

## **Spring Creek Chapter TU - Grants and Habitat Projects 1999-2012 Author: Art Kempf, PhD**

### **Summary**

The goal of this report is to document the habitat enhancement and restoration projects the Spring Creek Chapter of Trout Unlimited (SCCTU) and partners completed in the Spring Creek watershed between 1999 and 2012. As an initial step, SCCTU received a two year, \$96,000 PADEP Growing Greener grant in 2000 to conduct a geomorphic assessment of a 20-mile stretch of Spring Creek from Boalsburg to Milesburg. The study was conducted by LandStudies Inc (LSI) and resulted in identification and prioritization of thirteen impaired (primarily sedimentation and bank erosion) stream reaches in need of habitat restoration. Subsequently, eight habitat enhancement/restoration projects located at six sites were completed. These projects included: McCoy Phase I&II; Penn State Sheep Farm Phase I&II; Spring Creek Park (Houserville); PFBC SR 550 access (The Distillery); Fisherman's Paradise; and Buffalo Run (Benner Park). In total, 130 in-stream habitat enhancement devices were installed over approximately 8,750 ft of stream. All projects, with the exception of Fisherman's Paradise, included enhancement of riparian buffer zones and planting of native trees and shrubs. Total project costs were estimated at \$437,000 (includes grants, cash match, volunteer time, in-kind services, and material donations).

Many partners and community volunteers were involved in the habitat projects including the PA Fish and Boat Commission (PFBC), ClearWater Conservancy (CWC), Centre County Conservation District (CCCD), Penn State University (PSU), and several local organizations and businesses. CWC contributed a significant amount of funding and supervision toward completion of riparian enhancement efforts as well as grant management. The PFBC contributed a significant amount of funding and assistance with acquiring project funding, grant management, habitat design, and oversight of in-stream habitat construction.

Grant funding for the eight habitat projects came from four primary sources: PADEP (Growing Greener), PA DCNR (Community Conservation Partnership Program), National Fish and Wildlife Foundation (NFWF) and Trout Unlimited (Embrace-A-Stream program). In addition to securing grant monies for the eight habitat projects, SCCTU contributed an estimated \$40,000 in direct chapter funds toward project work and related watershed studies that focused on habitat enhancement and understanding water quality.

Completion of the eight habitat enhancement projects along with efforts by other watershed stakeholders to help offset increasing levels of development, impervious surface, stormwater runoff, and other human-induced impacts during the 1999-2012 period have collectively benefited Spring Creek and its exceptional wild brown trout fishery. The number of brown trout redds has shown an increasing trend during this time period and fishery evaluations conducted by the PFBC at the McCoy site showed that wild brown trout biomass increased three-fold following dam removal and follow-up habitat restoration.

## **Introduction**

The extensive riparian restoration projects conducted primarily in the upper reaches of the Spring Creek watershed during 1989-1998 (as described earlier by Dr. Bob Carline, Ref 1) were critical steps toward reversing some of the habitat degradation that had occurred. Unfortunately, the escalating negative impacts of farming practices, rapid urbanization and development in the Spring Creek watershed required even more vigilance and increased efforts by many community stakeholders (including SCCTU) to continue to restore/protect the watershed during the 1999-2012 period. Challenges with ground water withdrawals and surface water pollution (thermal, chemical, biological and suspended solids) were addressed during this period by key stakeholders like SCCTU, PFBC, CWC, PSU, CCCD, U.S. Fish and Wildlife Service, University Area Joint Authority (UAJA), Bellefonte Waste Water Treatment Plant (BWWTP), and PADEP plus many others. Working in partnership along with the benefit of volunteers, grant funding, and regulatory help from PADEP and local government, significant progress was made toward maintaining Spring Creek's status as a world-class wild trout fishery and moving toward achieving water quality targets established for the Chesapeake Bay 2000 Agreement.

This review will focus primarily on SCCTU's efforts to complete eight habitat restoration/improvement projects and support efforts aimed at better understanding Spring Creek watershed's water quality from 1999-2012. The restoration projects will be reviewed in chronological order, in recognition that project funding typically came from the combination of several grants, many of which also had different effective dates (typically 1-3years). As background, activities by a few key stakeholders will also be summarized, since their efforts have (and will continue to have) major long term benefits to the watershed and Spring Creek's water quality. These are: EPA/PADEP Water Regulations; The Water Resources Monitoring Project (WRMP); Clearwater Conservancy Riparian Restoration Program, and Center County Conservation District's Agricultural Best Management Practices Program. In addition, the reader is encouraged to review two recent publications related to the history of the Spring Creek watershed and fishery. These are: *The Fishery of Spring Creek, A Watershed Under Siege* (2011), PA Fish and Boat Commission, Technical report number 1 (Ref 2) and *Fly Fishing Pennsylvania's Spring Creek* (2003) by D.L. Shields (Ref 3).

## **EPA/PA DEP Water Regulations**

One of the most significant factors that impacted the 1999-2012 period and Spring Creek's water quality was the action taken by the EPA/PADEP to establish TMDL (Total Maximum Daily Limits) for point source effluent discharges from municipalities and industry. Allowable concentrations and loads of various pollutants are determined based upon effluent discharge levels that will not interfere with the "designated use" of the receiving stream. This action was taken in order to achieve compliance with the 1972 Clean Water Act and in support of the Chesapeake 2000 Agreement. For Spring Creek (designated as High Quality-Cold Water Fishes (HQ-CWF) by PA DEP) that action included the development of TMDL standards for TSS, Phosphorus, Nitrogen and thermal/temperature. PADEP utilized the TMDL standards to develop NPDES (National

Pollution Discharge Elimination System) permits for University Area Joint Authority (UAJA), Bellefonte Waste Water Treatment Plant (BWWTP), and PFBC hatcheries located at Benner Spring, Pleasant Gap and Bellefonte. NPDES permits issued for these facilities during 2002- 2010 had a significant long term impact on improving/ protecting Spring Creek as a HQ-CWF. This action combined with PADEP development of a non-point permitting system, Small Municipal Separate Storm Sewer System (MS4), for storm water management were significant factors in addressing issues with water quality and habitat degradation that was occurring in the watershed.

