CHILDS RIVER RESTORATION – SNEP FINAL REPORT

JULY 2023













Southeast New England Program (SNEP) Watershed Grants
Childs River Restoration Final Report

1. Cover Information

Date: 7/27/2023

Project Name: Upper Childs River Restoration
Contract Number: SNEPWG18-10-FRGC
Grant Period: September 2018 – June 2023 *(extension request approved December 2022)*

Contract Number: SNEPWG19-10-FRGC
Grant Period: September 2019 – June 2023 *(extension request approved December 2022)*

Grantee Organization: Falmouth Rod and Gun Club (FRGC or Club)
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2. Project Report Narrative

Massachusetts has lost more than 28% of its wetlands between the 1780s and 1980s,[1] and continues to lose wetlands every year.[2] Cranberry bogs are low-lying areas where natural rivers or wetlands previously existed but were manipulated by humans to cultivate cranberries on a large scale. Because they are actively fertilized and the water levels are carefully controlled by farmers, cranberry bogs are typically sources of nitrogen (releasing nitrogen into the surface waters downstream) contrasting with natural wetlands which act as nitrogen sinks (areas where nitrogen is released to the atmosphere through denitrification or stored in plants and soils).[3,4] There are currently over 48,000 acres of wetlands in the state and nearly 14,000 acres of cranberry bog, most of which are in southeastern MA in watersheds draining to Cape Cod Bay, Nantucket Sound, Narragansett Bay, or Buzzards Bay. [5]

The Massachusetts Division of Ecological Restoration (DER) estimates that more than 3000 dams are currently located in the state. These dams are a liability due to their age and the general trend of increased hydrology in the region, are a barrier to the movement of diadromous fish and other aquatic organisms and are a disruption to the natural movement of sediment critical to the development of floodplains and coastal estuaries and salt marshes which help protect our shorelines and infrastructure.

The Childs River flows south from Johns Pond through the US. Fish and Wildlife Service (USFWS) Mashpee National Wildlife Refuge (MNWR) across the property of the Falmouth Rod

[1] Dahl, T.E. 1990. Wetlands Losses in the United States 1780s to 1980s. U.S. Department of the Interior, Fish and Wildlife Service, Washington, D.C. 13pp.
[2] Harris, S.L. National Water Summary: Massachusetts Wetland Resources. U.S. Geological Survey.
[3] Teal, J.M. and B.L.Howes. 1995. Nitrogen balance in a Massachusetts cranberry bog and relationships to coastal eutrophication. Environmental Science and Technology 29:960-974.
[4] Leonardson, L, L Bengtsson, T Davidsson, T Persson and U. Emanuelsson. 1994.Nitrogen retention in artificially flooded meadows. Ambio 23: 332-341.
[5] Cape Cod Cranberry Growers Association. 2003-2023. How Cranberries Grow. https://www.cranberries.org/how-cranberries-grow [2/16/2023]

and Gun Club (Club or FRGC) and discharges into Eel Pond which is connected to Waquoit Bay on the Nantucket/Vineyard Sound (Figure 1). The Childs River is about 2 miles long from Johns Pond to Eel Pond and passes through the towns of Mashpee and Falmouth eventually discharging into Waquoit Bay. The natural origin of the river is in springs in the vicinity of what is now the abandoned Garner Bogs south of Old Barnstable Road but it was connected with an artificial ditch to Johns Pond in the mid-1800s to create a herring fishery. This connection was later used to supply additional water for the cranberry bogs. Water no longer flows continuously from the pond to the Childs River and the original herring run to Johns Pond along the neighboring Quashnet River is being actively maintained and has been restored. However, due to the natural springs located at the Garner Bog, water flow south of the bogs is fairly steady, which supported plans to restore this area as habitat for Brook Trout and other fish and wildlife. Figures 2 and 3 provide detailed summary of the Childs River site history as documented for this project.

Figure 1. Map of the Childs River and project restoration area including the former dam and impoundments at Carriage Shop Road and former Farley and Garner cranberry bogs.

Since the mid-1800s, mill dams and cranberry farming have severely impacted the hydrology, water quality, aquatic habitat, terrestrial habitat, and fish passage throughout the river's length. In addition to the overall health of the watershed, native sea-run Brook Trout populations have been greatly reduced in the Upper Childs River. Due to these impacts no Brook Trout had been

detected north of Carriage Shop Road since 2012 (with the exception of spring of 2019 during a period of higher stream flow due to precipitation).

The Childs River restoration was a six year (2017-2023), $2.9 million project. This project constructed in 2021 removed one earthen dam, a failed fish ladder and four additional fish passage barriers, improved the stream crossing at Carriage Shop Road for added freshwater and terrestrial organism passage, improved water quality, and restored 15.1 acres of retired cranberry bog to more natural stream and wetland habitat.

The former impoundment north of Carriage Shop Road before restoration (left) and one and two years (middle and right) following restoration after draining of the pond and creation of a river channel and wetland. Photo credits: FRGC and APCC.

Discussion of the Childs River Restoration began in 2014 with a team kickoff meeting held in 2017. The project was completed as a private-public partnership involving the towns of Falmouth and Mashpee as well as local, state and federal partners. However, the Falmouth Rod and Gun Club took the lead managing the project and partnerships through planning, design, permitting and construction. In 2017, the Club and their 501c3 partner the Sporting Safety, Conservation and Education Fund (SSCEF) funded the initial feasibility study and concept designs developed by the contracted engineer, Inter-Fluve Inc. Design work began in 2018 with 100% design plans completed in May of 2020. Final permits were approved in August of 2020 and construction began on August 26, 2020. Construction was completed a year later in September of 2021. Monitoring, evaluation and maintenance of the site is ongoing (Figure 4

Restoration planning site visit September 2016 with project team members (pictured left to right) Mark Kasprzyk (town of Falmouth), April Wobst (APCC) Dan Murphy, Gary Anderson, and Fran Smith (FRGC), Alex Hackman (formerly DER), and Betsy Gladfelter (FA). Photo credit: APCC.

Figure 2. Historic and archaeological summary of the Childs River site provided by the Public Archaeological Laboratory (PAL).

Historic and Archaeological Investigations

In 2019–2021, architectural historians documented the historic Waquoit River Herring Company mill pond, earthen dam, and fish ladder associated with the milling and fishery activities at Carriage Shop Road in the 19th to mid-20th centuries. In 2020, archaeologists studied the belowground remains of the historic mill buildings and water-power structures before the dam and fish ladder were removed and the pond drained as part of the river restoration work. (To learn more, read about the **Site History**).

Mill Pond

The mill pond was created in the early 19th century by building a dam on the Childs River near Carriage Shop Road. The dam was added to provide water power for Alexander Clark's woolen mill. It later powered the Waquoit Company carriage works and blacksmith shop owned by Alexander Crocker and Josiah Burgess. In the late 19th century, the town road by the mill (originally known as Meeting House Road) was moved to the north, where it crossed the mill pond and was renamed Carriage Shop Road.

Former mill pond on the north side of Carriage Shop Road, view north from the road.

Former mill pond on the south side of Carriage Shop Road, view west from the road.

Dam

The dam was at the south end of the mill pond near the original town road. It had a 200-foot-long east-west (primary) earthen berm that was 10 feet high at its crest. A 100-foot-long secondary (north-south or lateral) berm extended along the pond shoreline from the east end of the primary berm. The dam's outlet was a short, 3-foot-deep concrete spillway channel with 7-foot-long and 10-foot-long concrete sidewalls. Wooden boards in the channel were used to regulate the water level in the pond. A second overflow channel was created near the primary dam's western end, and a third outlet contained a fish ladder. The dam structure removed in 2020 was probably the original 19th-century mill dam that was rebuilt or changed to provide water for the 20th-century cranberry bogs.

At right, view of the top of the earthen (primary) dam, looking east.

Downstream side of the dam's concrete spillway channel, view northwest.

Falmouth Rod & Gun Club Fish Ladder

In 1968, the Falmouth Rod & Gun Club bought the land containing the dilapidated fishway next to the former mill pond and spillway channel. About the same time, the club replaced the then 50-foot-long fish ladder built in the 19th century by the Waquoit River Herring Company. The club also removed debris from the river channel to increase the number of herring during the spring runs up the river.

The 1968 fish ladder was a concrete and cinder block structure built on the east side of the pond at the east end of the dam. The fish ladder formed a low-gradient earthen channel approximately 95 feet long with a total drop of 3 feet. The structure had a series of low concrete walls with 10 inch-wide slots creating five pools to help the fish passage. By 2004 the fish ladder was reported to be poor/nonpassable.

Below, 1968–2020 fish ladder, looking south from north end of the lateral section of the historic dam.

Archaeological Finds

Archaeologists found the probable location of the mill's undershot waterwheel, which was covered with pond sediment since the 1940s. It appeared as a square depression in the low-lying area on the southwest side of the dam. No buried remains of the mill buildings or the historic waterwheel were found. However, hand excavations in this area recovered 19th-century window glass and machine-cut nails from the former Waquoit Company Shop buildings.

During the river restoration work, three wheel rim parts were found inside the culvert under Carriage Shop Road. The parts are most likely from the wagon or carriage wheels made at the mill in the 19th century. One of the metal rim parts has some inner wood still attached where machine-cut nails were set for the wheel's radiating spokes. The whole wheels reconstructed from these metal rim parts would have been about 39 to 44 inches across.

At right, 19th-century metal and wood rim parts from three wagon or carriage wheels.

At left, 19th-century wheel rim parts found inside the concrete portion of culvert under Carriage Shop Road, view north.

All photos and images courtesy of The Public Archaeology Laboratory, Inc. 2020

Figure 3. Summary of the Childs River site history including historic milling, river herring harvest, and cranberry bog farming.

Site History: Housewrights, Wheelwrights, and Damming Fish

The Childs River crossing at Carriage Shop Road is the site of the former mill pond, earthen dam, and fish ladder in the northwest section of the Waquoit Village National Historic District. They were used by local manufacturers, cranberry farmers, and the herring fishery from the early 19th to mid-20th centuries. None of these resources survive but they have been inventoried and the historical documentation records are maintained by the Falmouth Historical Commission.

Ca. 2013–2014 aerial image showing the historic mill pond, dam, and fish ladder before the Childs River Restoration Project. *(Credit: The Public Archaeology Laboratory, Inc. 2025)*

Waquoit Village Historic District

The Waquoit Village Historic District encompasses 170 acres on both sides of Waquoit Highway (Route 28) through the historic village center of Waquoit. The district is listed in the National Register of Historic Places. Most of the district's 66 residential buildings were constructed in the mid-19th century when the village was a thriving community. Residents worked in farming and the fisheries in two small industrial areas on the Childs and Quashnet (Moonakis) rivers.

At left: Waquoit River Historic District boundaries. *(Credit: Massachusetts Historical Commission 2020)*

Milling along the Childs River

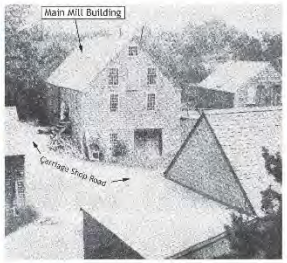
In the early 19th century, a water-powered woolen mill was built at the Childs River for Alexander Clark, a Falmouth resident. By 1831, he moved his business farther east to a mill site on the Quashnet (Moonakis) River. In the 1840s, Seth Benson, a local wheelwright (maker of wooden wheels), used Clark's former mill on the Childs River for his blacksmith shop. The 1850 federal census of manufacturers lists Benson as a carriage maker and wheelwright. That year his business used two tons of iron worth $500; 3,000 feet of wood planks worth $100; and 30 gallons of linseed oil worth $30. These materials were used to make 12 carriages with a total value of $900 (worth $32,000 today).

