LITTLE SEWICKLEY CREEK WATERSHED ASSOCIATION
WATERSHED ASSESSMENT REPORT SUMMARY

The mission of the Little Sewickley Creek Watershed Association (Association) is to protect and conserve the natural beauty and environmental health of Little Sewickley Creek and its watershed. To that end, in May 2017, the Association initiated a field-based condition assessment of Little Sewickley Creek and its major tributaries.

1.0 ASSESSMENT PROCESS

The Association, in cooperation with biologists from Civil & Environmental Consultants, Inc. (CEC), trained a team of volunteers to use the U.S. Department of Agriculture Natural Resource Conservation Service Stream Visual Assessment Protocol. This protocol is intended to provide a screening level assessment of a stream's physical, chemical, and biological characteristics. The volunteer teams broke the stream into assessment reaches with uniform characteristics.

The assessment team was composed of 38 volunteers, including members of the LSCWA Board; staff members from the Allegheny County Conservation District, Allegheny Land Trust, Fern Hollow Nature Center, and Sewickley Heights Borough; Quaker Valley High School environmental science interns (QV Creekers); and community members.

At the conclusion of the field assessment in May 2018, volunteers had walked over 26 miles of Little Sewickley Creek and its major tributaries from the confluence of Little Sewickley Creek with the Ohio River in Edgeworth Borough to its headwaters in Franklin Park Borough.

2.0 ASSESSMENT SCORES

For each of the 175 assessed stream reaches, staff and volunteers scored 12 parameters on a scale from 1 (lowest) to 10 (highest), for a maximum total score of 120. Individual component metric scores fell into one of four narrative categories:

- Optimal (7.8 to 10)
- Suboptimal (5.3 to 7.7)
- Marginal (2.8 to 5.2)
- Poor (0 to 2.7).

These scores (and stream and watershed quality) are more easily discussed by grouping the scoring parameters into three broad categories: physical, chemical, and biological.

2.1 Physical Characteristics

Major physical attributes include the watershed's topography, geology, and hydrology, as well as a stream's channel condition and alternation, stability, combination of pools and riffles, and instream habitat for fish and macroinvertebrates. Eight parameters (Channel Condition, Hydrologic Alteration, Bank Stability, Pools, Riffle Embeddedness, Instream Fish Cover, Barriers to Fish, and Insect/Invertebrate Habitat) are related to physical condition.

- Forty-five stream reaches averaged an optimal score for physical condition.
- One hundred and eighteen stream reaches averaged a sub-optimal score for physical condition.
- Twelve stream reaches averaged a marginal score for physical condition.

2.2 Chemical Characteristics

Chemical attributes include point and non-point pollution sources within the watershed and stream water-quality parameters, such as temperature, pH, conductivity, dissolved oxygen, and heavy metals and other contaminants. Two parameters on the visual assessment form (Water Appearance and Nutrient Enrichment) are related to chemical condition.

- One hundred and fifty-nine stream reaches averaged an optimal score for chemical condition.
- Fifteen stream reaches averaged a sub-optimal score for chemical condition.
- No streams scored in the marginal or poor range for chemical condition.

