleenwort				S3	4	46.7 ± 0.0	NS

Taxonomic Group	Scientific Name	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	# recs	Distance (km)	Prov
P	<i>Asplenium viride</i>	Green Spleenwort				S3	20	62.3 ± 0.0	NS
P	<i>Equisetum pratense</i>	Meadow Horsetail				S3	14	79.3 ± 0.0	NS
P	<i>Equisetum variegatum</i>	Variegated Horsetail				S3	39	43.2 ± 0.0	NS
P	<i>Isoetes tuckermanii</i> ssp. <i>acadiensis</i>	Acadian Quillwort				S3	3	17.3 ± 0.0	NS
P	<i>Diphasiastrum sitchense</i>	Sitka Ground-cedar				S3	19	35.2 ± 1.0	NS
P	<i>Huperzia appressa</i>	Mountain Firmoss				S3	1	92.9 ± 1.0	NS
P	<i>Sceptridium dissectum</i>	Dissected Moonwort				S3	3	49.2 ± 1.0	NS
P	<i>Polypodium appalachianum</i>	Appalachian Polypody				S3	1	91.2 ± 0.0	NS
P	<i>Bidens vulgata</i>	Tall Beggarticks				S3?	1	80.1 ± 0.0	NS
P	<i>Persicaria amphibia</i> var. <i>emersa</i>	Long-root Smartweed				S3?	1	50.0 ± 0.0	NS
P	<i>Diphasiastrum x sabinifolium</i>	Savin-leaved Ground-cedar				S3?	3	58.0 ± 5.0	NS
P	<i>Atriplex glabriuscula</i> var. <i>franktonii</i>	Frankton's Saltbush				S3S4	1	46.1 ± 0.0	NS
P	<i>Suaeda calceoliformis</i>	Horned Sea-blite				S3S4	5	28.8 ± 0.0	NS
P	<i>Myriophyllum sibiricum</i>	Siberian Water Milfoil				S3S4	2	54.0 ± 0.0	NS
P	<i>Nuphar microphylla</i>	Small Yellow Pond-lily				S3S4	1	95.9 ± 2.0	NS
P	<i>Sanguinaria canadensis</i>	Bloodroot				S3S4	141	40.0 ± 5.0	NS
P	<i>Polygonum fowleri</i>	Fowler's Knotweed				S3S4	4	54.2 ± 0.0	NS
P	<i>Rumex fueginus</i>	Tierra del Fuego Dock				S3S4	9	88.3 ± 0.0	NS
P	<i>Fragaria vesca</i> ssp. <i>americana</i>	Woodland Strawberry				S3S4	18	56.2 ± 0.0	NS
P	<i>Salix petiolaris</i>	Meadow Willow				S3S4	4	82.3 ± 0.0	NS
P	<i>Agalinis neoscotica</i>	Nova Scotia Agalinis				S3S4	3	0.7 ± 4.0	NS
P	<i>Eriophorum russeolum</i>	Russet Cottongrass				S3S4	7	46.7 ± 5.0	NS
P	<i>Triglochin gaspensis</i>	Gasp Arrowgrass				S3S4	23	53.8 ± 0.0	NS
P	<i>Juncus acuminatus</i>	Sharp-Fruit Rush				S3S4	3	52.0 ± 0.0	NS
P	<i>Luzula parviflora</i>	Small-flowered Woodrush				S3S4	3	46.1 ± 0.0	NS
P	<i>Liparis loeselii</i>	Loesel's Twayblade				S3S4	9	40.3 ± 0.0	NS
P	<i>Panicum philadelphicum</i>	Philadelphia Panicgrass				S3S4	1	77.2 ± 0.0	NS
P	<i>Trisetum spicatum</i>	Narrow False Oats				S3S4	1	88.3 ± 0.0	NS
P	<i>Cystopteris bulbifera</i>	Bulblet Bladder Fern				S3S4	117	46.8 ± 1.0	NS
P	<i>Equisetum hyemale</i>	Common Scouring-rush				S3S4	1	82.6 ± 0.0	NS
P	<i>Equisetum hyemale</i> ssp. <i>affine</i>	Common Scouring-rush				S3S4	36	44.3 ± 0.0	NS
P	<i>Equisetum scirpoides</i>	Dwarf Scouring-Rush				S3S4	64	79.8 ± 0.0	NS
P	<i>Diphasiastrum complanatum</i>	Northern Ground-cedar				S3S4	2	82.8 ± 5.0	NS
P	<i>Schizaea pusilla</i>	Little Curlygrass Fern				S3S4	9	8.3 ± 0.0	NS
P	<i>Viola canadensis</i>	Canada Violet				SH	1	97.7 ± 0.0	NS

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The recipient of these data shall acknowledge the AC CDC and the data sources listed below in any documents, reports, publications or presentations, in which this dataset makes a significant contribution.

