

DOE RUN COLDWATER CONSERVATION PLAN

Juniata College

Grant Lab

2020-2021



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Octoraro
Watershed
Association



Foundation for Pennsylvania Watersheds

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Historical Landscape

Doe Run, located in Chester County, has a rich historical context that dates all the way back to the 1700s. During the time of the Pilgrim habitation in this area, Doe Run settlements were struggling to keep up with Great Britain's patents for woven wire cloth, which was used to make flour and meal. John Milne created the sifting reel to improve the production of flour. This sifting reel became the commercial milling machine we know of today. Since there was a concentration of Pilgrims in southeastern Pennsylvania, many mills and mill dams were constructed (Historic Operation of Water Powered Mills in the State of Pennsylvania). Mill dams create a pond in a stream/river by slowing down the flow of water and allowing the water to pool up, creating a pressure head and storing energy. The water that spills over the dam is used to turn the wheel(s) of the mill to produce energy and create flour. Many historical mill dams in southeastern Pennsylvania exist from this era, and one such Dam is still standing in the middle of the Doe Run watershed, but is located on an inholding within the Runnymede Property.

Starting in 1946, the famous King Ranch from Texas moved up to the Chester County area to find more suitable farming land (Conserving the King Ranch, 2015). With the new green pastures between Coatesville and Unionville, King ranch bought up the Buck and Doe run watershed compiling 5,367 acres in total (Conserving the King Ranch 2015). The King Ranch property was bought by various people. The owner of Runnymede purchased 1,856 acres of King Ranch that now encompasses a large part of the Doe Run watershed. Runnymede Sanctuary is a 1,865 acre property in Chester County with a mission that "is for this generation, and beyond, to enjoy the ongoing activities and traditions of the area and respect, appreciate and enjoy the simplicity and beauty of nature". A significant portion of the Doe Run watershed falls within the Runnymede Sanctuary, and the sanctuary is very interested in having an assessment of Doe Run to further protect and enhance the stream ecosystem, to better share these resources with the community.

The Watershed

Doe Run is a tributary to Buck Run, located in Chester County. This stream is a headwater to the West Branch of the Brandywine Creek. The Brandywine Creek is a tributary to the Christiana River. The Christiana River flows into the Brandywine River. The Doe Run watershed is of special interest because there is anecdotal evidence of native brook trout and naturalized brown trout residing in the watershed. Doe Run is not currently listed on the PA Fish and Boat trout streams as a high quality coldwater fishery (HQCWF) or an exceptional value (EV) stream. To our knowledge, no formal fish assemblage assessments have been conducted on any of the tributaries to Doe Run that reside on the sanctuary. Limited macroinvertebrate sampling and physicochemical assessments of the Doe Run watershed have been conducted by Stroud Water Research center in past years. Making sure this stream network is healthy will continue to improve the rest of the watersheds downstream.

Doe Run, and especially its tributaries, are headwater streams. Headwater streams are the beginning of watersheds and therefore lay the groundwork for how the rest of the downstream ecosystem function. The river continuum concept states that water, nutrients and biota constantly move downstream which helps to maintain the health of the watershed (River Continuum Concept). Keeping headwaters healthy will benefit the organic matter processing,

nutrient cycling, and will ultimately contribute to the whole health of the river network (Clarke et al. 2008).

The historical and ongoing presence of agriculture in the Doe Run watershed presents a potential disruption to these natural ecological processes. Stream morphology, nutrient availability, biota diversity and much more can become negatively affected by the access cattle have to water resources. Their manure can affect the stream's physiochemistry and their excessive grazing can cause erosion (O'Callaghan et al. 2019). While cattle have largely been removed since the King Ranch ownership from the Doe Run watershed, some of that historical impact continues, with very narrow or non-existent riparian buffers existing on some of the tributaries to Doe Run. Riparian buffers play a key role in nutrient and sediment filtration and helping to mediate maximum summer stream temperatures in coldwater habitat. These are some of the key factors in providing habitat for native brook trout (*Salvelinus fontinalis*).

Fish passage is another important ecological factor for the habitation, reproduction, and sustainability of brook trout populations. Many aquatic organisms rely on the connections of waterways to survive. Brook trout use the connected waterways to escape from warmer summer water temperatures, forage, and to find more suitable areas to reproduce. With the increase of residential development, numerous culverts have been built for roads to cross over Doe Run and its tributaries (Nilsson et al. 2005). These culverts can act as fish passage barriers and create habitat fragmentation if aquatic connectivity is not considered during installation. And until recently, road culverts were not known to pose potential risks to aquatic connectivity. For these reasons, culverts pose potential threats to brook trout (and other aquatic organism) movement, threatening long-term survival (What is Fish Passage).

Methods

The Grant Lab, with the help of the Runnymede Sanctuary directors, identified 13 potential fish passage barriers on Doe Run Watershed on the Sanctuary. Stream crossing surveys were conducted on the Runnymede Sanctuary according to the North Atlantic Aquatic Connectivity Collaborative's (NAACC) Aquatic Connectivity Stream Crossing Surveys. All the surveys were conducted by level 1 certified surveyor (C. Grant). This comprehensive survey will be used to assess whether the stream crossing poses a threat to fish and other aquatic organism passage. At each location, a survey sheet was completed to assess the quality of the stream crossing and fish passage (Appendix A). Once the survey sheets were completed they were then entered into the NAACC national database for a long-term public record and are available for use in any future restoration efforts.

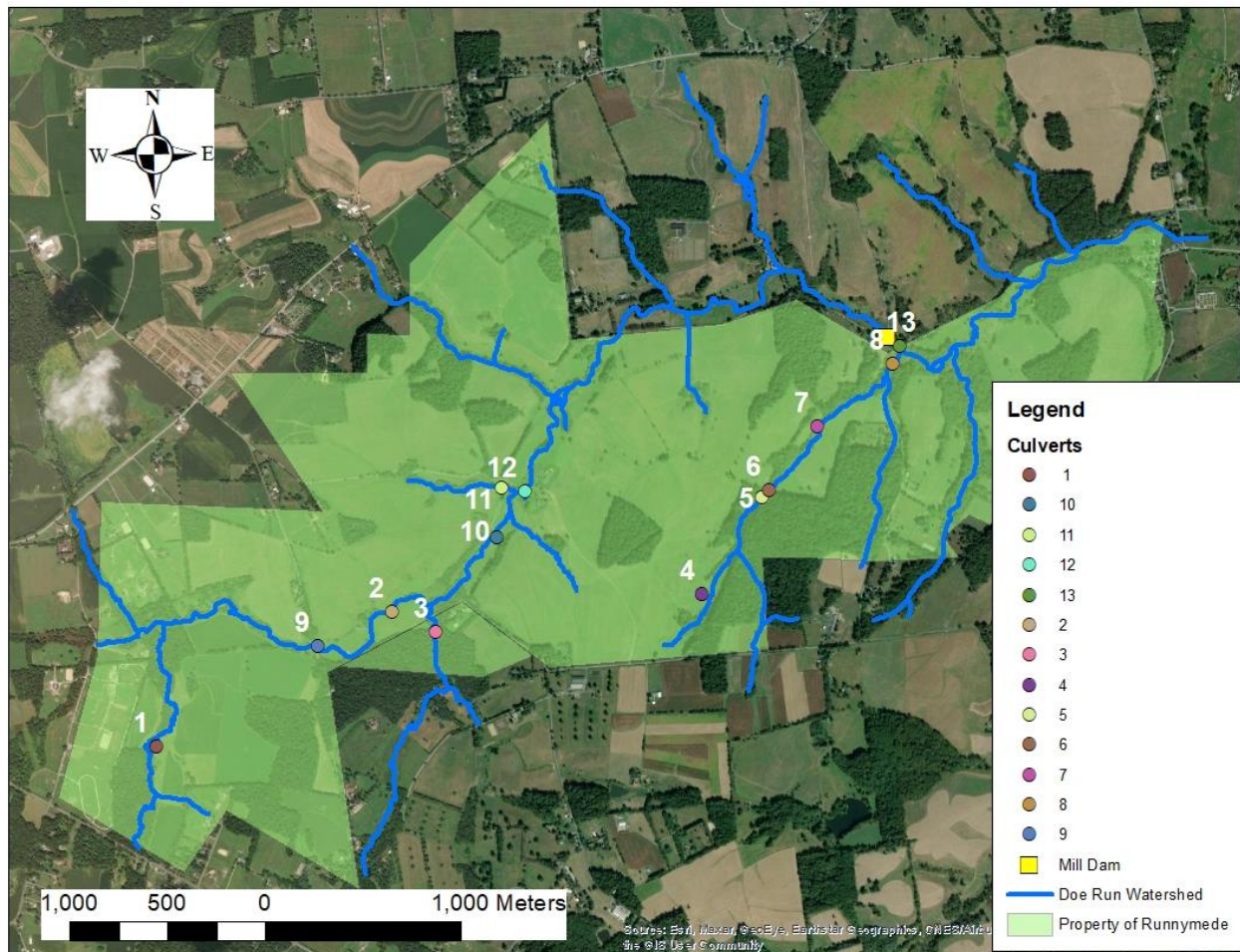


Figure 1. Map of Runnymede Sanctuary and the Doe Run watershed. Legend describes the culverts on the property as well as the historical mill dam, Runnymede property line and the Doe Run stream network (in blue).

Once NAACC surveys were completed, five stream crossings that pose the biggest threat to fish passage were selected for additional follow up assessment work. At each of the selected sites, a detailed stream assessment at 100m reaches upstream and downstream of the culvert was conducted. In order to test the physical organismal movement, we conducted macroinvertebrate surveys at 9 sites (had proposed to do 6). Benthic macroinvertebrates live in and on the substrate in the streams (Hauer and Resh 2017). Macroinvertebrates play a critical part in maintaining the health of stream ecosystems and the transfer of organic materials through stream food webs (Hauer and Resh 2017). Since these organisms are sensitive to pollution in streams, they are good indicators of stream health. The more diversity of macroinvertebrates in an ecosystem the healthier the stream is. Macroinvertebrates were sampled at each site by using a D-frame kick net and kicking for 5 minutes upstream of the kick net (Rapid Bioassessment Protocols For Use in Wadable Streams and Rivers, 1999). Each stream crossing was sampled upstream and downstream during the summer of 2020 and winter of 2021. Seasonally collected macroinvertebrate samples at a given location (e.g. upstream culvert #5) were composited for all later biodiversity measures. After kicking was finished all of the macroinvertebrates were removed from the net and were stored in 70% ethanol.

Macroinvertebrates were later identified in the lab to the order level with a Leico 3x dissecting microscope and using the Stroud Water macroinvertebrate key for identification.

At each site physiochemical water measurements were taken using an Oakton PCR Testr probe and a HANNA HI 9813-6 DO probe, which was calibrated weekly to ensure accurate results. The parameters being sampled were temperature (°C), pH, dissolved oxygen (mg/L), conductivity (µS/cm), and total dissolved solids (ppm). The water quality parameters were sampled upstream of any recent disturbance following the US Geological Survey's National Field Manual for the Collection of Water-Quality Data (National Field Manual for the Collection of Water-Quality Data).

Fish assemblages were determined through single-pass unblocked electro-fishing with a Smith and Root LR 24 backpack electrofisher using pulsed direct currents ranging from 200-600 volts, depending on stream conductivity. Both above and below the culverts were sampled to compare fish abundance. All captured fish were held in five-gallon buckets until completion of the pass, where they were identified to species level, and released to the stream unharmed. Additionally, we measured the total length (nearest mm) of any trout captured.

Data Analysis

Summer and winter sets of macroinvertebrates were combined to analyze. After all of the macroinvertebrates were identified, % EPT abundance, Taxa Richness and Shannon's Diversity index for each reach were calculated to assess community composition and stream health. Health of the stream can be quantified by counting how many different bugs were collected (Taxa Richness), the percentage of bugs that are sensitive to pollution (% EPT abundance), and the overall diversity at a single site (Shannon's Diversity/Species Evenness) (Hughes 1978). % EPT abundance tells us if an ecosystem is healthy enough to support the most pollution sensitive macroinvertebrates, Ephemeroptera, Plecoptera, and Trichoptera. Net difference calculations were also used to compare diversity differences between sampling sites.

Each culvert was given a score using the NAACC protocol (Aquatic Connectivity-Non Tidal, 2018). The score was based on 13 variables. Each variable was given a certain weight. Once the weights were calculated they were all added together to give a score from 0 (no passability) to 1 (complete passability). The variables that held the most weight are outlet drop and physical barriers. If the outlet drop score is lower than the weighted assessment score then the lower score is given as the final passability score. Once the numerical score is assigned there is also a descriptor based on the numeric score. A score of 1 is "no barrier", 0.8-0.99 is "insignificant barrier", 0.6-0.79 is "minor barrier", 0.4-0.59 is "moderate barrier", 0.2-0.39 is "significant barrier", and 0-0.19 is a "server barrier" (Aquatic Connectivity-Non Tidal, 2018).

The net difference for Shannon's Diversity Index (SDI) is calculated by taking the upstream SDI and subtracting the downstream SDI. Once the net SDI is calculated, we ran correlations between net biodiversity measures and culvert scores. This will show if poor culverts scores and low net SDI are correlated. The net difference is another indicator of fish passage. If the net difference is positive then there is more diversity upstream, if it is negative then there is more diversity downstream, and if the number is zero then the diversity is the same.

Results

Upon preliminary site visits to Doe Run, a young dead brook trout (Fig 2) was found in the UNT (unnamed tributary) of Doe Run just upstream of culvert 5 (Fig. 1). This was an exciting find since brook trout were not yet documented in this watershed. The same UNT to Doe Run was also found to contain several of the lowest scoring culverts in the Doe Run watershed. The NAACC data and the discovery of the dead young brook trout lead us to focus on this sub-watershed of Doe Run for the majority of detailed macroinvertebrate and fish assemblage work (Fig 3).



Figure 2. Dead young Brook Trout found at the UNT of Doe Run upstream of culvert 5.

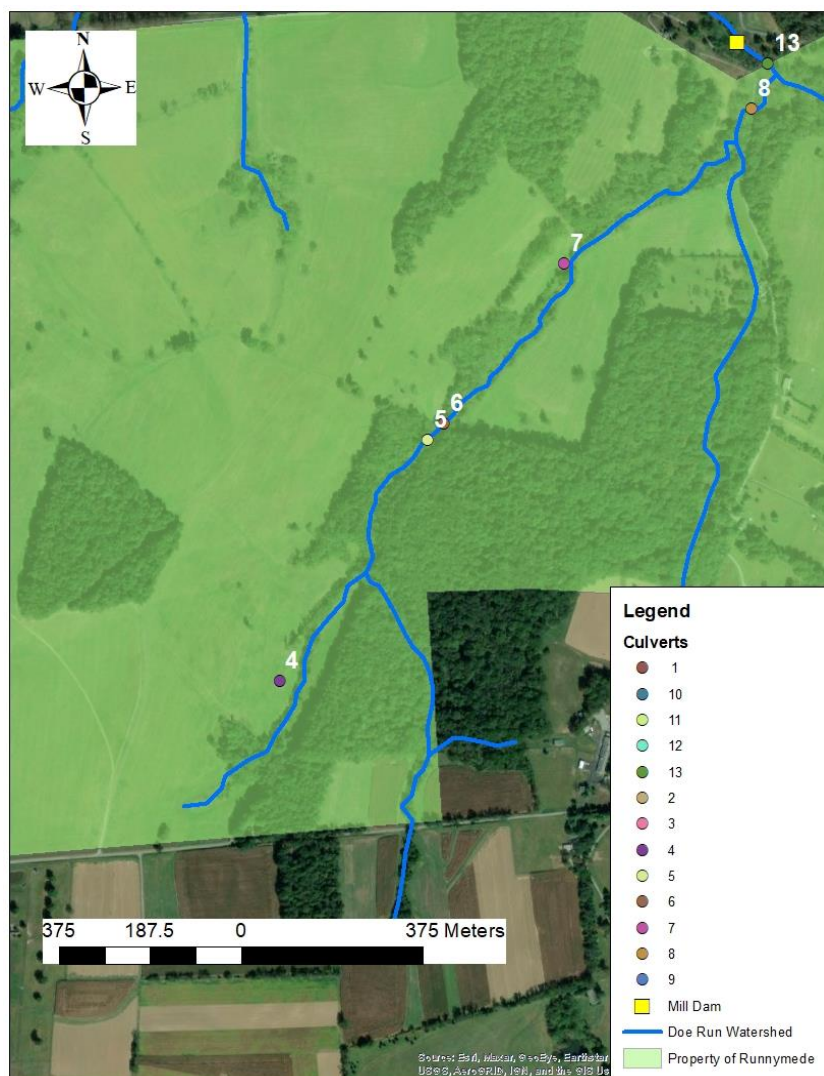


Figure 3. A map depicting the unnamed tributary (UNT) to Doe Run stream network with the associated culverts enumerated in the key. The dead brook trout was found just above culvert 5.

Culvert Scores

NAACC culvert scores varied from 0.62-1 (Table 1). There were no severe, significant, or moderate fish passage barriers, on the Runnymede property. Out of the 13 culverts assessed, numbers 6, 1, 5, 4, 8 received the lowest scores. We originally proposed to only assess the worst three culverts for fish passage, however, we felt it would be more thorough to assess all five culverts because of their low NAACC culvert score relative to the other scores on the Runnymede property. Furthermore, 4 of those 5 culverts were located in the sub-basin where the dead brook trout was found (Fig 3).

Fish Assemblages

Our fish assessment found both brook trout and brown trout (*Salmo trutta*) inhabited the Doe Run watershed. Overall, 15 fish species were found across all five assessed sites. A total of 10 brown trout and 14 brook trout (*Salvelinus fontinalis*) were collected. Another interesting finding was the capture of an American Eel (*Anguilla rostrata*), at the highest sampled point in the watershed, at culvert number 1 (Fig.7).

Within the UNT to Doe Run, more brook trout (Fig. 4) were encountered further upstream from the confluence with Doe Run, while more brown trout were observed downstream near the mouth (Fig 5). Grouping both species together, trout populations increased as distance upstream from the confluence Doe Run increased (Fig 8). While trout populations increased with distance upstream from the confluence, overall fish diversity decreased.

Culverts scoring under 0.6 means that it is a moderate, significant or severe barrier that is damaging the stream ecosystem. While most of our culvert scores were above 0.6, we still observed a positive correlation ($r=0.93$, $p=0.072$) between the net difference fish diversity and the culvert score within the UNT to Doe Run (Fig.9).



Figure 4. Image of a 180 mm Brook Trout found downstream of culvert 5 during electrofishing.



Figure 5. Image of a 210 mm Brown Trout found upstream of culvert 1 during electrofishing.



Figure 6. Image of three young trout found below culvert 5 during electrofishing. Two brook trout (70 mm and 70.5 mm) and one brown trout (70.5 mm).



Figure 7. Image of an American Eel collected above culvert 1 during electrofishing.

