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Michael S. Rolband
Resource Protection Group, Inc.
c/o Wetland Studies and Solutions, Inc.
5300 Wellington Branch Drive, Suite 100
Gainesville, Virginia 20155

Dear Mike,

This letter constitutes my sixth and final quarterly report for work on RFP #01 – Mussel Introduction into an Urban Stream Environment. The project objective was to assess the potential of the restored stream channels to support freshwater mussels. Data on survivorship and growth of translocated and hatchery-raised mussels will be used to assess the viability of the restored streams for stocking a larger population. This report covers the period from September 1 to December 31, 2021.

Work during this quarter focused on compiling and analyzing data collected for this project including mussel growth and survivorship as well as stream water quality and food conditions. Preliminary findings are as follows:

There was negligible over-winter (November-April) mortality of hatchery-raised mussels at The Glade (Table 1), though one enclosure was lost, and a few mussels were lost from individual enclosures. Overall, 82% of individuals from the Fall cohort were recovered over the 7-month trial, until high discharge events resulted in greater attrition before the June 9 census date. There was negligible growth of mussels over the 7-month interval. By contrast, mussels maintained at the hatchery pond increased in length by 9.7 mm (18%) during this interval.

Table 1. Winter-spring survivorship and growth of Utterbackiana implicata mussels stocked at two sites in a restored urban stream (The Glade) in comparison to individuals maintained at the hatchery pond (HLNFH).

	# Stocked	# Recovered			# Dead	Shell Length (mm)			
Site	11-Nov	24-Feb	28-Apr	9-Jun	Total	11-Nov	24-Feb	28-Apr	9-Jun
Glade #1	30	24	24	7	0	57.0 ± 0.7	56.4 ± 0.8	56.6 ± 0.7	56.2 ± 0.5
Glade #2	30	26	25	17	0	56.7 ± 0.8	56.8 ± 0.9	57.0 ± 0.9	56.6 ± 1.2
HLNFH	15		15	14	0	54.7 ± 1.1		58.4 ± 1.1	64.4 ± 0.8

A second cohort of hatchery-raised mussels was stocked at Snakeden and The Glade to assess summer (April-July) growth and survivorship (Table 2). Over the 3-month interval, mortality rates were 13% (The Glade) and 21% (Snakeden). For both streams, 57% of individuals were recovered, until high discharge events associated with Hurricane Ida resulted in loss of enclosures prior to the September 15 census date. There was negligible mortality among mussels stocked at the rural stream (Kimages) over the same period. There was minimal growth

of mussels at the restored urban sites and the rural site, whereas mussels at the hatchery pond increased in length by 10.2 mm (17%).

Table 2. Summer survivorship and growth of Utterbackiana implicata mussels stocked at two urban restored streams (The Glade and Snakeden), and one rural stream (Kimages) in comparison to individuals maintained at the hatchery pond (HLNFH).

	# Stocked	# Recovered			# Dead	Shell Length (mm)			
Site	28-Apr	9-Jun	28-Jul	15-Sep	Total	28-Apr	9-Jun	28-Jul	15-Sep
Glade	30	20	17	4	4	58.1 ± 0.8	58.6 ± 1.0	58.8 ± 1.0	58.5 ± 1.7
Snakeden	30	24	17	0	6	56.8 ± 0.8	57.0 ± 0.9	58.2 ± 1.0	NA
Kimages	15	15	12	12	1	57.9 ± 1.3	57.7 ± 1.3	58.5 ± 1.9	59.3 ± 1.9
HLNFH	15	15	15	15	0	58.8 ± 1.3	61.4 ± 1.3	66.3 ± 1.1	69.0 ± 1.2

Among the translocated *Elliptio complanata* mussels, 70% were found within the study reach through to the end of the 11-month monitoring period (Table 3). At Snakeden, the number of mussels recovered on each survey date declined steadily to ~60%, whereas at The Glade, the number of recovered mussels remained ~80%. Mortality rates were 4% (Snakeden) and 10% (The Glade) based on the recovery of empty shells. The translocated mussels grew in length by 5 mm (5.7%) over the period of study. Growth rates did not differ significantly between the two streams.

Table 3. Survivorship and growth of translocated Elliptio complanata mussels in two restored urban streams.

	# Stocked	# Recovered				# Dead	Shell Length (mm)			
Site	11-Nov	24-Feb	28-Apr	28-Jul	4-Oct	Total	11-Nov	28-Apr	28-Jul	4-Oct
Glade	50	30	40	36	41	2	90.8 ± 1.0	93.5 ± 0.9	94.4 ± 1.1	94.6 ± 1.1
Snakeden	50	45	41	31	29	5	86.0 ± 1.2	89.9 ± 0.8	90.6 ± 1.4	89.9 ± 1.2
Total/All	100	75	81	67	70	7	88.4 ± 1.1	91.7 ± 0.6	92.6 ± 0.9	93.4 ± 0.8

Remaining activities for this project include completion of the final report. Other anticipated products from this research include presentation of findings at the 2022 Joint Aquatic Sciences Meeting (session on *Conservation of urban aquatic systems: Interdisciplinary solutions to complicated problems*) and submission of a manuscript to a peer-reviewed journal in the aquatic sciences. Please contact me if you have any questions.

Sincerely,

Paul A. Bukaveckas