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APPENDIX D. MARITIME BREEDING BIRD ATLAS SQUARE



Square Summary (20PR00)

#species (1st atlas)				#species (2nd atlas)				#hours		#pc done	
poss	prob	conf	total	poss	prob	conf	total	1st	2nd	road	offrd
1	1	1	3	44	16	21	81	2	13.2	0	0

Region summary (#22: Guysborough)

#squares	#sq with data		#species		#pc done	target	#pc
	1st	2nd	1st	2nd			
54	44	49	129	149	227	202	

Target number of point counts in this square: 12 road side, 3 off road (1 in Mature coniferous, 1 in Mature deciduous, 1 in Open wetlands). Please try to ensure that each off-road station is located such that the entire 100m radius circle is within the prescribed habitat.

SPECIES	Code		%		SPECIES	Code		%		SPECIES	Code		%	
	1st	2nd	1st	2nd		1st	2nd	1st	2nd		1st	2nd	1st	2nd
Canada Goose		FY	4	57	Killdeer			11	2	Black-back Woodpecker			18	26
Wood Duck			6	22	Spotted Sandpiper	T	47	55		Northern Flicker	P	59	83	
American Black Duck	H	H	43	71	Greater Yellowlegs †	H	0	2		Pileated Woodpecker			13	32
Mallard			9	20	Least Sandpiper †		2	0		American Kestrel			18	30
Blue-winged Teal ‡			2	8	Wilson's Snipe		20	26		Merlin	H	9	28	
Green-winged Teal			11	18	American Woodcock	S	22	34		Olive-sided Flycatcher †	S	29	48	
Ring-necked Duck			29	40	Ring-billed Gull ‡§		0	0		Eastern Wood-Pewee			18	26
Common Eider §		FY	47	42	Herring Gull §		54	36		Yellow-bellied Flycatcher	S	34	85	
Common Merganser		P	13	53	Great Black-backed Gull §		56	38		Alder Flycatcher	CF	52	85	
Red-breast Merganser ‡		P	4	36	Roseate Tern ‡§		9	2		Least Flycatcher	S	25	55	
Ring-necked Pheasant ‡			2	20	Common Tern §		11	36		Eastern Phoebe ‡			2	8
Ruffed Grouse		FY	34	53	Arctic Tern ‡§		18	14		Eastern Kingbird			20	12
Spruce Grouse			22	32	Black Guillemot ‡§		11	16		Blue-headed Vireo	CF	47	75	
Common Loon	P	S	47	71	Rock Pigeon		15	26		Red-eyed Vireo	T	47	77	
Leach's Storm-Petrel ‡§			22	8	Mourning Dove	FY	15	73		<u>Gray Jay</u>			40	65
Double-crest Cormorant §			43	26	Great Horned Owl		15	20		Blue Jay	P	52	77	
Great Cormorant ‡§			9	6	Northern Hawk Owl †		0	0		American Crow	CF	61	85	
American Bittern ‡			4	12	Barred Owl		18	40		Common Raven	FY	59	83	
Great Blue Heron §			47	30	Long-eared Owl †	S	0	2		Tree Swallow	AE	54	83	
Turkey Vulture ‡ª			2	0	Short-eared Owl †	H	0	2		Bank Swallow §	AE	40	14	
Osprey		P	54	51	North Saw-whet Owl		2	24		Cliff Swallow §			20	6
Bald Eagle ¢		P	34	55	Common Nighthawk †	S	15	28		Barn Swallow	H	54	59	
Northern Harrier			27	24	Chimney Swift †		18	8		Black-capp Chickadee	S	54	91	
Sharp-shinned Hawk			9	16	Ruby-thr Hummingbird	H	34	61		Boreal Chickadee	S	63	85	
Northern Goshawk			11	8	Belted Kingfisher	H	43	73		Red-breast Nuthatch	FY	61	79	
Broad-winged Hawk ‡		H	4	22	Yellow-bellied Sapsucker		13	26		White-breast Nuthatch ‡			2	12
Red-tailed Hawk			22	42	Downy Woodpecker	S	34	55		Brown Creeper			6	30
Golden Eagle ‡			2	0	Hairy Woodpecker	P	36	71		Winter Wren	S	34	83	
Piping Plover †			4	2	Am Three-toed Woodpecker †		0	2		Golden-crown Kinglet	S	56	91	