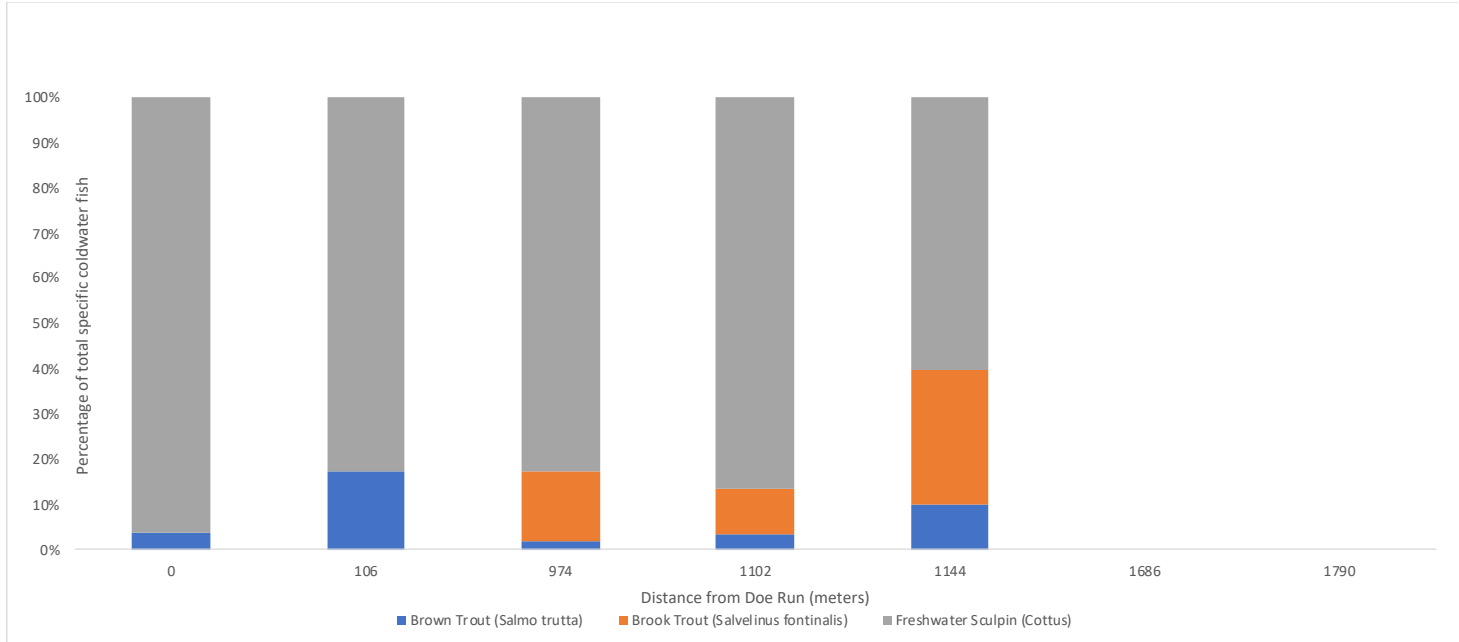


Figure 8. This graph shows the percentage of brook trout, brown trout, and freshwater sculpin spp. caught on the UNT to Doe Run at upstream distances from the Doe Run confluence. Each distance on the x-axis represents the culvert sample sites on the tributary (0 meters from Doe Run is culvert 8 and 1790 meters from Doe Run is culvert 4). At distance 1144 meters from Doe Run (culvert 5) we see the greatest amount of brook trout. No fish were captured at the headwaters of the UNT (1686, 1790).

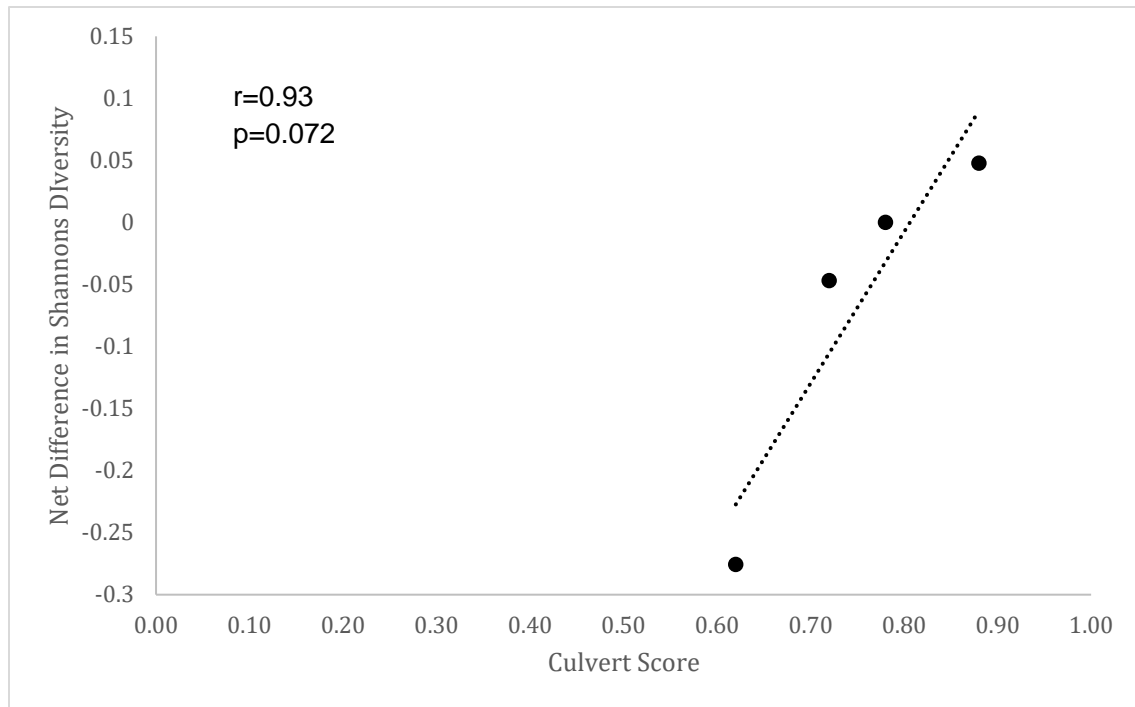


Figure 9. This graph shows the culvert scores for culverts 4, 5, 6, and 8, plotted against Net Shannon's Diversity difference for fish captured at sites on the UNT. Site sampling at culvert 1 was removed since no score can be calculated for fjords.

Macroinvertebrates

Across all sites, the macroinvertebrates totaled 675 individuals, with 14 order levels. Caddisfly (*Trichoptera*) was the most captured taxa. Overall, we saw a slight increase in macroinvertebrate diversity below the culverts sampled. In addition to sampling upstream and downstream of three select culverts, we also collected macroinvertebrates at sites at a distance above and below the historical mill dam on the main branch of Doe Run but on Runnymede Sanctuary property. These extra sites gave us information on the health of the watershed as a whole. The main branch sampling point above the Mill Dam on Doe Run supported all three of the sensitive macroinvertebrate families (Ephemeroptera, Plecoptera, and Tricoptera; Appendix B). The farthest upstream site (headwaters of Doe Run, culvert 1) showed the most diversity with the highest number of Shannon's diversity index and taxa evenness. Culverts 5 and 6 had the greatest difference in macroinvertebrate data above and below them, with more macroinvertebrate orders observed below the two structures (Fig 10). Below culvert 6 had a higher diversity and more taxa were collected. However, more pollution sensitive macroinvertebrates were found above culvert 5 with a higher % EPT abundance number (Fig 11).

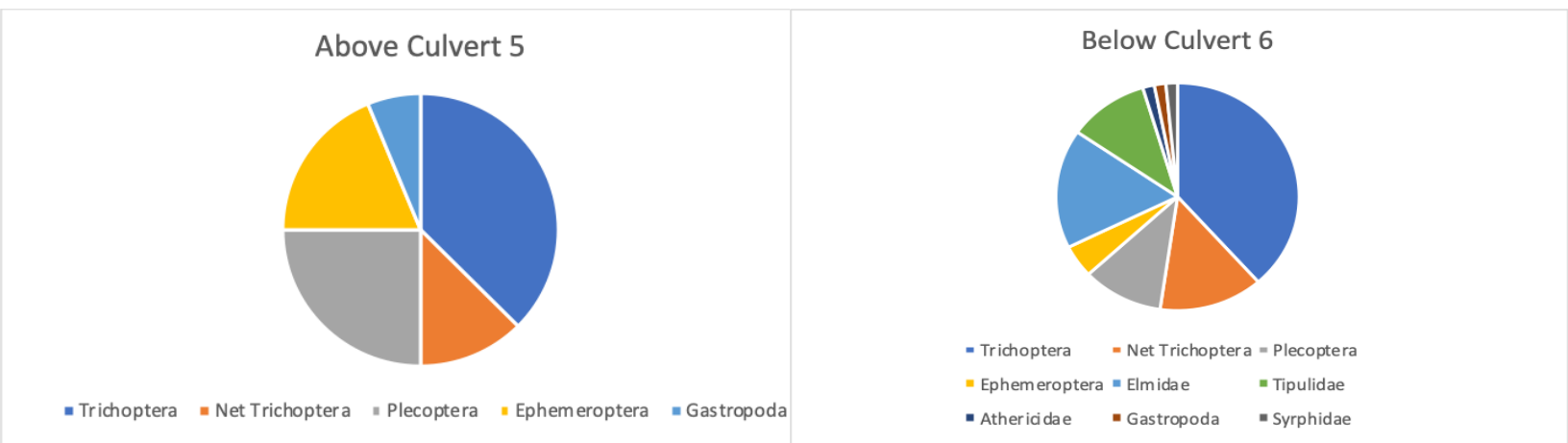
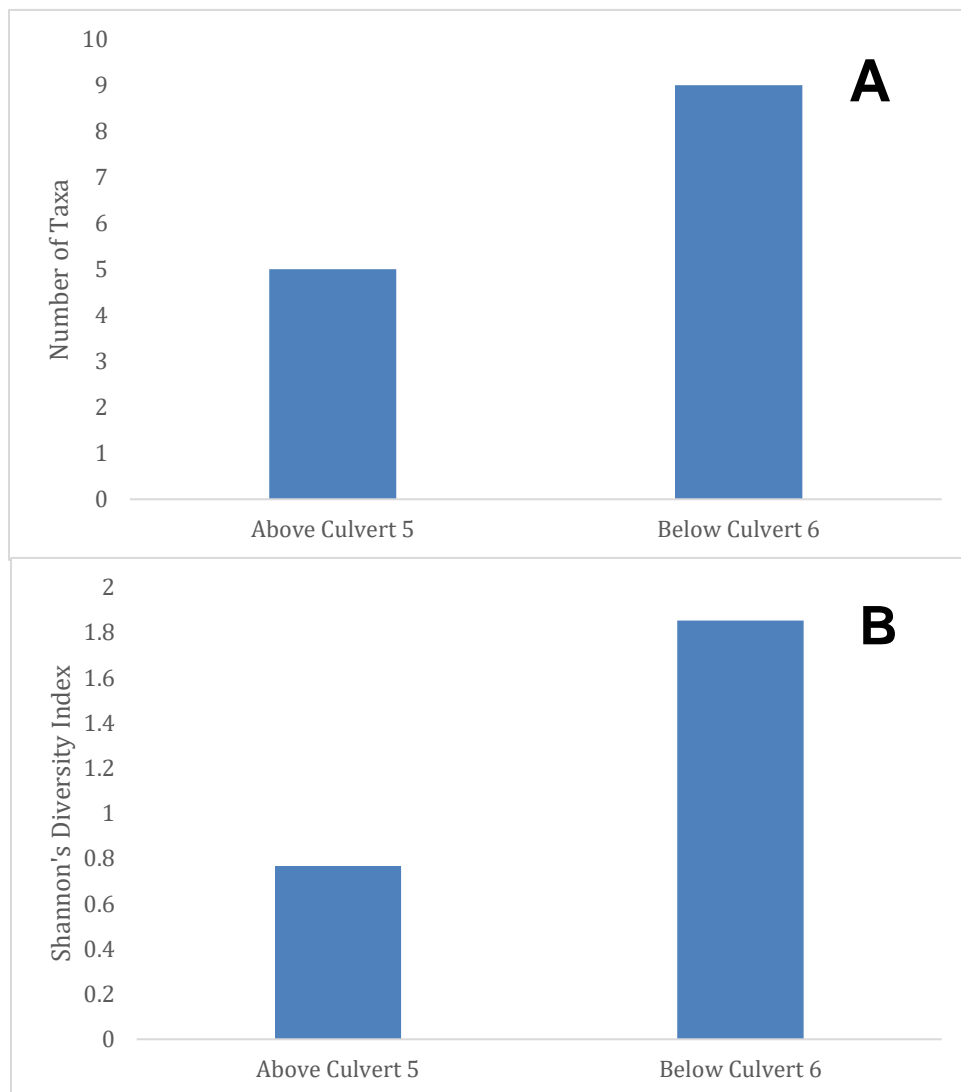


Figure 10. Total taxa present above culvert 5 and below culvert 6.



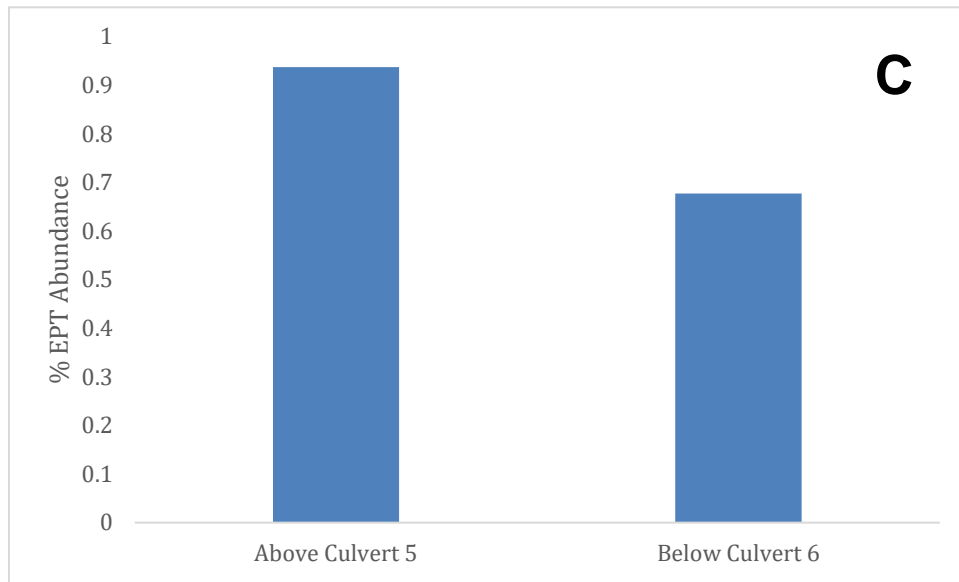


Figure 11. Bar graphs comparing the % EPT Abundance (C), Shannons Diveristy Index (SDI) (B), and Taxa richness (A) for macroinvertebrates at the sampling sites above and below of culverts 5 and 6.

Stream Physiochemistry

Overall, the stream physiochemistry was consistent and typical of the hilly piedmont physiographic region. The temperature ranged from 16.2°C-17.9°C , pH ranged from 6.72-7.14, TDS was between 85.3-168 ppm, Conductivity varied from 120-234 uS/cm, and DO fluctuated between 9.5-14.5 mg/L (Table 1).

Table 1. Showing the physiochemistry, fish, and macroinvertebrate data collected at each site, upstream and downstream of the five worst culverts.

Site	Score	Orientation	pH	Temperature °C	TDS (ppm)	Conductivity (ms/cm)	DO (mg/L)	Macro SDI	%EPT Abundance
1	-	Upstream	6.88	17.9	111	159.6	9.5	1.990*	0.706*
		Downstream	6.96	17.61	113	159	14.5		
4	0.78	Upstream	6.76	16.2	168	234	12.1	-	-
		Downstream	7.14	17.3	168	232	10.6	-	-
5	0.72	Upstream	6.54	16.3	108	152.2	12.8	0.767	0.938
		Downstream	6.72	16.3	107	153.2	13	0.752	0.765
6	0.62	Upstream	6.53	16.78	115	161.7	12.1	0.752	0.765
		Downstream	6.54	16.3	108	152.2	12.8	1.853	0.677
8	0.88	Upstream	6.82	16.5	86.3	120	12.7	1.192139	0.246
		Downstream	6.96	16.67	85.3	121	12.1	0.892	0.556

*Denotes that there was only one sample sites due to insufficient habitat for upstream/downstream sampling.

Discussion

Culvert Assessments

NAACC assessments suggest culvert 5 and 6 as being the lowest scoring fish passage barriers (Fig. 12). Culvert 5 had a score of 0.72 and culvert 6 had a score of 0.62 putting them in the range of a minor barrier (Appendix B). These culverts are only 60 meters away from each other which is not accounted for in the culvert scoring. Culvert 5 had moderate constriction and physical barriers that slowed down the stream flow, hindering fish passage, especially during low flow conditions. Culvert 6 scored poorly because it had a large amount of constriction at the inlet, no substrate cover, shallow water depth within the culvert and a significant scour pool at the outlet. The next worst fish passage barrier on the Runnymede Property of Doe Run is culvert 8 (Fig. 13). Culvert 8 is a double culvert made out of concrete and had a free-fall of up to 1.18 tenths of a foot on the outlet, and very little plunge pool length. These characteristics would make it very difficult to pass fish like brook trout. The best culverts have an open stream bottom that is on the same level as the stream, with ample openness for all aquatic organisms to pass, and no freefalls (a drop from the outlet to the stream) that come out of the outlet. Culvert number 3 on Runnymede is a good example of a passable box culvert (Fig 14). It should be noted that one low scoring culvert can significantly alter fish movement and populations in an entire watershed.



Figure 12. Showing inlets of culverts 5 and 6. Culvert 5 (left) has major constriction at the inlet and was mostly buried. The white circle on the left picture shows the relative area of where the culvert is being clogged. Culvert 6 (right) has physical barriers and little to no matching substrate covering the bottom of it.



Figure 13. Depicts outlet of culvert 8. Freefall numbers were 1.18 and 0.66 tenths of a foot respectively.



Figure 14. Culvert 3 is an example of a good culvert on the Runnymede Sanctuary property.

Fish Assemblages

Both brook trout and brown trout were present in the UNT to Doe Run, suggesting the stream habitat is a High Quality Coldwater Fishery (HQCWF). Brook trout are good indicator species since they need cold and clean water to thrive and are sensitive to low oxygen levels, presence of pollution, and fluctuations of pH (Brook Trout. Southeast Region of the USFWS). On the UNT to Doe Run, the most brook trout were found in the vicinity of culverts 5 and 6. Looking at culverts 5 and 6, there were more brook trout below the two culverts. That larger population of brook trout may not be able to swim upstream or reproduce with the other nearby populations since they are disconnected. The fragmented populations may also experience problems because not enough diversity is present in the genetic pool in small and isolated populations (Tortorotot et al. 2014). Another possible way that ecosystems on UNT to Doe Run are affected by culverts, is the lack of overall fish diversity that culverts can create when they fragment populations (Letcher et al. 2007). No trout were found at culvert 4, which was the highest sampled point on the UNT to Doe Run Tributary. This suggests that there are fish passage barriers or other environmental conditions that are not allowing trout and other fish to travel and habitat the headwaters of the UNT.

At the highest sampled point in the entire Doe Run watershed overall (culvert 1, Fig 1) two brown trout were found, suggesting habitable water for brook trout higher up in the watershed. The historical mill dam being preserved upstream of the UNT to Doe Run may be preventing brook trout from reaching the upper watershed as no brook trout were found upstream of the dam. The mill dam is located on a separate private inholding off of the Runnymede Property.

We are hopeful that the newly assessed brook trout and brown trout in the UNT to Doe Run will allow for protection of this watershed as a HQCWF. We will be entering this data into the PAFBC science collectors database for their review and submission. This should allow for future protection of this watershed by the PADEP

Macroinvertebrates

Macroinvertebrate data gives us indication of the health of the ecosystem. Since most macroinvertebrates live for 1-2 years, they reflect the recent health of a stream (Fish Passage at Dams Strategic Analysis). With the data collected we can conclude the stream's condition above and below the culverts. If the culverts are blocking biota movement or altering habitat, then we may see a decrease in health between the separated stream sections. Below culverts 5 and 6 had the greatest taxa richness/evenness and diversity (Fig. 9). More abundant and diverse macroinvertebrates below these culverts may mean that the culvert is having an impact on stream habitat conditions, potentially altering macroinvertebrate biodiversity.