In June 1855, Alexander Crocker and partners bought Benson's business. Their new Waquoit Company Shop made farm wagons, two-wheeled dump trucks, carriages, and wood framing for local buildings. As housewrights, the shop owners built and repaired wooden houses. They enlarged the old mill and built a separate blacksmith shop to prevent fire from reaching the mill. The shop's wagons were known for their blue and green colors, applied in the mill's second-floor paint shop. A wooden ramp was used to bring the painted wagons outside.

The dam at the south end of the mill pond was the site of an undershot wooden waterwheel that sat next to the former mill building. The wheel sat in a stone-lined pit that filled with water through a gate in the dam; the water rushed along the bottom of the pit to spin the wheel's paddle-like boards backwards. The spinning wheel turned vertical and horizontal shafting, gears, and pulleys connected to power the mill's machinery, which included an up-and-down saw, grindstone, and turning lathe.

From 1869 to 1900, the renamed Waquoit Manufacturing Company made mostly carriages and wagons under the direction of Alexander Crocker and Josiah Burgess. Crocker oversaw the wheelwright operations. Burgess ran the blacksmith shop that made all the metal parts except the axles. Crocker died about 1900; Burgess was in "failing health" and closed the business that same year.

At right, ca.1880s photograph of Waquoit Manufacturing Company mill buildings. *(Credit: Falmouth Historical Society)*



Waquoit River Herring Company

The Waquoit River Herring Company was formed in the mid-19th century to harvest river herring during their spring run up the Childs River from Waquoit Bay. The company constructed a fishway around the southeast side of the mill's dam. It also dug a canal northward to the herring's natural spawning ground at Johns Pond in Mashpee. The herring company caught an average of 80 to 100 barrels of herring each year, with the biggest catch of 180 barrels in 1872. The company still operated the fish ladder as late as 1919.

Cranberry Cultivation and Bogs

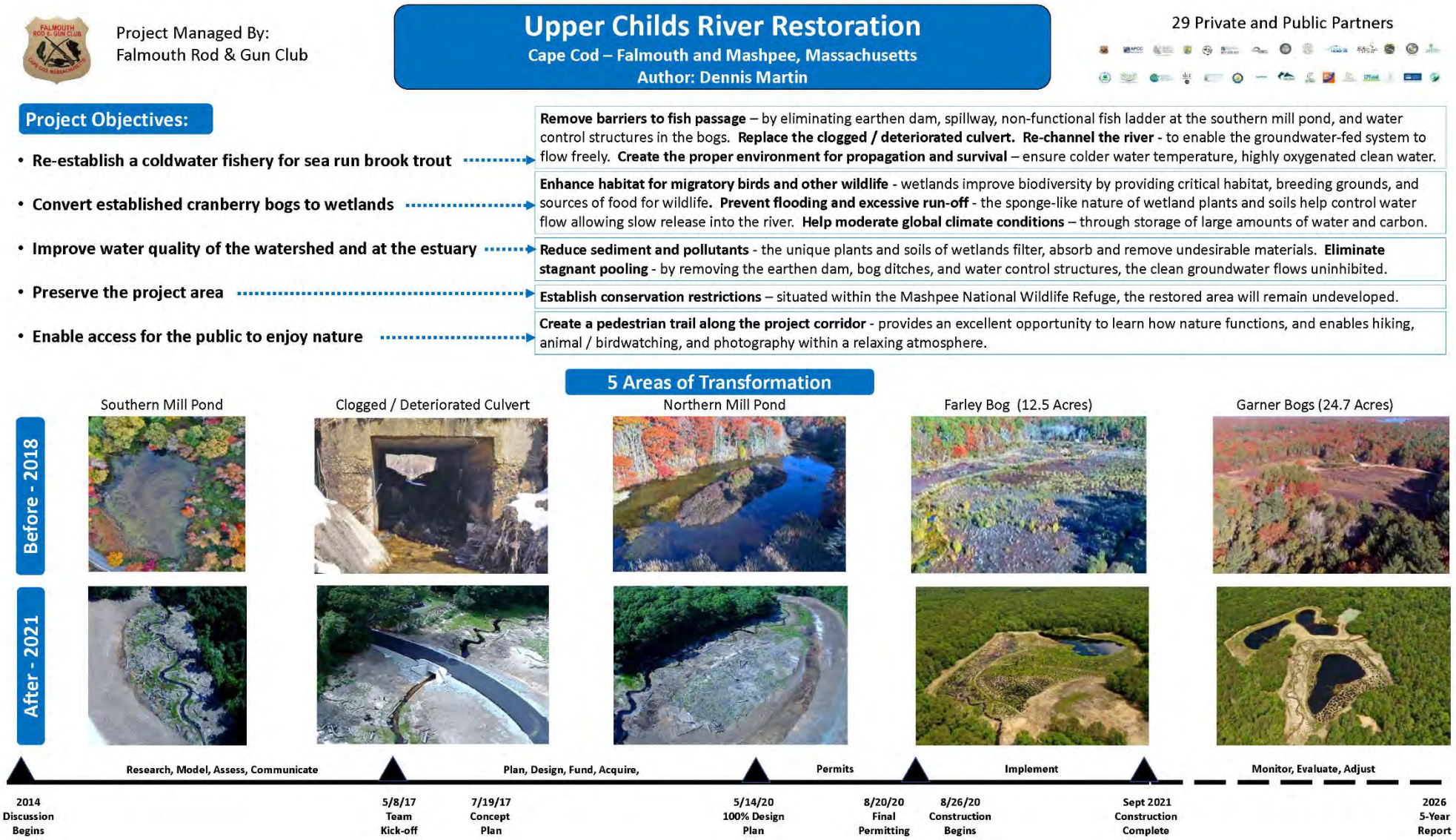
By the early-20th century, cranberry growing had replaced the carriage shop and fisheries as the main businesses along the Childs River. By 1920, there were nine cranberry bogs from Johns Pond south to where the river joined Waquoit Bay. Eight of the bogs were equipped with wooden chutes to allow for fish passage. The former mill pond and dam at Carriage Shop Road were modified with dikes and drainage channels to provide water for the bogs to the south. The river north of the dam became "little more than an artificial ditch lined with cranberry bogs."

At right: Ca. 1860 tintype showing the two-story mill with a ramp from the second story and the separate blacksmith shop to the right. *(Credit: Falmouth Historical Society)*

At left: Ca. 1930s photograph of the ruins of the mill's wooden waterwheel in its stone-lined pit. A part of the gear assembly used to turn the mill's machinery is on the left. *(Credit: Falmouth Historical Society)*

At right: 1920 photo of the mill pond showing the general location of the original fish ladder at the southeast side of the dam. *(Credit: Falmouth Historical Society).*

Figure 4. Upper Childs River restoration project summary and timeline.



The initial cash investment by the Club to support feasibility studies was used to leverage additional support from local, state and federal funding sources for implementation including grants from the Falmouth Fund of the Cape Cod Foundation (CCF) in 2018, Trout Unlimited Cape Cod Chapter and Embrace a Stream Program, the Massachusetts Environmental Trust (MET) in 2018, the EPA Southeast New England Program (SNEP) Watershed Grants through collaboration with Restore America's Estuaries in 2018 and 2019, the Falmouth Community Preservation Committee (CPC) in 2018 and 2019, the Mashpee Community Preservation Committee (CPC) in 2019, Ducks Unlimited in 2019, DER through their priority project program, the USFWS National Coastal Wetland Conservation Grant (NCWCG) in 2020, and the USFWS and town of Falmouth for replacement of the Carriage Shop Road culvert in 2022.

The total project cost is equal to $2,929,727 including $2,775,442 in expense and an additional $154,285 in tracked match (primarily FRGC and SSCEF in-kind contributions). A summary of this match is provided in Table 1. Included in this $2.7 million expense was $2.1 million devoted to construction activities for the river, bogs and culvert replacement. A summary of all funding for the Childs River restoration from feasibility studies through construction along with ongoing monitoring, education, APCC project management/technical support and FRGC expense can be found in Table 2. A detailed breakdown of construction expense by grant and project area specific to the river and bog restoration (excluding the culvert replacement work managed by the town of Falmouth) is provided in Table 3. The original contracted scope for construction of the river and bogs was $856,075. The final contract amount including all changes orders was $1,186,722.31 with an additional $600 for delivery of wood to the site. With the award of $819,000 from the USFWS NCWCG to DER to support construction and construction oversight, a portion of SNEP grant funds proposed for construction were reallocated to cover other expenses. With the culvert fully funded by the town of Falmouth and USFWS, NCWCG grant funds were able to be allocated to cover change orders for additional work to expand the area of sediment removal, size of ponds, and plantings to improve the overall impact of the restoration. Likewise, the Falmouth CPC 2019 grant award totaling $151,498 for construction was not needed due to this additional grant award and low bid received for construction. Thus, the Club ultimately reported back to the Falmouth CPC in 2022 that these funds would not be spent and could be allocated for other projects.

Table 1. Estimated value of in-kind and cash contributions providing match for the Childs River restoration from 2014 through 2023.

Match In-Kind and Cash	Estimated Value
FRGC 2014-2017 Project Planning	$16,950
FRGC 2018 Sale and Purchase (cash)	$1,500
APCC 2016-2017 Early Planning	$2,836
FRGC and SSCEF 2018-2019 Planning, Design, and Permitting (MET grant match)	$30,749
APCC staff time and permit print supplies (MET grant)	$4,091
FRGC and SSCEF 2018-2023 Design through Post-Construction (SNEP18/19 grant match)	$98,158.89
Project Team and Partner Time	not tracked
TOTAL	**$154,285**

Table 2. Summary of Childs River restoration project expense by funding source and project activity.

Funding Source	Feasibility	Design	Permitting	Construction	Monitoring	Education	APCC	FRGC	TOTAL Amount
FRGC	$68,000.00								**$68,000.00**
SSCEF	$3,200.00						$10,000.00		**$13,200.00**
CCF (2018)		$7,000.00					$1,000.00		**$8,000.00**
CCF (2023)					$223.50		$4,776.50		**$5,000.00**
Trout Unlimited					$2,500.00				**$2,500.00**
Embrace a Stream					$3,825.00				**$3,825.00**
MET (2018-2019)		$31,000.00	$23,600.00				$5,210.00		**$59,810.00**
Falmouth CPC (2018)		$57,000.00		$93,000.00					**$150,000.00**
SNEP (2018)		$18,833.17	$24,048.83	$191,058.40	$112,005.41	$19,572.73	$78,685.90	$5,795.56	**$450,000.00**
SNEP (2019)			$13,053.00	$201,026.46	$16,111.04	$14,809.50			**$245,000.00**
Masphee CPC (2019)				$240,510.00					**$240,510.00**
Ducks Unlimited					$5,000.00				**$5,000.00**
USFWS and Town of FA*		$50,600.00	$50,600.00	$526,575.00					**$627,775.00**
DER			$39,129.00	$28,693.00			$10,000.00		**$77,822.00**
DER NCWCG (2020)				$819,000.00					**$819,000.00**
TOTALS	**$71,200.00**	**$164,433.17**	**$150,430.83**	**$2,099,862.86**	**$139,664.95**	**$34,382.23**	**$109,672.40**	**$5,795.56**	**$2,775,442.00**
Falmouth CPC (2019)				*$0.00*					***$151,498.00***

*Note: Tighe & Bond contractual expense for design, permitting and construction oversight for replacement of the culvert under Carriage Shop Road as provided to the river restoration project team was not broken down by task so cost breakdown provided here is an estimate based on 1/3 of total contract for each of these tasks.