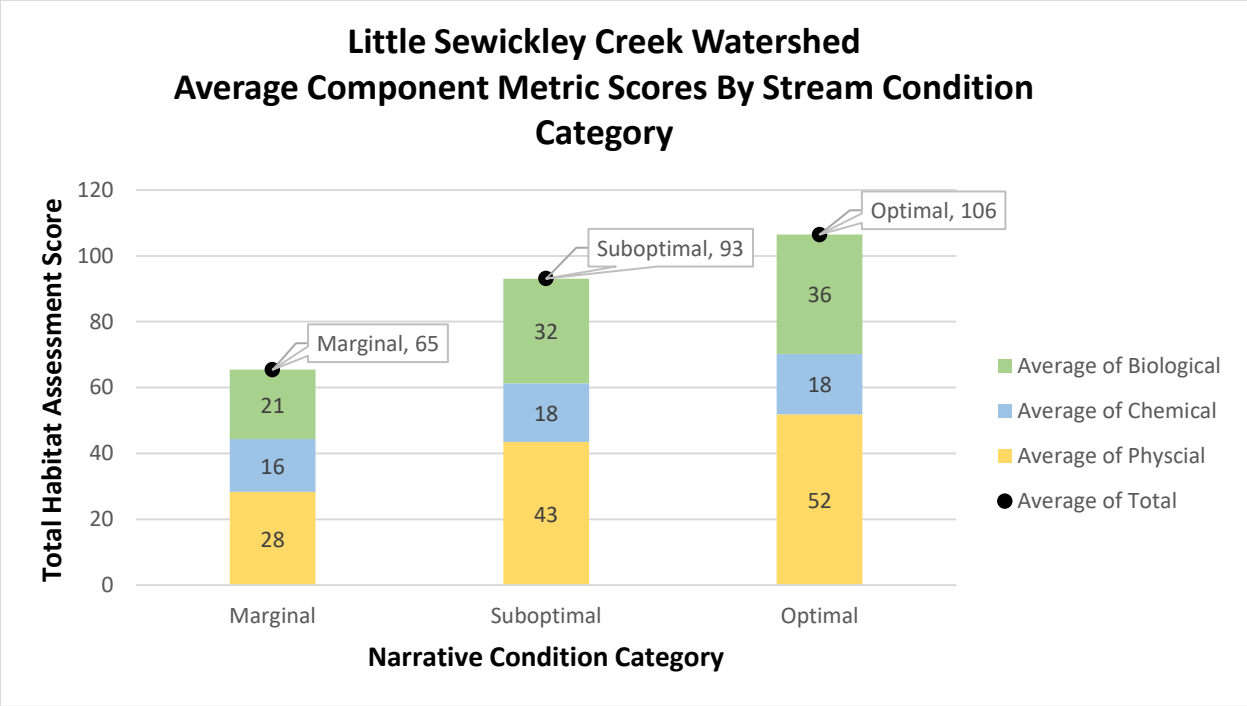
2.3 Biological Characteristics

The health and diversity of plants and animals within a watershed define its condition, while the health and diversity of fish, amphibians, macroinvertebrates, and microorganisms are the dominant attributes for a stream's biological condition. Two unique parameters (Riparian Zone and Canopy Cover) plus the two chemical parameters are predictive of the biological condition.

- One hundred and thirty-four stream reaches averaged an optimal score for biological condition.
- Thirty-eight stream reaches averaged a sub-optimal score for biological condition.
- Three stream reaches averaged a marginal score for biological condition.

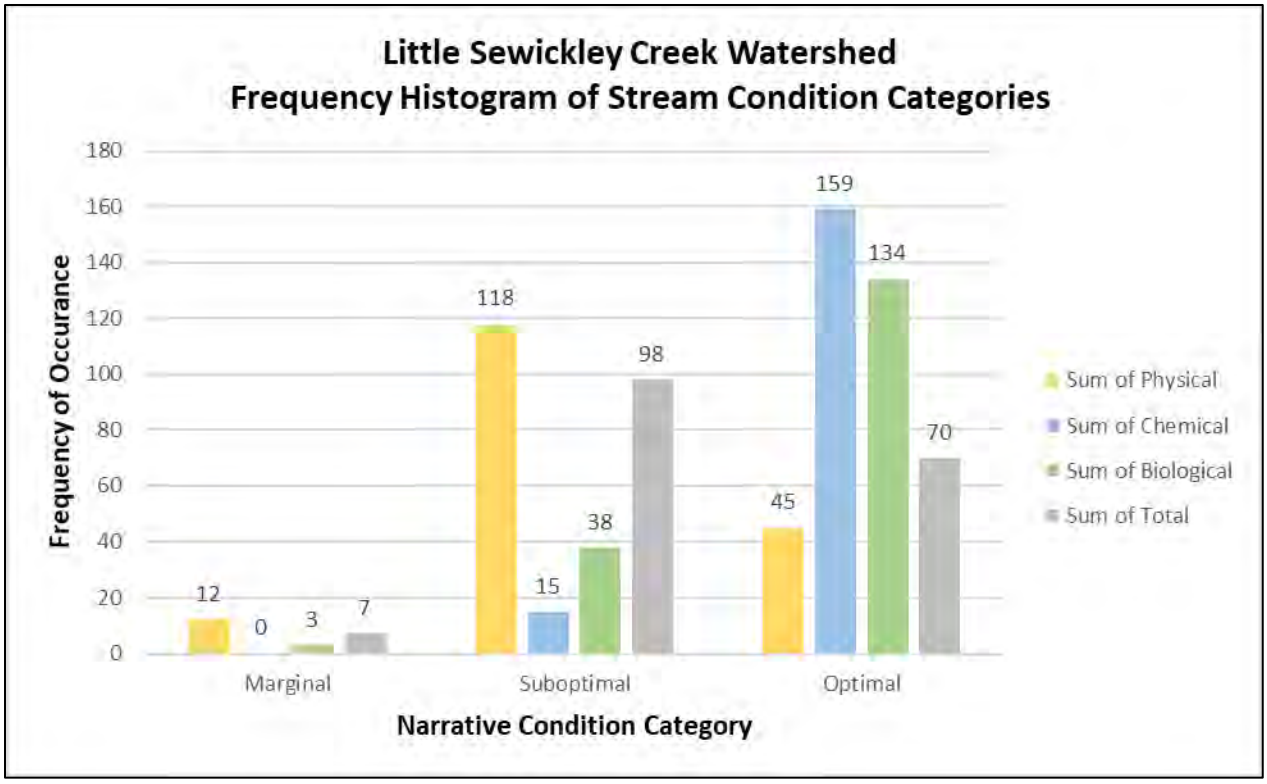
2.4 Combined Average Stream Reach Scores

