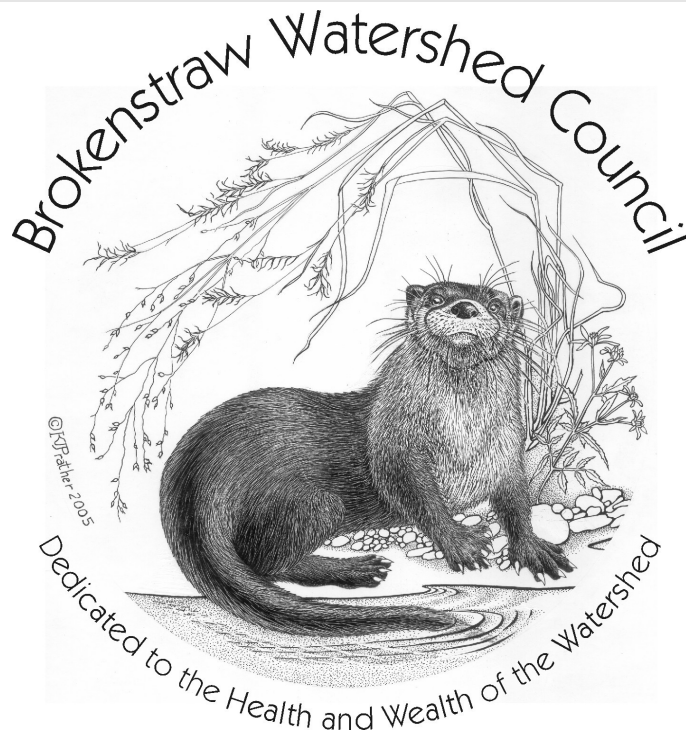


Spring Creek Watershed Conservation Plan

Presented by



www.coldwaterheritage.org

Made Possible by a Grant Through Coldwater Heritage Partnership (CHP):

Administered by Pennsylvania Council of Trout Unlimited (PATU) under contract with Department of Conservation & Natural Resources (DCNR) and receives funding assistance from DCNR, Pennsylvania Fish & Boat Commission (PFBC) & Foundation for Pennsylvania Watershed Program (FPWP)

Brokenstraw Watershed Council www.brokenstraw.org otter@brokenstraw.org 814-664-4050


Spring Creek Watershed Conservation Plan

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ACKNOWLEDGEMENTS

The Council is especially thankful for the hospitality and cooperation of landowners who live along beautiful Spring Creek.



Coldwater Heritage Partnership

The Brokenstraw Watershed Council would like to express our appreciation to the Coldwater Heritage Partnership including Pennsylvania Council of Trout Unlimited (PATU), Department of Conservation & Natural Resources (DCNR), Pennsylvania Fish & Boat Commission (PFBC), and Foundation for Pennsylvania Watersheds (FPWP) for providing the resources and the guidance to accomplish our Spring Creek assessment program.