Table 3. Summary of Childs River restoration construction expense for work around the former dam and impoundments, and in the Farley and Garner bogs. This breakdown of construction expense by area of the site and funding source does not include expense for the culvert replacement at Carriage Shop Road managed by the town of Falmouth shown in Table 2. Note final contracted expense for Lucianos Excavation totaled $1,186,722.31 with an additional expense of $600 for transport of logs to the site by Forest Keepers Tree Care.

Area of Site	FA CPC18	MA CPC	SNEP18	SNEP19	NCWCG	TOTALS
Dam and Impoundments	$93,017.11	$0.00	$95,878.82	$30,626.64	$361,698.78	**$581,221.35**
Farley Bog	-	-	$95,179.59	$10,637.80	$227,091.89	**$332,909.28**
Garner Bogs	$0.00	$240,510.00	$0.00	$30,063.40	$2,618.33	**$273,191.73**
Construction Total	**$93,017.11**	**$240,510.00**	**$191,058.41**	**$71,327.84**	**$591,409.00**	**$1,187,322.36**
IF Construction Oversight				$129,698.62	$227,591.00	**$357,289.62**
TOTALS	**$93,017.11**	**$240,510.00**	**$191,058.41**	**$201,026.46**	**$819,000.00**	**$1,544,611.98**

2.A. Project Results

The goal of this project was to restore the upper Childs River. Short-term objectives included: removing an earthen berm, removing impounded sediment and ponds from behind the berm, replacing an undersized road crossing culvert, reconstructing the river channel through former cranberry bogs, and restoring the adjacent river channel floodplains and wetlands for a variety of ecosystem types. The long-term objectives are to improve aquatic organism passage, increase aquatic and riparian habitat including cold water habitat for Brook Trout, improve water quality, and increase community resilience by addressing stressors and impacts throughout the watershed.

Activities Carried out to Complete the Project

The SNEP 2018 and 2019 grants supported completion of the project from development of permit-ready designs, through permitting, final design, construction, and post-construction planting and monitoring as well as ongoing education and outreach. The original SNEP18 proposed scope included development of permit-ready 60% designs (2018), permitting (August 2018-March 2019), final design and construction bidding (April-July 2019), construction and post-construction planting (August 2019-May 2020), as well as ongoing monitoring (photo-doc, fish sampling, and WQ monitoring), education, and outreach. The SNEP19 proposed scope included construction (spring-summer 2020) and monitoring (2019-2020). Details regarding these tasks and timing of final completed work along with changes to project scope and schedule is provided below.

Development of Permit Ready 60% Designs

In September of 2018, the project team met to review updates from Inter-Fluve including hydrology and hydraulic modeling, topographic survey data of the bogs, wetland delineation around the impoundment, and sediment sampling. Preliminary 60% design plans and cost estimates were completed by Inter-Fluve by early December with comments provided by the team following a mid-December meeting. At the same time the town of Falmouth hired Tighe & Bond as engineer to complete design and oversight for replacement of the culvert at Carriage Shop Road (town-owned). In early 2019, the 60% design plans were updated based on final comments received.

Pre-permitting site visit February 2018. Photo credit: APCC.

Permitting

Initial drafting of permit applications began in late 2018 in tandem with development of 60% design plans and all permits were filed in 2019. The MEPA permit application was submitted in February and a MEPA site visit was completed in March. The MEPA certificate was issued end of March approving the requested waiver of the EIR requirement. Additional sediment sampling for compliance with permit requirements was completed in April. The Chapter91/401 permit was subsequently submitted in May. In response to the MEPA filing the Massachusetts Historical Commission requested an archeological survey of noted historically sensitive areas and a cultural resources survey for the entire project area. The Massachusetts Division of Ecological

Restoration hired the Public Archaeology Laboratory, Inc. (PAL) to complete the cultural resources survey in June to be followed by survey work during construction at key locations within the project area. On October 21, 2019 we received notice that the Dept. of Environmental Protection (DEP), had completed its Administrative Review and our application was complete. On November 8, 2019 the MassDEP conducted an onsite visit for the Technical Review for the combined Chapter 91 and a Section 401 Dredging, Fill/Excavation Water Quality Certification permit. Additional sediment sampling was completed in early 2020 for completion of Dept. of Environmental Protection (DEP) permitting.

The Public Archaeology Lab, Inc. (PAL), completed its field work and submitted its report to the MA Historical Commission (MHC). The MHC returned its comments recommending the Army Corps of Engineers develop a Memorandum Of Agreement (MOA), which includes stipulations of: an updated MHC Inventory form for the Waquoit River Herring Company Dam and Fish Ladder, archaeological monitoring under a permit issued from the State Archaeologist of the sensitive areas during construction, and the development of an interpretive panel at the former dam location in consultation with the Falmouth Historical Commission. The US Army Corps 404 permit was held pending completion of this MOA. The Chapter 91 Dredging License was received on July 29, 2020 and the Army Corps 404 permit on August 21, 2020. As a condition to the permits archaeological documentation of the site had to be completed prior to start of work. As a result of this and delays in permitting the team requested and received an extension from the Massachusetts Division of Marine Fisheries on the time of year restriction for in water work from September 1st to September 15th. PALs was on site to observe construction, advise and document any uncovered artifacts during work on and around Carriage Shop Road. During removal of the old culvert in February of 2021 three old metal carriage wheel rims, some nails and spokes were discovered inside the old culvert. Work on the culvert was halted until PAL notified MHC, the Falmouth Historical Commission and the Army Corps of Engineers. PAL measured and photo-documented the items and was informed that since these articles were found outside of any meaningful archaeological site, they would not require an avoidance or mitigation plan. The inventoried items were secured by the Rod & Gun Club and later passed on to the local historical society.

In June of 2021, PAL prepared and submitted its revised final technical report titled "Archaeological Monitoring and Walkover Survey" on the project to the MHC, the Army Corps of Engineers, the MA Board of Underwater Archaeological Resources, and other agencies as required in the MOA between the MHC and the Army Corps.

Final Design and Construction Bidding

Inter-Fluve was contracted to complete final design and bidding for the river restoration work. The Inter-Fluve design and bidding effort was funded by a grant from the Falmouth Community Preservation Committee. The 100% design plans were completed in December of 2019 and reviewed by the project team in January of 2020. Additionally, Tighe & Bond completed 100% design plans for the culvert in late 2019 for review by the town of Falmouth Department of Public Works (DPW). The river restoration project was put out to bid in May of 2020. Bids were received in June and final award made to Lucianos Excavation Inc. (Lucianos) as lowest qualified bidder. Construction bidding for the culvert was completed separately.

Construction and Post-Construction Maintenance

In preparation for construction, DER contracted Inter-Fluve to coordinate delivery of woody material to the site. Logs and root wads were delivered in June of 2019 from the nearby Francis Crane Wildlife Management Area. Rykor Concrete and Civil provided in-kind donation of services to regrade the access road and prepare a staging area for these materials. In late 2019, additional logs and root balls were received, and a large sand pile was removed from the Farley Bog as an in-kind donation from a local construction company. The location of the sand pile was established for placement of spoils from the river and accumulated sand from cranberry farming to be removed from the bog surface during construction.

The US Highway Administration was responsible for the installation of the culvert under Carriage Shop Road. Falmouth DPW used State Chapter 90 Highway Funds to cover the cost of purchase of the culvert and an MOU was signed between US Highway and the town for completion of this portion of the project.

The project team began hosting bi-weekly zoom planning calls in spring of 2020 in advance of project bidding and continued these meetings throughout construction in 2020 and 2021. Inter-Fluve was contracted to provide ongoing technical assistance and in-person construction oversight including coordination with the town of Falmouth and Tighe & Bond for the culvert replacement.

On September 8, 2020 construction began with removal of trees and vegetation around the impoundments north and south of Carriage Shop Road and digging of diversion channels. A notch was put in the dam to dewater the ponds and to allow for completion of the diversion channels prior to the September 15th time of year restriction. During this initial dewatering process it was noted that a few large granite rocks within the culvert had fallen out. The town of Falmouth engineer and their engineers at Tighe & Bond kept close inspection of the culvert and steel plates were initially placed in the road to stabilize the roadbed until replacement of the culvert. However, upon further inspection in November it was decided by the town to close the road to vehicle traffic. Work began in the bogs at the end of September. Stream diversions and the new channels were dug in both the Farley and Garner Bogs. During October the work was focused on the Garner Bogs including removal of sand and grading of the wetland, creating waterfowl ponds and placement of large woody material in the new river channel. In November work began to shift more to the Farley bogs including similar scope. The bulk of the work in the bogs was completed in December with microtopography the main task remaining along with some final sand removal and planting.

Construction in the bogs including installation of woody material and creation of the new stream channel and ponds for waterfowl. Photo Credits: FRGC and Inter-Fluve.

January to June of 2021 was very busy with the bulk of construction work completed during this time period. Early in 2021 final work in the bogs was wrapped up, including placement of wood along the channel edges, addition of microtopography to the bog surface to create a diverse and varied landscape with microhabitats, removal of additional sand from the bog surface and grading out of the floodplains, and expansion of the eastern pond in the Garner bogs (the latter two items accomplished with change orders adding scope to the original proposed design). Staging for work on the stream channel and culvert at Carriage Shop Road commenced in January with work to remove the culvert underway in February.

As the project was approaching the March 15th TOY restriction for in-water work, a request was submitted for delay of the TOY restriction until April 30th. This request was denied. To allow for work to continue the team worked with partners and regulators to set up and get approved setup of a dewatering discharge basin to the west of the impoundment area on state-owned (DCR) property. Water was pumped to the discharge basin which subsequently seeped into the ground and allowed for settling of sediment to allow for compliance of no siltation in the stream during the TOY restriction. With this system in place, work was able to continue with removal of the existing impounded water and construction of the new river channel north and south of Carriage Shop Road. However, in March the team was notified that due to distribution of labor, materials, and services as a result of the COVID-19 pandemic, Old Castle Infrastructure, the fabricator of the new culvert, would not be able to deliver the culvert until June.

Meanwhile, work in the river channel was completed in April. This included installation of FES lifts along the new channel, wrapping soil in layers of biodegradable fabric, and staking these into the ground to stabilize the new channel and prevent erosion until vegetation is established. Wood was installed along stream channels and in the new river floodplain to create aquatic and wildlife refuges and habitat, and grading of the former impoundments was completed. The culvert was delivered ahead of schedule, on May 26th, with installation completed on June 4th. Construction on the roadway continued through June and July with Carriage Shop Road officially reopened in late August following culvert completion and demobilization of the site. Completion of the culvert replacement, while part of the larger restoration project, was managed by the town of Falmouth and their consultant Tighe & Bond, and coordination with the river restoration work was managed by Inter-Fluve under contract to the Club.

Construction of the new river channel through the former impoundments and installation of the new culvert at Carriage Shop Road. Photo credits: Inter-Fluve.