In order to develop TMDL standards, PADEP conducted a major Spring Creek watershed monitoring study (Physical attributes and benthic Macro Invertebrate Communities in Spring Creek and tributaries (Ref 4) during 2001-2002 to understand existing conditions. As a result of this study, 8 reaches totaling 16.2 miles or 20%, of the Spring Creek watershed was classified as “impaired” and these sites were placed on the EPA “integrated list”. Two thirds of the impaired mileage was located in the upper watershed and a significant amount (80%) of the degradation was attributed to non-point source pollution, in particular storm water runoff. Figure 1 shows details and a map of the impaired reaches. In addition to its use for developing TMDLs for point source pollution, this information was also utilized by PADEP to develop a MS4 permitting system as part of the NPDES phase II program where municipalities, or municipal-like entities, within designated urban areas are required to have MS4 permits. Implementation of this permitting in 2003 was a major step forward towards reduction of TSS and thermal pollution in Spring Creek.

**Figure 1. PADEP Impaired Reaches of Spring Creek**

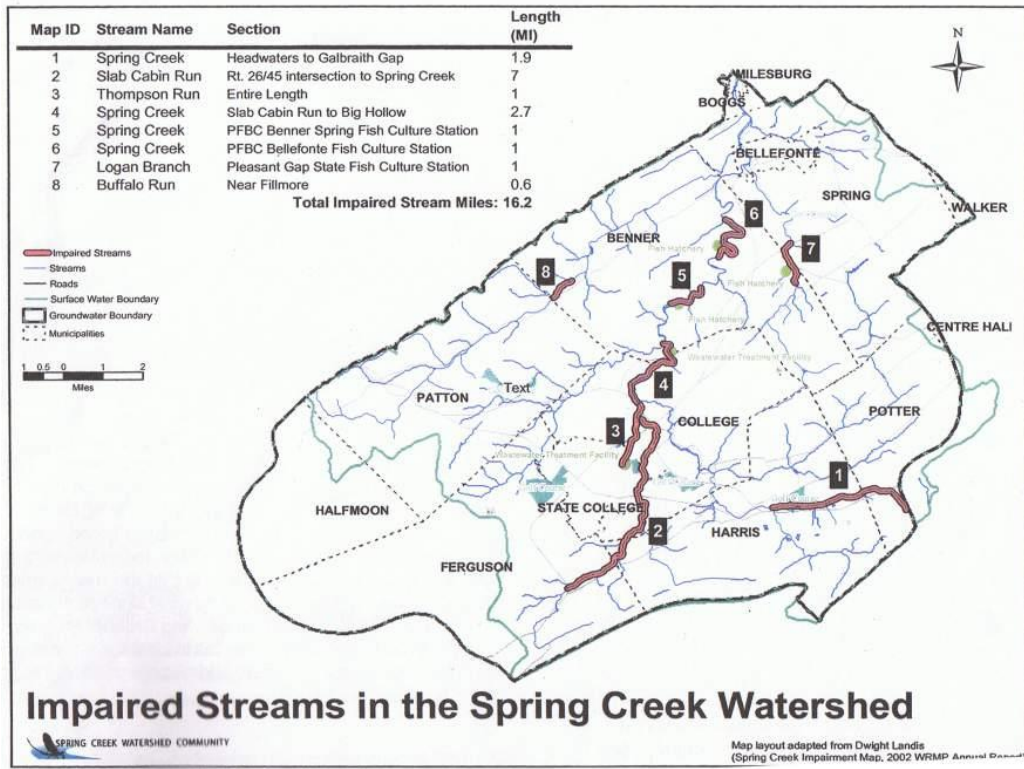


Figure 1. Impaired Streams in the Spring Creek Watershed

Fortunately, UAJA and the Centre Region had anticipated more stringent effluent regulations and also recognized that demand for potable water would become a long term issue resulting from continued strong regional growth. A “beneficial water reuse strategy” was developed to address these concerns which was based on the reality that future effluent discharge of (un-cooled) wastewater would be limited to 6 MGD and that any incremental discharge (estimated at potentially an additional 3MGD) would need to receive extensive treatment (tertiary) and reused/recycled. Re-use of this clean water could be accomplished via consumption by industry, farming and perhaps upstream distribution into the watershed. In view of the HQ-CWF designation of Spring Creek, this approach was essential to support continued future growth of the region, especially as it related to thermal pollution of the stream. The re-use strategy also provided the potential for recharging the watershed aquifer which would address growing concerns about increased demand on well water.

It should also be mentioned that PSU does not require NPDES permits from PADEP because of their innovative approach of using spray irrigation of all treated university waste water. Instead of discharging the approximately 2.3 MGD of secondary treated waste water into Spring Creek, PSU treated wastewater is sprayed directly on a 606 acre site located near Toftrees. This “Living Filter System” approach not only avoids associated pollution permitting issues associated with discharge into Spring Creek, but it also provides an avenue to recharge the ground water supply in the watershed. After 30 years of operation, the system has been proven to be an effective way to discharge treated municipal effluent. Monitoring of a groundwater well near the spray site has not indicated any contamination of the groundwater resulting from this approach.