The average combined scores for physical, chemical, and biological characteristics within each narrative category are summarized in the following chart.



The previously discussed functional ratings, as well as the overall assessment scores, are shown in the following frequency histogram. This histogram suggests that the majority of the assessed stream reaches within the Little Sewickley Creek Watershed are in good condition.

- Seventy stream reaches average score are optimal.
- Ninety-eight stream reaches average scores are sub-optimal.
- Seven stream reaches average scores are marginal.
- No stream reaches average scores are poor.



3.0 ASSESSMENT REACTION

The ultimate goal of the watershed assessment was to collect objective data throughout the watershed to quantify the physical, chemical, and biological attributes of the streams. Of the 175 individually assessed stream reaches within the watershed, 40 percent were assessed as optimal. This is a very high percentage for a watershed in an urbanized county and is reflective of the limited development that exists within the watershed. Additionally, 56 percent of the assessed stream reaches were assessed as sub-optimal. While these reaches present opportunities for further investigation and possible improvement, sub-optimal stream reaches are often functioning at acceptable levels. Only 4 percent of the assessed stream reaches within the watershed were assessed at marginal levels. These reaches are prime candidates for further investigation and improvement activities.

As the Little Sewickley Creek Watershed Association evaluates possible options for seeking to improve the overall health of Little Sewickley Creek and its watershed, a key focus will need to be the education, support, and coordination of activities of individual landowners throughout the watershed.

4.0 RECOMMENDATIONS

The Little Sewickley Creek Watershed Assessment generated a very large database of information that not only documents the current condition of the watershed but suggests areas of the watershed that can be targeted for improvement. The use of this database is essential to supplementing existing documentation/studies and will serve as a dynamic tool to inform actions the Association and its partners and supporters pursue.

CEC has analyzed the assessment results for the Little Sewickley Creek Watershed and offers the following recommendations for potential activities that will assist the Little Sewickley Creek Watershed Association in protecting, conserving, and improving the natural beauty and environmental health of Little Sewickley Creek and its watershed. Within each category, potential activities are categorized by their potential to positively impact a stream and the overall watershed (High, Moderate, and Low) and a range of potential costs to conduct the activity has been estimated.

- Low = Up to $5,000 (Possibly volunteer driven and using existing Association resources)
- Moderate = $5,000 to $50,000
- High = More than $50,000

In several cases, further definition of an activity is required to properly estimate potential costs. Figure 17: Watershed Improvement and Priority Areas Recommendation Map shows potential project areas within the watershed.

Just as Little Sewickley Creek and the Little Sewickley Creek Watershed were assessed using the three broad categories of physical, chemical, and biological condition, it is helpful to discuss strategies to address stream and watershed deficiencies using these same three categories, plus a category for more general recommendations with potentially broader impacts.

4.1 GENERAL RECOMMENDATIONS

A number of activities have the potential to affect the overall Little Sewickley Creek Watershed or the Association, itself. They can improve the Association's ongoing research on the watershed and help to shape the selection and direction of future projects. The establishment of a physical location to serve as a visible presence for the Association and its educational outreach could greatly expand public awareness of the Association and assist in the pursuit of its mission.

Activity	Potential Impact	Possible Cost
Maintain existing Little Sewickley Creek Watershed Online GIS Database.	High	Low
Study existing member municipal ordinances for requirements related to stream and wetland building setbacks, maintenance of riparian corridors and buffers, logging, and dedication/ownership of steep slopes, unbuildable lots, zoning district buffers, and other "open" space frequently created during develop projects and often deeded to homeowner associations.	Moderate	Low
Further analyze existing assessment data to determine reference stream reaches to serve as baseline for evaluating watershed potential and future stream improvement activities.	Moderate	Low
Conduct assessment of the headwaters of Streams/Tributaries 36657B (Walker Park), 36657F, and 36658 (Walker Park), which were not included in original assessment.	Moderate	Low
Investigate water seep at base of King Lake dam.	High	Moderate
Designate Walker Park (Streams 36657 (Little Sewickley Creek), 36657B (Walker Park), 36658 (Walker Park)) as a demonstration area for various stream- and watershed-enhancing activities and community education. • Create stream access points to encourage interaction while limiting damage to streambank and riparian corridor. • Control invasive plant species. • Construct and install stream stabilization structures. • Create riparian buffer plantings along Little Sewickley Creek. • Use existing park facilities for in-field landowner/homeowner education on Little Sewickley Creek watershed, riparian buffers and plantings, importance of wetland protection, etc. • Install educational signage to inform public about the value of each demonstration project	High	Costs dependent on scope
Update watershed map with new LiDAR data and field identification of small tributaries and springs/seeps.	Low	Low