Habitat differences upstream vs downstream of the culverts are likely driven by the changing flow dynamics and sediment load to the stream. Changing the flow velocities, scour, and direction impacts the movement of bed load and erosion and depositional features of the stream upstream and downstream of low scoring culverts. Upstream of culvert 5 had less diversity than below culvert 6, which is likely due to the "damming effect" observed upstream of culvert 5 (Fig 12). The increase of bed sediment load and siltation in that reach will change the stream substrate. Changing the stream characteristics will decrease habitat for the macroinvertebrate

taxa that require rock/cobble and woody debris substrate to thrive. From our data we see that above culvert 6, where the “damming effect” occurred, is where there was a decrease in diversity and taxa richness. These alterations to macroinvertebrate habitat will have cascading effects through the ecosystem's food web and will ultimately impact the fish communities. Specifically, brook trout are seen to have increased populations where there are more caddisflies, stoneflies, or mayflies present (Haley).

Stream Physiochemical Measures

The stream physiochemical numbers suggest that the stream is a suitable habitat for trout. Trout need high dissolved oxygen levels to survive, which the stream provides. Both species of trout survive best in a temperature range of 14–23°C (Hitt et al. 2017). The highest temperatures that brook trout will withstand is 23°C, when the water becomes this warm the brook trout will move upstream to cooler water (Meisner 1990). However, the temperature in UNT to Doe Run is warmer in the headwaters at the time of our June sampling. While the temperature is still within the brook trout's temperature range the maximum stream temperatures are not usually experienced until late August, so the temperature could approach the brook trout's upper limit.

The higher conductivity levels are likely due to karst topography and limestone geology. The limestone presence in the stream aids in buffering the pH of the stream against anthropogenic changes, like acid rain and pollution (McClurg et al. 2007). These higher levels of conductivity are helping to buffer the stream in a positive way.

Larger Riparian areas can help keep stream physiochemistry levels stable and will lower the temperature of the stream. More trees lead to more overhead cover which keeps the streams at lower temperatures (McClurg et al. 2007). The riparian area helps to buffer against agrochemicals and nutrient runoff. The trees also provide more habitat for terrestrial and aquatic insects, providing more food for the fish (Parkyn et al. 2003). The root systems of the trees will lower the amount of erosion that occurs, which keeps the total dissolved solid (TDS) levels down (Janisch et al. 2012).

Recommendations

The recent documentation of native brook trout populations in the Doe Run watershed is of great importance. To protect and enhance these current brook trout populations, and improve overall ecosystem connectivity and aquatic organism habitat, we propose several recommendations for future restoration efforts.

1) Replace or remove Culvert #5

Culvert 5 was visually assessed to have the largest fish passage impact. It was one of the lowest scoring culverts of all 13 since it has a blocked inlet that does not allow for fish to pass. This culvert passability also worsened from our documented NAACC score because of a 7-inch rain event that occurred on June 11, the week before fish sampling. The culvert could not handle the bankful flow and caused the stream to fill in the culvert completely, and flow around the culvert and erode an abandoned township road (Fig. 14). We recommend either reconstructing the culvert to allow for fish passage, or completely removing the culvert (if road is no longer used for access). We recommend that either option be done in combination with typical in-stream fish habitat work to help

increase habitat and stabilize stream banks and stream bed. If the culvert is not essential, it is better to be completely removed.



Figure 14. Left image shows the conditions following 7-inch rainfall event where the stream reached a level above bank full, bypassing culvert 5 and eroding township road (left). The right image shows culvert 5 inlet completely blocked following bankfull event.

2) Conduct riparian plantings at key locations along the UNT watershed

To further improve the populations of brook trout we recommend increasing the size of the riparian buffer along areas of the UNT to Doe Run. Riparian planting will have a number of benefits to the stream including decreasing thermal load, decreasing erosion, and increasing habitat for macroinvertebrates (Parkyn et al. 2003). Multiple areas surrounding the UNT to Doe Run would benefit from an increased riparian buffer (Fig. 15). Particularly the headwaters region of the tributary, near culvert 4, would be most important to focus riparian planting. Since we did not find any brook trout up near culvert 4, completing riparian planting in that area will aid in decreasing stream temperature and improving fish habitat. Providing a greater riparian zone of 15-20 meters (in unison with fish barrier and habitat work) will create healthier stream ecosystems that will continue to grow the brook trout populations.

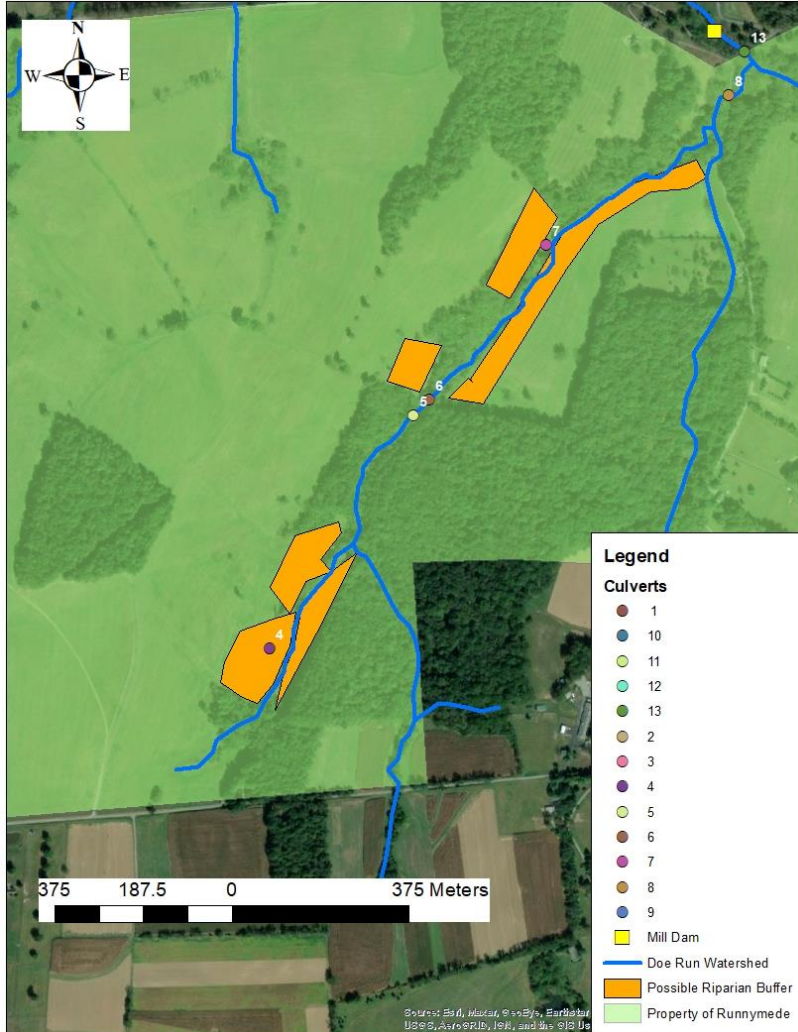


Figure 15. Map of UNT to Doe Run watershed with the culvert numbers denoted. The orange shaded areas on the map indicates locations to focus future riparian planting efforts.

3) Replace Culvert #8

Culvert 8 was another culvert in the UNT to negatively affect the brook trout population. The main reason was because of its outlet freefalls (Fig. 13). This gives the culvert a low NAACC scoring meaning fish passage and other aquatic organism passage is low. The free fall at the outlet makes it difficult for trout and other fish to jump up the culvert to then swim through it. We recommend replacing this culvert in a way that there is no free fall and there is only one single structure.

Recommendation Summary:

We believe that these recommendations will increase the distribution of trout in the UNT to Doe Run by creating a connected area of refugia within the larger watershed. Increasing distribution will not only help to create a more robust population of brook trout in the UNT but may also help to repopulate the entire Doe Run watershed in the long-term. However, to increase upstream range of brook trout in Doe Run (outside of the UNT), steps will need to be taken to address the historical fish passage barrier of the mill dam that is located on an inholding within the Runnymede Property. Dam removal would be most ideal from an aquatic organism perspective; however, we recognize that the historical significance of the dam may make that unlikely. If that is the case, creating a fish ladder near the mill dam or relocating brook trout to key locations upstream of the dam may help to increase brook trout range in the Doe Run watershed.

These recommendations will not only increase aquatic connectivity and fish habitat but will also create opportunities for the local community to partner in environmental stewardship and education with the Runnymede Sanctuary. The Grant Lab at Juniata is happy to help to facilitate these future efforts as needed. We have a long-standing relationship with the US Fish and Wildlife Service with work on dam removal, stream restoration and habitat work, and riparian tree plantings. This would be best implemented in collaboration with a local group such as the Chester County Conservation District or another non-profit group to help build community ties. Runnymede has expressed interest in continued involvement in helping increase brook trout habitat and connectivity within the Doe Run watershed.

Runnymede has discussed the recommendations and will strive to implement them as soon as possible. They have been planning on planting more trees on the property and will be putting some of those near culvert 4. Culvert 5 will be removed to stop the barrier it creates on the UNT to Doe Run. Culvert 8 is a part of the Londonderry township's road. Therefore, reconstructing this culvert will be harder to achieve. They anticipate the road near the culvert being fixed in the near future. They will ask about reconstructing the culvert when the township comes out to fix that section of the road.

Potential Partners

- Chester County Conservation District
313 West Market St
West Chester, PA 19380
Phone: (610) 344-6000
- Octoraro Watershed Association
517 Pine Grove Rd
Nottingham, PA 19362
Phone: (717) 529-2132
- Brandywine Conservancy
1 Hoffman's Mill Rd
P.O. Box 141
Chadds Ford, PA 19317
Phone: (610) 388-2700
- Natural Lands Trust
1031 Palmers Mill Rd
Media, PA 19063
Phone: (610) 353-5587
- Brownfield Science and Technology
John Kollmeier
3157 Limestone Rd
Cochranville, PA 19330
Phone: (610) 593-5500
- Runnymede Sanctuary
Tim Durborrow
304-394 Creek Rd
Coatesville, PA 19320
Phone: (610) 367-8288
- Open Land Conservancy of Chester County
PO Box 1031
Paoli, PA, 19301
Phone: (610) 647-5380

Future Funding Opportunities

- The National Fish and Wildlife Foundation
<https://www.nfwf.org/programs/bring-back-natives>
- U.S Fish and Wildlife Service
<https://www.fws.gov/fisheries/fish-passage.html>
- NOAA Fisheries
<https://www.fisheries.noaa.gov/national/funding-and-financial-services/priorities-habitat-restoration-grants>
- Washington State Recreation and Conservation Office
<https://rco.wa.gov/grant/brian-abbott-fish-barrier-removal-board/>
- Stroud Water Research Center
<https://stroudcenter.org/education/projects/>
- Trout Unlimited
<https://www.tu.org/conservation/conservation-areas/watershed-restoration/conservation-funding/>
- Coldwater Heritage Partnership
<https://coldwaterheritage.org/>
- Keystone 10 million Trees Partnership
<http://www.tenmilliontrees.org/partners/pia/luzerne-conservation-district.html>
- Eastern Brook Trout Joint Venture
<https://easternbrooktrout.org/funding-opportunities>
- Foundation for Pennsylvania Watersheds
<http://pennsylvaniawatersheds.org/apply-for-a-grant/>

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Appendix A: NAACC Forms



AQUATIC CONNECTIVITY Stream Crossing Survey DATA FORM

DATABASE ENTRY BY _____ ENTRY DATE _____
 DATA ENTRY REVIEWED BY _____ REVIEW DATE _____

CROSSING DATA	Crossing Code <u>Tractor Crossing #1 (culvert 1)</u>		Local ID (Optional) _____	
	Date Observed (00/00/0000) <u>6/30/20</u>		Lead Observer <u>Chris Grant</u>	
	Town/County <u>Coatesville</u>		Stream <u>Doe Run</u>	
	Road <u>Gibble Road (~1/2 mile)</u>		Type <input checked="" type="checkbox"/> MULTILANE <input checked="" type="checkbox"/> PAVED <input type="checkbox"/> UNPAVED <input type="checkbox"/> DRIVEWAY <input type="checkbox"/> TRAIL <input type="checkbox"/> RAILROAD	
	GPS Coordinates (Decimal degrees) <u>39.8851</u> °N Latitude		<u>-75.8954</u> °W Longitude	
Location Description _____				
Crossing Type <input type="checkbox"/> BRIDGE <input type="checkbox"/> CULVERT <input type="checkbox"/> MULTIPLE CULVERT <input checked="" type="checkbox"/> FORD <input type="checkbox"/> NO CROSSING <input type="checkbox"/> REMOVED CROSSING <input type="checkbox"/> BURIED STREAM <input type="checkbox"/> INACCESSIBLE <input type="checkbox"/> PARTIALLY INACCESSIBLE <input type="checkbox"/> NO UPSTREAM CHANNEL <input type="checkbox"/> BRIDGE ADEQUATE				Number of Culverts/ Bridge Cells <u>N/A</u>
Photo IDs INLET <u>NA</u> OUTLET <u>NA</u> UPSTREAM <u>1</u> DOWNSTREAM <u>2</u> OTHER _____				
Flow Condition <input type="checkbox"/> NO FLOW <input checked="" type="checkbox"/> TYPICAL-LOW <input type="checkbox"/> MODERATE <input type="checkbox"/> HIGH			Crossing Condition <input checked="" type="checkbox"/> OK <input type="checkbox"/> POOR <input type="checkbox"/> NEW <input type="checkbox"/> UNKNOWN	
Tidal Site <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO <input type="checkbox"/> UNKNOWN		Alignment <input checked="" type="checkbox"/> FLOW-ALIGNED <input type="checkbox"/> SKEWED (>45°)	Road Fill Height (Top of culvert to road surface; bridge = 0) <u>0/NA</u>	
Bankfull Width (Optional) <u>28.2</u>		Confidence <input checked="" type="checkbox"/> HIGH <input type="checkbox"/> LOW/ESTIMATED	Constriction <input type="checkbox"/> SEVERE <input type="checkbox"/> MODERATE <input type="checkbox"/> SPANS ONLY BANKFULL/ACTIVE CHANNEL	
Tailwater Scour Pool <input type="checkbox"/> NONE <input checked="" type="checkbox"/> SMALL <input type="checkbox"/> LARGE		<input checked="" type="checkbox"/> SPANS FULL CHANNEL & BANKS		
Crossing Comments <u>Jackson</u>				

STRUCTURE 1	Structure Material <input type="checkbox"/> METAL <input type="checkbox"/> CONCRETE <input type="checkbox"/> PLASTIC <input type="checkbox"/> WOOD <input checked="" type="checkbox"/> ROCK/STONE <input type="checkbox"/> FIBERGLASS <input type="checkbox"/> COMBINATION				
	Outlet Shape <input type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/> 5 <input type="checkbox"/> 6 <input checked="" type="checkbox"/> 7 <input type="checkbox"/> FORD <input type="checkbox"/> UNKNOWN <input type="checkbox"/> REMOVED				
	Outlet Armoring <input type="checkbox"/> NONE <input type="checkbox"/> NOT EXTENSIVE <input type="checkbox"/> EXTENSIVE				
	Outlet Grade (Pick one) <input type="checkbox"/> AT STREAM GRADE <input type="checkbox"/> FREE FALL <input checked="" type="checkbox"/> CASCADE <input type="checkbox"/> FREE FALL ONTO CASCADE <input type="checkbox"/> CLOGGED/COLLAPSED/SUBMERGED <input type="checkbox"/> UNKNOWN				
	Outlet Dimensions A. Width <u>2.95</u> B. Height <u>NA</u> C. Substrate/Water Width <u>2.95</u> D. Water Depth <u>0.262</u>				
OUTLET	Outlet Drop to Water Surface <u>0.0</u> Outlet Drop to Stream Bottom <u>0.0</u> E. Abutment Height (Type 7 bridges only) <u>NA</u>				
	L. Structure Length (Overall length from inlet to outlet) _____				
	Inlet Shape <input type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/> 5 <input type="checkbox"/> 6 <input checked="" type="checkbox"/> 7 <input type="checkbox"/> FORD <input type="checkbox"/> UNKNOWN <input type="checkbox"/> REMOVED				
	Inlet Type <input type="checkbox"/> PROJECTING <input type="checkbox"/> HEADWALL <input type="checkbox"/> WINGWALLS <input type="checkbox"/> HEADWALL & WINGWALLS <input type="checkbox"/> MITERED TO SLOPE <input checked="" type="checkbox"/> OTHER <input type="checkbox"/> NONE				
	Inlet Grade (Pick one) <input checked="" type="checkbox"/> AT STREAM GRADE <input type="checkbox"/> INLET DROP <input type="checkbox"/> PERCHED <input type="checkbox"/> CLOGGED/COLLAPSED/SUBMERGED <input type="checkbox"/> UNKNOWN				
INLET	Inlet Dimensions A. Width <u>2.62</u> B. Height <u>NA 0.0</u> C. Substrate/Water Width <u>2.62</u> D. Water Depth <u>0.196</u>				
	Slope % (Optional) <u>NA</u> Slope Confidence <input type="checkbox"/> HIGH <input type="checkbox"/> LOW				
	Internal Structures <input checked="" type="checkbox"/> NONE <input type="checkbox"/> BAFFLES/WEIRS <input type="checkbox"/> SUPPORTS <input type="checkbox"/> OTHER _____				
	Structure Substrate Matches Stream <input type="checkbox"/> NONE <input checked="" type="checkbox"/> COMPARABLE <input type="checkbox"/> CONTRASTING <input type="checkbox"/> NOT APPROPRIATE <input type="checkbox"/> UNKNOWN				
	Structure Substrate Type (Pick one) <input type="checkbox"/> NONE <input type="checkbox"/> SILT <input type="checkbox"/> SAND <input type="checkbox"/> GRAVEL <input checked="" type="checkbox"/> COBBLE <input type="checkbox"/> BOULDER <input type="checkbox"/> BEDROCK <input type="checkbox"/> UNKNOWN				
ADDITIONAL CONDITIONS	Structure Substrate Coverage <input type="checkbox"/> NONE <input type="checkbox"/> 25% <input type="checkbox"/> 50% <input checked="" type="checkbox"/> 75% <input type="checkbox"/> 100% <input type="checkbox"/> UNKNOWN				
	Physical Barriers (Pick all that apply) <input checked="" type="checkbox"/> NONE <input type="checkbox"/> DEBRIS/SEDIMENT/ROCK <input type="checkbox"/> DEFORMATION <input type="checkbox"/> FREE FALL <input type="checkbox"/> FENCING <input type="checkbox"/> DRY <input type="checkbox"/> OTHER				
	Severity (Choose carefully based on barrier type(s) above) <input checked="" type="checkbox"/> NONE <input type="checkbox"/> MINOR <input type="checkbox"/> MODERATE <input type="checkbox"/> SEVERE				
	Water Depth Matches Stream <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO-SHALLOWER <input type="checkbox"/> NO-DEEPER <input type="checkbox"/> UNKNOWN <input type="checkbox"/> DRY				
	Water Velocity Matches Stream <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO-FASTER <input type="checkbox"/> NO-SLOWER <input type="checkbox"/> UNKNOWN <input type="checkbox"/> DRY				
Dry Passage through Structure? <input type="checkbox"/> YES <input type="checkbox"/> NO <input type="checkbox"/> UNKNOWN					
Height above Dry Passage <u>NA</u>					
Comments _____					