Review and discussion of site planting plans was completed in early 2021 with input from the Falmouth and Mashpee Conservation Commission agents, Woodwell Climate Research Center's Chris Neil, MA Fisheries Steve Hurley and other project partners. Planting of the whole site got

underway in May with hydroseeding completed in June. Additional seeding and planting was completed in the fall of 2021 along with placement of large boulders along the eastern edge of the former northern impoundment to delineate the existing parking and road access from the restoration area. The team continues to monitor the site for plant survival, invasive species, erosion and sediment movement. Japanese knotweed has been observed at the Farley Bog and work will be done to continue to manage and eradicate this invasive plant. In 2022, the Club contracted with Lucianos and Essex for additional work including: 1) plantings in the ponds in both the Farley and Garner bogs, 2) additional tree plantings to replace beech trees with Scarlet oaks (due to concerns about beech bark blight), 3) weeding and mulching around chestnut trees planted in 2021, and 4) filling of a ditch outlet dug illegally by locals, which connected the western Garner bog pond to the stream channel and resulted in warm water flowing into the stream. The additional plantings in the ponds provide habitat and food for waterfowl. All landscape work, including ongoing monitoring and maintenance for three years post-construction, is to be completed by Essex Horticulture under subcontract to Lucianos. To ensure this maintenance responsibility was met, the retainage was held to be paid out with SNEP grant funding on a quarterly basis through end of 2022.

Aerial images of the restored Farley Bog, Garner bogs and former impoundments. Photo credit: Inter-Fluve.

After completion of construction along Carriage Shop Road, erosion of sediment within the river floodplain and from road runoff during major storm events became an issue. A number of nor-easters in the fall of 2021 caused substantial erosion damage to parts of the project area. Due to delays in project timeline, vegetation and seeding in these areas did not have sufficient time to get established prior to the fall storm season. Erosion of sediment is of particular concern as fine sediment can enter the system and settle on the rocky streambed impairing new and existing Brook Trout spawning habitat. The Club approved a change order to provide for erosion repairs and additional plantings and Lucianos and Essex Horticulture spent considerable time installing water bars, mats, and coils, to repair the area and to mitigate damage from future storms. The town of Falmouth agreed to address this with installation of infiltrating catch basins along the road and a grassy swale on the southeastern side of Carriage Shop Road where it drains to the river. Final installation was completed in late 2022 and the town is continuing to monitor the new stormwater infrastructure as vegetation is established in the swale and on site. Inter-Fluve was contracted to assist with coordination between the restoration project and the town.

Monitoring

In 2018, photo-documentation stands were set up by the Club and Jim Rassman, formerly of Waquoit Bay National Estuarine Research Reserve (WBNERR), and ten temperature sensing data loggers deployed through the project area. In 2019, plans for monitoring were finalized including an EPA approved QAPP incorporating water quality monitoring to be completed by Woodwell Climate Research Center (formerly Woods Hole Research Center).

Eastern Garner Bog picture post images May and November 2020 (top left and right) and 2021 (bottom left and right) showing progression of work from before, during and after construction. Photo credit: FRGC.

The Club contracted with Woodwell to complete ongoing discrete water quality sampling and nutrient analysis. Monitoring equipment was removed from the river during portions of the construction to allow for work to be completed. In 2021, a contract was established with Woodwell to complete a baseline monitoring report. This scope included review and analysis of water quality and vegetation data, and review and integration of existing pre-construction fish sampling data from MassWildlife. In December of 2021, the Club and Woodwell sought and received approval from the Falmouth Conservation Commission for installation of a USGS flow gauge on DCR property at Parsons Lane. While not integrated into the restoration project monitoring plan directly, this flow gauge will be integral to providing future analysis of nutrient load reduction from the restoration when paired with the water quality sampling data collected for this project. The baseline report of pre-construction data was finalized in 2022.

Steve Hurley, MassWildlife demonstration of electro-fishing Sept. 2021. Photo credit: FRGC.

In 2021 the Falmouth Rod and Gun Club engaged Benjamin Forestry Services to prepare a Forestry Management Plan. This plan was finalized in May, incorporating portions of the wooded areas within the restoration project area. This plan will be used by the Club to support ongoing maintenance of the site and property.

Monitoring of temperature, dissolved oxygen and fish has been ongoing in the Childs River by Steve Hurley at MassWildlife. Steve, with support from the Club, completes biannual electrofish surveying of several points in stream to count, measure and tag Brook Trout. With grant funding the project team has been able to support this ongoing effort throughout the project period. In 2022 with SNEP grant funding, the Club purchased three in-stream

BioMark monitoring systems to support ongoing fish sampling and improve tracking of tagged fish movements throughout the river.

In 2022, due to changes in staffing and capacity, data analysis and development of the one-year post-construction report transitioned from Woodwell to APCC. The report includes data from 2019 through 2022 (before, during and after construction). It was also agreed that after September 2022 (one year post-construction), water quality sampling would be reduced to four of the nine original locations for long-term sampling and analysis of nutrient data. Selection of the four station subset was based on initial baseline report findings and driven by the need to limit costs for longer-term data collection and reporting. Completion of the one-year report was a joint effort between APCC, Woodwell, and Steve Hurley. Steve Hurley of MassWildlife completed the semi-annual fish survey in September and provided analyzed data to APCC and the Club. Chris Neill of Woodwell provided draft analysis of vegetation survey data through summer of 2021. APCC completed analysis of water quality data comparing pre, during and post construction changes throughout the river and compiled this with the fish and vegetation data provided by MassWildlife and Woodwell. The draft one-year post-construction monitoring report was distributed to the team in December for comment. Jim Rassman (former Stewardship Coordinator at WBNERR) had worked closely with the Club to set up picture posts and continuous data loggers to track temperature and dissolved oxygen levels. The data from these loggers was downloaded by the Club and has been hosted on WBNERR servers. Working with WBNERR fellow, Allison Noble of Northeastern University, WBNERR deployed acoustic loggers on site in 2020. The Club and APCC worked to coordinate with the research fellow and WBNERR staff for redeployment of the data loggers in 2022. Analysis of this data was completed by Allison Noble and APCC and incorporated into the One-Year Post-Construction Monitoring report finalized in 2023.

Short and Long-Term Objectives

The following is a summary of the proposed objectives and progress towards achieving these objectives to date.

1) Remove the earthen dam below Carriage Shop Road by end of 2020 improving access to upstream habitat for fish including Brook Trout and American eel as measured by ongoing annual fish sampling by MassWildlife.

Removal of the earthen dam and installation of the new culvert at Carriage Shop Road was completed in 2021. With delays in permitting as well as culvert fabrication and delivery as result of the COVID-19 pandemic, work started and finished later than expected. However, the project team worked together to continue to progress the restoration through construction in 2020 and 2021 despite these challenges.

Brook Trout documented upstream of Carriage Shop Road Sept. 2021. Photo credit: FRGC.

State Fish Biologist Steve Hurley did an electroshock census of the Childs River in May of 2022 following completion of restoration in 2021. A total of 19 Brook Trout were captured

in the former impoundment areas including five young of the year (YOY) and 17 were captured below and in the lower half of Farley bog including four YOY. These results show great success in rehabilitating the river for Brook Trout habitat as there was a substantial increase in the number of fish in the restored areas. Also, the capture of YOY Brook Trout in both the Farley Bog and the newly constructed stream channels through the former Carriage Shop Road ponds indicates successful spawning in the restored areas! With the return of Brook Trout back to the upper Childs River, a major objective of the project has been achieved. American Eel were also found in all areas surveyed and small numbers of YOY sunfish, golden shiner, one small brown bullhead and a few killifish were also observed.

2) Improved water quality within three years following restoration in the area of the former dam and impoundment. Long-term improvements to water quality in the retired cranberry bogs. Measured by: water temperature, dissolved oxygen and nutrient concentrations.

Steve Hurley reported that after the removal of the Carriage Shop Road ponds, average temperatures below the former pond/impoundments were significantly lower in the summer and warmer in the winter than they were prior to the dam removal and river restoration. Temperature conditions in the former pond area are now within suitable ranges for Brook Trout throughout the year. In prior years, few if any fish were found north of the old dam and ponds. The water was simply too warm and this habitat was inaccessible due to the failed fish ladder. Additional improvements (decline) to temperature were measured below Farley Bog and in the Garner Bog. Likewise, summer dissolved oxygen levels measured within one-year of restoration also showed improved fish habitat with reduced daily range fluctuations and levels at or just below 6 mg/L, the optimum level for fish survival. During construction concentrations of some nutrient parameters (mainly nitrate, ammonium, and silica) increased. While findings show success in the restored area regaining natural attenuation function by spring of 2022 (i.e., nutrients were actively being taken up or cycled into other forms within the former bogs and impoundment), as of September 2022, the restoration has not reduced overall nutrient levels within the system. However, longer-term monitoring of nutrients is ongoing to better understand the impact of restoration on water quality within the project area and downstream in the nutrient-impaired Waquoit Bay.

3) Improved fish passage within the first year following restoration, increased aquatic habitat opportunities immediately following construction and increased fish populations within three years of restoration. Measured by: removal of fish passage barriers as documented by an as-built survey and annual and semi-annual fish surveys of total number of adult fish as well as young of the year (YOY).

Final as-builts were completed in November of 2021 with completion of construction in the bogs and former impoundments as described above demonstrating successful removal of all barriers to fish passage. As described above under objectives 1 and 2 revitalized Brook Trout numbers and clear signs of successful spawning following restoration demonstrate the project has achieved improved fish passage and provided aquatic habitat to support this cold water fish.

4) Provide improved habitat for Brook Trout and other fish, waterfowl and wildlife by 2022 as measured by stream temperature, photo-documentation of river and bog, as-built designs, and MassWildlife annual sampling of fish.

Sarah Klionsky has been monitoring vegetation plots in restored cranberry bogs for her PhD research at the University of Connecticut and in collaboration with Chris Neill at the Woodwell Climate Research Center. Sarah and Chris monitored vegetation in the Farley and Garner bogs prior to construction and began monitoring the vegetation in those same locations after construction. Through this monitoring, they noticed a marked increase in the number of wetland species and percent cover of wetland species. In the former Farley Bog, plant species increased in number from 49 to 82 between 2019 and 2021; and in the former Garner Bogs, plant species increased in number from 60 to 94 between 2019 and 2021.

Semi-annual fish surveys are ongoing with initial findings summarized in the one-year post restoration report (APCC, 2023) along with improvements to water temperature, dissolved oxygen and positive changes in wetland vegetation within the former bogs indicating successful restoration of more natural wetland habitat and hydrology.

5) Increase community resilience to climate change and sea level rise through removal of barriers, expansion of floodplains, and replacement of aging and undersized infrastructure.

With completion of this project, a failed fish ladder and earthen berm were removed and the degraded culvert at Carriage Shop Road replaced. The impounded water (ponds) behind these barriers were drained and a new river channel and floodplain constructed increasing the community resilience to climate change. Additionally, stormwater improvements were made along the road by the town of Falmouth to treat runoff and to seek to address ongoing erosion and siltation issues at the site post-construction.

6) Increased area of viable Atlantic white cedar wetland habitat within three years of restoration. Measured by photo documentation and maturity of planted trees.

Monitoring of survival of planting vegetation is ongoing by Essex Horticulture. Beyond those included in the planting plan, an additional 40 Atlantic white cedar (AWC) trees were donated and planted on site by Glorianna Davenport of Living Laboratory to gather information and determine best practices for optimal growth and survival. The AWC planted near the berm around the large pond in Farley bog as well as closer to the edges of the bogs were reported in June of 2023 as having good survival due to restored conditions. Some locations more central to the bog did not have a good survival rate, probably because there is too much surface water in these areas. Further monitoring of survival and documentation of growth will continue post-construction.

7) Increase public access to and knowledge of the river and restoration benefits as measured by education and outreach events held and number of attendees, press releases, newsletters and other materials created and distributed.

8) And contribution to regional knowledge through project features in local and regional news within the first year following restoration and integration of data gathering into regional understanding of impacts of restoration on water quality and watershed health within five years of restoration. Measured by: public event and press events, state and regional partners use of monitoring data and reporting, other outreach and communication products.

