

## Final Report: Muddy Creek Stream Restoration-Marquardt Farm Phase 3

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1. Public Announcement- The Coldwater Heritage Partnership \$9,200 grant award letter received March 19, 2020 coincided with imposition of Covid 19 restrictions by Governor Tom Wolf which precluded scheduling a public meeting prior to the start of construction the second week of July 2020. A presentation was scheduled for a September 2020 outside meeting at Coburn Park, but IT equipment was not available. The March 25, 2021 “Annual Membership Meeting” provided a virtual platform to make a brief announcement to the PVCA general membership. On July 24, 2021, PVCA sponsored “Riversongs”, normally an annual indoor event and music festival celebrating the Penns Creek watershed. Due to the pandemic social distancing, the 2021 Riversongs venue was several tents at the Millheim Fire Company grounds and open to the general public. PVCA president Patrick Leary and Lysle Sherwin, Seven Willows LLC staffed a Watershed Committee table exhibit displaying a poster on the overall Muddy Creek project and a color poster noting funding sources, before and after photos, and a design plan of the 16 fish habitat/bank stabilization practices implemented in Phase Three.
2. Photos- see attachments *a* through *h* following Section 6
  - a. Poster display at second public meeting- July 24, 2021
  - b. Structures and locations
  - c. Before construction (8, 9, 10)
  - d. After construction: Note coir fabric and live stakes on 60 ft muddsill
  - e. Before construction (11, 12, 13)
  - f. After construction: Note reduction in stream width and improved depth and aeration
  - g. PVCA live stake harvest
  - h. Live stake/seedling planting site
3. Summary - With all necessary permits in hand from a separately funded project completed October 4, 2019 under an PAFBC extension to work in a Class A Wild Trout fishery, additional hemlock logs from Hoover Logging, Huntingdon PA. were ordered by Foundation for California University for delivery June 2020. Seedling purchase orders with Alpha Nursery, Michigan, and Chief River Nursery, Wisconsin were placed by US Fish and Wildlife Service to meet match commitments. Quarry stone was purchased by Foundation for California University and delivered from the Pleasant Gap Quarry to the Marquardt farm bordering Harter Road in the Muddy Creek watershed in Georges Valley, Gregg Township, Centre County.

Sixteen fish habitat structures were installed by Habitat Forever work crews over seven days in a 1,200 ft stream reach (Design schematic attached). Due to the additional \$1,200 awarded, a 40 ft brush mattress (site #10) in the original plan was amended to construct a 60 foot muddsill structure, resulting in more overhead cover and pool habitat depth by substantially narrowing a wide, slow-flowing pool. The new configuration downstream of a log cross vane (site #8) greatly increased sediment scour in the stream thalweg and directed flow to remove sediment accumulation at the muddsill. Similarly, a cross vane at site 11 was installed to direct flow along the face log of downstream structures at sites 12-16. Instream construction was completed July

27, including coir erosion and sediment fabric suitable for live stake planting and standard rye seeding with straw mulch.

Installation of the buffer planting and live stake bank stabilization phase was profoundly impacted by the covid pandemic. An April 2020 stake harvesting was cancelled by Chesapeake Conservancy located at Susquehanna University due to unavailability of student volunteer and intern labor. Approximately 700 stakes from long term freezer storage were received in June 2020 but proved to have poor rooting capability and survival. Planting was delayed by the lack of labor, extending into late June when most of central Pennsylvania was in severe drought conditions, further reducing survival. PVCA mobilized a live stake harvest by 6 vaccinated Watershed Committee members in March 2021 followed two weeks later by planting 300 silky willow stakes at Muddy Creek by 17 BSA Troop 20 youth and parents, who also performed tree shelter and other maintenance tasks. A total of 37 volunteer hours were contributed to the Phase Three project by these two activities. In addition, Lysle Sherwin dba Seven Willows LLC harvested and planted 266 silky dogwood and silky willow stakes. A total of 1,266 live stakes were planted at Muddy Creek by volunteer labor which was less than the matching commitment of 1,500 stakes from Chesapeake Conservancy and the associated PVCA volunteer planting labor match.