4.2 PHYSICAL CONDITION RECOMMENDATIONS

Activities which identify and address areas of active and severe streambank erosion and channelization will improve stream stability, reduce sediment loading, and reduce riffle embeddedness. In some locations, prior efforts to reduce streambank erosion can be investigated to determine whether they are still providing this function.

Additionally, the stream channel of Little Sewickley Creek and Fern Hollow appears to have been straightened and relocated in several locations. These areas can be identified by straight stream reaches along the base of a steep slope, with an artificial dike or mound of soil preventing the stream from accessing its floodplain during high flows. The original historic channel may be filled or still partially visible as along Little Sewickley Creek, or it may still be serving as a secondary overflow channel during high flows. The relocated channel is ultimately unstable and a study to assess the stability of the original channel may restore stability throughout the reach.

The assessment revealed that instream fish cover, barriers to fish, and insect/invertebrate habitat scores are consistently high throughout the watershed and activities undertaken to improve these scores would likely show little improvement.

Activity	Potential Impact	Possible Cost
Initiate or continue investigations into previously identified (gas) wells in the watershed and evaluating potential effects on streams.	High	Low
Share information on culvert conditions with Allegheny County Department of Public Works and municipal road departments, including compromised culverts on Streams/Tributaries 36657C, 36661 (Sneed), 36662A (Backbone Road ACC), and 36669 (Audubon Trib).	High	Low
Meet with Allegheny County Department of Public Works and municipal road departments to establish on ongoing awareness of potential streambank/road bank conflicts and incompatibilities. Advocate for big-picture, long-term, stream-enhancing solutions. • Contact Costas Samaras, Director of Carnegie Mellon University's Center for Engineering and Resilience for Climate Adaptation, regarding initiative to revise engineering design criteria for sizing culverts and implementing BMPs to withstand the changing climatic conditions. • Contact Tara Moberg who works with The Nature Conservancy to advance water-related infrastructure conservation strategies in areas of river connectivity, environmental flows, and energy.	High	Low
Repair headcuts on Streams 36666 (Wagoner's Hollow) and 36669 (Audubon Trib).	Moderate	Low
Plant willow live stakes on unstable streambanks reaches in priority areas and Streams/Tributaries 36657F, 36662A (Backbone Road ACC), and 36669 (Audubon Trib).	Moderate	Low

Activity	Potential Impact	Possible Cost
Investigate and evaluate methods to stabilize selected small landslides/slumps to determine best approach for long-term restoration.	Moderate	Low, depending on scope
Contact appropriate owner of culvert directing Tributary 36657C under Backbone Road. Careless repair could cause heavy sedimentation to Little Sewickley Creek after repair.	Moderate	Low
Construct bankfull benches and install toewood, as appropriate to repair actively eroding streams banks in priority areas.	High	High
Investigate historic relocated channel areas along Little Sewickley Creek and Fern Hollow to determine potential of returning stream to original channel or stable geomorphic pattern.	Moderate	High, depending on scope
Construct stable stream crossings at existing higher-use and unstable trail crossings on Streams/Tributaries 36664A (Woodland Road), 36665 (Cabin Hollow), and 36666 (Audubon Trib).	Low	Low
Repair damaged culvert outfalls/install aprons in priority areas.	Moderate	Moderate
Explore option of removing first rock dam on Little Sewickley Creek upstream of Walker Park and use rocks to stabilize eroding banks.	Low	Moderate

4.3 CHEMICAL CONDITION RECOMMENDATIONS

The visual assessment provided a first step in identifying possible water-quality concerns with the watershed, but further investigation is necessary to evaluate these early clues. Future activities designed to improve the chemical composition, i.e. reduce or remove substances or pollutants from the stream, need to be based on quantitative water-testing results, and extensive historical water testing in the watershed can provide additional clues for testing.