### **Water Resources Monitoring Project (WRMP)**

This project was initiated by the Spring Creek Watershed Community in 1997 as part of a strategic plan to understand/monitor surface and ground water flows in the Spring Creek watershed. What started in 1998 as a monitoring program (flow, temperature and nutrients) for 12 surface water stations has since expanded in 2011 to include quarterly sampling/testing of 15 surface water sites, 5 wells and 7 springs in the watershed for a number of organic and inorganic pollutants. In addition, surface water measurements of flow (60 min interval) and temperature (30 min interval) are made at 13 and 14 locations, respectively. Benthic macroinvertebrate testing (quarterly) was also added, as a one time effort, to the 2012 monitoring program. Details on project history and locations of the currently monitoring stations can be found in the comprehensive annual reports located on the [WRMP website](http://www.springcreekmonitoring.org/documents.html) (<http://www.springcreekmonitoring.org/documents.html>). WRMP annual reports also contain detailed summaries/comparisons of the monitoring results and discussion of implications to the watershed. WRMP is currently staffed with a project manager (residing at CWC) who leads/coordinates (using volunteers) monitoring, sampling and testing efforts. Guidance and funding for WRMP work is managed by the Spring Creek Watershed Association.

SCCTU and many other community stakeholders provided seed money and ongoing financial support to this monitoring program since its inception in 1997. The long term data set being amassed by the WRMP provides the means to detect changes in the

quantity and quality of surface waters and groundwater in the Spring Creek watershed. Ongoing data collection since 1998 has been an invaluable resource in determining nutrient reductions that have occurred in the watershed resulting from implementation of PADEP regulations and best management practices (BMP) for point and non-point pollution. WRMP data will continue to be extremely important for management of the Spring Creek resource for years to come.

### **ClearWater Conservancy Riparian Conservation Program**

ClearWater Conservancy (CWC) has been a key stakeholder dedicated to restoration and protection of the Spring Creek watershed. CWC developed a Riparian Conservation Program in 1998 with the overall goal to improve stream quality in the Spring Creek watershed through four areas of focus: stream assessment, stewardship, restoration and protection. The majority of their protection work has been accomplished by working with private landowners to establish riparian buffer zones and by planting native shrubs and trees throughout the Spring Creek watershed. Because of their expertise and commitment to the riparian conservation program, CWC has been a key partner in all SCCTU habitat restoration projects, providing supervision and in many cases funding for riparian restoration efforts. It should be mentioned that, during 2000-2011 CWC also led two in-stream habitat restoration projects (Elks Club-2006 and Boalsburg Military Museum-2001) in partnership with SCCTU, U.S. Fish and Wildlife Service and PFBC. Ongoing riparian conservation efforts by CWC are critical to Spring Creek habitat improvement and protection.

### **Centre County Conservation District**

The Centre County Conservation District (CCCD) has also been a key stakeholder and SCCTU habitat enhancement project partner in restoration and protection of the Spring Creek watershed. CCCD provides cost share funding and technical assistance for the installation of Best Management Practices (BMP) on farms and for the management of nutrient management plans. Efforts with private farms and partnerships with community stakeholders have resulted in significant reductions in nutrient and sediment loading throughout the SC watershed. Literally, miles of fencing and riparian buffer protection in the Spring Creek watershed can be attributed to CCCD efforts. Since almost 80% of the nutrient pollution loading in the Spring Creek watershed originates from non-point sources the success of both CCCD and CWC conservation programs is critical to achieving improvement and protection in stream water quality.

### **Spring Creek Chapter of Trout Unlimited Habitat Projects, 1999-2012**

#### **1999 - Land Studies Geomorphic Study**

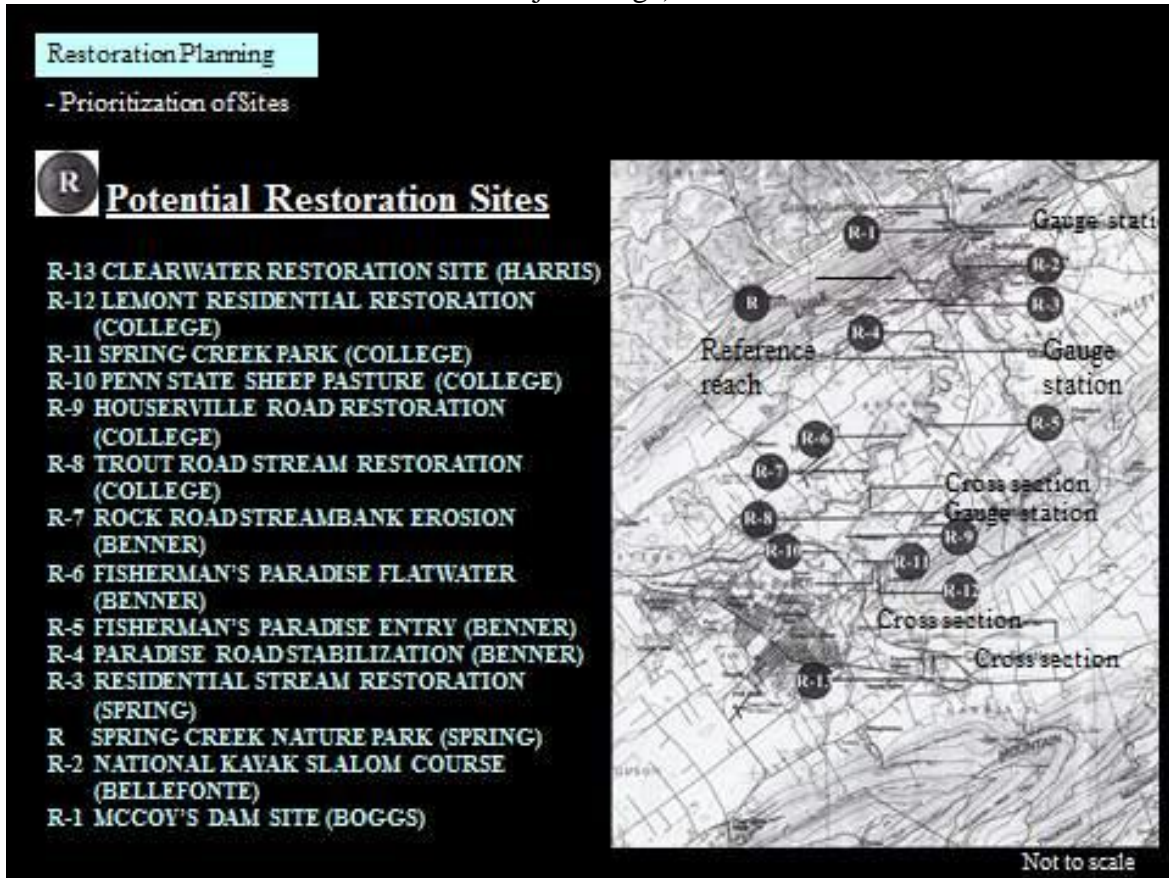
In 1999, SCCTU received a 2-yr, \$96,000 PADEP-319 grant (Non Point Source Management and Watershed Restoration and Assistance Program) and hired LandStudies Inc (LSI) of Lititz, PA to conduct an extensive geomorphic assessment of the main channel (approximately 20 miles) of Spring Creek from Boalsburg to Milesburg. The geomorphic study included measurement of sinuosity, slope and riffle pebble counts. In addition to the data generated, one of the deliverables of the study was a prioritized list of 13 impaired stretches (located on public and private land) in the main stem of Spring