See Table 4 and Section 2.F. narrative of this report summarizing education and outreach impact as well as supporting materials for copies of press releases, news articles and key outreach materials.

Findings to Date and Lessons Learned

The timing of project construction bidding early during the COVID-19 pandemic was fortuitous for this project as bids received came in lower than anticipated. Likewise, with a well-established set of partners at the local, state and federal levels this project was able to secure more funding than was needed for completion of construction as initially proposed. The combination of low bid cost and additional grant funding allowed the project to take advantage of opportunities to include more change orders to expand upon the extent of restoration work in the bogs and river and improve the overall impact of the project. Change orders included additional sand removal, microtopography, expanded pond excavation and plantings. However, as described in detail in the section below the pandemic had an overall negative impact on timing of the project resulting in delays to permitting and construction.

For additional details on findings to date and report on impact of the project see the executive summary and full One-Year Post Construction Report (APCC, 2023).

Changes Made to the Project Plan over the Course of the Project

Without sufficient funds secured to complete 60% design until award of the MET and SNEP grants in late 2018 work on design plans was not able to commence as early as proposed. Earlier project planning anticipated completion of 60% design plans by end of September 2018. However, with a quick turnaround by Inter-Fluve preliminary 60% design plans were completed by December of 2018 with permitting on track with initial drafting done concurrent to work on the 60% permit ready design plans.

One challenge to project progress was aligning the design work for habitat restoration with the Carriage Shop Road culvert design. The habitat restoration of the former impoundment and bogs was managed by the Club with Inter-Fluve contracted to be complete design and permitting. Whereas, the town of Falmouth was managing the culvert replacement at Carriage Shop Road with design work contracted to Tighe & Bond. The goal was to have culvert design work completed to allow Inter-Fluve to file a single set of permit applications for the project as a whole. This scope of work outside of the project managed by the Club was delayed from the original anticipated timeline. Tighe & Bond delivered their culvert analysis report in May of 2019 and the preferred design was selected. However, the project team had hoped this would have been completed sooner to more directly align with initial filing of permits for the river and bog restoration. With work on the dam and river so closely tied together with the culvert replacement, it was necessary for construction to occur in tandem, thus delays in design and permitting related to the culvert pushed back construction for the project as a whole.

Following delays in 2019, construction was expected to commence in spring or summer of 2020, but the COVID-19 pandemic in March of 2020 led to further delays in permit review and approval. Due to the COVID-19, closures and restrictions on public comment and review completion of permits was delayed. The project team was working in coordination with the Corps and DEP regional office to continue to progress these permits but this delay in review and approval of permits pushed back the timeline of the project further. Construction was initially proposed to begin fall of 2019, but ultimately did not commence until September of 2020. The team had planned to do a ribbon cutting event at the start of construction but due to delays in schedule and COVID-19 concerns a press release was issued and interviews completed but no event was held in 2020. The new culvert for Carriage Shop Road was originally scheduled to be delivered around October 31st, 2020. However, we received notice from Falmouth DPW in late 2020 that due to the pandemic, the culvert fabricator had severe manpower shortages and was projecting the culvert would not be available until March 31, 2021. Then in March, this was updated that the culvert would be further delayed until delivery in June. As a result of these delays, the Club requested a no-cost extension for the SNEP grants through December of 2021 to allow for completion of construction, monitoring and outreach post-implementation.

In December of 2019, the Falmouth Community Preservation Committee approved an application for $151,498 in additional funding for this project. These funds were intended to complement the SNEP 2019 award, making up the difference between the requested and final awarded funds for work on the dam and Farley bog. However, this Falmouth CPC funding was ultimately not needed due to award of $819,000 to DER in 2020 from the USFWS National Coastal Wetlands Conservation Grant. This grant included a proposed $400,000 for culvert replacement which was not ultimately needed as the town of Falmouth and USFWS highway administration funds covered the cost of culvert design and construction. Thus, the NCWCG funding was redirected to cover other parts of construction intended to be paid for the 2019 Falmouth CPC grant and SNEP 2018 and 2019 grants.

The team was notified in May of 2022 of the departure of Alex Hackman from his position as Cranberry Bog restoration manager at DER. Jess Cohn the interim project contact, left DER as well in 2023, resulting in a gap in DER capacity and involvement. At the same time, the team was notified that Lindsay Scott of Woodwell would be leaving her position in September of 2022. Lindsay was the lead managing the ongoing water quality data analysis for Woodwell including drafting of the baseline monitoring report. The team had been anticipating further monitoring to be supported by DER and for sampling, analysis and reporting to be completed by Woodwell. Throughout 2022, the team worked together to develop alternative plans and secure separate funding for this work. APCC was contracted by the Club to complete analysis and reporting for one-year post-construction monitoring data. Working with the Club, APCC assisted with transition of water quality sampling and analysis to WBNERR in late 2022 and secured commitment from DER to support permit reporting and closeout in 2023 and 2024.

Installation of final educational signage post-construction also experienced delays due to several changes in anticipated timeline for printing by the subcontracted company (Fossil) and two misprints of signs sent in September and November of 2022. However, despite these challenges

the Club and Inter-Fluve were able to work out to get a replacement mounting for one sign and the Club subcontracted M.R. Soares Co. to complete final installation in December of 2022.

The combined impact of these challenges was that the Club had to request two extensions on the SNEP grant funding to allow for completion of construction, monitoring and reporting.

Next Steps for Future Progress

The Club will continue to coordinate with the Waquoit Bay National Estuarine Research Reserve (WBNERR) to provide access for ongoing water quality sampling. WBNERR is committed to collecting and filter water samples through September 2024 in order to provide at minimum three years of post-restoration water quality monitoring data. Sample collection and processing will be completed through a combination of staff and volunteers. WBNERR has in place a contract with the Center for Coastal Studies and will fund the laboratory analysis of water quality samples collected throughout this period. Data will be processed by the Center for Coastal Studies Water Quality Lab for ammonium, nitrate, orthophosphate, silicate, and total dissolved nitrogen. The Center will continue to subcontract the analysis of dissolved organic carbon through the Woods Hole Oceanographic Institution.

The water quality data will be included in a three-year post-restoration report. The plan is to build upon the one-year post-restoration report, developed by APCC, through continued coordination with MassWildlife, Woodwell Climate Research Center, and WBNERR to include not only water quality data but also fish survey results, data from continuous temperature and dissolved oxygen loggers, and vegetation monitoring data from the former bogs.

APCC is continuing to work with partners to secure DER FY24 funding to contract Inter-Fluve Inc. to meet final permitting requirements, including survey work and reporting. Timing of permit closeout is still being discussed.

Challenges for Future Progress

The team has been in discussion with WBNERR to secure additional funding in their annual budget to continue to support monitoring, and APCC and the Club are working with DER to fill funding gaps for permitting and reporting. Fortunately, WBNERR has agreed to fund water quality sample collection and analysis through September of 2024, and DER has secured funding for Inter-Fluve to complete permit reporting by June of 2024. However, further funding would be needed to complete monitoring or permit closeout if these tasks persist beyond these periods.

The Club is coordinating with the town of Falmouth to track accumulation and complete periodic clean out of sediment traps which may impact timing of permit closeout. The sediment traps are meant to control sand flushing from former bog systems and maintain suitable fish spawning habitat. However, if sand continues to collect in the traps into this fall and winter, this could delay the closeout of the permits next spring.

Additionally, completion of analysis and reporting on year two and year three post-construction data in late 2024 will depend on funding availability. APCC will work with partners to secure funding for the data analysis and report development. This report will be critical to understand

the longer-term impacts on stream habitat in the Childs River following the removal of the impoundments, restoration of the bogs, and reconstruction of the culvert.

Erosion of sediment due to stormwater runoff along the northeast and southeast side of Carriage Shop Road has been an ongoing issue since completion of construction in 2021. Responsibility for addressing the runoff falls to the town of Falmouth as the road is town owned but design and installation of the new system was delayed, and erosion continued to be an issue through summer of 2022. After installation, it was noted by the Club that some of the road runoff was bypassing the new catch basins installed by the town. The town is aware of this and communicated they are continuing to monitor the stormwater infrastructure. However, communication from the town regarding the stormwater has been limited. The team will continue to monitor this location to seek to address any ongoing or future sediment erosion issues.

2.C. Compliance

List or summarize any compliance activities completed – Quality Assurance Project Plan (QAPP), permits, etc.

Development of a Quality Assurance Project Plan (QAPP) got underway in 2018 including photo-documentation, sediment sampling and water quality monitoring. APCC managed drafting of the QAPP with input from DER, Inter-Fluve, the Club, WBNERR, and Woodwell Climate Research Center (formerly known as Woods Hole Research Center). The draft QAPP was updated in early 2019 and submitted to VHB for review in April. Following further revisions the QAPP was submitted to the EPA for review in May. The QAPP was finalized and approved with signatures in August of 2019.

Inter-Fluve completed draft and submission of all permit applications in 2019 with final permits approved in 2020. The following is a list of all permits completed for this project:

- Section 106 Project Notification Form to the Massachusetts Historical Commission
- Expanded Environmental Notification Form (EENF) for the waiver of an Environmental Impact Review through the Massachusetts Environmental Policy Act (MEPA)
- BRP WW 26 Combined 401 Dredge/Fill Permit and Chapter 91 Waterways Permit to MassDEP
- Chapter 91 License to MassDEP for the new road crossing
- Section 404 Permit to the Army Corps of Engineers (ACOE) including Section 106 review (historical and archaeological assessment) and Section 7 review (federally endangered species)
- Wetlands Protection Act Notice of Intent to the Mashpee and Falmouth Conservation Commissions and MassDEP

All permit applications were completed in 2020. Inter-Fluve's contract was amended in 2022 to include additional survey work and reporting to comply with permit requirements. Survey work was completed in the fall and final report submitted to the Falmouth Conservation Commission and DEP in December of 2022. Discussion is ongoing about timing for closeout of construction permits to allow for ongoing maintenance and cleanout of sediment traps. These sediment traps were installed across the site to capture sand migrating from the bogs or washing down from erosion to avoid impairment of in-stream Brook Trout habitat. The Club and MassWildlife

monitors these sediment traps and working with the town of Falmouth has arranged to periodically (1-2x/year) scoop out excess fine sediment captured here. A final decision on timing for close out of permits will be made in late 2023 or early 2024.

2.D. Project Partners

Below is a list of major project partners and associates along with a description of their contribution to the project:

April Wobst (APCC), Nick Nelson (IF), Gary Anderson, Jim Anker and Ken Bates (FRGC) at the SNEP18 grant award event. Photo credit: APCC.

FRGC and SSCEF – Project manager. Gary Anderson managed the project with support from Dennis Martin and A.D. Colburn. Dennis managed education and outreach, and A.D. managed monitoring. Additional key members assisting with the project included Ken Bates, Jim Anker, Tim Lynch, Ron Densmore, Bobby Palmer, and Dan Murphy. Members provided in-kind contribution of their time for project management, grant administration, site visits, participation in meetings/events, monitoring, photo-documentation, development of outreach materials, educational presentations, and post-construction site maintenance. Contracts managed included: Inter-Fluve, APCC, and Lucianos along with additional small contracts (e.g. Rykor). Members managed education and outreach activities to the community working with APCC to publicize and advertise events and updates on the project via newsletters and press releases. Club members worked closely with partners on planning and implementation of monitoring including photo-documentation of the project at picture posts and during all phases of construction, assisting Steve Hurley with bi-annual electrofish surveys, and assisting Woodwell and WBNERR with water quality sampling.