5/26/16

AQUATIC CONNECTIVITY STREAM CROSSING SURVEY DATA FORM



AQUATIC CONNECTIVITY
Stream Crossing Survey
DATA FORM

DATABASE ENTRY BY _____ ENTRY DATE _____
DATA ENTRY REVIEWED BY _____ REVIEW DATE _____

CROSSING DATA	Crossing Code	Tractor Crossing # 2 (culvert 2)		Local ID (Optional)							
	Date Observed (00/00/0000)	6/30/20		Lead Observer	Chris Grant						
	Town/County	Coatesville		Stream							
	Road	Near fernwood Rd		Type	<input type="checkbox"/> MULTILANE <input checked="" type="checkbox"/> PAVED <input type="checkbox"/> UNPAVED <input type="checkbox"/> DRIVEWAY <input type="checkbox"/> TRAIL <input type="checkbox"/> RAILROAD						
	GPS Coordinates (Decimal degrees)	39.8911		*N Latitude	- 75.8811 *W Longitude						
	Location Description	Tipping									
	Crossing Type	<input type="checkbox"/> BRIDGE <input type="checkbox"/> CULVERT <input type="checkbox"/> MULTIPLE CULVERT <input checked="" type="checkbox"/> FORD <input type="checkbox"/> NO CROSSING <input type="checkbox"/> REMOVED CROSSING			Number of Culverts/ Bridge Cells NA						
	<input type="checkbox"/> BURIED STREAM <input type="checkbox"/> INACCESSIBLE <input type="checkbox"/> PARTIALLY INACCESSIBLE <input type="checkbox"/> NO UPSTREAM CHANNEL <input type="checkbox"/> BRIDGE ADEQUATE										
	Photo IDs	INLET	NA	OUTLET	NA	UPSTREAM	3	DOWNSTREAM	4	OTHER	
	Flow Condition	<input type="checkbox"/> NO FLOW <input checked="" type="checkbox"/> TYPICAL-LOW <input type="checkbox"/> MODERATE <input type="checkbox"/> HIGH			Crossing Condition	<input checked="" type="checkbox"/> OK <input type="checkbox"/> POOR <input type="checkbox"/> NEW <input type="checkbox"/> UNKNOWN					

OUTLET	STRUCTURE 1		Structure Material	<input type="checkbox"/> METAL <input type="checkbox"/> CONCRETE <input type="checkbox"/> PLASTIC <input type="checkbox"/> WOOD <input type="checkbox"/> ROCK/STONE <input type="checkbox"/> FIBERGLASS <input type="checkbox"/> COMBINATION								
	Outlet Shape	<input type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/> 5 <input type="checkbox"/> 6 <input type="checkbox"/> 7 <input checked="" type="checkbox"/> FORD <input type="checkbox"/> UNKNOWN <input type="checkbox"/> REMOVED							Outlet Armoring	<input checked="" type="checkbox"/> NONE <input type="checkbox"/> NOT EXTENSIVE <input type="checkbox"/> EXTENSIVE		
	Outlet Grade (Pick one)	<input type="checkbox"/> AT STREAM GRADE <input type="checkbox"/> FREE FALL <input type="checkbox"/> CASCADE <input type="checkbox"/> FREE FALL ONTO CASCADE <input type="checkbox"/> CLOGGED/COLLAPSED/SUBMERGED <input type="checkbox"/> UNKNOWN										
	Outlet Dimensions	A. Width	17.39	B. Height	NA	C. Substrate/Water Width	17.39	D. Water Depth	0.328			
	Outlet Drop to Water Surface	NA	Outlet Drop to Stream Bottom	NA	E. Abutment Height (Type 7 bridges only)	NA						
L. Structure Length (Overall length from inlet to outlet) (NA) 1476												
INLET	Inlet Shape	<input type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/> 5 <input type="checkbox"/> 6 <input type="checkbox"/> 7 <input checked="" type="checkbox"/> FORD <input type="checkbox"/> UNKNOWN <input type="checkbox"/> REMOVED										
	Inlet Type	<input type="checkbox"/> PROJECTING <input type="checkbox"/> HEADWALL <input type="checkbox"/> WINGWALLS <input type="checkbox"/> HEADWALL & WINGWALLS <input type="checkbox"/> MITERED TO SLOPE <input checked="" type="checkbox"/> OTHER <input type="checkbox"/> NONE										
	Inlet Grade (Pick one)	<input checked="" type="checkbox"/> AT STREAM GRADE <input type="checkbox"/> INLET DROP <input type="checkbox"/> PERCHED <input type="checkbox"/> CLOGGED/COLLAPSED/SUBMERGED <input type="checkbox"/> UNKNOWN										
Inlet Dimensions A. Width 11.48 B. Height NA C. Substrate/Water Width 11.48 D. Water Depth 0.686												
ADDITIONAL CONDITIONS	Slope % (Optional)	NA	Slope Confidence	<input type="checkbox"/> HIGH <input type="checkbox"/> LOW		Internal Structures	<input type="checkbox"/> NONE <input type="checkbox"/> BAFFLES/WEIRS <input type="checkbox"/> SUPPORTS <input type="checkbox"/> OTHER					
	Structure Substrate Matches Stream	<input type="checkbox"/> NONE <input checked="" type="checkbox"/> COMPARABLE <input type="checkbox"/> CONTRASTING <input type="checkbox"/> NOT APPROPRIATE <input type="checkbox"/> UNKNOWN										
	Structure Substrate Type (Pick one)	<input type="checkbox"/> NONE <input type="checkbox"/> SILT <input type="checkbox"/> SAND <input type="checkbox"/> GRAVEL <input checked="" type="checkbox"/> COBBLE <input type="checkbox"/> BOULDER <input type="checkbox"/> BEDROCK <input type="checkbox"/> UNKNOWN										
	Structure Substrate Coverage	<input type="checkbox"/> NONE <input type="checkbox"/> 25% <input type="checkbox"/> 50% <input checked="" type="checkbox"/> 75% <input type="checkbox"/> 100% <input type="checkbox"/> UNKNOWN										
	Physical Barriers (Pick all that apply)	<input checked="" type="checkbox"/> NONE <input type="checkbox"/> DEBRIS/SEDIMENT/ROCK <input type="checkbox"/> DEFORMATION <input type="checkbox"/> FREE FALL <input type="checkbox"/> FENCING <input type="checkbox"/> DRY <input type="checkbox"/> OTHER										
	Severity (Choose carefully based on barrier type(s) above)	<input checked="" type="checkbox"/> NONE <input type="checkbox"/> MINOR <input type="checkbox"/> MODERATE <input type="checkbox"/> SEVERE										
	Water Depth Matches Stream	<input checked="" type="checkbox"/> YES <input type="checkbox"/> NO-SHALLOWER <input type="checkbox"/> NO-DEEPER <input type="checkbox"/> UNKNOWN <input type="checkbox"/> DRY										
	Water Velocity Matches Stream	<input checked="" type="checkbox"/> YES <input type="checkbox"/> NO-FASTER <input type="checkbox"/> NO-SLOWER <input type="checkbox"/> UNKNOWN <input type="checkbox"/> DRY										
	Dry Passage through Structure?	<input type="checkbox"/> YES <input type="checkbox"/> NO <input type="checkbox"/> UNKNOWN										
	Height above Dry Passage	NA										
Comments												

5/26/16



AQUATIC CONNECTIVITY
Stream Crossing Survey
DATA FORM

DATABASE ENTRY BY _____ ENTRY DATE _____
DATA ENTRY REVIEWED BY _____ REVIEW DATE _____

CROSSING DATA

Crossing Code Old Township Bridge (culvert 3) Local ID (Optional) _____
Date Observed (00/00/0000) 6/30/20 Lead Observer Chris Grant
Town/County Coatesville Stream Doe Run
Road Fernwood Rd (off) Type ☐ MULTILANE ☐ PAVED ☐ UNPAVED ☐ DRIVEWAY ☐ TRAIL ☐ RAILROAD
GPS Coordinates (Decimal degrees) 39.8901 °N Latitude -75.8785 °W Longitude
Location Description
Crossing Type ☒ BRIDGE ☐ CULVERT ☐ MULTIPLE CULVERT ☐ FORD ☐ NO CROSSING ☐ REMOVED CROSSING
☐ BURIED STREAM ☐ INACCESSIBLE ☐ PARTIALLY INACCESSIBLE ☐ NO UPSTREAM CHANNEL ☐ BRIDGE ADEQUATE
Number of Culverts/ Bridge Cells 1
Photo IDs INLET 7 OUTLET 8 UPSTREAM 5 DOWNSTREAM 6 OTHER _____
Flow Condition ☐ NO FLOW ☒ TYPICAL-LOW ☐ MODERATE ☐ HIGH Crossing Condition ☒ OK ☐ POOR ☐ NEW ☐ UNKNOWN
Tidal Site ☐ YES ☒ NO ☐ UNKNOWN Alignment ☐ FLOW-ALIGNED ☒ SKEWED (>45°) Road Fill Height (Top of culvert to road surface; bridge = 0) 0
Bankfull Width (Optional) 36.15 Confidence ☒ HIGH ☐ LOW/ESTIMATED Constriction ☐ SEVERE ☐ MODERATE ☒ SPANS ONLY BANKFULL/
Tailwater Scour Pool ☒ NONE ☐ SMALL ☐ LARGE ☐ SPANS FULL CHANNEL & BANKS
Crossing Comments old I-beam wooden Bridge

STRUCTURE 1

Structure Material ☐ METAL ☐ CONCRETE ☐ PLASTIC ☐ WOOD ☐ ROCK/STONE ☐ FIBERGLASS ☐ COMBINATION
Outlet Shape ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☒ 5 ☐ 6 ☐ 7 ☐ FORD ☐ UNKNOWN ☐ REMOVED Outlet Armoring ☐ NONE ☐ NOT EXTENSIVE ☐ EXTENSIVE
Outlet Grade (Pick one) ☒ AT STREAM GRADE ☐ FREE FALL ☐ CASCADE ☐ FREE FALL ONTO CASCADE ☐ CLOGGED/COLLAPSED/SUBMERGED ☐ UNKNOWN
Outlet Dimensions A. Width 18.05 B. Height 5.58 C. Substrate/Water Width 18.05 D. Water Depth 1.05
Outlet Drop to Water Surface 0.0 Outlet Drop to Stream Bottom NA E. Abutment Height (Type 7 bridges only) NA
L. Structure Length (Overall length from inlet to outlet) 15.42
INLET
Inlet Shape ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☒ 5 ☐ 6 ☐ 7 ☐ FORD ☐ UNKNOWN ☐ REMOVED
Inlet Type ☐ PROJECTING ☐ HEADWALL ☒ WINGWALLS ☐ HEADWALL & WINGWALLS ☐ MITERED TO SLOPE ☐ OTHER ☐ NONE
Inlet Grade (Pick one) ☒ AT STREAM GRADE ☐ INLET DROP ☐ PERCHED ☐ CLOGGED/COLLAPSED/SUBMERGED ☐ UNKNOWN
Inlet Dimensions A. Width 17.72 B. Height 5.25 C. Substrate/Water Width 17.72 D. Water Depth 0.984
Slope % (Optional) NA Slope Confidence ☐ HIGH ☐ LOW Internal Structures ☒ NONE ☐ BAFFLES/WEIRS ☐ SUPPORTS ☐ OTHER
ADDITIONAL CONDITIONS
Structure Substrate Matches Stream ☐ NONE ☒ COMPARABLE ☐ CONTRASTING ☐ NOT APPROPRIATE ☐ UNKNOWN
Structure Substrate Type (Pick one) ☐ NONE ☐ SILT ☐ SAND ☐ GRAVEL ☐ COBBLE ☒ BOULDER ☐ BEDROCK ☐ UNKNOWN
Structure Substrate Coverage ☐ NONE ☐ 25% ☐ 50% ☒ 75% ☐ 100% ☐ UNKNOWN
Physical Barriers (Pick all that apply) ☐ NONE ☒ DEBRIS/SEDIMENT/ROCK ☐ DEFORMATION ☐ FREE FALL ☐ FENCING ☐ DRY ☐ OTHER
Severity (Choose carefully based on barrier type(s) above) ☐ NONE ☐ MINOR ☒ MODERATE ☐ SEVERE
Water Depth Matches Stream ☒ YES ☐ NO-SHALLOWER ☐ NO-DEEPER ☐ UNKNOWN ☐ DRY
Water Velocity Matches Stream ☒ YES ☐ NO-FASTER ☐ NO-SLOWER ☐ UNKNOWN ☐ DRY
Dry Passage through Structure? ☐ YES ☒ NO ☐ UNKNOWN Height above Dry Passage NA
Comments _____

5/26/16

AQUATIC CONNECTIVITY STREAM CROSSING SURVEY DATA FORM



AQUATIC CONNECTIVITY
Stream Crossing Survey
DATA FORM

DATABASE ENTRY BY _____ ENTRY DATE _____
DATA ENTRY REVIEWED BY _____ REVIEW DATE _____

CROSSING DATA	Crossing Code	Culvert 4, Silo Area			Local ID (Optional)						
	Date Observed (00/00/0000)	6/30/20			Lead Observer	Chris Grant					
	Town/County	Coatesville			Stream	Doe Run					
	Road				Type	<input type="checkbox"/> MULTILANE <input type="checkbox"/> PAVED <input type="checkbox"/> UNPAVED <input type="checkbox"/> DRIVEWAY <input type="checkbox"/> TRAIL <input type="checkbox"/> RAILROAD					
	GPS Coordinates (Decimal degrees)	39.8916			*N Latitude	- 79.8625 *W Longitude					
	Location Description										
	Crossing Type	<input type="checkbox"/> BRIDGE <input checked="" type="checkbox"/> CULVERT <input type="checkbox"/> MULTIPLE CULVERT <input type="checkbox"/> FORD <input type="checkbox"/> NO CROSSING <input type="checkbox"/> REMOVED CROSSING				Number of Culverts/ Bridge Cells 1					
	<input type="checkbox"/> BURIED STREAM <input type="checkbox"/> INACCESSIBLE <input type="checkbox"/> PARTIALLY INACCESSIBLE <input type="checkbox"/> NO UPSTREAM CHANNEL <input type="checkbox"/> BRIDGE ADEQUATE										
	Photo IDs	INLET	11	OUTLET	12	UPSTREAM	9	DOWNSIDE	10	OTHER	
	Flow Condition	<input type="checkbox"/> NO FLOW <input checked="" type="checkbox"/> TYPICAL-LOW <input type="checkbox"/> MODERATE <input type="checkbox"/> HIGH			Crossing Condition	<input checked="" type="checkbox"/> OK <input type="checkbox"/> POOR <input type="checkbox"/> NEW <input type="checkbox"/> UNKNOWN					
Tidal Site	<input type="checkbox"/> YES <input checked="" type="checkbox"/> NO <input type="checkbox"/> UNKNOWN			Alignment	<input type="checkbox"/> FLOW-ALIGNED <input type="checkbox"/> SKEWED (>45°)			Road Fill Height (Top of culvert to road surface; bridge = 0)	1.017		
Bankfull Width (Optional)	12.47			Confidence	<input checked="" type="checkbox"/> HIGH <input type="checkbox"/> LOW/ESTIMATED			Constriction	<input type="checkbox"/> SEVERE <input checked="" type="checkbox"/> MODERATE <input type="checkbox"/> SPANS ONLY BANKFULL/ ACTIVE CHANNEL		
Tailwater Scour Pool	<input checked="" type="checkbox"/> NONE <input type="checkbox"/> SMALL <input type="checkbox"/> LARGE						<input type="checkbox"/> SPANS FULL CHANNEL & BANKS				
Crossing Comments						Free fall inside of culvert (.2m) bc of pipe section + narrowing					

OUTLET	STRUCTURE 1											
	Structure Material <input type="checkbox"/> METAL <input checked="" type="checkbox"/> CONCRETE <input type="checkbox"/> PLASTIC <input type="checkbox"/> WOOD <input type="checkbox"/> ROCK/STONE <input type="checkbox"/> FIBERGLASS <input type="checkbox"/> COMBINATION											
	Outlet Shape	<input checked="" type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/> 5 <input type="checkbox"/> 6 <input type="checkbox"/> 7 <input type="checkbox"/> FORD <input type="checkbox"/> UNKNOWN <input type="checkbox"/> REMOVED										
	Outlet Grade (Pick one)	<input checked="" type="checkbox"/> AT STREAM GRADE <input type="checkbox"/> FREE FALL <input type="checkbox"/> CASCADE <input type="checkbox"/> FREE FALL ONTO CASCADE <input type="checkbox"/> CLOGGED/COLLAPSED/SUBMERGED <input type="checkbox"/> UNKNOWN										
	Outlet Dimensions	A. Width 3.61 B. Height 2.46 C. Substrate/Water Width 1.64 D. Water Depth 0.262										
INLET	Outlet Drop to Water Surface 0.0 Outlet Drop to Stream Bottom 0.0 E. Abutment Height (Type 7 bridges only) NA											
	L. Structure Length (Overall length from inlet to outlet) 24.606											
	Inlet Shape	<input checked="" type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/> 5 <input type="checkbox"/> 6 <input type="checkbox"/> 7 <input type="checkbox"/> FORD <input type="checkbox"/> UNKNOWN <input type="checkbox"/> REMOVED										
	Inlet Type	<input checked="" type="checkbox"/> PROJECTING <input type="checkbox"/> HEADWALL <input type="checkbox"/> WINGWALLS <input type="checkbox"/> HEADWALL & WINGWALLS <input type="checkbox"/> MITERED TO SLOPE <input type="checkbox"/> OTHER <input type="checkbox"/> NONE										
	Inlet Grade (Pick one)	<input checked="" type="checkbox"/> AT STREAM GRADE <input type="checkbox"/> INLET DROP <input type="checkbox"/> PERCHED <input type="checkbox"/> CLOGGED/COLLAPSED/SUBMERGED <input type="checkbox"/> UNKNOWN										
ADDITIONAL CONDITIONS	Inlet Dimensions A. Width 3.61 B. Height 2.395 C. Substrate/Water Width 1.41 D. Water Depth 0.984											
	Slope % (Optional) NA Slope Confidence <input type="checkbox"/> HIGH <input type="checkbox"/> LOW Internal Structures <input checked="" type="checkbox"/> NONE <input type="checkbox"/> BAFFLES/WEIRS <input type="checkbox"/> SUPPORTS <input type="checkbox"/> OTHER											
	Structure Substrate Matches Stream <input type="checkbox"/> NONE <input type="checkbox"/> COMPARABLE <input checked="" type="checkbox"/> CONTRASTING <input type="checkbox"/> NOT APPROPRIATE <input type="checkbox"/> UNKNOWN											
	Structure Substrate Type (Pick one) <input checked="" type="checkbox"/> NONE <input type="checkbox"/> SILT <input type="checkbox"/> SAND <input type="checkbox"/> GRAVEL <input type="checkbox"/> COBBLE <input type="checkbox"/> BOULDER <input type="checkbox"/> BEDROCK <input type="checkbox"/> UNKNOWN											
	Structure Substrate Coverage <input checked="" type="checkbox"/> NONE <input type="checkbox"/> 25% <input type="checkbox"/> 50% <input type="checkbox"/> 75% <input type="checkbox"/> 100% <input type="checkbox"/> UNKNOWN											
	Physical Barriers (Pick all that apply) <input checked="" type="checkbox"/> NONE <input type="checkbox"/> DEBRIS/SEDIMENT/ROCK <input type="checkbox"/> DEFORMATION <input type="checkbox"/> FREE FALL <input type="checkbox"/> FENCING <input type="checkbox"/> DRY <input type="checkbox"/> OTHER											
	Severity (Choose carefully based on barrier type(s) above) <input checked="" type="checkbox"/> NONE <input type="checkbox"/> MINOR <input type="checkbox"/> MODERATE <input type="checkbox"/> SEVERE											
	Water Depth Matches Stream <input checked="" type="checkbox"/> YES <input type="checkbox"/> NO-SHALLOWER <input type="checkbox"/> NO-DEEPER <input type="checkbox"/> UNKNOWN <input type="checkbox"/> DRY											
	Water Velocity Matches Stream <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO-FASTER <input type="checkbox"/> NO-SLOWER <input type="checkbox"/> UNKNOWN <input type="checkbox"/> DRY											
	Dry Passage through Structure? <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO <input type="checkbox"/> UNKNOWN Height above Dry Passage _____											
Comments												