Creek (see prioritized site map Figure 2). Impairment was typically indicated by the level of sedimentation and stream bank erosion present in a given stretch. The study was completed in 2000 and has served as the basis for identification of future in-stream and riparian restoration projects conducted by SCCTU and partners from 2000-2012.

**Figure 2 LSI list of 13 Prioritized Stream Reaches for Habitat Enhancement**

(click on the following for [PDF Format by Clicking Here](#) or in [Microsoft Powerpoint Format by clicking here](#) Or go to TU Website and find on Stream Projects Page)



Through 2012, six of the 13 sites identified on the LSI list (specific to the main channel of Spring Creek) have received restoration through the combined efforts of SCCTU and partners. An additional site identified on the LSI list was completed by the U.S. Fish and Wildlife Service at the Clair property located north of Houserville below the Trout Rd bridge. This site is private and closed to public angling. Two additional sites that weren't on the LSI list have also received restoration work by SCCTU (i.e. PFBC- SR 550 access and Buffalo Run at Benner Township Park). Access and public ownership have been the key factors that have determined site selection, with a focus on sites open to public angling.

### **2000-2002 - LandStudies Buffalo Run Site “the Demonstration Site”**

Soon after completion of the LSI study, SCCTU obtained a 2 year, \$102,000 PADEP “Growing Greener” grant in 2000 for restoration of a “Demonstration Site” selected by LSI as “the” top priority site on the LSI list. The demonstration site was located off Slaughterhouse Road in the Bellefonte area on Spring Township property. The project was intended to focus on restoration of a 1,500ft stretch of Spring Creek immediately upstream of the SMS Sutton Engineering Inc facility. Restoration work was to be done by LSI with support of SCCTU volunteers and included plans for both in-stream and riparian buffer enhancement. In addition, once the habitat project was completed Spring Township had plans to convert the entire 7 acre site into a community nature park. Unfortunately the project never happened. Concerns from homeowners, site access and some unexpectedly very positive findings from a “Fish Community Assessment” conducted by PSU and redd count surveys resulted in a decision to move the project to a more suitable location.

This was a major set-back to the Spring Township Park project and to the SCCTU habitat program which had intended to utilize the “Growing Greener” grant funding not only to design, permit and restore the Spring Township Park stretch, but also seek pre-approval for an additional eight impaired sites on the LSI list. This would streamline efforts and reduce costs for completion of future SCCTU habitat improvement projects. Difficulties encountered with the first phase of this project ultimately resulted in postponing efforts to proceed with seeking DEP approval for permitting multiple sites.

Alternatively, two Spring Creek sites near the “Rock” and the PSU Sheep Farm were considered for a “demonstration site”, but after thorough evaluation, work could not be completed in that time frame at those locations. Issues with cost requirements, access and interference with other ongoing storm water monitoring projects associated with I-99 construction (storm water run-off concerns) prevented their selection. As a result of these complications and growing concerns about the Growing Greener grant spending timeline, the project was switched to a new “demonstration site” at Buffalo Run, a tributary to Spring Creek, located at the Benner Township Park off SR 550.

The Buffalo Run project was completed by LSI with support of SCCTU volunteers during 2001. In total, 17 devices were installed in a 650ft stretch, including twelve small stone cross vanes and five single-log vane deflectors. More than 300 tons of stone was utilized to create the habitat structures. Significant work was also done to protect the highly eroded stream bank sections located between the cross vane devices. This was done by facing the banks with straw bales secured in place using high density wooden staking. A recent survey of the site by SCCTU indicated that this technique did not prove to be effective for bank stabilization. In addition to the in-stream habitat enhancement, a riparian buffer was established on both banks of the stream using a combination of native shrubs and trees.

In addition to the habitat projects completed during the 2000-2002 period, SCCTU also contributed Chapter money to help initiate and support the Water Resource Monitoring Project (WRMP). Since 1999, SCCTU has continued to support the important work of

WRMP through direct Chapter funding of \$2,500 per year. As mentioned earlier, this work is essential to understanding / measuring the long term health of the watershed.

SCCTU also contributed \$650 to Henderson Eagle Scout Troop #34 in 2001 for the construction of the handicap access platform located on PFBC property at the access parking area above SR550, along Spring Creek Rd. The project was completed with donations of materials and equipment from local businesses and support from SCCTU and troop 34 volunteers.

### **2002-2004 First Cast Youth Camp-Outreach and Education**

Although not directly related to habitat restoration projects, SCCTU received a 2yr, \$13,634 PADEP “Growing Greener” grant for use in youth ”Outreach and Education” . Grant monies were utilized for sponsoring students to participate in a “first cast” environmental youth camp program at Spring Creek during 2002-2004.