To address the live stake shortfall, 238 container seedlings were obtained from the Chesapeake Bay Foundation K10 Program at no cost and planted at Muddy Creek on three dates in fall 2020 and spring 2021. Retail value of the container plants is \$4 each. Payment of planting labor was provided by a 2017 National Fish and Wildlife Foundation grant to PVCA. The 1,750 seedlings purchased by US Fish and Wildlife Service, Pennsylvania Field Office at a cost of \$2,427.08 exceeded the proposed cash match value of \$1,500.00. Of those donated seedlings, 1,378 seedlings were planted by Habitat Forever contract labor at Muddy Creek sites funded by \$1,378.00 from the National Fish and Wildlife Foundation grant to PVCA. An additional 122 K10 program container plants were provided to several Muddy Creek landowners willing to plant on their property.

A site visit to the completed stream work by Rachel Kester, program director, Coldwater Heritage Partnership took place September 9, 2020 hosted by PVCA Watershed Committee chair Tom Doman and Lysle Sherwin. She congratulated the project sponsors on being the first of the 2020 awardees in completing in-stream work.

#### 4. Outcomes

All project outcomes have been completed as described in the grant application and budget with the exception of the number of dormant live stakes and the related volunteer planting labor as in-kind match. Container plants received at no cost from Chesapeake Bay Foundation and PVCA grant funds available from National Fish and Wildlife Foundation to hire labor were utilized to achieve the outcomes. A planned redd count activity was postponed due to extremely low stream flow in fall, 2020. Current stream flow conditions appear promising to reschedule the redd count from near the mouth upstream about 1.5 miles to include the Phase 3 reach.

5. Sustainability

Flood events and channel blockage debris jams from tree mortality, particularly the current ash mortality are the most significant threats to structural integrity of the fish habitat and bank stabilization practices. Habitat Forever/Partners for Fish and Wildlife designs and builds to Rosgen and PA Fish and Boat Commission standards (bankful flow events) and utilizes hemlock log materials highly resistant to rot when installed below base flow water level. It is noteworthy that more than 60 structures have been installed since 2014 by previous work at Muddy Creek and none have experienced structural failure or problems. Herbivore browsing, invasive vegetation competing for light and growing space, disease, and drought are ongoing threats to stream side plantings. Planting high quality nursery stock, using non-preferred deer browse species such as alder, spice bush, black haw viburnum, and other natives at high density on streambanks protected by coir material can serve to improve survival and growth rates while reducing bank scour problems. The use of vole and deer repellents such as Repellex tablets is coming into increased use for protection during the first couple of growing seasons.

6. Accomplishments and Outputs

- (a.) The stream substrate shows visual evidence of cleaner, sediment-free gravel, particularly downstream of the two cross vane structures at structures 8 and 11. Pool depth has improved and stream width narrowed most noticeably at structure 11 and downstream along the sequence of 5 structures on river left (12-16). No existing riparian trees were lost to construction, retaining a 50% canopy closure overall although the pool area at the 60 ft mudsill has an open southern exposure. Large shade species (swamp white oak, basswood, and sycamore) were planted on the south bank to eventually improve canopy shade. Single log vanes at 5 and 9 are directing flow to the opposite bank stabilized by modified mudsill and by 40 feet of rock toe supporting the undercut root wad of a large walnut.
- (b.) In terms of linear bank protection, the mudsills, modified mudsills, rock and log toe structures are protecting 340 linear feet. As a general rule of thumb, bank protection from a single 20 foot log or stone vane extends 20 feet upstream, the vane itself, and two vane lengths downstream. Thus, a single 20 foot vane protects 80 feet of streambank, and doubled for a cross vane protecting both banks. The four vanes are protecting 240 feet of bank, bringing the project total to 580 linear feet of stabilized streambank.

Total live stakes and seedlings planted to date amounts to 3,004. Fall 2021 maintenance replanting by PVCA volunteers to replace higher than usual live stake mortality will proceed depending on covid pandemic situation, or postponed to the spring 2022 planting season if appropriate.



Image a





Image b



Image c, Before





Image d, After





Image e, Site #11, Before





Image f, Site #11, After





Image g, PVCA Live Stake Harvest





Image h, Seedling Planting