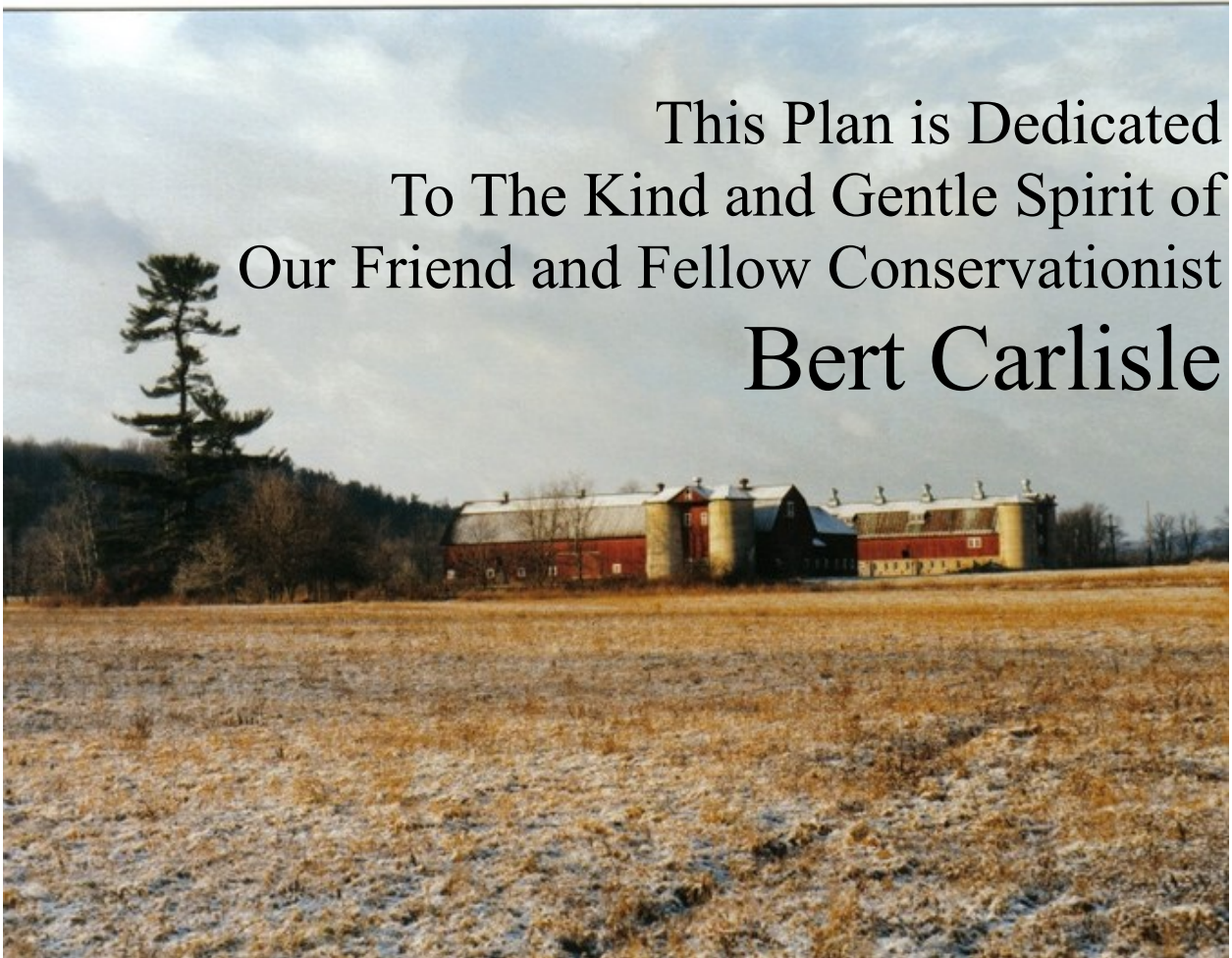
Ben Wright and Matt Bixler of the Western Pennsylvania Conservancy provided visual assessment training. The USDA's *Stream Assessment Protocol* and EPA's *Rapid Bioassessment Protocol for use in Wadeable Streams and Rivers* was used to assess the conditions of the main stem of Spring Creek, Warren County.

The hearty, persistent assessment team included: Allegheny National Forest Hydrologist Charles Keeports, Boy Scout leader David Mourer, website designer Joan Hamel, outdoor sportsman Theodore O'Harah, violinist Kathy Kosko, Columbus Elementary School Teaming with Nature Club member Tegan Christensen and Warren County Conservation District Watershed Specialist Jean Gomory and Brokenstraw Watershed Council Board members: Dorothy Hvozda, Donald Thomas, Michael Hampsey, William Kibler, Tracy Christensen, and Karen Prather.