### **2005-2006 Storm Water Characterization and PSU Slab Cabin Run Bio-Retention System**

In 2005, SCCTU received a 2yr \$7,400 National TU “Embrace-A-Stream” grant for conducting a study of “Characterization of Storm Water Pollution in the Spring Creek Watershed”. The project was completed by PSU/Bob Carline (Ref 5) and was critical to understanding pollution loadings (TSS, nitrates and total phosphates) resulting from storm water events in the lower reaches of Slab Cabin Run. The study ultimately provided justification for a \$169,000, PADEP “Growing Greener” grant that was awarded in 2006 to the PSU Office of the Physical Plant for construction of the Millbrook Marsh Bio-Retention System in 2007. The project objective was to re-connect Slab Cabin Run with its 1-2yr flood plain to regain the natural function of wetland soils and plants to retain pollutants during storm water events. This was accomplished by installation (by the U.S. Fish and Wildlife Service) of five rock cross vanes and three log cross vanes at various locations within Millbrook Marsh in the Slab Cabin Run stream channel. For this project, the cross vanes were elevated and helped to reconnect the stream to the floodplain upstream of the structures. During the marsh flooding process, sediment and other pollutants are filtered out of the storm water.

### **2007 - SCCTU Grant Awards Overview and PSU Sheep Farm Site Phase I**

Habitat restoration efforts during 2007-2010 were invigorated by the PFBC and partners removal of the McCoy-Linn dam located between Bellefonte and Milesburg during summer 2007. Following dam removal, the PFBC, SCCTU, CWC, and CCCD formed a partnership to fund a comprehensive, six-site habitat restoration program for Spring Creek that included major restoration of the former McCoy-Linn Dam site. The total cost (including grants, donations, and in-kind contributions) for habitat restoration of the six sites during 2007-2010 was approximately \$370,000. SCCTU received four grants for support of this work: 3-yr, \$179,200 DCNR Community Conservation Partnership Program grant, 2-yr, \$45,000 NFWF More Fish Partnership Fund grant and two National TU Embrace-A-Stream grants (\$5,000 and \$4,400). The five habitat sites that were



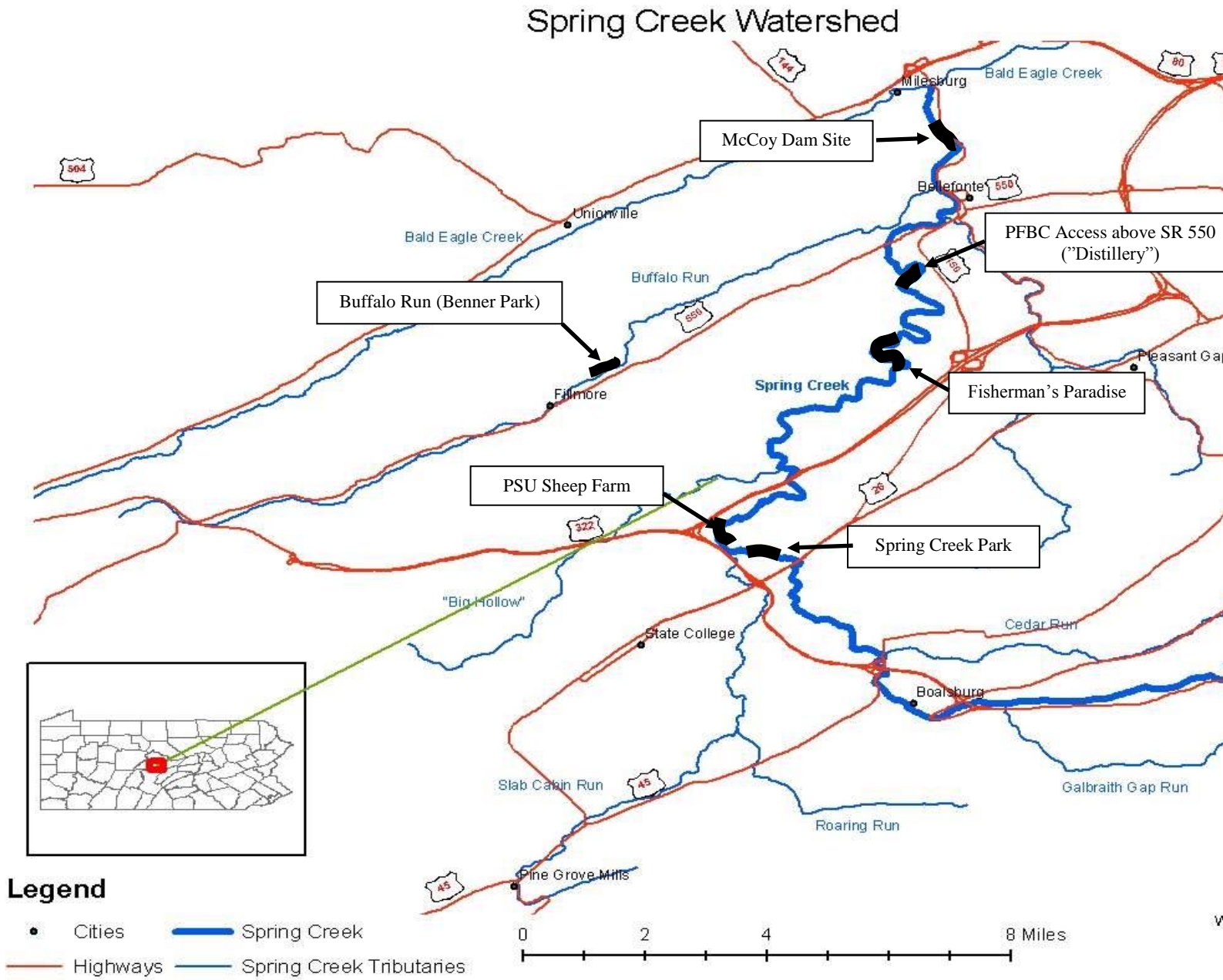
completed utilizing these grant funds are: PSU Sheep Farm phase I&II, McCoy Dam phase I&II, PFBC SR 550 access (The Distillery), Spring Creek Park (Houserville) and PFBC Fisherman’s Paradise. Although detailed designs were completed for a sixth site (Rock Road), restoration work was not done there due to issues with access and high cost. Figure 3 (Page 10, below) shows the location of the restoration stretches completed to date in the Spring Creek watershed.