The historical data shows a long history of elevated conductivity in Little Sewickley Creek. Analytical data collected in 1981-1982 also showed unusually high concentrations of chloride and sodium in the upper reaches of Little Sewickley Creek. A letter, dated November 5, 1981, from Green International, Inc. stated, “The values for dissolved solids, specific conductance, chloride, and sodium show that there is salt water going into the creek above the first sampling point, and that the salt is being diluted as it moves downstream”; however, the source of these constituents was never identified. Further investigation into whether these conditions are still present would provide valuable insight for developing a plan to improve the chemical condition of the stream.

Activity	Potential Impact	Possible Cost
Develop a watershed-wide water-quality monitoring program to update historic data and identify potential areas or discharge points of concern.	High	Low
Investigate gas bubbles escaping from channel in Little Sewickley Creek.	Moderate	Low
Investigate areas of high algae growth/high nutrient enrichment to determine causes on Little Sewickley Creek (upper reaches) and Stream 36669 (Audubon Trib).	Moderate	Low
Plug/cap open well casings identified on Streams 36662 (Backbone Road) and 36668 (Hunt Road).	Unknown	Low
Investigate and consider implementing a passive treatment system for stormwater entering streams via catch basins and parking areas to reduce pollutants commonly associated with highway runoff.	High	High
Determine source of unidentified discharge points to streams as shown on Figure 17.	High	Moderate
Implement a watershed-wide water sampling and analysis program.	High	Moderate

4.4 BIOLOGICAL CONDITION RECOMMENDATIONS

Activities undertaken to improve physical and chemical conditions of Little Sewickley Creek are likely to improve biological conditions within the stream. The parameters used to assess biological conditions do reveal that there are opportunities to improve riparian habitat and canopy cover where feasible. The assessment, however, produced limited data that can be used to assess the condition of the overall watershed. Incidental evidence suggests there are opportunities to remove debris, control invasive plant species, evaluate land use on publicly owned land, and review stream-related ordinances of watershed municipalities.

In the PADEP's 2015 Stream Redesignation Evaluation Report (based on 2013 data), the Habitat Assessment scores for streams within the Watershed were within the optimal or suboptimal category, which this assessment confirms. However, the PADEP study concluded that the benthic macroinvertebrate community within the Little Sewickley Creek Watershed was dominated by pollution tolerant and facultative taxa and had poor diversity, resulting in low comparability percentages relative to the exceptional value reference stream in Greene County.

Since the PADEP's biological assessment used the anti-degradation protocol and was focused on the mainstem of Little Sewickley Creek and two of its largest tributaries, it is recommended that a more focused biological sampling be conducted based on a review of the historical and new water quality data and the current habitat assessment to find stream reaches that represent the best

available physical and chemical conditions in the watershed. Sampling these streams will represent reference conditions and the potential biological condition the streams can be expected to achieve. Use of a different sampling protocol, such as the PADEP's *A Benthic Macroinvertebrate Index of Biotic Integrity for Wadeable Freestone Riffle-Run Streams in Pennsylvania*[2], would allow for calculation of a numeric score that can be compared to statewide values, rather than comparison to only the exceptional value streams in Pennsylvania.

Activity	Potential Impact	Possible Cost
Develop a more focused biological sampling program to identify stream reaches representing reference reaches using PADEP's Benthic Macroinvertebrate Index of Biotic Integrity protocol.	High	Moderate
Initiate an invasive plant species management program focusing on Japanese knotweed (*Polygonum cuspidatum*)(upstream of Walker Park), Japanese barberry (*Berberis thunbergii*), privet (*Ligustrum* sp.), lesser celandine (*Ranunculus ficaria*), and common reed (*Phragmites australis*), and routinely monitor for the appearance of new, potentially invasive, species, such as Japanese spirea (*Spiraea japonica*) and doublefile viburnum (*Viburnum plicatum*).	Low	Low
Establish/Improve riparian buffers in priority areas, Fern Hollow, and Streams/Tributaries 36657G (Henry Road), 36660 (Sevin Road), 36662A (Backbone Road ACC), 36668 (Hunt Road).	Low	Low

4.5 PUBLIC EDUCATION

As the Little Sewickley Creek Watershed Association evaluates possible options for seeking to improve the overall health of Little Sewickley Creek and its watershed, a key focus will need to be the education, support, and coordination of activities of individual landowners throughout the watershed. Approximately 129 landowners have property that fronts along Little Sewickley Creek and its tributaries. The cooperation of these landowners will be essential as the Association embarks on a long-term strategy to protect and conserve the natural beauty and environmental health of Little Sewickley Creek and its watershed.

[2] Pennsylvania Department of Environmental Protection, Division of Water Quality Standards, March 2012