October 27, 1937 - November 26, 2007

In Memory



This Plan is Dedicated
To The Kind and Gentle Spirit of
Our Friend and Fellow Conservationist
Bert Carlisle

Carlisle Estate, Spring Creek, PA

PREFACE

THE VALUES AND FUNCTIONS OF THE SPRING CREEK WATERSHED

Close-up of Dead Man's Run 2005

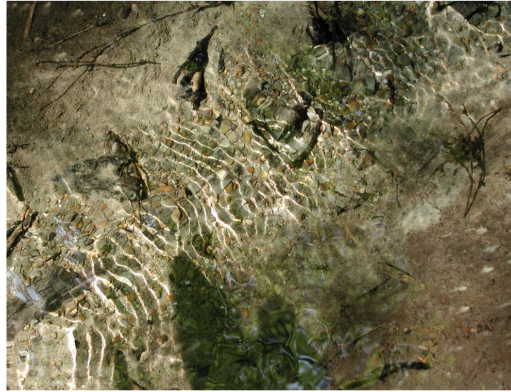


Photo by Catherine Pecller

The entire Brokenstraw Watershed and the Spring Creek Watershed in particular supports some of the most outstanding glacial wetlands in Pennsylvania. Several glacial fens supporting Endangered and Threatened plants and outstanding invertebrate diversity are widely scattered throughout both watersheds. The glacial hills and wetland depressions within much of the Spring Creek Valley are some of the most scenic vistas in Northwestern Pennsylvania.

Botanical Surveys conducted by the Museum within the Spring Creek Valley during the last 15 years have revealed several outstanding glacial fens and White Pine–Yellow Birch–Black Ash Seepage Forests. Many of the rare plants within the Spring Creek Watershed are known from less than five locations within the Commonwealth of Pennsylvania. A few are known from three or fewer locations in Pennsylvania and one Pennsylvania State Endangered plant within the Spring Creek Basin is currently known nowhere else in Pennsylvania. New occurrences of Exceptional Value Pennsylvania Wetlands are still being discovered within the basin and many more exceptional wetlands with statewide or global significance will certainly be discovered in coming years.

The high water quality of Spring Creek, the outstanding large stands of native Hemlock Northern Hardwood Forest throughout much of the basin slopes and divides and the outstanding wetlands along the main channel of Spring Creek and many glacial fens on the valley slopes and stream edges of Spring Creek should qualify the basin as a nationally important river. Every effort should be made to protect the large forest stands and wetlands along the main channel of Spring Creek in order to maintain the current high quality waters now flowing through the valley. Protection of the stream today will ensure that future generations will be able to enjoy the experience of fishing for native Brook Trout along the creek and casual encounters with many other noteworthy species now thriving within the wild and clean waters of Spring Creek.

Dr. James K. Bissell, Curator of Botany, Coordinator of Natural Areas,
Director of the Center for Conservation & Biodiversity
Cleveland Museum of Natural History

VALUES OF THE SPRING CREEK WATERSHED

The steep eastern mountainside on the right ends here where the Brokenstraw valley begins and the Spring Creek delta area widens.



The Spring Creek watershed contains some of the most impressive flowing springs and seeps I've seen anywhere in the world. The most prominent springs maintain uninterrupted flow over fine gravel substrate tributaries. Ultimately, they coalesce to form Spring Creek, which supports reproducing trout and is designated as a high quality cold water fishery under Title 25, Chapter 93 of the PA Code.

The springs, seepages, tributaries and Spring Creek itself support a diverse array of taxa, many of which are rare, threatened or endangered, or have poorly understood life histories. Recent investigations by the scientific community are only beginning to demonstrate the significance of this area to botanic, invertebrate and vertebrate communities. There is still much work to be done, and more discoveries and intricacies are sure to reveal themselves as investigations and surveys continue.

From the perspective of the user, this watershed provides a reliable source of high quality water to Brokenstraw Creek and eventually the Allegheny River. The species rich waters provide fishermen, youth and aquatic naturalists with countless hours of superior recreation.