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Maritimes Breeding Bird Atlas - Summary Sheet for Square 20PR00 (page 2 of 2)

SPECIES	Code		%		SPECIES	Code		%		SPECIES	Code		%	
	1st	2nd	1st	2nd		1st	2nd	1st	2nd		1st	2nd	1st	2nd
Ruby-crown Kinglet		T	61	89	Pine Warbler †			0	2	Evening Grosbeak		H	34	30
Eastern Bluebird †			2	2	Yellow-rumped Warbler	CF	61	93		House Sparrow			27	4
Veery		S	11	18	Black-thr Green Warbler	CF	56	91						
Swainson's Thrush		P	56	91	Canada Warbler †	S	38	34						
Hermit Thrush		CF	63	91	Wilson's Warbler	S	31	34						
American Robin		CF	65	91	Chipping Sparrow	S	34	26						
Gray Catbird		S	22	38	Savannah Sparrow	S	34	46						
Northern Mockingbird †			4	0	Ipswich Sparrow †			2	0					
European Starling		CF	47	71	Nelson's Sh.-tail Sparrow			9	18					
Cedar Waxwing		S	43	83	Fox Sparrow	S	29	38						
Ovenbird		S	20	61	Song Sparrow	CF	68	87						
North Waterthrush		S	18	42	Lincoln's Sparrow	S	47	73						
Black-white Warbler		P	54	91	Swamp Sparrow	S	43	81						
Tennessee Warbler		S	50	44	White-throat Sparrow	FY	59	93						
Nashville Warbler		S	45	81	Dark-eyed Junco	AY	CF	68	93					
Mourning Warbler		S	43	55	Scarlet Tanager †			0	0					
Common Yellowthroat		P	63	95	Rose-breast Grosbeak			22	4					
Hooded Warbler ‡			0	0	Bobolink			25	0					
American Redstart		T	56	87	Red-wing Blackbird	S	29	40						
Cape May Warbler			20	12	Eastern Meadowlark †			0	2					
Northern Parula		S	45	67	Rusty Blackbird †			18	14					
Magnolia Warbler		S	61	91	Common Grackle	CF	43	79						
Bay-breasted Warbler		S	34	55	Brown-head Cowbird			22	2					
Blackburnian Warbler		S	36	44	Pine Grosbeak			34	18					
Yellow Warbler		T	43	73	Purple Finch	S	52	79						
Chestn-sided Warbler		S	22	42	Red Crossbill †			9	22					
Blackpoll Warbler		FY	27	32	White-winged Crossbill			38	36					
Black-thr Blue Warbler			11	10	Pine Siskin			43	32					
Palm Warbler		S	50	83	American Goldfinch	P	56	85						

This list includes all species found during the Maritimes Breeding Bird Atlas (1st atlas: 1986-1990, 2nd atlas: 2006-2010) in the region #22 (Guysborough). Underlined species are those that you should try to add to this square (20PR00). They have not yet been reported during the 2nd atlas, but were found during the 1st atlas in this square or have been reported in more than 50% of the squares in this region during the 2nd atlas so far. "Code" is the code for the highest breeding evidence for that species in square 20PR00 during the 2nd and 1st atlas respectively. The % columns give the percentage of squares in that region where that species was reported during the 2nd and 1st atlas (this gives an idea of the expected chance of finding that species in region #22). Rare/Colonial Species Report Forms should be completed for species marked: § (Colonial), ‡ (regionally rare), † (rare in the Maritimes) or ¶ (rare in the Maritimes, documentation only required for confirmed records). Current as of 30/05/2021. An up-to-date version of this sheet is available from <http://www.mba-aom.ca/jsp/summaryform.jsp?squareID=20PR00?lang=en>

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