The PSU Sheep Farm, located immediately downstream of Spring Creek Park was the first site selected for habitat enhancement work. Project work was completed in two phases during 2007 (phase I) and 2010 (phase II) at a total cost of \$60,600. The sheep farm was one of the most significantly impaired stretches identified on both the LSI and PADEP “integrated” lists and required both in-stream and riparian habitat enhancements. Years of degradation from farming practices and storm water surges from Slab Cabin Run had resulted in severe sedimentation and stream bank erosion in this stretch of stream. During phase I, a total of ten fish habitat enhancement devices including a 100ft mudsill, nine multi-log vane deflectors and 15+ random boulders were installed throughout a 1,300 ft. stretch of the stream. In addition, livestock fencing was moved away from the stream to create a 40-50 ft. riparian buffer. Approximately 400 trees & shrubs were planted in the spring of 2008 along the entire 2,700 ft. stretch of the PSU sheep farm property to enhance reforestation of the entire riparian zone. The project was a joint partnership between many stakeholders with additional funding received from CCCD (\$6,000 for fencing) and PSU (\$4,000 for fencing). The U.S. Fish and Wildlife Service provided equipment for relocation of fencing. Donations of equipment and professional staff supervision that were made by the PFBC were a significant contribution to completion of the project. CWC contributed grant monies and managed all phases of the riparian restoration efforts.

### **2007 - Sheep Farm Multi Log Vane Deflector**



Figure 3. Location of Projects Completed in the Spring Creek Watershed from 1999-2012



### **2008 - McCoy Phase I and PFBC SR 550 - “The Distillery”**

Following dam removal in 2007, habitat restoration was completed at the McCoy Site in two phases during 2008-2009 at a total cost of \$208,000. Prior to dam removal, the entire 2,000 ft stretch of Spring Creek was flooded by the 12ft high dam which not only prevented fish migration but also resulted in significant upstream habitat degradation due to accumulation of major sediment deposits and encouraged thermal heating of Spring Creek. The entire McCoy site was included on the LSI list, but surprisingly was not included on the DEP “integrated” list.

### **2007 - McCoy Linn Dam Demolition**





## 2008 - After dam removal, before habitat work

Phase I of the restoration effort was completed in 2008 and involved only limited in-stream work due to concerns that the stream bed channel had not yet stabilized in the stretch above the dam. In total, five devices were installed, three at the lower reaches near the (removed) dam base and two at the far upper reaches of the site. Two large rock vanes were installed (one on each bank) near the site of the former dam base to help stabilize the



channel. In addition, two small rock deflectors were installed on the west bank at the upper (South) reach of the site to stabilize severe bank erosion that was occurring near a wetlands runoff area. A large gravel bar (that had been deposited mid-stream directly below the location of the former dam base) was partially removed and re-positioned to guide stream flow toward mid-channel and the east stream bank. This was done in preparation for establishing a fishing/boating access ramp on the east bank (near the parking area). Some of the stone removed from the gravel bar was used to stabilize the fifth device, a small rock vane deflector that was installed on the west stream bank directly below the large rock vane. In addition, a gravel parking lot was constructed for improved public access.

### 2008 - PBFC 550 “The Distillery” Log Faced Stone Deflectors



Following completion of McCoy phase I, habitat restoration efforts for 2008 shifted to the PFBC site located above SR 550 (“The Distillery” – See Above). This site was not identified on the LSI list, but significant erosion of the west bank was occurring that was not only removing significant amounts of the west bank but was threatening to undercut the footbridge located in the middle of the stretch. Habitat work was completed by SCCTU volunteers in partnership with PFBC and CWC at a total estimated cost of \$25,800. A total of four devices were installed over a 600ft stretch. Two large log faced stone deflectors, one improved overhead cover stone deflector and a stone deflector were installed on the west bank of the stream. At least 30 large boulders were also distributed in-stream for habitat creation. Riparian planting of 200 trees and shrubs was completed in fall 2008 by SCCTU and other volunteers under the supervision of CWC.

### **2009 - McCoy Phase II**

Phase II, the most significant phase of the habitat enhancement project was completed during 2009 and consisted of creating a flood plain bench on the east bank to help dissipate energy during high flow events; installation of 69 devices including 4 large rock cross vane structures, four large mudsills, multiple multi-log and rock vane deflectors and 27 root wads (added for enhanced habitat creation). In addition, more than 60 large boulders were randomly distributed in-stream for habitat enhancement. The entire 2,000 ft east bank of the restoration site was professionally planted with 840 native trees and shrubs during fall 2009. A significant portion of the funding and supervision for the riparian work was provided by CWC.

### **2009 – Restoring Stream to Natural Dimensions at the McCoy site and creating a Floodplain Bench**



This was the first Spring Creek habitat enhancement project that utilized large rock cross vanes for habitat creation and water flow management (similar, but much smaller rock cross vanes were utilized in Buffalo Run and Slab Cabin Run projects). Utilization of this technology at McCoy was necessary due to the relatively high gradient and flow velocity in this stretch. Structures of this type are effective in directing flow toward the middle of the stream channel, provide run/scour pool habitat, and also dissipate some of the kinetic energy of the water, thereby reducing flow velocity. The result is reduction of stream bank erosion, especially during high flow conditions. In-stream work during Phase II of the McCoy project was completed with support from PFBC, Gleim Environmental Inc., WHM Consulting and volunteers from SCCTU and the community.