The glacial history of the watershed has resulted in a rich complex of wetlands and soils that in turn support an equally rich complex of habitat cover types, wildlife and land uses. This, combined with a deep-rooted sportsmen's culture, has made the area a sportsmen's paradise. Big game hunters continue to migrate to the area to pursue deer, turkey and bear. Trappers find beaver, mink, raccoons, fox and coyote in large quantities. Small game hunters can find a bounty of rabbits, squirrels and grouse within the watershed. An expanding bobcat population and recent nearby reintroductions of river otter and fisher find these animals becoming more prominent in the landscape. Waterfowl and woodcock use the complexes of wetlands, oxbows and shrublands during their migrations. Again, because of the complexity of habitat cover types, birders can find a treasure of opportunity within the Spring Creek watershed.

In summary, the geologic and anthropogenic histories have intertwined to create an interesting assemblage of natural features that support an exceptionally diverse area. Some of the diversity persists as a result of land and resource protection afforded by landowners, conservation organizations and government agencies. Some has resulted from historical land uses. It warrants stating however, that the diversity that is present today is not an inexhaustible resource that will withstand any and all uses. Only an investment in continued protection, and land use planning and management will sustain or improve diversity for posterity.

Shayne Hoachlander, Land Management Group Supervisor
Pennsylvania Game Commission

SIGNIFICANCE OF MAMMAL SPECIES

The Spring Creek Watershed provides various habitats for many species of mammals including common species such as the white-tailed deer, *Odocoileus virginianus*, various shrew species of the Genus *sorex* and myriad rodent species including the white-footed and deer mice of the Genus *Peromyscus*. What is of more importance, however, is the habitat provided for the lesser known and uncommon species including the northern water shrew, *Sorex alustris albibarbis* and the fisher, *Martes pennanti*. Formal surveys and other sightings have confirmed the occurrence of both.



White-tailed deer
Odocoileus virginianus

The importance of the northern water shrew lies with its status as a possible indicator of water quality. The food resources that are necessary to the shrew's continued persistence at any single site are such that they are dependent on high water quality. If the water quality degrades, the food resources are diminished and the water shrew disappears.



White-footed mouse
Peromyscus leucopus

Surveys conducted during 2005 along several 1st order streams emptying into the Spring Creek averaged 5 species of small mammals including the northern water shrew as well as several more common species. It is likely that more intensive surveys would have produced more species but time was limited for this particular project. It should be noted, however, that habitats all along both Atlas Run as well as Spring Creek were somewhat pristine and diverse and capable of supporting a mammal fauna of more than 15-20 species of all sizes, both common and rare. The wetlands adjacent to Atlas Run and likely more common along other stretches of Spring Creek serve to support species that have high moisture requirements such as shrews and moles.



Fisher (Pekan)
Martes pennanti

In my estimation the worth of the watershed lies both in its ability to buffer water for consumptive uses as well as support a diverse assemblage of wildlife.

James A. Hart, M.Sc.
Pennsylvania Natural Heritage Program
Western Pennsylvania Conservancy

Small Mammal Survey with Jim Hart

July, 2005



Jim

Shrew Habitat ➡



Northern Water Shrew



Jonathan Setting Trap



Northern Water Shrew *Sorex palustris* (Soricidae) Latin shrew marshy, a shrew species rarely observed in Pennsylvania. This species was once thought to be extremely rare but recent evidence seems to indicate that it is much more widespread in the northern tier counties of Pennsylvania than previously thought. One of the larger shrew species, the northern water shrew swims and dives in pools along the smaller tributaries that empty into moderate to larger sized streams. Since its diet consists primarily of macro-invertebrates such as caddisfly, stonefly, mayfly and other aquatic insect species, it most likely depends on clean, un-degraded streams and wetlands and may serve in the future as an “indicator species”, a species that may alert us to arising environmental problems. In July of 2005, these images were taken during a mammal survey by **Jim Hart** with the assistance of local volunteers like **Jonathan Hvozda** shown above.