Inter-Fluve (IF) – Engineer. Managed by Nick Nelson. Completed feasibility studies, survey work, restoration designs for the former impoundment and bogs, permitting for the project including culvert replacement, construction oversight and coordination with the town of Falmouth, USFWS and Tighe & Bond for culvert work. Inter-Fluve was contracted to complete design, printing and delivery of educational signs as well as year one post-construction survey work and photo-documentation to comply with permitting requirements.

Association to Preserve Cape Cod (APCC) – Subcontractor. Managed by April Wobst with support from Jordan Mora and Bryan Horsley. Provided technical support along with project management, grant administration, monitoring and outreach. This included management of QAPP development, review and comment on all technical documents and reports, coordination of monitoring amongst partners, expense and match tracking, monthly and semi-annual grant reporting, development of outreach materials, presentation of the project at regional and national conferences, drafting and distribution of press releases, sharing project updates to APCC members, analysis of post-construction water quality data and development of a year one

monitoring report, assistance with contract development, and transition of monitoring and permit close-out work to project partners.

USFWS Mashpee National Wildlife Refuge and USFWS state office – The USFWS currently owns and protects 341 acres upstream of the project site but the entire refuge is managed in partnership with other local landowners, including Club. The USFWS provided technical support and review of design plans and was critical in securing funding for the culvert replacement. USFWS finalized agreements with the town of Falmouth for culvert construction funding. Primary contributions from Tom Eagle and Carl Melberg. Participated in construction management calls, monitored ongoing culvert installation and worked closely with town of Falmouth and U.S. Highway Administration on culvert replacement and the related road work.

Falmouth and Mashpee Community Preservation Committees (CPC) – Funding from the CPCs supported land ownership transfer and establishment of conservation restriction for land in Falmouth and setup of a long-term lease agreement for land in Mashpee putting the full project area under ownership of the FRGC. The Falmouth CPC supported final design work as well as construction. The Mashpee CPC funding supported construction in the Garner bogs.

Falmouth Department of Public Works – Managed contracting and oversight of the culvert replacement at Carriage Shop Road, a town owned roadway. This included contracts with Tighe & Bond for culvert design, permitting coordination with Inter-Fluve, and construction oversight; along with management of fabrication and delivery of the culvert; and contracting with Lucianos for installation of the new culvert. The town of Falmouth funded purchase of the culvert and Tighe & Bond scope for design and construction oversight. The town worked closely with the USFWS and U.S. Highway Administration on agreements and funding for installation of the culvert. The town completed design and installation of stormwater measures along Carriage Shop Road including a series of infiltrating catch basins and a grassy swale.

Waquoit Bay National Estuarine Research Reserve (WBNERR) – Provided technical and monitoring support including review of design plans, establishment of photo-documentation stations, deployment and management of temperature and dissolved oxygen data loggers, download and hosting of logger data, and starting in 2023 management of post-construction water quality sampling and analysis. WBNERR served as project liason for the Department of Conservation and Recreation (DCR) for coordination and approval of work on DCR land around Carriage Shop Road. Contributions by Jim Rassman, Alison Noble, Tonna-Marie Surgeon Rogers, and Ryan Clark.

Ryan Clark (WBNERR) and Jordan Mora (APCC) processing water samples in 2023. Photo credit: FRGC.

Massachusetts Division of Fisheries and Wildlife (MassWildlife) – Technical support including review and input on design plans, construction and maintenance to ensure final restoration would maximize benefits to Brook Trout and minimize negative impacts to existing habitat. Ongoing bi-annual temperature monitoring and electrofish surveys were completed by Steve Hurley at MassWildlife in coordination with the FRGC. Analysis and summary fish survey and data logger data was provided for the baseline and one-year post-construction monitoring reports.

MassWildlife staff supported promotion and distribution of press releases and provided quotes and interviews for media.

Massachusetts Division of Ecological Restoration (DER) – Technical support and funding. Project lead Alex Hackman with support from Jess Cohn, Melissa Riley and Kristen Ferry. The Childs River restoration was designated as a DER priority project. DER staff provided review of all design documents, provided input on monitoring plans, filled funding gaps to comply with permitting requirements, participated in construction planning meetings, and are supporting post-construction permit reporting and close out. DER funded portions of APCC time as the local non-profit assisting the FRGC with project management, sediment sampling by Inter-Fluve and PAL survey work and education material development to comply with permit requirements, transport and delivery of woody material for construction, DER applied for and was awarded a grant from the USFWS National Coastal Wetlands Conservation Grant equal to $819,000 to support construction and participated in construction planning calls informing decisions on change orders for final sediment removal, microtopography and site grading.

Woodwell Climate Research Center (formerly Woods Hole Research Center) – Contracted by the FRGC to complete water quality sampling, data analysis and reporting. Contracted by DER to complete annual vegetation surveys in the former cranberry bogs. Project leads included Max Holmes and Chris Neil with water quality lab analysis and reporting by Lindsay Scott. Assisted with drafting and revision of the QAPP. From 2019 to 2022 Woodwell completed field data collection and lab analysis of water quality samples at nine stations throughout the project area. In 2021 this along with other monitoring data was compiled and Woodwell completed analysis of water quality and vegetation data. Woodwell completed the baseline pre-construction monitoring report in June of 2022.

2.E. Volunteer and Community Involvement

The FRGC and SSCEF as noted above both provided their time as in-kind match for project management, construction contract management, and ongoing monitoring and maintenance of the site. A total of 9 members of the FRGC and SSCEF tracked their time as match throughout the project. An estimated $16,950 for 565 hours of in-kind contributions were provided from 2014 to 2017 for early project planning prior to award of any grant. FRGC and SSCEF in-kind contribution was initially used as match for a MET grant and subsequent to that for the SNEP grants. In total $30,749.02 of match or 1,025 hours at a rate of $30/hr was provided from September of 2018 through April of 2019 for the MET grant. For the SNEP18 and SNEP19 grants from 2019-2023 an additional $98,158.89 or 3,975.65 hours of in-kind match was provided at a rate of $24.69/hr. The estimated value of the combined total volunteer contribution was equal to $145,857.89 for 5,565 hours (Table 1).

Additional project team and community members also contributed significantly to the project. The time of these staff and volunteers was not tracked for this project but were integral to completion of the project planning, monitoring and implementation. Project team members of note include: Tom Eagle, and Carl Melberg of the USFWS; Steve Hurley of MassWildlife; Alex Hackman, Jess Cohn, Melissa Riley and Kristen Ferry of DER; Jim Rassman, Ryan Clark and Tonna-Marie Surgeon-Rogers of WBNERR; and Glorianna Davenport of Living Laboratory. Additional project support was provided by the Friends of Mashpee National Wildlife Refuge and the Cape Cod Chapter of Trout Unlimited.

2.F. Outreach & Communications

The goals of outreach were to expand the impact of this project and relay the message about this work and the benefits of restoration to the public. Through outreach and community the team objectives were to maintain and garner additional public support to carry this project through to completion, educate the public about the project and the benefits of restoration for the aquatic ecosystem and recreation, and promote the project and funding organizations as major contributors.

The team had proposed to achieve these goals and objectives through quarterly press releases, media site visits, ground-breaking event at the start of construction, a celebratory event at the end of construction, annual youth day/hunts, school and scout events including tagging/count programs, guided tours and site visits, newsletter updates, annual meetings with partners, web/social media updates, and updates at the Cape Coastal conference. The following is a summary of work completed.

Press releases were completed on roughly an annual basis with a greater concentration of news articles and press attention received in 2020-2021 immediately before, during and after construction. Press releases were sent out to media announcing the 2018 Massachusetts Environmental Trust (MET) and SNEP grant awards. The MET press release was picked up by the Cape Cod Times and the SNEP grant covered by multiple outlets. The project team attended the SNEP award event and created a project summary poster. The project received press in late fall of 2018 in conjunction with a joint application with the town of Mashpee for funding by the Mashpee Community Preservation Committee to cover Garner bog construction expense. The project was also presented at the RAE Summit in December of 2018.

The project was presented to the Massachusetts Secretary of Energy and Environmental Affairs in January of 2019 as part of a proposal seeking additional funding from the state. The club promoted the project at their annual Youth Day Event in June and project manager Gary Anderson taped a 35-minute interview about the project with Falmouth Community television. The interview was aired several times on the local access TV channel and made available on YouTube. In July of 2019, APCC and the FRGC hosted a set of walking tours for the public with invitation to abutters, community members, the towns and media. A tour was hosted at the nearby Coonamessett River to show a similar project already underway and partly completed with a tour at the Childs River the following week to discuss plans for work at this site.

Ron Amidon, Commissioner of MA Dept. of Fish and Game, representatives from the MA Division of Ecological Restoration (DER), State Senator Susan Moran and a member of her staff accompanied UCRRP team members on a site visit of the project in July of 2020. Several additional site visits were conducted in late 2020 including Ed Hadad, Chair of the Falmouth Historical Commission, Megan Amsler, Chair of the Falmouth Energy Committee, Sam Houghton of WCAI Radio, Betsy Gladfelter of Falmouth Conservation Commission, Glorianna Davenport of the Tidmarsh Restoration Project/Living Laboratory in Plymouth, Drew McManus Mashpee Conservation agent, representatives from the Bass River Restoration Project, a lender from Cape Cod Five, and new DER staff. On August 6, 2021 DER and the Club hosted a site tour for members of the Joint Committee on the Environment, Natural Resources, and Agriculture.

A press release was distributed announcing the start of construction and an article was published by the Falmouth Enterprise in the September 18th, 2020 edition as well as in other online publications. In November of 2020, WCAI ran a story on cranberry bog restoration and the Childs River project: https://www.capeandislands.org/post/returning-cranberry-bogs-nature-green-exit-strategy#stream/0.

The Club and APCC planned and hosted a ribbon cutting event on September 23, 2021 to celebrate completion of construction. The event attended by close to 100 people included presentation, lunch, site tours and electrofishing demonstrations by Steve Hurley. The event was publicized with a media alert and press release with Save the Date and final invitations sent to project team members, funders, partners and members of the public adjacent to the project.

Construction completion celebration event including electrofishing demonstration with Brook Trout found in the newly constructed river channel north of Carriage Shop Road (Sept. 23, 2021). Photo credits: APCC.

An updated project summary factsheet for the public was created for outreach throughout design and permitting. Following completion of the project a trifold brochure, series of project posters, and power point presentation were developed by the Club for community outreach and education as summarized in Table 4. APCC supported creation of a final trail map for use in these materials and final signage. The Club developed this into an educational program called "The Science Behind the Project" and presented this to students at the Falmouth Academy and to several other groups in 2021 and 2022. The Club spoke to local reporters about the project and an article on the success of restoration to date was published by the Falmouth Enterprise on June 25, 2022 highlighting the return of Brook Trout to the upper Childs River.

Table 4. Summary of education and outreach impact for the Childs River restoration.