### **2009 - McCoy Rock Cross Vane**



Another first for a Spring Creek habitat project was the inclusion of root wad devices into rock and log vane structures at McCoy for additional stream bank erosion protection and incremental habitat creation. A total of 27 root wads were installed along the west stream bank in various arrangements typically located in grouping of 2-3 wads, positioned directly downstream of a log or stone vane device. This application seemed especially appropriate for utilization in this relatively wide-open stretch of stream where overhead protection of the trout is desired.



### **2009 - McCoy Multi Log Vane Deflectors with Root Wads**



### **2010 - Spring Crk Park, Sheep Farm Phase II & Fisherman's Paradise**

Restoration efforts for 2010 focused on three locations: Spring Creek Park (SCP) in Houserville, PSU Sheep Farm phase II (stretch located between the bridge at Houserville Rd and the PSU sheep farm bridge) and PFBC Fisherman's Paradise. Grant monies that remained at the completion of these three projects were utilized to create and install interpretive panels in spring 2011 at a total cost \$18,000 for all five project sites that were completed during 2008-2010.

Habitat restoration work at Spring Creek Park (total cost \$51,400) and in the remaining portion of the adjoining PSU Sheep farm phase II stretch included installation of in-stream devices, bank stabilization and riparian buffer plantings. This 3,100 ft stretch of stream was impacted from years of intensive public use and stormwater runoff from development. Stream bank erosion and excessive sedimentation was evident throughout the entire stretch which was included in both the LSI and PADEP "integrated" lists. Habitat preservation in this stretch will continue to be a challenge due to the impact of high public utilization in the Park and ongoing storm water issues, especially in the PSU Sheep Farm stretch below the confluence of Spring Creek and Slab Cabin Run.

The Spring Creek Park project installed a total of 26 in-stream devices, one 90 ft mud sill and 50-60 randomly distributed boulders throughout the 1,700 ft restoration length, located upstream of the Puddintown Rd bridge. Two rock dams (hand-built by visitors/residents) were also removed to facilitate stream channel flow. Devices installed

included single and multi log vane deflectors, rock vane deflectors and stone deflectors. The devices were installed on both sides of the stream bank as needed. In addition to the in-stream structures, riparian planting of 573 trees and shrubs was done in SCP under the supervision of CWC. Riparian buffer planting was completed in the fall of 2010. PFBC provided design and supervised all in-stream habitat restoration work at SCP and Sheep Farm phase II.

The PSU Sheep Farm phase II was completed simultaneously with habitat restoration activity at Spring Creek Park. Five devices including a large 150 ft modified mud sill were installed in this 1,400 ft stretch. The modified mud sill was installed on the east bank directly below the Puddinton Rd. bridge to remedy a significant erosion problem



**2010 Sheep Farm Modified Mud Sill**

occurring at that location. Because of its design it will also provided excellent habitat for trout. The remaining four devices were installed directly above the PSU sheep farm bridge and included; one log faced rock deflector and one rock deflector on the east bank and two small rock deflectors on the west bank. This completed all habitat enhancement work at the PSU Sheep Farm. Riparian buffers had been widened and planted, fencing installed and in-stream structures installed for erosion control and habitat enhancement along the entire 2,700ft stretch of the farm.

The final restoration project for 2010 was completed in the Stackhouse section of Fisherman's Paradise and consisted of installation of three multi-log vane deflectors and one stacked stone log faced deflector. These devices were added to the

west side of the stream at a location just upstream of the regulated no-wading section. More than 20 large boulders were also distributed for habitat creation in this stretch. In addition, four brush fills (utilizing cut willow branches) were installed downstream of existing deflectors and walls (in reaches just above the Stackhouse parking lot) to trap sediment and encourage formation of stabilized stream banks at these locations. Some work was also done to repair a few existing habitat structures below the foot bridge. In total, habitat enhancement/repair was done on approximately 1,100 ft stretch of the Fisherman's Paradise. Total cost for completion of the work by SCCTU volunteers and PFBC supervision is estimated at \$6,700.

## 2010 - Fisherman's Paradise Stacked Stone Log Faced Deflector



### **Assessing Benefits of Habitat Enhancement During 1999-2012**

Completion of the eight habitat enhancement projects along with efforts by other watershed stakeholders to help improve water quality and offset increasing levels of development, impervious surface, stormwater runoff, and other human-induced impacts during the 1999-2012 period have collectively benefited Spring Creek and its exceptional wild brown trout fishery. PADEP and local government regulations, Slab Cabin Bio-retention project, McCoy dam removal, ongoing riparian buffer creation, and implementation of BMP's for farming and storm water management all occurred during this period. The habitat enhancement projects and numerous water quality improvements were simultaneously being done throughout the Spring Creek watershed, thus we feel all of these actions played a role in improving the fishery. It's also important to note that the majority of the SCCTU projects were completed during 2008-2010 and the full benefits may have yet to be observed.