Mr. Kibler & YMCA Children Netting Macro-invertebrates

Insect Abundance

Edwin C. Masteller, Ph.D., Entomologist, Professor Emeritus, Penn State, The Behrend College, lists Spring Creek is one of six Pennsylvania streams that have such a wealth of caddisfly biodiversity. There have been over eighty caddisfly species identified on the Carlisle Estate. Mayfly, stonefly, dragonfly, moth and butterfly species abound. This attests to the unique habitats associated with the innumerable high pH spring seeps and runs along Spring Creek. Lainard Bush, artist and naturalist working with Dr. Edwin Masteller, collected species some of which are housed at the Smithsonian Institution and the Cleveland Museum of Natural History. Future invertebrate sampling will surely reveal more remarkable biodiversity.



Water Penny



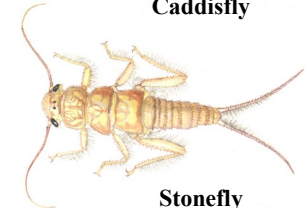
Mayfly



Damselfly



Caddisfly



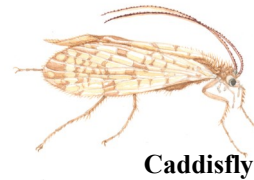
Stonefly



Dragonfly



Dobsonfly
Hellgrammite



Caddisfly

**Garry Kell and
Duane Berkey
Fly Fishing Demonstration
on Spring Creek with YMCA
August, 2007**

Fishing Spring Creek

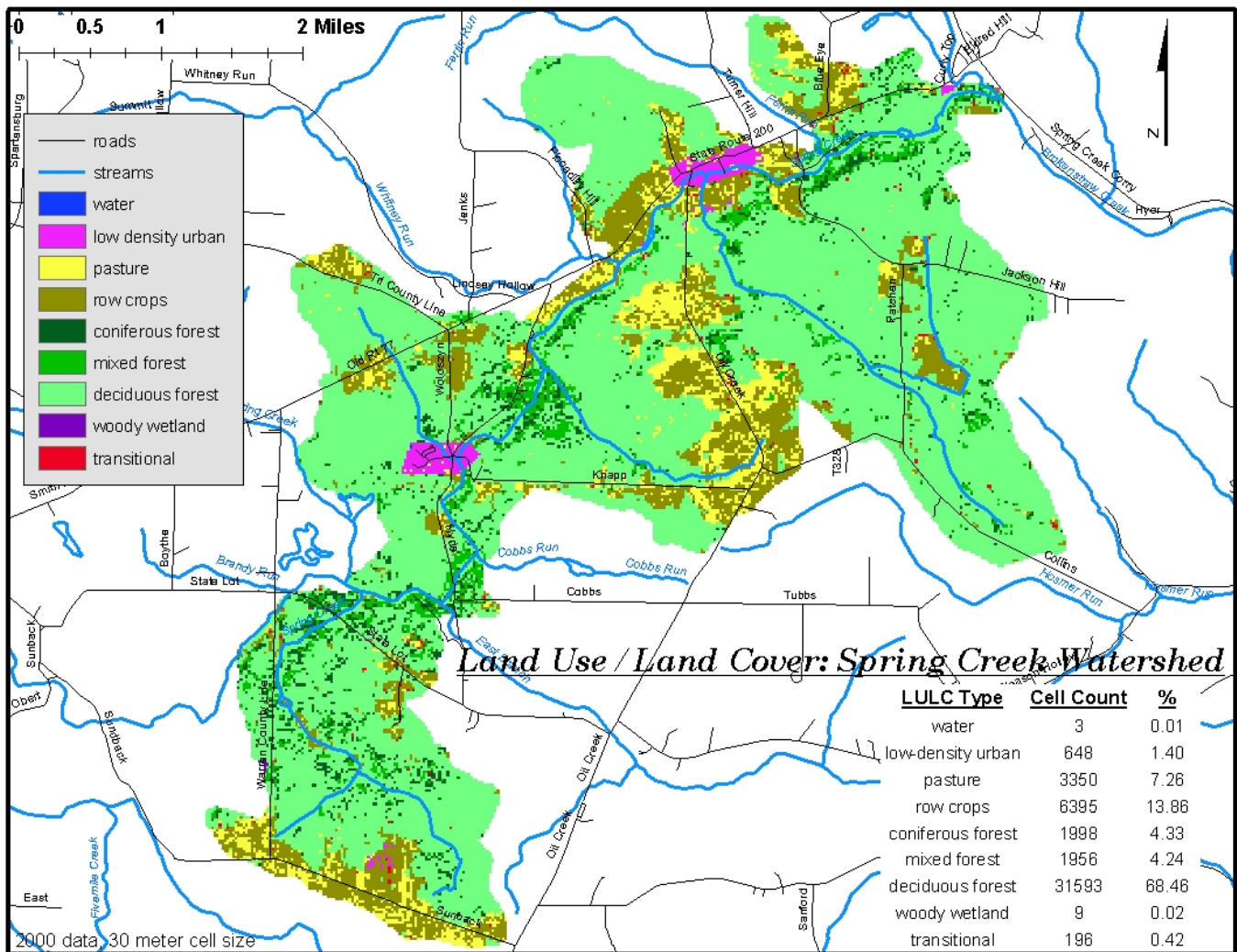
After fly fishing for over 40 years in places all across the United States, Spring Creek has earned a special place in my memory. The unique qualities of Spring Creek are many and interesting but none so rewarding as spending a day within its swirling currents. I stand in awe at its various moods from quiet currents slipping along dark and mysterious undercut banks to the bubbly riffles bouncing through the rocks. My heart races at the thought of drifting a fly through these currents in hopes of uncovering their inhabitants. One never knows, it may be the playful little Eastern Brook Trout, the crown jewel of our native fishes, or the large stealthy German Brown that finds your fly.