AQUATIC CONNECTIVITY Stream Crossing Survey DATA FORM

DATABASE ENTRY BY _____ ENTRY DATE _____
DATA ENTRY REVIEWED BY _____ REVIEW DATE _____

CROSSING DATA

Crossing Code Twins Culvert 5 Local ID (Optional) _____
Date Observed (00/00/0000) 6/30/2020 Lead Observer Chris Grant
Town/County Coatesville Stream Doe Run
Road _____ Type ☐ MULTILANE ☐ PAVED ☐ UNPAVED ☐ DRIVEWAY ☐ TRAIL ☐ RAILROAD
GPS Coordinates (Decimal degrees) 39.8960 °N Latitude -75.8288 °W Longitude
Location Description
Crossing Type ☐ BRIDGE ☒ CULVERT ☐ MULTIPLE CULVERT ☐ FORD ☐ NO CROSSING ☐ REMOVED CROSSING
☐ BURIED STREAM ☐ INACCESSIBLE ☐ PARTIALLY INACCESSIBLE ☐ NO UPSTREAM CHANNEL ☐ BRIDGE ADEQUATE
Number of Culverts/ Bridge Cells 1
Photo IDs INLET 15 OUTLET 16 UPSTREAM 13 DOWNSTREAM 14 OTHER _____
Flow Condition ☐ NO FLOW ☒ TYPICAL-LOW ☐ MODERATE ☐ HIGH Crossing Condition ☒ OK ☐ POOR ☐ NEW ☐ UNKNOWN
Tidal Site ☐ YES ☒ NO ☐ UNKNOWN Alignment ☒ FLOW-ALIGNED ☐ SKEWED (>45°) Road Fill Height (Top of culvert to road surface; bridge = 0) 3.28
Bankfull Width (Optional) 15.75 Confidence ☒ HIGH ☐ LOW/ESTIMATED Constriction ☐ SEVERE ☒ MODERATE ☐ SPANS ONLY BANKFULL/ACTIVE CHANNEL
Tailwater Scour Pool ☒ NONE ☐ SMALL ☐ LARGE ☐ SPANS FULL CHANNEL & BANKS
Crossing Comments _____

STRUCTURE 1

Structure Material ☐ METAL ☐ CONCRETE ☐ PLASTIC ☐ WOOD ☐ ROCK/STONE ☐ FIBERGLASS ☒ COMBINATION
Outlet Shape ☒ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7 ☐ FORD ☐ UNKNOWN ☐ REMOVED Outlet Armoring ☐ NONE ☐ NOT EXTENSIVE ☐ EXTENSIVE
Outlet Grade (Pick one) ☒ AT STREAM GRADE ☐ FREE FALL ☐ CASCADE ☐ FREE FALL ONTO CASCADE ☐ CLOGGED/COLLAPSED/SUBMERGED ☐ UNKNOWN
Outlet Dimensions A. Width 3.18 B. Height 1.57 C. Substrate/Water Width 3.18 D. Water Depth 0.656
Outlet Drop to Water Surface NA Outlet Drop to Stream Bottom NA E. Abutment Height (Type 7 bridges only) NA
L. Structure Length (Overall length from inlet to outlet) 15.75
INLET
Inlet Shape ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7 ☐ FORD ☒ UNKNOWN ☐ REMOVED
Inlet Type ☐ PROJECTING ☐ HEADWALL ☐ WINGWALLS ☐ HEADWALL & WINGWALLS ☐ MITERED TO SLOPE ☐ OTHER ☒ NONE
Inlet Grade (Pick one) ☐ AT STREAM GRADE ☒ INLET DROP ☐ PERCHED ☐ CLOGGED/COLLAPSED/SUBMERGED ☐ UNKNOWN
Inlet Dimensions A. Width NA B. Height NA C. Substrate/Water Width NA D. Water Depth NA
Slope % (Optional) NA Slope Confidence ☐ HIGH ☐ LOW Internal Structures ☐ NONE ☐ BAFFLES/WEIRS ☐ SUPPORTS ☐ OTHER _____
ADDITIONAL CONDITIONS
Structure Substrate Matches Stream ☐ NONE ☒ COMPARABLE ☐ CONTRASTING ☐ NOT APPROPRIATE ☐ UNKNOWN
Structure Substrate Type (Pick one) ☐ NONE ☐ SILT ☒ SAND ☐ GRAVEL ☐ COBBLE ☐ BOULDER ☐ BEDROCK ☐ UNKNOWN
Structure Substrate Coverage ☐ NONE ☐ 25% ☐ 50% ☐ 75% ☒ 100% ☐ UNKNOWN
Physical Barriers (Pick all that apply) ☐ NONE ☒ DEBRIS/SEDIMENT/ROCK ☐ DEFORMATION ☐ FREE FALL ☐ FENCING ☐ DRY ☐ OTHER
Severity (Choose carefully based on barrier type(s) above) ☐ NONE ☐ MINOR ☐ MODERATE ☒ SEVERE
Water Depth Matches Stream ☒ YES ☐ NO-SHALLOWER ☐ NO-DEEPER ☐ UNKNOWN ☐ DRY
Water Velocity Matches Stream ☐ YES ☐ NO-FASTER ☒ NO-SLOWER ☐ UNKNOWN ☐ DRY
Dry Passage through Structure? ☐ YES ☒ NO ☐ UNKNOWN Height above Dry Passage _____
Comments Culvert shape looks like 3 due to age - sediment built up

Blocked

5/26/16

AQUATIC CONNECTIVITY STREAM CROSSING SURVEY DATA FORM



AQUATIC CONNECTIVITY
Stream Crossing Survey
DATA FORM

DATABASE ENTRY BY

ENTRY DATE

DATA ENTRY REVIEWED BY

REVIEW DATE

CROSSING DATA	Crossing Code	Culvert 6, Twin			Local ID (Optional)					
	Date Observed (00/00/0000)	6/30/2020			Lead Observer	Chris Grant				
	Town/County	Coatesville			Stream	Doe Run				
	Road				Type	<input type="checkbox"/> MULTILANE <input type="checkbox"/> PAVED <input type="checkbox"/> UNPAVED <input type="checkbox"/> DRIVEWAY <input type="checkbox"/> TRAIL <input type="checkbox"/> RAILROAD				
	GPS Coordinates (Decimal degrees)	39.8963			*N Latitude	- 75.8584 *W Longitude				
	Location Description									
	Crossing Type	<input type="checkbox"/> BRIDGE <input checked="" type="checkbox"/> CULVERT <input type="checkbox"/> MULTIPLE CULVERT <input type="checkbox"/> FORD <input type="checkbox"/> NO CROSSING <input type="checkbox"/> REMOVED CROSSING				Number of Culverts/ Bridge Cells				
	<input type="checkbox"/> BURIED STREAM <input type="checkbox"/> INACCESSIBLE <input type="checkbox"/> PARTIALLY INACCESSIBLE <input type="checkbox"/> NO UPSTREAM CHANNEL <input type="checkbox"/> BRIDGE ADEQUATE									
	Photo IDs	INLET	20	OUTLET	19	UPSTREAM	17	DOWNSIDE	18	OTHER
	Flow Condition	<input type="checkbox"/> NO FLOW <input type="checkbox"/> TYPICAL-LOW <input type="checkbox"/> MODERATE <input type="checkbox"/> HIGH			Crossing Condition	<input type="checkbox"/> OK <input type="checkbox"/> POOR <input type="checkbox"/> NEW <input type="checkbox"/> UNKNOWN				
Tidal Site	<input type="checkbox"/> YES <input checked="" type="checkbox"/> NO <input type="checkbox"/> UNKNOWN			Alignment	<input type="checkbox"/> FLOW-ALIGNED <input checked="" type="checkbox"/> SKEWED (>45°)			Road Fill Height (Top of culvert to road surface; bridge = 0)	1.312	
Bankfull Width (Optional)	15.75			Confidence	<input checked="" type="checkbox"/> HIGH <input type="checkbox"/> LOW/ESTIMATED			Constriction	<input type="checkbox"/> SEVERE <input checked="" type="checkbox"/> MODERATE <input type="checkbox"/> SPANS ONLY BANKFULL/ ACTIVE CHANNEL	
Tailwater Scour Pool	<input type="checkbox"/> NONE <input type="checkbox"/> SMALL <input checked="" type="checkbox"/> LARGE			<input type="checkbox"/> SPANS FULL CHANNEL & BANKS						
Crossing Comments										

OUTLET	STRUCTURE 1		Structure Material	<input checked="" type="checkbox"/> METAL <input type="checkbox"/> CONCRETE <input type="checkbox"/> PLASTIC <input type="checkbox"/> WOOD <input type="checkbox"/> ROCK/STONE <input type="checkbox"/> FIBERGLASS <input type="checkbox"/> COMBINATION																								
	Outlet Shape	<input checked="" type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/> 5 <input type="checkbox"/> 6 <input type="checkbox"/> 7 <input type="checkbox"/> FORD <input type="checkbox"/> UNKNOWN <input type="checkbox"/> REMOVED							Outlet Armoring	<input type="checkbox"/> NONE <input checked="" type="checkbox"/> NOT EXTENSIVE <input type="checkbox"/> EXTENSIVE																		
	Outlet Grade (Pick one)	<input checked="" type="checkbox"/> AT STREAM GRADE <input type="checkbox"/> FREE FALL <input type="checkbox"/> CASCADE <input type="checkbox"/> FREE FALL ONTO CASCADE <input type="checkbox"/> CLOGGED/COLLAPSED/SUBMERGED <input type="checkbox"/> UNKNOWN																										
	Outlet Dimensions	A. Width	4.24		B. Height	3.18		C. Substrate/Water Width	2.20		D. Water Depth	0.065																
	Outlet Drop to Water Surface	NA		Outlet Drop to Stream Bottom	0.262		Abutment Height (Type 7 bridges only)	NA																				
L. Structure Length (Overall length from inlet to outlet)													29.86															
INLET	Inlet Shape	<input checked="" type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/> 5 <input type="checkbox"/> 6 <input type="checkbox"/> 7 <input type="checkbox"/> FORD <input type="checkbox"/> UNKNOWN <input type="checkbox"/> REMOVED																										
	Inlet Type	<input checked="" type="checkbox"/> PROJECTING <input type="checkbox"/> HEADWALL <input type="checkbox"/> WINGWALLS <input type="checkbox"/> HEADWALL & WINGWALLS <input type="checkbox"/> MITERED TO SLOPE <input type="checkbox"/> OTHER <input type="checkbox"/> NONE																										
	Inlet Grade (Pick one)	<input checked="" type="checkbox"/> AT STREAM GRADE <input type="checkbox"/> INLET DROP <input type="checkbox"/> PERCHED <input type="checkbox"/> CLOGGED/COLLAPSED/SUBMERGED <input type="checkbox"/> UNKNOWN																										
Inlet Dimensions													A. Width		4.43		B. Height		3.3		C. Substrate/Water Width		2.63		D. Water Depth		0.164	
ADDITIONAL CONDITIONS	Slope % (Optional)		Slope Confidence		<input type="checkbox"/> HIGH <input type="checkbox"/> LOW		Internal Structures		<input checked="" type="checkbox"/> NONE <input type="checkbox"/> BAFFLES/WEIRS <input type="checkbox"/> SUPPORTS <input type="checkbox"/> OTHER																			
	Structure Substrate Matches Stream		<input checked="" type="checkbox"/> NONE <input type="checkbox"/> COMPARABLE <input type="checkbox"/> CONTRASTING <input type="checkbox"/> NOT APPROPRIATE <input type="checkbox"/> UNKNOWN																									
	Structure Substrate Type (Pick one)		<input checked="" type="checkbox"/> NONE <input type="checkbox"/> SILT <input type="checkbox"/> SAND <input type="checkbox"/> GRAVEL <input type="checkbox"/> COBBLE <input type="checkbox"/> BOULDER <input type="checkbox"/> BEDROCK <input type="checkbox"/> UNKNOWN																									
	Structure Substrate Coverage		<input checked="" type="checkbox"/> NONE <input type="checkbox"/> 25% <input type="checkbox"/> 50% <input type="checkbox"/> 75% <input type="checkbox"/> 100% <input type="checkbox"/> UNKNOWN																									
	Physical Barriers (Pick all that apply)		<input type="checkbox"/> NONE <input checked="" type="checkbox"/> DEBRIS/SEDIMENT/ROCK <input type="checkbox"/> DEFORMATION <input type="checkbox"/> FREE FALL <input type="checkbox"/> FENCING <input type="checkbox"/> DRY <input type="checkbox"/> OTHER																									
	Severity (Choose carefully based on barrier type(s) above)		<input type="checkbox"/> NONE <input type="checkbox"/> MINOR <input type="checkbox"/> MODERATE <input type="checkbox"/> SEVERE																									
	Water Depth Matches Stream		<input type="checkbox"/> YES <input checked="" type="checkbox"/> NO-SHALLOWER <input type="checkbox"/> NO-DEEPER <input type="checkbox"/> UNKNOWN <input type="checkbox"/> DRY																									
	Water Velocity Matches Stream		<input checked="" type="checkbox"/> YES <input type="checkbox"/> NO-FASTER <input type="checkbox"/> NO-SLOWER <input type="checkbox"/> UNKNOWN <input type="checkbox"/> DRY																									
	Dry Passage through Structure?		<input type="checkbox"/> YES <input checked="" type="checkbox"/> NO <input type="checkbox"/> UNKNOWN					Height above Dry Passage																				
	Comments													Sample for bugs and fish														



AQUATIC CONNECTIVITY
Stream Crossing Survey
DATA FORM

DATABASE ENTRY BY

ENTRY DATE

DATA ENTRY REVIEWED BY

REVIEW DATE

CROSSING DATA

Crossing Code	Culvert 7		Local ID (Optional)	
Date Observed (00/00/0000)	6/30/20		Lead Observer	Chris Grant
Town/County	Coatesville		Stream	Doe Run
Road	Type	<input type="checkbox"/> MULTILANE <input type="checkbox"/> PAVED <input type="checkbox"/> UNPAVED <input type="checkbox"/> DRIVEWAY <input type="checkbox"/> TRAIL <input type="checkbox"/> RAILROAD		
GPS Coordinates (Decimal degrees)	39.8992		*N Latitude	-75.8554 *W Longitude
Location Description				
Crossing Type	<input type="checkbox"/> BRIDGE <input checked="" type="checkbox"/> CULVERT <input type="checkbox"/> MULTIPLE CULVERT <input type="checkbox"/> FORD <input type="checkbox"/> NO CROSSING <input type="checkbox"/> REMOVED CROSSING			Number of Culverts/ Bridge Cells
				1
<input type="checkbox"/> BURIED STREAM <input type="checkbox"/> INACCESSIBLE <input type="checkbox"/> PARTIALLY INACCESSIBLE <input type="checkbox"/> NO UPSTREAM CHANNEL <input type="checkbox"/> BRIDGE ADEQUATE				
Photo IDs	INLET	23	OUTLET	24
	UPSTREAM	21	DOWNSTREAM	22
	OTHER			
Flow Condition	<input type="checkbox"/> NO FLOW <input checked="" type="checkbox"/> TYPICAL-LOW <input type="checkbox"/> MODERATE <input type="checkbox"/> HIGH			Crossing Condition <input checked="" type="checkbox"/> OK <input type="checkbox"/> POOR <input type="checkbox"/> NEW <input type="checkbox"/> UNKNOWN
Tidal Site	<input type="checkbox"/> YES <input checked="" type="checkbox"/> NO <input type="checkbox"/> UNKNOWN			Alignment <input checked="" type="checkbox"/> FLOW-ALIGNED <input type="checkbox"/> SKEWED (>45°)
				Road Fill Height (Top of culvert to road surface; bridge = 0) .754
Bankfull Width (Optional)	14.76		Confidence	<input checked="" type="checkbox"/> HIGH <input type="checkbox"/> LOW/ESTIMATED
Tailwater Scour Pool	<input checked="" type="checkbox"/> NONE <input type="checkbox"/> SMALL <input type="checkbox"/> LARGE			Constriction <input type="checkbox"/> SEVERE <input checked="" type="checkbox"/> MODERATE <input type="checkbox"/> SPANS ONLY BANKFULL/ ACTIVE CHANNEL
				<input type="checkbox"/> SPANS FULL CHANNEL & BANKS
Crossing Comments				

STRUCTURE 1

Structure Material	<input checked="" type="checkbox"/> METAL <input type="checkbox"/> CONCRETE <input type="checkbox"/> PLASTIC <input type="checkbox"/> WOOD <input type="checkbox"/> ROCK/STONE <input type="checkbox"/> FIBERGLASS <input type="checkbox"/> COMBINATION							
Outlet Shape	<input checked="" type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/> 5 <input type="checkbox"/> 6 <input type="checkbox"/> 7 <input type="checkbox"/> FORD <input type="checkbox"/> UNKNOWN <input type="checkbox"/> REMOVED							
Outlet Armoring	<input type="checkbox"/> NONE <input type="checkbox"/> NOT EXTENSIVE <input type="checkbox"/> EXTENSIVE							
Outlet Grade (Pick one)	<input checked="" type="checkbox"/> AT STREAM GRADE <input type="checkbox"/> FREE FALL <input type="checkbox"/> CASCADE <input type="checkbox"/> FREE FALL ONTO CASCADE <input type="checkbox"/> CLOGGED/COLLAPSED/SUBMERGED <input type="checkbox"/> UNKNOWN							
Outlet Dimensions	A. Width	3.608	B. Height	2.95	C. Substrate/Water Width	3.94	D. Water Depth	0.5
Outlet Drop to Water Surface	NA/0.0		Outlet Drop to Stream Bottom	0.0		E. Abutment Height (Type 7 bridges only)	NA	
L. Structure Length (Overall length from inlet to outlet)	20.013							
Inlet Shape	<input checked="" type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/> 5 <input type="checkbox"/> 6 <input type="checkbox"/> 7 <input type="checkbox"/> FORD <input type="checkbox"/> UNKNOWN <input type="checkbox"/> REMOVED							
Inlet Type	<input type="checkbox"/> PROJECTING <input type="checkbox"/> HEADWALL <input type="checkbox"/> WINGWALLS <input type="checkbox"/> HEADWALL & WINGWALLS <input type="checkbox"/> MITERED TO SLOPE <input type="checkbox"/> OTHER <input type="checkbox"/> NONE							
Inlet Grade (Pick one)	<input checked="" type="checkbox"/> AT STREAM GRADE <input type="checkbox"/> INLET DROP <input type="checkbox"/> PERCHED <input type="checkbox"/> CLOGGED/COLLAPSED/SUBMERGED <input type="checkbox"/> UNKNOWN							
Inlet Dimensions	A. Width	3.61	B. Height	2.95	C. Substrate/Water Width	3.94	D. Water Depth	2.460
Slope % (Optional)	NA		Slope Confidence	<input type="checkbox"/> HIGH <input type="checkbox"/> LOW		Internal Structures	<input checked="" type="checkbox"/> NONE <input type="checkbox"/> BAFFLES/WEIRS <input type="checkbox"/> SUPPORTS <input type="checkbox"/> OTHER	
Structure Substrate Matches Stream	<input type="checkbox"/> NONE <input checked="" type="checkbox"/> COMPARABLE <input type="checkbox"/> CONTRASTING <input type="checkbox"/> NOT APPROPRIATE <input type="checkbox"/> UNKNOWN							
Structure Substrate Type (Pick one)	<input type="checkbox"/> NONE <input checked="" type="checkbox"/> SILT <input type="checkbox"/> SAND <input type="checkbox"/> GRAVEL <input type="checkbox"/> COBBLE <input type="checkbox"/> BOULDER <input type="checkbox"/> BEDROCK <input type="checkbox"/> UNKNOWN							
Structure Substrate Coverage	<input type="checkbox"/> NONE <input type="checkbox"/> 25% <input type="checkbox"/> 50% <input checked="" type="checkbox"/> 75% <input type="checkbox"/> 100% <input type="checkbox"/> UNKNOWN							
Physical Barriers (Pick all that apply)	<input checked="" type="checkbox"/> NONE <input type="checkbox"/> DEBRIS/SEDIMENT/ROCK <input type="checkbox"/> DEFORMATION <input type="checkbox"/> FREE FALL <input type="checkbox"/> FENCING <input type="checkbox"/> DRY <input type="checkbox"/> OTHER							
Severity (Choose carefully based on barrier type(s) above)	<input checked="" type="checkbox"/> NONE <input type="checkbox"/> MINOR <input type="checkbox"/> MODERATE <input type="checkbox"/> SEVERE							
Water Depth Matches Stream	<input checked="" type="checkbox"/> YES <input type="checkbox"/> NO-SHALLOWER <input type="checkbox"/> NO-DEEPER <input type="checkbox"/> UNKNOWN <input type="checkbox"/> DRY							
Water Velocity Matches Stream	<input checked="" type="checkbox"/> YES <input type="checkbox"/> NO-FASTER <input type="checkbox"/> NO-SLOWER <input type="checkbox"/> UNKNOWN <input type="checkbox"/> DRY							
Dry Passage through Structure?	<input checked="" type="checkbox"/> YES <input checked="" type="checkbox"/> NO <input type="checkbox"/> UNKNOWN							
Height above Dry Passage								
Comments								