Date	Event or Activity	Est. Attendees
9/24/2018	SNEP Award Event and Poster Presentation	50
Dec-18	RAE Summit Presentation	50
1/6/2019	EOEEA Meeting with Secretary Beaton, Senator Vinny deMacedo and Representatives David Vieira and Dylan Fernandes	15
3/15/2019	MEPA Permitting Site Visit/Tour	13
Jun-19	FRGC Annual Youth Day	30
7/6/2019	Falmouth TV Interview Airdate, Video online (# of views)	47
7/16/2019	Coonamessett River Walking Tour	15
7/23/2019	Childs River Walking Tour	15
7/8/2020	Site Tour with Commissioner Ron Amidon, Senator Susan Moran	3
Late 2020	Other Site Visits (town and local reps)	15

5/4/2021	Friends of Mashpee National Wildlife Refuge Presentation	5
5/21/2021	Cheeky Fishing Tournament Presentation	26
7/10/2021	Falmouth Veterans Presentation	10
Aug-21	Childs River Aug 2021 Restoration Video (APCC vimeo views)	94
8/6/2021	MA Joint Committee on Environmental, Natural Resources and Agriculture (ENRA) Site Visit with DER	23
9/21/2021	Falmouth Academy Science Class Presentation	60
9/22/2021	Falmouth Academy Site Tour	30
9/23/2021	Construction Completion Restoration Celebration	100
12/6/2021	Masons of the Marine Lodge Presentation	24
3/1/2022	SNEP webinar: Project Successes in the Region	72
4/3/2022	Boy Scouts of America Site Orientation	29
5/18/2022	SNEP Symposium with Childs Poster	164
6/16/2022	EBC Coonamessett River Award for Outstanding Collaboration	300
9/26/2022	3 Lectures to Falmouth Academy 7th Grade Science Classes	41
9/28/2022	Guided Tour of Restoration Site - Falmouth Academy Students	34
11/16/2022	Restoration Presentation at the West Falmouth Public Library	21
		1,286
	Membership and Online Reach	
Ongoing	FRGC Membership including 11 FRGC and SSCEF Board members	318
Ongoing	APCC membership - Newsletters, e-news, annual reports	5,000
Ongoing	APCC social media (Facebook and Instagram followers)	6,521
		11,839

Working with Eagle Scouts, a plan for installation of two observation sites at the former Farley and Garner bogs was established and approved by SSCEF, the Club, the Falmouth town Conservation Commission and the Building Commissioner. These viewing areas were designed to be incorporated into the existing and new trail system to be established for the public following completion of construction.

A temporary project sign acknowledging all partners and funders was posted at the site entrance at the start of construction in September of 2020 and final signs were designed and installed in 2022. The final signage includes two signs designed by PALs related to the old herring run and Carriage shop Road, two project overview signs placed at the site entrances to the north and south end of the project area and trails in Falmouth and Mashpee, and two signs describing cranberry bog restoration placed and the viewing platforms established in the Farley and Garner bogs.




Final signs installed at the former bog viewing platform and adjacent to the former impoundment. Additional signage was included at the site trail entrances in Falmouth and Mashpee. Photo credits: FRGC and APCC.

The FRGC developed a video summarizing the project using drone footage captured by one of their members and project volunteers. The project was photo-documented by the Club and Inter-Fluve taking images from established picture posts, regular photos of construction activities, and drone surveys to provide aerial images. The Falmouth Rod and Gun Club set up a dropbox with photos. Permission for access can be requested from Dennis Martin atdfmartincape@gmail.com https://www.dropbox.com/sh/d9wnuiwqs0l4dq7/AADqjUgkbaG2Q534fMi7R-jua?dl=0

The project was regularly promoted to FRGC, SSCEF and APCC members including presentations to club members and the board, updates on APCC social media and weekly e-newsletters to members and in APCC quarterly and annual member reports. https://apcc.org/wp-content/uploads/2020/12/APCC-Shore-Lines-Winter-2020.pdf

SSCEF, FRGC, and APCC updated their webpages periodically with details about the project with current project content available at:
https://www.thefrgc.net/about-4
https://www.sscefund.org/
https://apcc.org/river-and-bog-restoration/

3. Project Budget Report

3.A. Summary Budget Table SNEPWG18-10-FRGC

Budget Category	Total Budgeted Funds	Total Budgeted Match	Total Budgeted Grant + Match	Actual Grant Funds Expended	Actual Match Funds Expended	Actual Expended Grant + Match	Match Source
Personnel	$0.00	$4,938.00	**$4,938.00**	n/a	$76,583.28	**$76,583.28**	FRGC & SSCEF
Fringe	$0.00	$0.00	**$0.00**	n/a	n/a	**n/a**	n/a
Travel	$750.00	$0.00	**$750.00**	$238.96	n/a	**$238.96**	n/a
Equipment**	$35,000.00	$0.00	**$35,000.00**	$0.00	n/a	**$0.00**	n/a
Supplies*	$18,400.00	$0.00	**$18,400.00**	$46,347.15	$2,896.20	**$49,243.35**	n/a
Contractual*	$395,850.00	$144,310.00	**$540,160.00**	$403,413.89	$128,969.30	**$532,383.19**	MET, DER, CCF, FA CPC, Rykor, SSCEF
Total Direct	**$450,000.00**	**$149,248.00**	**$599,248.00**	**$450,000.00**	**$208,448.78**	**$658,448.78**	**n/a**
Indirect	$0.00	$0.00	**$0.00**	$0.00	$0.00	**$0.00**	n/a
Total	**$450,000.00**	**$149,248.00**	**$599,248.00**	**$450,000.00**	**$208,448.78**	**$658,448.78**	**n/a**

*Budgeted Expense Based on Budget Revision Approved 17 August 2021
** Budget Reallocation Approved February 2022

3.A. Summary Budget Table: SNEPWG19-10-FRGC

Budget Category	Total Budgeted Funds	Total Budgeted Match	Grant Funds this Period	Grant Funds Cumulative	Match Funds this Period	Match Funds Cumulative	Match Source
Personnel	$0.00	$9,876.00	n/a	n/a	$0.00	$21,576.61	FRGC & SSCEF
Fringe	$0.00	$0.00	n/a	n/a	n/a	n/a	n/a
Travel	$500.00	$0.00	$0.00	$0.00	n/a	n/a	n/a
Equipment	$0.00	$0.00	n/a	n/a	n/a	n/a	n/a
Supplies	$5,000.00	$0.00	$0.00	$400.00	n/a	n/a	
Contractual	$239,500.00	$75,000.00	$50,864.26	$150,781.30	$0.00	$70,143.16	DER, FA/MA CPC
Total Direct	**$245,000.00**	**$84,876.00**	**$50,864.26**	**$151,181.30**	**$0.00**	**$91,719.77**	**n/a**
Indirect	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	n/a
Total	**$245,000.00**	**$84,876.00**	**$50,864.26**	**$151,181.30**	**$0.00**	**$91,719.77**	**n/a**

Budget Category	Total Budgeted Funds	Total Budgeted Match	Total Budgeted Grant + Match	Actual Grant Funds Expended	Actual Match Funds Expended	Actual Expended Grant + Match	Match Source
Personnel	$0.00	$9,876.00	**$9,876.00**	n/a	$21,576.61	**$21,576.61**	FRGC/SSCEF
Fringe	$0.00	$0.00	**$0.00**	n/a	n/a	**n/a**	n/a
Travel	$500.00	$0.00	**$500.00**	$0.00	n/a	**$0.00**	n/a
Equipment	$0.00	$0.00	**$0.00**	n/a	n/a	**n/a**	n/a
Supplies	$5,000.00	$0.00	**$5,000.00**	$2,784.65	n/a	**$2,784.65**	n/a
Contractual	$239,500.00	$75,000.00	**$314,500.00**	$242,215.35	$70,143.16	**$312,358.51**	DER, MA CPC, FA CPC
Total Direct	**$245,000.00**	**$84,876.00**	**$329,876.00**	**$245,000.00**	**$91,719.77**	**$336,719.77**	**n/a**
Indirect	$0.00	$0.00	**$0.00**	$0.00	$0.00	**$0.00**	n/a
Total	**$245,000.00**	**$84,876.00**	**$329,876.00**	**$245,000.00**	**$91,719.77**	**$336,719.77**	**n/a**

3.B. Detailed Project Budget Table SNEPWG18-10-FRGC

Cost Item or Category	Cost Basis	RAE SNEP Request	Total Non-Federal Match	Grant Funds Cumulative	Match Funds Cumulative	Match Source	Total Proposed Cost (Expense + Match)	Total Actual Cost (Expense + Match)
Personnel								
Project Management 2018-2020	5pp x 40hrs at $24.69/hr		$4,938.00	n/a	$76,583.28	FRGC and SSCEF in kind	**$4,938.00**	**$76,583.28**
							$0.00	
Total Personnel		**$0.00**	**$4,938.00**	**$0.00**	**$76,583.28**		**$4,938.00**	**$76,583.28**
Fringe								
n/a							**$0.00**	**$0.00**
Total Fringe		**$0.00**	**$0.00**	**$0.00**	**$0.00**		**$0.00**	**$0.00**
Travel								
n/a		$750.00		$238.96			**$750.00**	**$238.96**
Total Travel		**$750.00**	**$0.00**	**$238.96**	**$0.00**		**$750.00**	**$238.96**
Equipment								
Equipment		$35,000.00	$0.00	$0.00			**$35,000.00**	**$0.00**
Total Equipment		**$35,000.00**	**$0.00**	**$0.00**	**$0.00**		**$35,000.00**	**$0.00**
Supplies								
Meeting Expense and Printing		$18,400.00		$46,347.15	$2,896.20		**$18,400.00**	**$49,243.35**
Total Supplies		**$18,400.00**	**$0.00**	**$46,347.15**	**$2,896.20**		**$18,400.00**	**$49,243.35**
Contractual								
Association Preservation Cape Cod								
Project Management, Technical Support and Monitoring 2018-2022	2pp x 140 hrs at $54.75	$54,130.00	$5,210.00	$78,685.90	$10,052.30	MET, DER, CCF	**$59,340.00**	**$88,738.20**
Inter-Fluve - Design & Engineering								
60% Design		$11,050.00	$31,000.00	$18,833.17	$31,000.00	MET	**$42,050.00**	**$49,833.17**

Permitting: including Sediment sampling, wetlands delineation, topographic survey		$31,832.00	$23,600.00	$24,048.83	$29,750.00	MET	**$55,432.00**	**$53,798.83**
Final Design and Bid Services			$57,000.00		$53,126.99	Falmouth CPC Funds	**$57,000.00**	**$53,126.99**
Sign Design & Printing				$10,177.38				**$10,177.38**
Other Falmouth R&G Contractual		$3,000.00	$0.00				**$3,000.00**	**$8,596.60**
Attorney Fees				$3,455.60				
BSS Design Survey				$120.00				
Rykor					$3,040.00	Rykor		
Benjamin Forestry Services				$1,981.00				
Construction								
Dam and bog construction contract		$223,415.00		$170,593.02			**$223,415.00**	**$170,593.02**
Plantings and Trees/Root Wads			$24,000.00	$20,465.38	$2,000.00	SSCEF for Tree Pulling and Piling	**$24,000.00**	**$22,465.38**
Water Quality Monitoring								
QAPP and sample analysis		$72,423.00	$3,500.00	$75,053.61		FRGC in kind above	**$75,923.00**	**$75,053.61**
Total Contractual		**$395,850.00**	**$144,310.00**	**$403,413.89**	**$128,969.30**		**$540,160.00**	**$532,383.19**
Other								
Total Other		**$0.00**	**$0.00**	**$0.00**	**$0.00**		**$0.00**	
TOTAL DIRECT		**$450,000**	**$149,248**	**$450,000**	**$208,448.78**		**$599,248.00**	**$658,448.78**
INDIRECT (10%)		n/a	n/a	n/a	n/a		**n/a**	**n/a**
TOTAL (DIRECT+INDIRECT)		**$450,000**	**$149,248**	**$450,000**	**$208,448.78**		**$599,248.00**	**$658,448.78**
Non-Federal Match as Percentage of Request:			**33.17%**		**46.32%**			