It doesn't matter though because fishing Spring Creek is not about the number or size of the catch but about the very character of the land, water and vegetation that cradles the stream and harbors the wonderful web of life that I so enjoy. It is standing in the beauty and uniqueness of the stream, witnessing aquatic insects warmed by the sun in time with their biological clock, beginning their ascent to adulthood. Seeing these moth like caddis emerge from the water flittering here fluttering there, understanding that you may be witnessing a rare species found only in a very few special places, gives cause to stop and give thanks.

When I am fortunate enough to find a native brookie dancing on the end of my line, I can only stand in admiration of its tremendous struggle to survive in spite of decades of abuse to our watersheds. It is truly amazing!! It is then that I reflect and give thanks to the great men and women of the Brokenstraw Watershed Council and others like them for their diligent work to ensure a better future for our streams. As I gently release this wonderful creature, I can only think that its vivid colors and markings which give such pleasure represent the brookie's standing ovation to those working to assure his survival!

Gary Kell
Friend and Fly Fisher of Spring Creek

Land Use / Land Coverage-Spring Creek Watershed



How does Spring Creek relate to the Brokenstraw Creek Watershed?

The Brokenstraw Creek Watershed is located in Pennsylvania’s northwestern Warren and eastern Erie Counties, as well as in New York’s southern Chautauqua County. It is a 313 Square Mile drainage basin and is a major tributary to the northern portion of the Allegheny River. Spring Creek is a major tributary of Brokenstraw Creek.

“The total length of Spring Creek is 11.26785 miles. The drainage area is 39.2 square miles. The latitude and longitude of the mouth is 415147/793055 degrees minute seconds. It enters Brokenstraw Creek at river mile 19 which means it enters Brokenstraw Creek 19 miles upstream of the mouth of Brokenstraw Creek.”