5/26/16

AQUATIC CONNECTIVITY STREAM CROSSING SURVEY DATA FORM



AQUATIC CONNECTIVITY
Stream Crossing Survey
DATA FORM

DATABASE ENTRY BY

ENTRY DATE

DATA ENTRY REVIEWED BY

REVIEW DATE

CROSSING DATA

Crossing Code	Culvert 8 (Double Culvert)	Local ID (Optional)	
Date Observed (00/00/0000)	6/30/2020	Lead Observer	Chris Grant
Town/County	Coatesville	Stream	Doe Run
Road	St Malachi Rd	Type	<input type="checkbox"/> MULTILANE <input checked="" type="checkbox"/> PAVED <input type="checkbox"/> UNPAVED <input type="checkbox"/> DRIVEWAY <input type="checkbox"/> TRAIL <input type="checkbox"/> RAILROAD
GPS Coordinates (Decimal degrees)	39.9020	*N Latitude	-75.8508 *W Longitude
Location Description			
Crossing Type	<input type="checkbox"/> BRIDGE <input type="checkbox"/> CULVERT <input checked="" type="checkbox"/> MULTIPLE CULVERT <input type="checkbox"/> FORD <input type="checkbox"/> NO CROSSING <input type="checkbox"/> REMOVED CROSSING		Number of Culverts/ Bridge Cells
	<input type="checkbox"/> BURIED STREAM <input type="checkbox"/> INACCESSIBLE <input type="checkbox"/> PARTIALLY INACCESSIBLE <input type="checkbox"/> NO UPSTREAM CHANNEL <input type="checkbox"/> BRIDGE ADEQUATE		2
Photo IDs	INLET 27	OUTLET 28	UPSTREAM 26 DOWNSTREAM 26 OTHER
Flow Condition	<input type="checkbox"/> NO FLOW <input checked="" type="checkbox"/> TYPICAL-LOW <input type="checkbox"/> MODERATE <input type="checkbox"/> HIGH		Crossing Condition <input checked="" type="checkbox"/> OK <input type="checkbox"/> POOR <input type="checkbox"/> NEW <input type="checkbox"/> UNKNOWN
Tidal Site	<input type="checkbox"/> YES <input checked="" type="checkbox"/> NO <input type="checkbox"/> UNKNOWN	Alignment	<input type="checkbox"/> FLOW-ALIGNED <input checked="" type="checkbox"/> SKEWED (>45°)
Bankfull Width (Optional)	12.99S	Confidence	<input checked="" type="checkbox"/> HIGH <input type="checkbox"/> LOW/ESTIMATED
Tailwater Scour Pool	<input type="checkbox"/> NONE <input checked="" type="checkbox"/> SMALL <input type="checkbox"/> LARGE		Road Fill Height (Top of culvert to road surface; bridge = 0) .492
			Constriction <input type="checkbox"/> SEVERE <input checked="" type="checkbox"/> MODERATE <input type="checkbox"/> SPANS ONLY BANKFULL/ ACTIVE CHANNEL
			<input type="checkbox"/> SPANS FULL CHANNEL & BANKS
Crossing Comments			

STRUCTURE 1

Structure Material	<input type="checkbox"/> METAL <input checked="" type="checkbox"/> CONCRETE <input type="checkbox"/> PLASTIC <input type="checkbox"/> WOOD <input type="checkbox"/> ROCK/STONE <input type="checkbox"/> FIBERGLASS <input type="checkbox"/> COMBINATION
Outlet Shape	<input checked="" type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/> 5 <input type="checkbox"/> 6 <input type="checkbox"/> 7 <input type="checkbox"/> FORD <input type="checkbox"/> UNKNOWN <input type="checkbox"/> REMOVED
Outlet Grade (Pick one)	<input type="checkbox"/> AT STREAM GRADE <input checked="" type="checkbox"/> FREE FALL <input type="checkbox"/> CASCADE <input type="checkbox"/> FREE FALL ONTO CASCADE <input type="checkbox"/> CLOGGED/COLLAPSED/SUBMERGED <input type="checkbox"/> UNKNOWN
Outlet Dimensions	A. Width 4.92 B. Height 5.28 C. Substrate/Water Width 1.48 D. Water Depth 0.068
Outlet Drop to Water Surface	1.18
Outlet Drop to Stream Bottom	1.31
E. Abutment Height (Type 7 bridges only)	NA
L. Structure Length (Overall length from inlet to outlet)	33.136
Inlet Shape	<input checked="" type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/> 5 <input type="checkbox"/> 6 <input type="checkbox"/> 7 <input type="checkbox"/> FORD <input type="checkbox"/> UNKNOWN <input type="checkbox"/> REMOVED
Inlet Type	<input checked="" type="checkbox"/> PROJECTING <input type="checkbox"/> HEADWALL <input type="checkbox"/> WINGWALLS <input type="checkbox"/> HEADWALL & WINGWALLS <input type="checkbox"/> MITERED TO SLOPE <input type="checkbox"/> OTHER <input type="checkbox"/> NONE
Inlet Grade (Pick one)	<input checked="" type="checkbox"/> AT STREAM GRADE <input type="checkbox"/> INLET DROP <input type="checkbox"/> PERCHED <input type="checkbox"/> CLOGGED/COLLAPSED/SUBMERGED <input type="checkbox"/> UNKNOWN
Inlet Dimensions	A. Width 4.92 B. Height 5.25 C. Substrate/Water Width 2.49 D. Water Depth 0.557
Slope % (Optional)	NA
Slope Confidence	<input type="checkbox"/> HIGH <input type="checkbox"/> LOW
Internal Structures	<input checked="" type="checkbox"/> NONE <input type="checkbox"/> BAFFLES/WEIRS <input type="checkbox"/> SUPPORTS <input type="checkbox"/> OTHER
Structure Substrate Matches Stream	<input type="checkbox"/> NONE <input checked="" type="checkbox"/> COMPARABLE <input type="checkbox"/> CONTRASTING <input type="checkbox"/> NOT APPROPRIATE <input type="checkbox"/> UNKNOWN
Structure Substrate Type (Pick one)	<input type="checkbox"/> NONE <input type="checkbox"/> SILT <input type="checkbox"/> SAND <input type="checkbox"/> GRAVEL <input checked="" type="checkbox"/> COBBLE <input type="checkbox"/> BOULDER <input type="checkbox"/> BEDROCK <input type="checkbox"/> UNKNOWN
Structure Substrate Coverage	<input type="checkbox"/> NONE <input checked="" type="checkbox"/> 25% <input type="checkbox"/> 50% <input type="checkbox"/> 75% <input type="checkbox"/> 100% <input type="checkbox"/> UNKNOWN
Physical Barriers (Pick all that apply)	<input checked="" type="checkbox"/> NONE <input type="checkbox"/> DEBRIS/SEDIMENT/ROCK <input type="checkbox"/> DEFORMATION <input type="checkbox"/> FREE FALL <input type="checkbox"/> FENCING <input type="checkbox"/> DRY <input type="checkbox"/> OTHER
Severity (Choose carefully based on barrier type(s) above)	<input checked="" type="checkbox"/> NONE <input type="checkbox"/> MINOR <input type="checkbox"/> MODERATE <input type="checkbox"/> SEVERE
Water Depth Matches Stream	<input checked="" type="checkbox"/> YES <input type="checkbox"/> NO-SHALLOWER <input type="checkbox"/> NO-DEEPER <input type="checkbox"/> UNKNOWN <input type="checkbox"/> DRY
Water Velocity Matches Stream	<input checked="" type="checkbox"/> YES <input type="checkbox"/> NO-FASTER <input type="checkbox"/> NO-SLOWER <input type="checkbox"/> UNKNOWN <input type="checkbox"/> DRY
Dry Passage through Structure?	<input type="checkbox"/> YES <input checked="" type="checkbox"/> NO <input type="checkbox"/> UNKNOWN
Height above Dry Passage	NA
Comments	E-fish and bug sample here

5/26/16

AQUATIC CONNECTIVITY STREAM CROSSING SURVEY DATA FORM

STRUCTURE 2		Structure Material															
		<input type="checkbox"/> METAL	<input checked="" type="checkbox"/> CONCRETE	<input type="checkbox"/> PLASTIC	<input type="checkbox"/> WOOD	<input type="checkbox"/> ROCK/STONE	<input type="checkbox"/> FIBERGLASS	<input type="checkbox"/> COMBINATION									
OUTLET	Outlet Shape	<input checked="" type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5	<input type="checkbox"/> 6	<input type="checkbox"/> 7	<input type="checkbox"/> FORD	<input type="checkbox"/> UNKNOWN	<input type="checkbox"/> REMOVED	Outlet Armoring	<input type="checkbox"/> NONE	<input type="checkbox"/> NOT EXTENSIVE	<input type="checkbox"/> EXTENSIVE		
	Outlet Grade (Pick one)	<input type="checkbox"/> AT STREAM GRADE <input checked="" type="checkbox"/> FREE FALL <input type="checkbox"/> CASCADE <input type="checkbox"/> FREE FALL ONTO CASCADE <input type="checkbox"/> CLOGGED/COLLAPSED/SUBMERGED <input type="checkbox"/> UNKNOWN															
	Outlet Dimensions	A. Width		4.92		B. Height		5.25		C. Substrate/Water Width		0.984		D. Water Depth		0.065	
	Outlet Drop to Water Surface	0.656		Outlet Drop to Stream Bottom		0.931		E. Abutment Height (Type 7 bridges only)		NA							
L. Structure Length (Overall length from inlet to outlet)		37.073															
INLET	Inlet Shape	<input checked="" type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5	<input type="checkbox"/> 6	<input type="checkbox"/> 7	<input type="checkbox"/> FORD	<input type="checkbox"/> UNKNOWN	<input type="checkbox"/> REMOVED						
	Inlet Type	<input checked="" type="checkbox"/> PROJECTING <input type="checkbox"/> HEADWALL <input type="checkbox"/> WINGWALLS <input type="checkbox"/> HEADWALL & WINGWALLS <input type="checkbox"/> MITERED TO SLOPE <input type="checkbox"/> OTHER <input type="checkbox"/> NONE															
	Inlet Grade (Pick one)	<input checked="" type="checkbox"/> AT STREAM GRADE <input type="checkbox"/> INLET DROP <input type="checkbox"/> PERCHED <input type="checkbox"/> CLOGGED/COLLAPSED/SUBMERGED <input type="checkbox"/> UNKNOWN															
	Inlet Dimensions	A. Width		4.92		B. Height		5.25		C. Substrate/Water Width		2.3		D. Water Depth		0.597	
ADDITIONAL CONDITIONS	Slope % (Optional)	NA		Slope Confidence		<input type="checkbox"/> HIGH <input type="checkbox"/> LOW		Internal Structures		<input type="checkbox"/> NONE <input type="checkbox"/> BAFFLES/WEIRS <input type="checkbox"/> SUPPORTS <input type="checkbox"/> OTHER							
	Structure Substrate Matches Stream	<input type="checkbox"/> NONE <input type="checkbox"/> COMPARABLE <input checked="" type="checkbox"/> CONTRASTING <input type="checkbox"/> NOT APPROPRIATE <input type="checkbox"/> UNKNOWN															
	Structure Substrate Type (Pick one)	<input type="checkbox"/> NONE <input checked="" type="checkbox"/> SILT <input type="checkbox"/> SAND <input type="checkbox"/> GRAVEL <input type="checkbox"/> COBBLE <input type="checkbox"/> BOULDER <input type="checkbox"/> BEDROCK <input type="checkbox"/> UNKNOWN															
	Structure Substrate Coverage	<input type="checkbox"/> NONE <input type="checkbox"/> 25% <input type="checkbox"/> 50% <input type="checkbox"/> 75% <input checked="" type="checkbox"/> 100% <input type="checkbox"/> UNKNOWN															
	Physical Barriers (Pick all that apply)	<input checked="" type="checkbox"/> NONE <input type="checkbox"/> DEBRIS/SEDIMENT/ROCK <input type="checkbox"/> DEFORMATION <input type="checkbox"/> FREE FALL <input type="checkbox"/> FENCING <input type="checkbox"/> DRY <input type="checkbox"/> OTHER															
	Severity (Choose carefully based on barrier type(s) above)	<input checked="" type="checkbox"/> NONE <input type="checkbox"/> MINOR <input type="checkbox"/> MODERATE <input type="checkbox"/> SEVERE															
	Water Depth Matches Stream	<input type="checkbox"/> YES <input type="checkbox"/> NO-SHALLOWER <input checked="" type="checkbox"/> NO-DEEPER <input type="checkbox"/> UNKNOWN <input type="checkbox"/> DRY															
	Water Velocity Matches Stream	<input type="checkbox"/> YES <input type="checkbox"/> NO-FASTER <input checked="" type="checkbox"/> NO-SLOWER <input type="checkbox"/> UNKNOWN <input type="checkbox"/> DRY															
	Dry Passage through Structure?	<input type="checkbox"/> YES <input checked="" type="checkbox"/> NO <input type="checkbox"/> UNKNOWN		Height above Dry Passage													
	Comments																

STRUCTURE 3		Structure Material															
		<input type="checkbox"/> METAL	<input type="checkbox"/> CONCRETE	<input type="checkbox"/> PLASTIC	<input type="checkbox"/> WOOD	<input type="checkbox"/> ROCK/STONE	<input type="checkbox"/> FIBERGLASS	<input type="checkbox"/> COMBINATION									
OUTLET	Outlet Shape	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5	<input type="checkbox"/> 6	<input type="checkbox"/> 7	<input type="checkbox"/> FORD	<input type="checkbox"/> UNKNOWN	<input type="checkbox"/> REMOVED	Outlet Armoring	<input type="checkbox"/> NONE	<input type="checkbox"/> NOT EXTENSIVE	<input type="checkbox"/> EXTENSIVE		
	Outlet Grade (Pick one)	<input type="checkbox"/> AT STREAM GRADE <input type="checkbox"/> FREE FALL <input type="checkbox"/> CASCADE <input type="checkbox"/> FREE FALL ONTO CASCADE <input type="checkbox"/> CLOGGED/COLLAPSED/SUBMERGED <input type="checkbox"/> UNKNOWN															
	Outlet Dimensions	A. Width				B. Height				C. Substrate/Water Width				D. Water Depth			
	Outlet Drop to Water Surface			Outlet Drop to Stream Bottom				E. Abutment Height (Type 7 bridges only)									
L. Structure Length (Overall length from inlet to outlet)																	
INLET	Inlet Shape	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5	<input type="checkbox"/> 6	<input type="checkbox"/> 7	<input type="checkbox"/> FORD	<input type="checkbox"/> UNKNOWN	<input type="checkbox"/> REMOVED						
	Inlet Type	<input type="checkbox"/> PROJECTING <input type="checkbox"/> HEADWALL <input type="checkbox"/> WINGWALLS <input type="checkbox"/> HEADWALL & WINGWALLS <input type="checkbox"/> MITERED TO SLOPE <input type="checkbox"/> OTHER <input type="checkbox"/> NONE															
	Inlet Grade (Pick one)	<input type="checkbox"/> AT STREAM GRADE <input type="checkbox"/> INLET DROP <input type="checkbox"/> PERCHED <input type="checkbox"/> CLOGGED/COLLAPSED/SUBMERGED <input type="checkbox"/> UNKNOWN															
	Inlet Dimensions	A. Width				B. Height				C. Substrate/Water Width				D. Water Depth			
ADDITIONAL CONDITIONS	Slope % (Optional)			Slope Confidence		<input type="checkbox"/> HIGH <input type="checkbox"/> LOW		Internal Structures		<input type="checkbox"/> NONE <input type="checkbox"/> BAFFLES/WEIRS <input type="checkbox"/> SUPPORTS <input type="checkbox"/> OTHER							
	Structure Substrate Matches Stream	<input type="checkbox"/> NONE <input type="checkbox"/> COMPARABLE <input type="checkbox"/> CONTRASTING <input type="checkbox"/> NOT APPROPRIATE <input type="checkbox"/> UNKNOWN															
	Structure Substrate Type (Pick one)	<input type="checkbox"/> NONE <input type="checkbox"/> SILT <input type="checkbox"/> SAND <input type="checkbox"/> GRAVEL <input type="checkbox"/> COBBLE <input type="checkbox"/> BOULDER <input type="checkbox"/> BEDROCK <input type="checkbox"/> UNKNOWN															
	Structure Substrate Coverage	<input type="checkbox"/> NONE <input type="checkbox"/> 25% <input type="checkbox"/> 50% <input type="checkbox"/> 75% <input type="checkbox"/> 100% <input type="checkbox"/> UNKNOWN															
	Physical Barriers (Pick all that apply)	<input type="checkbox"/> NONE <input type="checkbox"/> DEBRIS/SEDIMENT/ROCK <input type="checkbox"/> DEFORMATION <input type="checkbox"/> FREE FALL <input type="checkbox"/> FENCING <input type="checkbox"/> DRY <input type="checkbox"/> OTHER															
	Severity (Choose carefully based on barrier type(s) above)	<input type="checkbox"/> NONE <input type="checkbox"/> MINOR <input type="checkbox"/> MODERATE <input type="checkbox"/> SEVERE															
	Water Depth Matches Stream	<input type="checkbox"/> YES <input type="checkbox"/> NO-SHALLOWER <input type="checkbox"/> NO-DEEPER <input type="checkbox"/> UNKNOWN <input type="checkbox"/> DRY															
	Water Velocity Matches Stream	<input type="checkbox"/> YES <input type="checkbox"/> NO-FASTER <input type="checkbox"/> NO-SLOWER <input type="checkbox"/> UNKNOWN <input type="checkbox"/> DRY															
	Dry Passage through Structure?	<input type="checkbox"/> YES <input type="checkbox"/> NO <input type="checkbox"/> UNKNOWN		Height above Dry Passage													
	Comments																