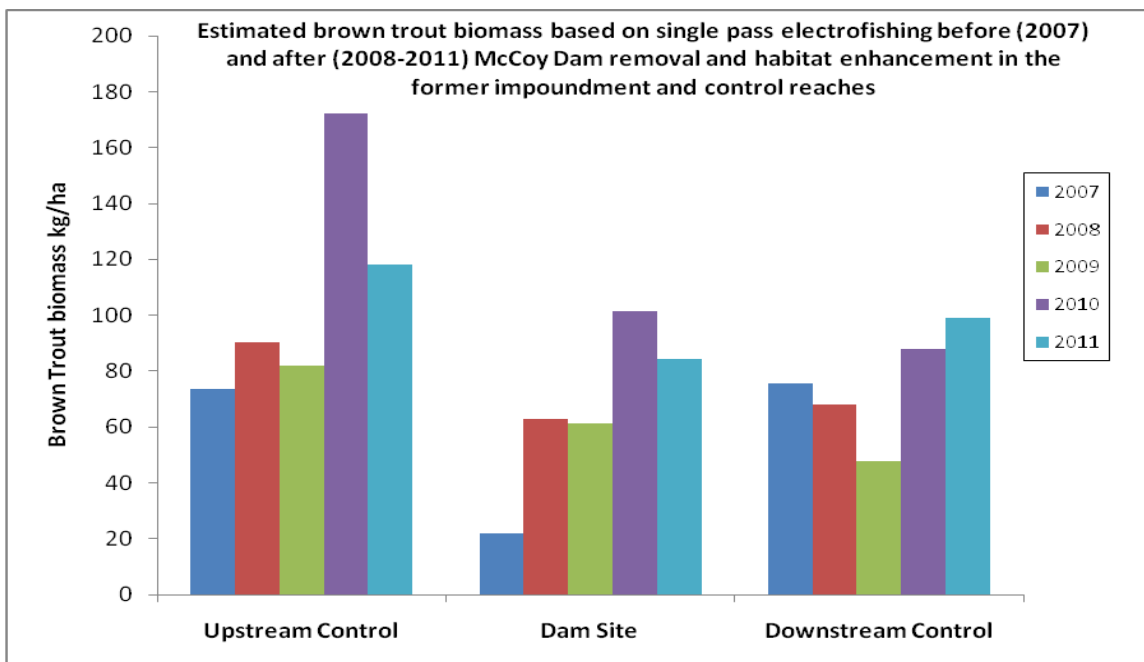
Reports by Dr .Bob Carline, 2012 (Stream Bank Stabilization in the Spring Creek Watershed, 1989-1998) and PFBC Technical Report Number 1, 2011 (The Fishery of Spring Creek, A Watershed Under Siege) summarize, in detail, trends observed with Spring Creek water quality and the biological community through 2006-2007. These reports indicated that the significant stream bank stabilization work that was completed in the upper watershed during 1989-1999 resulted in reduced sediment loads and improved macroinvertebrate density and diversity in both Cedar Run and Slab Cabin Run. Total suspended solids (TSS in mg/L) remained fairly constant in upper Spring Creek, but



declined significantly in the Slab Cabin Run and Cedar Run sub-basins. Concentration of nitrate remained unchanged and orthophosphorus concentration trended downward based on samples collected at the Axemann gauging station (EPA (2007, WRMP report 2009). Unfortunately, no conclusions can be made regarding loading trends for these two nutrients, because only very limited sampling has been done during storm water events. Since it's estimated that storm water events are responsible for 70-85% of the sediment load it's critical that this type of testing is undertaken in order to assess the benefits from riparian restoration and storm water control measures.

In addition to riparian restoration efforts during 1999-2012, a significant amount of SCCTU effort was directed toward in-stream habitat enhancement and stream bank stabilization, creating improved spawning and adult trout habitat. Results of biological monitoring have confirmed the positive benefits of the projects. Brown trout redd count data has been collected by the Pennsylvania Cooperative Fish and Wildlife Research Unit and PFBC since 1987 indicates that since around 2000 a considerable increase has occurred in the total count of redds in Spring Creek (Milesburg to SR 45 bridge in Boalsburg). Annual redd counts increased by 70% from 1,009 to 1,797 counts during this period (data from PFBC, J. Detar). This included a two fold increase in redds at the Sheep Farm site after the habitat enhancement project was completed. Additionally, the PFBC's monitoring of the brown trout population at the McCoy site (Fig 4) showed that biomass increased three-fold following the removal of McCoy Dam and follow-up instream and riparian habitat restoration. These are positive indications that the collective efforts to reduce sedimentation loads, improve water quality, and enhance physical and riparian habitats in the watershed have resulted in improved habitat for brown trout.

Figure 4. Brown Trout Response to the Improved Habitat at the McCoy Site



Insufficient data is available at this point to make any conclusions regarding the macroinvertebrate community, but samples were collected by WRMP in 2012. Results from that study should become available soon. In addition, PADEP will conduct a Spring Creek watershed macroinvertebrate survey in 2013. These data will be very important for re-assessment of impaired stretches of the Spring Creek watershed.

**References:**

- 1) Carline R. 2012 “Stream Bank Stabilization in the Spring Creek Watershed, 1989-1998, Spring Creek Chapter TU website.
- 2) Carline, R., R. Dunlap, J. Detar and B. Hollender. 2011. The fishery of Spring Creek – a watershed under siege. PA Fish and Boat commission, Technical Report Number 1. Available at: [http://www.fish.state.pa.us/water/streams/springck\\_fishery.pdf](http://www.fish.state.pa.us/water/streams/springck_fishery.pdf).
- 3) Shields, D. L. 2003. Fly Fishing Pennsylvania’s Spring Creek, DLS Enterprises, Lemont, PA.
- 4) Hughey, R.E. 2002, Spring Creek in Centre Co. PA, DEP file #22966. Pennsylvania Department of Environmental Protection memorandum, February 5, 2002. Williamsport.
- 5) Carline R, “Characterization of Stormwater Pollution in the Spring Creek Watershed” 2005, TU EAS grant and WRMP 2005 Annual Report.

**Figures:**

- 1) DEP Impaired sites map (from WRMP Annual Report 2003)
- 2) Map of SC main channel (showing LSI impaired sites Source: LSI Geomorphic Study)
- 3) Spring Creek Watershed map showing locations of completed habitat projects for SCCTU, CWC and USF&W. Source: J. Detar, PFBC.
- 4) Summary of fishery evaluations at the McCoy site before and after dam removal and follow-up habitat enhancement. Source: J. Detar, PFBC