3.B. Detailed Project Budget Table SNEPWG19-10-FRGC

Cost Item or Category	Cost Basis	RAE SNEP Request	Non-Federal Match	SNEP Total Cumulative	Match Total Cumulative	Match Source	Total Proposed Cost (Expense + Match)	Total Actual Cost (Expense + Match)
Personnel								
Project Management and Monitoring 2019-2021	5pp total 400 hrs at $24.69/hr		$9,876.00	n/a	$21,576.61	FRGC and SSCEF in kind	$9,876.00	$21,576.61
Total Personnel		**$0.00**	**$9,876.00**	**$0.00**	**$21,576.61**		**$9,876.00**	**$21,576.61**
Fringe								
n/a							$0.00	$0.00
Total Fringe		**$0.00**	**$0.00**	**$0.00**	**$0.00**		**$0.00**	**$0.00**
Travel								
Travel Expense		$500.00		$0.00			$500.00	$0.00
Total Travel		**$500.00**	**$0.00**	**$0.00**	**$0.00**		**$500.00**	**$0.00**
Equipment								
n/a							$0.00	$0.00
Total Equipment		**$0.00**	**$0.00**	**$0.00**	**$0.00**		**$0.00**	**$0.00**
Supplies								
Outreach, Signs, Printing and Events		$5,000.00		$2,784.65	n/a		$5,000.00	$2,784.65
Total Supplies		**$5,000.00**	**$0.00**	**$2,784.65**	**$0.00**		**$5,000.00**	**$2,784.65**
Contractual								
Association to Preserve Cape Cod								
Project Management and Technical Support (2019-2021)	2pp x 170 hrs at $59		$10,000.00	n/a	$8,525.16	DER	$10,000.00	$8,525.16
Construction								

Dam construction contract		$114,600.00		$23,720.48	$3,855.50	FA CPC	$114,600.00	$27,575.98
Bog construction			$65,000.00	$47,607.36	$57,762.50	FA/MA CPC	$65,000.00	$105,369.86
Construction Oversight (Inter-fluve)		$100,000.00		$129,698.62	n/a		$100,000.00	$129,698.62
Inter-Fluve Permitting, Construction Close-out, Signage				$26,255.00				$26,255.00
Sign Installation				$1,207.50				$1,207.50
Water Quality Monitoring								
Sample collection analysis (WHRC expense)		$24,900.00		$13,726.39	n/a		$24,900.00	$13,726.39
Total Contractual		**$239,500.00**	**$75,000.00**	**$242,215.35**	**$70,143.16**		**$314,500.00**	**$312,358.51**
Other								
n/a								
Total Other		**$0.00**	**$0.00**	**$0.00**	**$0.00**		**$0.00**	**$0.00**
TOTAL DIRECT		**$245,000.00**	**$84,876.00**	**$245,000.00**	**$91,719.77**		**$329,876.00**	**$336,719.77**
INDIRECT (10%)		n/a	n/a	n/a	n/a		n/a	
TOTAL (DIRECT+INDIRECT)		**$245,000.00**	**$84,876.00**	**$245,000.00**	**$91,719.77**		**$329,876.00**	**$336,719.77**
Non-Federal Match as Percentage of Request:			**34.64%**		**37.44%**			

3.C. Budget Narrative SNEPWG18-10-FRGC

Personnel: No expense was included for personnel. The proposed match included $4,938 in-kind contribution from the FRGC and SSCEF for project management. Actual match totaling $76,583.28 far exceeded this total due to the extended time period of the project. The FRGC and SSCEF elected to continue to track time through completion of this grant to demonstrate the final contribution and value provided to complete this project. (Note: Additional cash and in-kind match was also provided for outside of the SNEP18 grant – see Table 1.)

Fringe: No fringe cost has been included for expense or match.

Travel: There was no budgeted expense or match originally proposed for travel. In February of 2019, RAE approved a request to shift $750 from contractual expense to travel expense. A total of $238.96 expense was charged for travel for a 2019 meeting with Secretary Beaton in Boston and travel to the 2019 SNEP workshop in Fall River.

Equipment: There was no budgeted expense or match originally proposed for this cost category. In February of 2022 approved reallocation of funds included shifting $35,000 from contractual expense to equipment to cover the cost of in-stream monitoring systems to track movement of tagged Brook Trout in the Childs River. However, the actual expense of the three systems was billed as multiple individual items, so final expense was advised to be billed as supplies as no individual item exceeded the threshold to qualify as an equipment expense. No expense was charged for equipment. The underspend in equipment is offset but an overspend in supplies.

Supplies: The original request did not include expense for supplies, but in February of 2019, RAE approved a request to shift $5,400 from contractual to supplies to cover Club and project team expenses. In August of 2021 an additional request for reallocation was approved shifting an additional $13,000 from contractual expense to supplies to support post-construction monitoring and outreach for the project for a total proposed allotted budget of $18,400. Actual supply expense totaled $46,347.15 (see detail below) including $26,183.39 for the BioMark fish survey systems anticipated as an equipment expense. Thus, a total of $20,163.76 other expense was allocated to supplies representing only a small deviation from the proposed 2021 budget of $18,400. A total of $2,896.00 in match was provided for supplies.

Meeting supply expense included refreshments as well as printing of handouts and design plans in the early phases of the project (2018-2019) totaled $1,791.93. Education and outreach supplies (2020-2023) including printing and materials used for advertising events (e.g., flyers and mailings), school group programs (e.g., informational brochures), and other presentations/forums (e.g., posters) totaled $3,222.88. The total expense for the ribbon-cutting event hosted by the Falmouth Rod and Gun Club in September 2021 (not including outreach materials) was $3,874.59 and this included a rented tour shuttle, food, and other printing needs (i.e., agendas, etc.). The total supply expenses directed towards monitoring (2021-2023) was $36,951.80 including the $26,183.39 for three instream BioMark fish survey systems for tracking movement, $6,127.63 for data loggers and associated replacement parts, $824.18 for PIT tags for fish survey work by MassWidlife and $3,816.60 to cover a portion of the Aqua Troll 500 unit, carrying box and calibration kits for ongoing water quality monitoring (the remainder of which was charged to

the SNEP19 grant). Lastly, the Club spent $505.95 from the SNEP18 supplies budget in 2021 to purchase materials for the trail viewing platforms constructed in the two bogs.

Contractual:
The original SNEP18 budget proposed $450,000 in contractual expense including $15,330 for a contract with APCC to provide project management, technical support and monitoring, $49,032 for Inter-Fluve for 60% design and permitting, $378,138 dam/impoundment and Farley bog construction, and $7,500 for development of a QAPP and for water quality sample analysis. As noted above portions of this contractual expense was approved for reallocation with the final proposed contractual budget equal to $395,850.

Total contractual expenses for the period 2018-2023 was $403,413.89. APCC expense totaled $78,685.90 for project planning, grant administration, education/outreach, QAPP development, monitoring coordination, and analysis and drafting of the one year post-construction monitoring report. Inter-Fluve expense totaled $53,059.38 for design, permitting, construction bidding, and sign design and printing. Lucianos Excavation expense totaled $191,058.41 for mobilization, construction, plantings (subcontracted Essex Horticulture) and demobilization. The Woodwell Climate Research Center expense totaled $75,053.61 for water quality sampling, lab analysis, and data analysis and drafting of the baseline monitoring report. Additional miscellaneous contractual expenses included attorney fees (totaling $3,455.60) to review property transactions and review of stormwater swale easement, Benjamin Forestry Services ($1,981) to support completion of a forestry management plan, and $120 for BSS Design to survey a land parcel. With award of additional grants strictly awarded for construction, funding needed to support contractual expenditures from the SNEP18 grant was less than anticipated. As a result, additional contractual expense was allocated for APCC and Woodwell to complete the baseline and one-year monitoring reports as well as to support APCC project and grant management through the extended project time period through June of 2023. With the flexibility of the SNEP funding and approval for reallocation of contractual expense the project was able to support a year and half of otherwise unfunded post-construction maintenance and monitoring.

The proposed contractual match was $144,310 including: $59,810 from the Massachusetts Environmental Trust to support APCC, 60% designs and permitting; $57,000 from Falmouth CPC funding for final design and bidding; $24,000 in-kind for plantings and tree/root wads; and $3,500 FRGC in-kind contribution for water quality sampling. Actual contractual match totaled $128,969.29 including $10,052.30 to support APCC project management, $60,750 from the Massachusetts Environmental Trust (MET) for 60% design and permitting, $53,126.99 from the Falmouth CPC for final design and bidding, $3,040 provided by Rykor for regrading and site staging area preparation and $2,000 funded by SSCEF for tree pulling and piling. APCC time was funded jointly by MET, DER and a grant from the Cape Cod Foundation Falmouth Fund. A reduction in proposed in-kind match for plantings was offset by the FRGC and SSCEF personnel in-kind contributions.

Indirect: No indirect cost has been included for expense or match.

3.C. Budget Narrative SNEPWG19-10-FRGC

Personnel: The SNEP19 budget proposed included no personnel expense but proposed $9,876 in-kind match from FRGC and SSCEF. Actual in-kind match exceeded this totaling $21,575.61.

Fringe: No expense or match was included for fringe expense.

Travel and Equipment: A total of $500 was proposed for travel expense but no funds were spent on travel under this grant. No expense or match was included for equipment.

Supplies: A total of $5000 was proposed for supply expense for outreach, printing, signs, and events. Final expense equaled $2,784.65 including $400 for temporary construction sign printing and $2,384.65 to cover a portion of the cost for Aqua troll sampling supplies to support ongoing water quality monitoring in 2023 and beyond. Additional cost for supplies was covered under the SNEP18 grant. No match was proposed or provided for supplies.

Contractual:
The SNEP19 budget proposed $239,500 for contractual expense including $114,600 for dam construction, $100,000 for Inter-Fluve construction oversight, and $24,900 for Woodwell sample collection analysis. Actual contractual expense was equal to $242,215.35. Actual expense for subcontracts with Inter-Fluve totaled $155,953.62 for permitting, technical support, construction oversight, and sign development. Construction expenses for Lucianos and Essex Horticulture for work around the dam and bogs totaled $71,327.84. A total of $13,726.39 was spent towards the Woodwell contract to finish out nutrient sample analyses, and $1,207.50 was spent on installation of final education signs onsite. With additional funds awarded from other grants specific to construction less SNEP funding was spent on construction contracts. In exchange, a larger amount of funds was spent on Inter-Fluve's contract to cover the extended construction period resulting from permitting and COVID-19 related construction delays. Likewise, a greater portion of SNEP18 funds were allocated to Woodwell contractual expense for water quality monitoring so the final SNEP19 cost for Woodwell contracts was less than proposed.

Total contractual match proposed was $75,000 including $10,000 in DER funding for APCC project management and technical assistance and $65,000 match for Garner bog construction funded by the Mashpee CPC. Actual contractual match did not deviate much from the proposed budget. Total match equaled $70,143.16 including $8,525.16 funded by DER for APCC technical assistance and $61,618 for dam and bog construction funded by the Falmouth and Mashpee CPCs.

Indirect: No indirect cost was included for expense or match.

4. Supporting Materials:
https://preservethecape.sharepoint.com/:f:/g/Grants/EiPX_oSu3WpErEXRVIHGh3oBNu0s7esNs2a6_540VXivCA?e=bpLwxR

- Final QAPP
- Final design plans and as-builts
- Final permit documents
- Press releases and new articles
- Summary outreach and education materials including images of final signs.
- Final baseline and one-year monitoring reports

5. Certification
The undersigned verifies that the descriptions of activities and expenditures in this progress report are accurate to the best of my knowledge; and that the activities were conducted in agreement with the grant contract. I also understand that matching fund levels established in the grant contract must be met.

Grantee Signature:

Name: A.D. Colburn
Job Title: Project Leader
Date: 7/27/2023
Organization: Falmouth Rod and Gun Club, Inc.