AQUATIC CONNECTIVITY
Stream Crossing Survey
DATA FORM

DATABASE ENTRY BY _____ ENTRY DATE _____
DATA ENTRY REVIEWED BY _____ REVIEW DATE _____

* Major flooding happened before surveying these

CROSSING DATA

Crossing Code Culvert 9 Local ID (Optional) _____

Date Observed (00/00/0000) 8/7/2020 Lead Observer _____

Town/County _____ Stream _____

Road Fernwood Rd Type ☐ MULTILANE ☒ PAVED ☐ UNPAVED ☐ DRIVEWAY ☐ TRAIL ☐ RAILROAD

GPS Coordinates (Decimal degrees) 39.8896 °N Latitude -75.8056 °W Longitude

Location Description

Crossing Type ☒ BRIDGE ☐ CULVERT ☐ MULTIPLE CULVERT ☐ FORD ☐ NO CROSSING ☐ REMOVED CROSSING
☐ BURIED STREAM ☐ INACCESSIBLE ☐ PARTIALLY INACCESSIBLE ☐ NO UPSTREAM CHANNEL ☐ BRIDGE ADEQUATE

Number of Culverts / Bridge Cells 1

Photo IDs INLET 31 OUTLET 32 UPSTREAM 29 DOWNSTREAM 30 OTHER _____

Flow Condition ☐ NO FLOW ☐ TYPICAL-LOW ☒ MODERATE ☐ HIGH Crossing Condition ☒ OK ☐ POOR ☐ NEW ☐ UNKNOWN

Tidal Site ☐ YES ☐ NO ☐ UNKNOWN Alignment ☐ FLOW-ALIGNED ☒ SKEWED (>45°) Road Fill Height (Top of culvert to road surface; bridge = 0) NA

Bankfull Width (Optional) _____ Confidence ☐ HIGH ☐ LOW/ESTIMATED Constriction ☐ SEVERE ☐ MODERATE ☐ SPANS ONLY BANKFULL/ACTIVE CHANNEL

Tailwater Scour Pool ☒ NONE ☐ SMALL ☐ LARGE ☐ SPANS FULL CHANNEL & BANKS

Crossing Comments _____

STRUCTURE 1

Structure Material ☐ METAL ☒ CONCRETE ☐ PLASTIC ☐ WOOD ☐ ROCK/STONE ☐ FIBERGLASS ☐ COMBINATION

OUTLET

Outlet Shape ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☒ 5 ☐ 6 ☐ 7 ☐ FORD ☐ UNKNOWN ☐ REMOVED Outlet Armoring ☐ NONE ☐ NOT EXTENSIVE ☐ EXTENSIVE

Outlet Grade (Pick one) ☒ AT STREAM GRADE ☐ FREE FALL ☐ CASCADE ☐ FREE FALL ONTO CASCADE ☐ CLOGGED/COLLAPSED/SUBMERGED ☐ UNKNOWN

Outlet Dimensions A. Width 29.95 B. Height 4.59 C. Substrate/Water Width 20.99 D. Water Depth 3.215

Outlet Drop to Water Surface NA Outlet Drop to Stream Bottom NA E. Abutment Height (Type 7 bridges only) NA

L. Structure Length (Overall length from inlet to outlet) 15.419

INLET

Inlet Shape ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☒ 5 ☐ 6 ☐ 7 ☐ FORD ☐ UNKNOWN ☐ REMOVED

Inlet Type ☐ PROJECTING ☐ HEADWALL ☐ WINGWALLS ☐ HEADWALL & WINGWALLS ☐ MITERED TO SLOPE ☐ OTHER ☐ NONE

Inlet Grade (Pick one) ☒ AT STREAM GRADE ☐ INLET DROP ☐ PERCHED ☐ CLOGGED/COLLAPSED/SUBMERGED ☐ UNKNOWN

Inlet Dimensions A. Width 30.51 B. Height 4.92 C. Substrate/Water Width 24.61 D. Water Depth 3.412

ADDITIONAL CONDITIONS

Slope % (Optional) _____ Slope Confidence ☐ HIGH ☐ LOW Internal Structures ☒ NONE ☐ BAFFLES/WEIRS ☐ SUPPORTS ☐ OTHER _____

Structure Substrate Matches Stream ☐ NONE ☒ COMPARABLE ☐ CONTRASTING ☐ NOT APPROPRIATE ☐ UNKNOWN

Structure Substrate Type (Pick one) ☐ NONE ☐ SILT ☐ SAND ☐ GRAVEL ☒ COBBLE ☐ BOULDER ☐ BEDROCK ☐ UNKNOWN

Structure Substrate Coverage ☐ NONE ☐ 25% ☐ 50% ☐ 75% ☒ 100% ☐ UNKNOWN

Physical Barriers (Pick all that apply) ☐ NONE ☒ DEBRIS/SEDIMENT/ROCK ☐ DEFORMATION ☐ FREE FALL ☐ FENCING ☐ DRY ☐ OTHER

Severity (Choose carefully based on barrier type(s) above) ☐ NONE ☐ MINOR ☒ MODERATE ☐ SEVERE * because of storm day before.

Water Depth Matches Stream ☒ YES ☐ NO-SHALLOWER ☐ NO-DEEPER ☐ UNKNOWN ☐ DRY

Water Velocity Matches Stream ☒ YES ☐ NO-FASTER ☐ NO-SLOWER ☐ UNKNOWN ☐ DRY

Dry Passage through Structure? ☐ YES ☒ NO ☐ UNKNOWN Height above Dry Passage _____

Comments _____

5/26/16

AQUATIC CONNECTIVITY STREAM CROSSING SURVEY DATA FORM



AQUATIC CONNECTIVITY
Stream Crossing Survey
DATA FORM

DATABASE ENTRY BY _____ ENTRY DATE _____
DATA ENTRY REVIEWED BY _____ REVIEW DATE _____

CROSSING DATA	Crossing Code	Culvert 10			Local ID (Optional)	
	Date Observed (00/00/0000)	8/7/20			Lead Observer	
	Town/County				Stream	
	Road	Runnymede Rd			Type	<input type="checkbox"/> MULTILANE <input checked="" type="checkbox"/> PAVED <input type="checkbox"/> UNPAVED <input type="checkbox"/> DRIVEWAY <input type="checkbox"/> TRAIL <input type="checkbox"/> RAILROAD
	GPS Coordinates (Decimal degrees)	39.8944			*N Latitude	- 75.8747 *W Longitude
	Location Description					
	Crossing Type <input checked="" type="checkbox"/> BRIDGE <input type="checkbox"/> CULVERT <input type="checkbox"/> MULTIPLE CULVERT <input type="checkbox"/> FORD <input type="checkbox"/> NO CROSSING <input type="checkbox"/> REMOVED CROSSING					Number of Culverts/ Bridge Cells
	<input type="checkbox"/> BURIED STREAM <input type="checkbox"/> INACCESSIBLE <input type="checkbox"/> PARTIALLY INACCESSIBLE <input type="checkbox"/> NO UPSTREAM CHANNEL <input type="checkbox"/> BRIDGE ADEQUATE					
	Photo IDs INLET 35 OUTLET 36 UPSTREAM 33 DOWNSTREAM 34 OTHER					
	Flow Condition <input type="checkbox"/> NO FLOW <input type="checkbox"/> TYPICAL-LOW <input checked="" type="checkbox"/> MODERATE <input type="checkbox"/> HIGH Crossing Condition <input checked="" type="checkbox"/> OK <input type="checkbox"/> POOR <input type="checkbox"/> NEW <input type="checkbox"/> UNKNOWN					
Tidal Site <input type="checkbox"/> YES <input type="checkbox"/> NO <input type="checkbox"/> UNKNOWN Alignment <input checked="" type="checkbox"/> FLOW-ALIGNED <input type="checkbox"/> SKEWED (>45°) Road Fill Height (Top of culvert to road surface; bridge = 0)						
Bankfull Width (Optional) Confidence <input type="checkbox"/> HIGH <input type="checkbox"/> LOW/ESTIMATED Constriction <input type="checkbox"/> SEVERE <input type="checkbox"/> MODERATE <input type="checkbox"/> SPANS ONLY BANKFULL/ ACTIVE CHANNEL						
Tailwater Scour Pool <input checked="" type="checkbox"/> NONE <input type="checkbox"/> SMALL <input type="checkbox"/> LARGE <input type="checkbox"/> SPANS FULL CHANNEL & BANKS						
Crossing Comments						

OUTLET	STRUCTURE 1		Structure Material <input type="checkbox"/> METAL <input checked="" type="checkbox"/> CONCRETE <input type="checkbox"/> PLASTIC <input type="checkbox"/> WOOD <input type="checkbox"/> ROCK/STONE <input type="checkbox"/> FIBERGLASS <input type="checkbox"/> COMBINATION									
	Outlet Shape		<input type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input checked="" type="checkbox"/> 5 <input type="checkbox"/> 6 <input type="checkbox"/> 7 <input type="checkbox"/> FORD <input type="checkbox"/> UNKNOWN <input type="checkbox"/> REMOVED							Outlet Armoring <input type="checkbox"/> NONE <input type="checkbox"/> NOT EXTENSIVE <input type="checkbox"/> EXTENSIVE		
	Outlet Grade (Pick one)		<input checked="" type="checkbox"/> AT STREAM GRADE <input type="checkbox"/> FREE FALL <input type="checkbox"/> CASCADE <input type="checkbox"/> FREE FALL ONTO CASCADE <input type="checkbox"/> CLOGGED/COLLAPSED/SUBMERGED <input type="checkbox"/> UNKNOWN									
	Outlet Dimensions		A. Width 19.88 B. Height 4.07 C. Substrate/Water Width 19.88 D. Water Depth 2.49									
	Outlet Drop to Water Surface		NA Outlet Drop to Stream Bottom NA E. Abutment Height (Type 7 bridges only) NA									
INLET	L. Structure Length (Overall length from inlet to outlet)		15.32									
	Inlet Shape		<input type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input checked="" type="checkbox"/> 5 <input type="checkbox"/> 6 <input type="checkbox"/> 7 <input type="checkbox"/> FORD <input type="checkbox"/> UNKNOWN <input type="checkbox"/> REMOVED									
	Inlet Type		<input type="checkbox"/> PROJECTING <input type="checkbox"/> HEADWALL <input checked="" type="checkbox"/> WINGWALLS <input type="checkbox"/> HEADWALL & WINGWALLS <input type="checkbox"/> MITERED TO SLOPE <input type="checkbox"/> OTHER <input type="checkbox"/> NONE									
	Inlet Grade (Pick one)		<input checked="" type="checkbox"/> AT STREAM GRADE <input type="checkbox"/> INLET DROP <input type="checkbox"/> PERCHED <input type="checkbox"/> CLOGGED/COLLAPSED/SUBMERGED <input type="checkbox"/> UNKNOWN									
	Inlet Dimensions		A. Width 18.86 B. Height 4.59 C. Substrate/Water Width 18.86 D. Water Depth 3.61									
ADDITIONAL CONDITIONS	Slope % (Optional)		Slope Confidence <input type="checkbox"/> HIGH <input type="checkbox"/> LOW		Internal Structures <input type="checkbox"/> NONE <input type="checkbox"/> BAFFLES/WEIRS <input type="checkbox"/> SUPPORTS <input type="checkbox"/> OTHER							
	Structure Substrate Matches Stream		<input type="checkbox"/> NONE <input checked="" type="checkbox"/> COMPARABLE <input type="checkbox"/> CONTRASTING <input type="checkbox"/> NOT APPROPRIATE <input type="checkbox"/> UNKNOWN									
	Structure Substrate Type (Pick one)		<input type="checkbox"/> NONE <input type="checkbox"/> SILT <input type="checkbox"/> SAND <input type="checkbox"/> GRAVEL <input checked="" type="checkbox"/> COBBLE <input type="checkbox"/> BOULDER <input type="checkbox"/> BEDROCK <input type="checkbox"/> UNKNOWN									
	Structure Substrate Coverage		<input type="checkbox"/> NONE <input type="checkbox"/> 25% <input type="checkbox"/> 50% <input type="checkbox"/> 75% <input checked="" type="checkbox"/> 100% <input type="checkbox"/> UNKNOWN									
	Physical Barriers (Pick all that apply)		<input type="checkbox"/> NONE <input checked="" type="checkbox"/> DEBRIS/SEDIMENT/ROCK <input type="checkbox"/> DEFORMATION <input type="checkbox"/> FREE FALL <input type="checkbox"/> FENCING <input type="checkbox"/> DRY <input type="checkbox"/> OTHER									
	Severity (Choose carefully based on barrier type(s) above)		<input type="checkbox"/> NONE <input type="checkbox"/> MINOR <input checked="" type="checkbox"/> MODERATE <input type="checkbox"/> SEVERE * flooding									
	Water Depth Matches Stream		<input checked="" type="checkbox"/> YES <input type="checkbox"/> NO-SHALLOWER <input type="checkbox"/> NO-DEEPER <input type="checkbox"/> UNKNOWN <input type="checkbox"/> DRY									
	Water Velocity Matches Stream		<input checked="" type="checkbox"/> YES <input type="checkbox"/> NO-FASTER <input type="checkbox"/> NO-SLOWER <input type="checkbox"/> UNKNOWN <input type="checkbox"/> DRY									
	Dry Passage through Structure?		<input type="checkbox"/> YES <input checked="" type="checkbox"/> NO <input type="checkbox"/> UNKNOWN Height above Dry Passage									
	Comments											



AQUATIC CONNECTIVITY
Stream Crossing Survey
DATA FORM

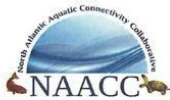
DATABASE ENTRY BY _____ ENTRY DATE _____
DATA ENTRY REVIEWED BY _____ REVIEW DATE _____

CROSSING DATA	Crossing Code	Culvert 11			Local ID (Optional)	
	Date Observed (00/00/0000)	8/7/20			Lead Observer	
	Town/County				Stream	
	Road	Runnymede Rd			Type	<input checked="" type="checkbox"/> PAVED <input type="checkbox"/> UNPAVED <input type="checkbox"/> DRIVEWAY <input type="checkbox"/> TRAIL <input type="checkbox"/> RAILROAD
	GPS Coordinates (Decimal degrees)	39.8967			*N Latitude	- 75.8744 *W Longitude
	Location Description					
	Crossing Type <input checked="" type="checkbox"/> BRIDGE <input type="checkbox"/> CULVERT <input type="checkbox"/> MULTIPLE CULVERT <input type="checkbox"/> FORD <input type="checkbox"/> NO CROSSING <input type="checkbox"/> REMOVED CROSSING					Number of Culverts/ Bridge Cells
	<input type="checkbox"/> BURIED STREAM <input type="checkbox"/> INACCESSIBLE <input type="checkbox"/> PARTIALLY INACCESSIBLE <input type="checkbox"/> NO UPSTREAM CHANNEL <input type="checkbox"/> BRIDGE ADEQUATE					
	Photo IDs INLET 39 OUTLET 40 UPSTREAM 37 DOWNSTREAM 38 OTHER					
	Flow Condition <input type="checkbox"/> NO FLOW <input checked="" type="checkbox"/> TYPICAL-LOW <input type="checkbox"/> MODERATE <input type="checkbox"/> HIGH Crossing Condition <input type="checkbox"/> OK <input type="checkbox"/> POOR <input type="checkbox"/> NEW <input type="checkbox"/> UNKNOWN					

STRUCTURE 1	Structure Material <input type="checkbox"/> METAL <input checked="" type="checkbox"/> CONCRETE <input type="checkbox"/> PLASTIC <input type="checkbox"/> WOOD <input type="checkbox"/> ROCK/STONE <input type="checkbox"/> FIBERGLASS <input type="checkbox"/> COMBINATION						
	Outlet Shape <input type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input checked="" type="checkbox"/> 5 <input type="checkbox"/> 6 <input type="checkbox"/> 7 <input type="checkbox"/> FORD <input type="checkbox"/> UNKNOWN <input type="checkbox"/> REMOVED Outlet Armoring <input type="checkbox"/> NONE <input type="checkbox"/> NOT EXTENSIVE <input type="checkbox"/> EXTENSIVE						
	Outlet Grade (Pick one) <input type="checkbox"/> AT STREAM GRADE <input type="checkbox"/> FREE FALL <input type="checkbox"/> CASCADE <input type="checkbox"/> FREE FALL ONTO CASCADE <input type="checkbox"/> CLOGGED/COLLAPSED/SUBMERGED <input type="checkbox"/> UNKNOWN						
	Outlet Dimensions A. Width 8.53 B. Height 4.92 C. Substrate/Water Width 5.77 D. Water Depth 0.328						
	Outlet Drop to Water Surface NA Outlet Drop to Stream Bottom NA E. Abutment Height (Type 7 bridges only) NA						
	L. Structure Length (Overall length from inlet to outlet) 28.083						
	INLET	Inlet Shape <input type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input checked="" type="checkbox"/> 5 <input type="checkbox"/> 6 <input type="checkbox"/> 7 <input type="checkbox"/> FORD <input type="checkbox"/> UNKNOWN <input type="checkbox"/> REMOVED					
		Inlet Type <input type="checkbox"/> PROJECTING <input type="checkbox"/> HEADWALL <input checked="" type="checkbox"/> WINGWALLS <input checked="" type="checkbox"/> HEADWALL & WINGWALLS <input type="checkbox"/> MITERED TO SLOPE <input type="checkbox"/> OTHER <input type="checkbox"/> NONE					
		Inlet Grade (Pick one) <input type="checkbox"/> AT STREAM GRADE <input checked="" type="checkbox"/> INLET DROP <input type="checkbox"/> PERCHED <input type="checkbox"/> CLOGGED/COLLAPSED/SUBMERGED <input type="checkbox"/> UNKNOWN					
		Inlet Dimensions A. Width 14.70 B. Height 3.94 C. Substrate/Water Width 1.97 D. Water Depth 0.489					
Slope % (Optional) _____ Slope Confidence <input type="checkbox"/> HIGH <input type="checkbox"/> LOW Internal Structures <input type="checkbox"/> NONE <input type="checkbox"/> BAFFLES/WEIRS <input type="checkbox"/> SUPPORTS <input type="checkbox"/> OTHER							
Structure Substrate Matches Stream <input type="checkbox"/> NONE <input checked="" type="checkbox"/> COMPARABLE <input type="checkbox"/> CONTRASTING <input type="checkbox"/> NOT APPROPRIATE <input type="checkbox"/> UNKNOWN							
Structure Substrate Type (Pick one) <input type="checkbox"/> NONE <input type="checkbox"/> SILT <input type="checkbox"/> SAND <input type="checkbox"/> GRAVEL <input checked="" type="checkbox"/> COBBLE <input type="checkbox"/> BOULDER <input type="checkbox"/> BEDROCK <input type="checkbox"/> UNKNOWN							
Structure Substrate Coverage <input type="checkbox"/> NONE <input type="checkbox"/> 25% <input type="checkbox"/> 50% <input type="checkbox"/> 75% <input checked="" type="checkbox"/> 100% <input type="checkbox"/> UNKNOWN							
Physical Barriers (Pick all that apply) <input checked="" type="checkbox"/> NONE <input type="checkbox"/> DEBRIS/SEDIMENT/ROCK <input type="checkbox"/> DEFORMATION <input type="checkbox"/> FREE FALL <input type="checkbox"/> FENCING <input type="checkbox"/> DRY <input type="checkbox"/> OTHER							
Severity (Choose carefully based on barrier type(s) above) <input checked="" type="checkbox"/> NONE <input type="checkbox"/> MINOR <input type="checkbox"/> MODERATE <input type="checkbox"/> SEVERE							