Allen Woomer, Area Fisheries Manager
 Pennsylvania Fish and Boat Commission

Brokenstraw Watershed Council



A Grassroots Organization

The Council is a 501 (C) (3) non-profit incorporated on June 22, 2005.

www.brokenstraw.org
otter@brokenstraw.org

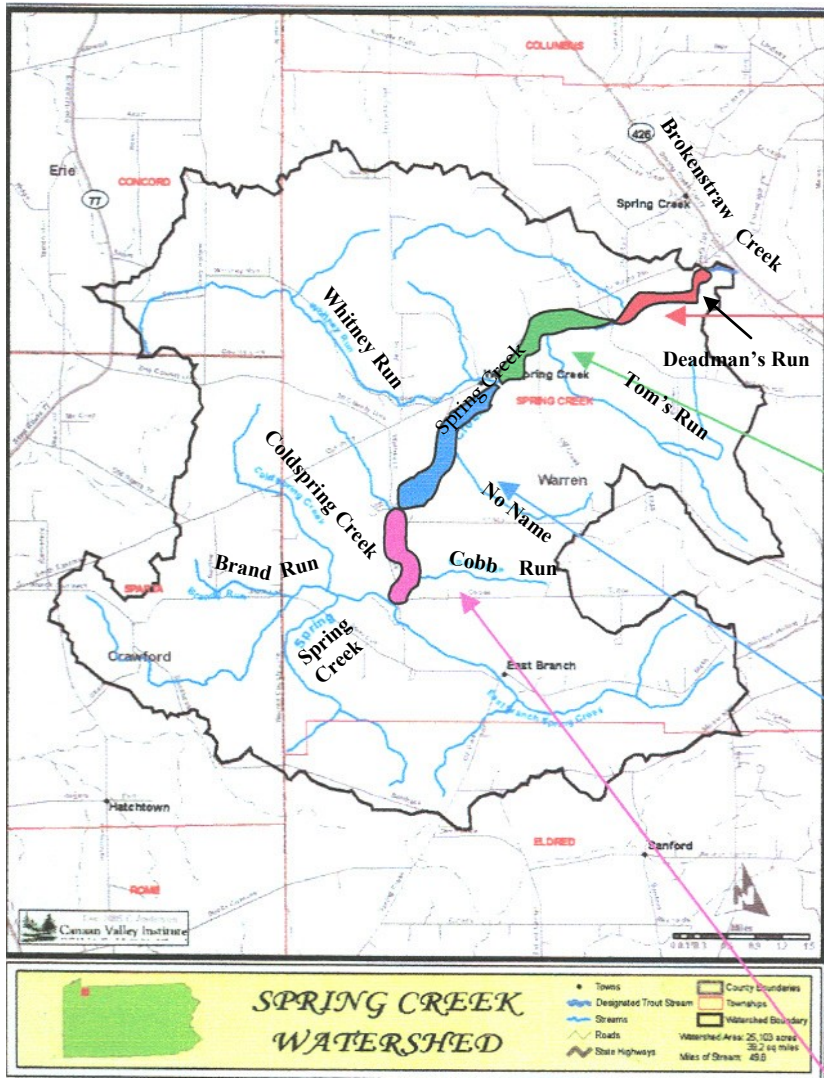
Mission The Brokenstraw Watershed Council is dedicated to the promotion and protection of the health and wealth of the watershed through:

- Appreciation, education, and outreach services;
- Assessment of the watershed's unique values and challenges; and
- Identification and implementation of practical solutions for present and future generations.

Conservation Action Plan Steps:

- Organize opportunities for public participation, especially property owners and other stakeholders, in all phases of the process.
- Conduct a visual assessment of Spring Creek.
- Compile observations and data from BWC and other sources regarding the unique characteristics of the Spring Creek ecosystem.
- Identify areas of concern.
- Prioritize concerns.
- Devise a draft plan to resolve areas of concern within practical bounds.
- Make the plan available for public comments through presentation, CD, hard copy and online forms.
- Write final plan after consideration of public input.
- Implement the plan.

Description of Assessment



Segment 1

Segment 2

Segment 3

Segment 4

- Segment 1** Confluence with Brokenstraw Creek to Jackson Hill Bridge
- Segment 2** Jackson Hill Bridge to Confluence with Whitney Run
- Segment 3** Confluence with Whitney Run to Woloszyn Road Bridge
- Segment 4** Woloszyn Road Bridge to the headwaters at the confluence with Coldspring Creek and Brandy Run.