ADDITIONAL CONDITIONS	Water Depth Matches Stream <input checked="" type="checkbox"/> YES <input type="checkbox"/> NO-SHALLOWER <input type="checkbox"/> NO-DEEPER <input type="checkbox"/> UNKNOWN <input type="checkbox"/> DRY					
	Water Velocity Matches Stream <input checked="" type="checkbox"/> YES <input type="checkbox"/> NO-FASTER <input type="checkbox"/> NO-SLOWER <input type="checkbox"/> UNKNOWN <input type="checkbox"/> DRY					
	Dry Passage through Structure? <input checked="" type="checkbox"/> YES <input type="checkbox"/> NO <input type="checkbox"/> UNKNOWN Height above Dry Passage 2.952					
	Comments					

5/26/16



AQUATIC CONNECTIVITY
Stream Crossing Survey
DATA FORM

DATABASE ENTRY BY _____ ENTRY DATE _____
DATA ENTRY REVIEWED BY _____ REVIEW DATE _____

CROSSING DATA	Crossing Code	Culvert 12		Local ID (Optional)						
	Date Observed (00/00/0000)	8/7/20		Lead Observer						
	Town/County			Stream						
	Road	Runny made Rd		Type	<input type="checkbox"/> MULTILANE <input checked="" type="checkbox"/> PAVED <input type="checkbox"/> UNPAVED <input type="checkbox"/> DRIVEWAY <input type="checkbox"/> TRAIL <input type="checkbox"/> RAILROAD					
	GPS Coordinates (Decimal degrees)	39.8965		*N Latitude	- 76.8730 *W Longitude					
	Location Description									
	Crossing Type	<input checked="" type="checkbox"/> BRIDGE <input type="checkbox"/> CULVERT <input type="checkbox"/> MULTIPLE CULVERT <input type="checkbox"/> FORD <input type="checkbox"/> NO CROSSING <input type="checkbox"/> REMOVED CROSSING			Number of Culverts/ Bridge Cells					
	<input type="checkbox"/> BURIED STREAM <input type="checkbox"/> INACCESSIBLE <input type="checkbox"/> PARTIALLY INACCESSIBLE <input type="checkbox"/> NO UPSTREAM CHANNEL <input type="checkbox"/> BRIDGE ADEQUATE									
	Photo IDs	INLET	43	OUTLET	44	UPSTREAM	41	DOWNSTREAM	42	OTHER
	Flow Condition	<input type="checkbox"/> NO FLOW <input checked="" type="checkbox"/> TYPICAL-LOW <input type="checkbox"/> MODERATE <input type="checkbox"/> HIGH			Crossing Condition	<input checked="" type="checkbox"/> OK <input type="checkbox"/> POOR <input type="checkbox"/> NEW <input type="checkbox"/> UNKNOWN				
Tidal Site	<input type="checkbox"/> YES <input type="checkbox"/> NO <input type="checkbox"/> UNKNOWN		Alignment	<input type="checkbox"/> FLOW-ALIGNED <input checked="" type="checkbox"/> SKEWED (>45°)		Road Fill Height (Top of culvert to road surface; bridge = 0)				
Bankfull Width (Optional)			Confidence	<input type="checkbox"/> HIGH <input type="checkbox"/> LOW/ESTIMATED		Constriction <input type="checkbox"/> SEVERE <input checked="" type="checkbox"/> MODERATE <input type="checkbox"/> SPANS ONLY BANKFULL/ACTIVE CHANNEL				
Tailwater Scour Pool	<input checked="" type="checkbox"/> NONE <input type="checkbox"/> SMALL <input type="checkbox"/> LARGE					SPANS FULL CHANNEL & BANKS				
Crossing Comments										

OUTLET	STRUCTURE 1		Structure Material	<input type="checkbox"/> METAL <input type="checkbox"/> CONCRETE <input type="checkbox"/> PLASTIC <input type="checkbox"/> WOOD <input checked="" type="checkbox"/> ROCK/STONE <input type="checkbox"/> FIBERGLASS <input type="checkbox"/> COMBINATION							
	Outlet Shape	<input type="checkbox"/> 1 <input type="checkbox"/> 2 <input checked="" type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/> 5 <input type="checkbox"/> 6 <input type="checkbox"/> 7 <input type="checkbox"/> FORD <input type="checkbox"/> UNKNOWN <input type="checkbox"/> REMOVED							Outlet Armoring	<input type="checkbox"/> NONE <input type="checkbox"/> NOT EXTENSIVE <input type="checkbox"/> EXTENSIVE	
	Outlet Grade (Pick one)	<input checked="" type="checkbox"/> AT STREAM GRADE <input type="checkbox"/> FREE FALL <input type="checkbox"/> CASCADE <input type="checkbox"/> FREE FALL ONTO CASCADE <input type="checkbox"/> CLOGGED/COLLAPSED/SUBMERGED <input type="checkbox"/> UNKNOWN									
	Outlet Dimensions	A. Width	31.96	B. Height	6.96	C. Substrate/Water Width	31.96	D. Water Depth	1.87		
	Outlet Drop to Water Surface	NA		Outlet Drop to Stream Bottom	NA		E. Abutment Height (Type 7 bridges only)	NA			
INLET	L. Structure Length (Overall length from inlet to outlet)		17.814								
	Inlet Shape	<input type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/> 5 <input type="checkbox"/> 6 <input type="checkbox"/> 7 <input type="checkbox"/> FORD <input type="checkbox"/> UNKNOWN <input type="checkbox"/> REMOVED									
	Inlet Type	<input type="checkbox"/> PROJECTING <input type="checkbox"/> HEADWALL <input type="checkbox"/> WINGWALLS <input type="checkbox"/> HEADWALL & WINGWALLS <input type="checkbox"/> MITERED TO SLOPE <input type="checkbox"/> OTHER <input type="checkbox"/> NONE									
	Inlet Grade (Pick one)	<input type="checkbox"/> AT STREAM GRADE <input type="checkbox"/> INLET DROP <input type="checkbox"/> PERCHED <input type="checkbox"/> CLOGGED/COLLAPSED/SUBMERGED <input type="checkbox"/> UNKNOWN									
ADDITIONAL CONDITIONS	Inlet Dimensions	A. Width	84.38	B. Height	7.55	C. Substrate/Water Width	84.38	D. Water Depth	3.94		
	Slope % (Optional)			Slope Confidence	<input type="checkbox"/> HIGH <input type="checkbox"/> LOW		Internal Structures	<input checked="" type="checkbox"/> NONE <input type="checkbox"/> BAFFLES/WEIRS <input type="checkbox"/> SUPPORTS <input type="checkbox"/> OTHER			
	Structure Substrate Matches Stream	<input type="checkbox"/> NONE <input checked="" type="checkbox"/> COMPARABLE <input type="checkbox"/> CONTRASTING <input type="checkbox"/> NOT APPROPRIATE <input type="checkbox"/> UNKNOWN									
	Structure Substrate Type (Pick one)	<input type="checkbox"/> NONE <input type="checkbox"/> SILT <input type="checkbox"/> SAND <input type="checkbox"/> GRAVEL <input checked="" type="checkbox"/> COBBLE <input type="checkbox"/> BOULDER <input type="checkbox"/> BEDROCK <input type="checkbox"/> UNKNOWN									
	Structure Substrate Coverage	<input type="checkbox"/> NONE <input type="checkbox"/> 25% <input type="checkbox"/> 50% <input type="checkbox"/> 75% <input checked="" type="checkbox"/> 100% <input type="checkbox"/> UNKNOWN									
	Physical Barriers (Pick all that apply)	<input type="checkbox"/> NONE <input type="checkbox"/> DEBRIS/SEDIMENT/ROCK <input type="checkbox"/> DEFORMATION <input type="checkbox"/> FREE FALL <input type="checkbox"/> FENCING <input type="checkbox"/> DRY <input checked="" type="checkbox"/> OTHER									
	Severity (Choose carefully based on barrier type(s) above)	<input type="checkbox"/> NONE <input type="checkbox"/> MINOR <input checked="" type="checkbox"/> MODERATE <input type="checkbox"/> SEVERE									
	Water Depth Matches Stream	<input checked="" type="checkbox"/> YES <input type="checkbox"/> NO-SHALLOWER <input type="checkbox"/> NO-DEEPER <input type="checkbox"/> UNKNOWN <input type="checkbox"/> DRY									
	Water Velocity Matches Stream	<input checked="" type="checkbox"/> YES <input type="checkbox"/> NO-FASTER <input type="checkbox"/> NO-SLOWER <input type="checkbox"/> UNKNOWN <input type="checkbox"/> DRY									
	Dry Passage through Structure?	<input type="checkbox"/> YES <input checked="" type="checkbox"/> NO <input type="checkbox"/> UNKNOWN							Height above Dry Passage _____		
Comments											

NEW Bridge. the original meandering stream has been skewed.



AQUATIC CONNECTIVITY Stream Crossing Survey DATA FORM

DATABASE ENTRY BY _____ ENTRY DATE _____
DATA ENTRY REVIEWED BY _____ REVIEW DATE _____

CROSSING DATA	Crossing Code	Culvert 13			Local ID (Optional)					
	Date Observed (00/00/0000)	8/7/20		Lead Observer						
	Town/County	Runnymede Rd		Stream						
	Road	Type	<input checked="" type="checkbox"/> PAVED <input type="checkbox"/> UNPAVED <input type="checkbox"/> DRIVEWAY <input type="checkbox"/> TRAIL <input type="checkbox"/> RAILROAD							
	GPS Coordinates (Decimal degrees)	39.90280	*N Latitude	-75.85053	*W Longitude					
	Location Description	Below the Dam!								
	Crossing Type	<input checked="" type="checkbox"/> BRIDGE <input type="checkbox"/> CULVERT <input type="checkbox"/> MULTIPLE CULVERT <input type="checkbox"/> FORD <input type="checkbox"/> NO CROSSING <input type="checkbox"/> REMOVED CROSSING <input type="checkbox"/> BURIED STREAM <input type="checkbox"/> INACCESSIBLE <input type="checkbox"/> PARTIALLY INACCESSIBLE <input type="checkbox"/> NO UPSTREAM CHANNEL <input type="checkbox"/> BRIDGE ADEQUATE				Number of Culverts/ Bridge Cells				
	Photo IDs	INLET	47	OUTLET	48	UPSTREAM	46	DOWNSTREAM	46	OTHER
	Flow Condition	<input type="checkbox"/> NO FLOW <input checked="" type="checkbox"/> TYPICAL-LOW <input type="checkbox"/> MODERATE <input type="checkbox"/> HIGH			Crossing Condition	<input checked="" type="checkbox"/> OK <input type="checkbox"/> POOR <input type="checkbox"/> NEW <input type="checkbox"/> UNKNOWN				
	Tidal Site	<input type="checkbox"/> YES <input type="checkbox"/> NO <input type="checkbox"/> UNKNOWN		Alignment	<input checked="" type="checkbox"/> FLOW-ALIGNED <input type="checkbox"/> SKEWED (>45°)			Road Fill Height (Top of culvert to road surface; bridge = 0)		
Bankfull Width (Optional)	Confidence		<input type="checkbox"/> HIGH <input type="checkbox"/> LOW/ESTIMATED		Constriction	<input type="checkbox"/> SEVERE <input type="checkbox"/> MODERATE <input type="checkbox"/> SPANS ONLY BANKFULL/ ACTIVE CHANNEL <input type="checkbox"/> SPANS FULL CHANNEL & BANKS				
Tailwater Scour Pool	<input checked="" type="checkbox"/> NONE <input type="checkbox"/> SMALL <input type="checkbox"/> LARGE									
Crossing Comments										

STRUCTURE 1	Structure Material	<input type="checkbox"/> METAL <input checked="" type="checkbox"/> CONCRETE <input type="checkbox"/> PLASTIC <input type="checkbox"/> WOOD <input type="checkbox"/> ROCK/STONE <input type="checkbox"/> FIBERGLASS <input type="checkbox"/> COMBINATION							
	Outlet Shape	<input type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input checked="" type="checkbox"/> 5 <input type="checkbox"/> 6 <input type="checkbox"/> 7 <input type="checkbox"/> FORD <input type="checkbox"/> UNKNOWN <input type="checkbox"/> REMOVED							
	Outlet Armoring	<input type="checkbox"/> NONE <input type="checkbox"/> NOT EXTENSIVE <input type="checkbox"/> EXTENSIVE							
	Outlet Grade (Pick one)	<input checked="" type="checkbox"/> AT STREAM GRADE <input type="checkbox"/> FREE FALL <input type="checkbox"/> CASCADE <input type="checkbox"/> FREE FALL ONTO CASCADE <input type="checkbox"/> CLOGGED/COLLAPSED/SUBMERGED <input type="checkbox"/> UNKNOWN							
	Outlet Dimensions	A. Width	47.08	B. Height	6.89	C. Substrate/Water Width	33.83	D. Water Depth	4.27
	Outlet Drop to Water Surface	NA		Outlet Drop to Stream Bottom	NA		E. Abutment Height (Type 7 bridges only)	NA	
	L. Structure Length (Overall length from inlet to outlet)	18.37							
	Inlet Shape	<input type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input checked="" type="checkbox"/> 5 <input type="checkbox"/> 6 <input type="checkbox"/> 7 <input type="checkbox"/> FORD <input type="checkbox"/> UNKNOWN <input type="checkbox"/> REMOVED							
	Inlet Type	<input type="checkbox"/> PROJECTING <input type="checkbox"/> HEADWALL <input type="checkbox"/> WINGWALLS <input type="checkbox"/> HEADWALL & WINGWALLS <input type="checkbox"/> MITERED TO SLOPE <input type="checkbox"/> OTHER <input checked="" type="checkbox"/> NONE							
	Inlet Grade (Pick one)	<input checked="" type="checkbox"/> AT STREAM GRADE <input type="checkbox"/> INLET DROP <input type="checkbox"/> PERCHED <input type="checkbox"/> CLOGGED/COLLAPSED/SUBMERGED <input type="checkbox"/> UNKNOWN							
Inlet Dimensions	A. Width	45.28	B. Height	6.89	C. Substrate/Water Width	41.57	D. Water Depth	2.98	
ADDITIONAL CONDITIONS	Slope % (Optional)	Slope Confidence		<input type="checkbox"/> HIGH <input type="checkbox"/> LOW					
	Internal Structures	<input type="checkbox"/> NONE <input type="checkbox"/> BAFFLES/WEIRS <input type="checkbox"/> SUPPORTS <input type="checkbox"/> OTHER							
	Structure Substrate Matches Stream	<input type="checkbox"/> NONE <input checked="" type="checkbox"/> COMPARABLE <input type="checkbox"/> CONTRASTING <input type="checkbox"/> NOT APPROPRIATE <input type="checkbox"/> UNKNOWN							
	Structure Substrate Type (Pick one)	<input type="checkbox"/> NONE <input type="checkbox"/> SILT <input type="checkbox"/> SAND <input type="checkbox"/> GRAVEL <input type="checkbox"/> COBBLE <input checked="" type="checkbox"/> BOULDER <input type="checkbox"/> BEDROCK <input type="checkbox"/> UNKNOWN							
	Structure Substrate Coverage	<input type="checkbox"/> NONE <input type="checkbox"/> 25% <input type="checkbox"/> 50% <input type="checkbox"/> 75% <input checked="" type="checkbox"/> 100% <input type="checkbox"/> UNKNOWN							
	Physical Barriers (Pick all that apply)	<input checked="" type="checkbox"/> NONE <input type="checkbox"/> DEBRIS/SEDIMENT/ROCK <input type="checkbox"/> DEFORMATION <input type="checkbox"/> FREE FALL <input type="checkbox"/> FENCING <input type="checkbox"/> DRY <input type="checkbox"/> OTHER							
	Severity (Choose carefully based on barrier type(s) above)	<input type="checkbox"/> NONE <input type="checkbox"/> MINOR <input type="checkbox"/> MODERATE <input type="checkbox"/> SEVERE							
	Water Depth Matches Stream	<input checked="" type="checkbox"/> YES <input type="checkbox"/> NO-SHALLOWER <input type="checkbox"/> NO-DEEPER <input type="checkbox"/> UNKNOWN <input type="checkbox"/> DRY							
	Water Velocity Matches Stream	<input checked="" type="checkbox"/> YES <input type="checkbox"/> NO-FASTER <input type="checkbox"/> NO-SLOWER <input type="checkbox"/> UNKNOWN <input type="checkbox"/> DRY							
	Dry Passage through Structure?	<input type="checkbox"/> YES <input checked="" type="checkbox"/> NO <input type="checkbox"/> UNKNOWN		Height above Dry Passage _____					
Comments									

5/26/16

AQUATIC CONNECTIVITY STREAM CROSSING SURVEY DATA FORM

Appendix B: Master Data Table Shows every site that was sampled and all of the statistics ran at every site. * denotes no data available. **denotes that there was only one palace to sample for macroinvertebrates at the culvert site. *** These sites did not have culverts to sample or the culvert was not sampled. **** Fords cannot be scored using the NAACC scoring system.

Site	Score	Descriptor	Stream Orientation	Latitude	Longitude	Fish Shannons Diversity	Brown Trout Abundance	Brook Trout Abundance	Macroinvertebrate Shannons	%EPT Abundance	Macroinvertebrate Taxa Evenness
1	****	Insignificant Barrier	Upstream	39.8853321	-75.8957977	1.508	1	0			
			Downstream	39.8859037	-75.8946708	1.602	1	0	1.90**	0.706**	0.735**
2	****	Minor Barrier	Upstream			*	*	*	*	*	*
			Downstream	39.8851	-75.8954	*	*	*	*	*	*
0.94	Insignificant Barrier	Upstream	39.8901	-75.8785	*	*	*	*	*	*	*
3		Downstream			*	*	*	*	*	*	*
0.78	Minor Barrier	Upstream	39.8909197	-75.862265	0.000	0	0	0	*	*	*
4		Downstream	39.891797	-75.861957	0.000	0	0	0	*	*	*
0.72	Minor Barrier	Upstream	39.895866	-75.859049	0.754	1	1	3	0.767	0.938	0.283
5		Downstream	39.894074	-75.858612	1.030	1	1	3	0.752	0.765	0.278
0.62	Minor Barrier	Upstream	39.894074	-75.858612	1.030	1	1	3	0.752	0.765	0.278
6		Downstream	39.896744	-75.857543	1.077	1	1	8	1.853	0.677	0.684
0.92	Insignificant Barrier	Upstream	39.8992	-75.8554	*	*	*	*	*	*	*
7		Downstream			*	*	*	*	*	*	*
0.88	Insignificant Barrier	Upstream	39.901979	-75.85087	1.355	4	0	0	1.197139401	0.245614035	-0.350
8		Downstream	39.9026709	-75.8501009	1.307	1	0	0	0.891855888	0.555555556	0.329
0.97	Insignificant Barrier	Upstream	39.8895	-75.8856	*	*	*	*	*	*	*
9		Downstream			*	*	*	*	*	*	*
0.97	Insignificant Barrier	Upstream	39.8944	-75.8747	*	*	*	*	*	*	*
10		Downstream			*	*	*	*	*	*	*
0.91	Insignificant Barrier	Upstream	39.8967	-75.8744	*	*	*	*	*	*	*
11		Downstream			*	*	*	*	*	*	*
0.93	Insignificant Barrier	Upstream	39.8965	-75.873	*	*	*	*	*	*	*
12		Downstream			*	*	*	*	*	*	*
1.00	No Barrier	Upstream	39.02817	-75.850404	*	*	*	*	*	*	*
13		Downstream			*	*	*	*	*	*	*
14	***	*		39.9027	-75.850134	*	*	*	1.658	0.741	0.612
15	***	*		39.90326	-75.86803	*	*	*	1.253	0.832	0.463
16	***	*		39.90098	-75.871549	*	*	*	1.567	0.706	0.579