The Spring Creek assessment team was divided into four groups with each team being responsible for one-fourth segment of the creek. The teams carried out their tasks in the summer and fall of 2006 and winter and spring of 2007. Channel conditions, riparian zones, bank stability, water appearance, nutrient enrichment, fish barriers, in-stream fish cover, embeddedness, macroinvertebrate habitat, and canopy cover were assessed. A numerical rating from 1 to 10 was used with 10 being excellent quality, 7.5-8.9 good, 6.1-7.4 fair, and < 6.0 poor. Sewage/manure presence, water temperature, pH, turbidity, weather conditions, land use, substrate, active channel width, invasive species, and GPS points were noted.

DEFINITIONS of ASSESSMENT TERMS and Related Information

Riparian Buffer Zones, vegetated areas next to water resources that protect water from nonpoint source pollution and provide bank stabilization and aquatic and wildlife habitat. The nonpoint source pollutants such as some pesticides and nutrients (fertilizers, detergents...) move almost exclusively through surface runoff. Natural buffers of forest, shrubs, and native groundcover can intercept surface runoff as well as subsurface flow.

Stream Width Bank width is measured from left bank to right bank at a height determined by the high water mark, which is distinguished by a break in the general slope of the bank or general lack of vegetation along the bank. To minimize potential measuring error, the tape measure is both held level and pulled taut.

Bank Stability, a measure of erosion occurring in the channel banks

Substrate Material In this context, refers to what is found in the bed of the stream. At times the actual bed may be buried. The various sizes are expressed in inches from Boulders >12, Rubble 10-12, Cobble 2.5-10, Gravel 0.1-2.5, Sand <0.1, and Clay <.062.

In-stream Fish Cover - Larger substrate: boulders, rubble, cobble, and gravel, riffles, pools, and large woody debris structures provide camouflage protection for diverse fish and macroinvertebrate populations.

Embeddedness - the degree to which sand and silt (fines) surround or cover the larger gravel, cobble, and boulder-sized creek bed material. The fines observed are notated in four general percentages: -10% Excellent (0-25%), -30% Good (25-50%), -60% Fair (50-75%), -90% Poor (>75%). If there are variations at one place, it is best to look at more than one location in a riffle and average the results. N/A is used if there are no riffles.

Pool— a slower moving, deeper section of the stream.

Riffle - a faster moving water in the stream caused by a steeper decline in the stream's elevation. The water is usually more shallow in the riffles.

pH symbolizes potential of hydrogen and is a measurement used to show the acidity of a solution. The pH scale ranges from 0 to 14 with 7 being neutral. Lower numbers indicate acidity, and higher numbers alkalinity. A pH of 7 is considered ideal for aquatic life.

**Source: Mill Creek Watershed , Westmoreland County, Conservation Plan, Prepared By
The Forbes Trail Chapter of Trout Unlimited**

Nutrient Enrichment can be the result of agricultural practices including lack of stream fencing to limit livestock access and lack of riparian vegetative buffer zones to catch runoff that causes water contamination from manure and fertilizer. Following these two best management practices (BMP's) will mitigate the problem. There are organizations and agencies that often assist farmers either by providing labor or funding.

Benthic is an adjective, defined as relating to or occurring at the bottom of a body of water.

Macroinvertebrates are animals without backbones that can be seen with the naked eye. Benthic macroinvertebrates have long been used for biological monitoring purposes because they are a widespread, diverse group of sedentary and relatively long-lived species. They often respond predictably to human watershed disturbances. One can utilize biological surveys that identify the macroinvertebrates and their relative abundance, as indicators of prevailing water quality and physical habitat conditions. Insects at different stages in their life cycle are prominent aquatic invertebrates and are a source of food that support many animal species. Caddisfly, stonefly, mayfly, midge, and water penny larvae; emerging dragonfly; and water striders are examples found in Spring Creek. Crayfish , threadworms, and orb snails are other macroinvertebrates.

Canopy Cover In relation to a creek, canopy cover means the percentage of tree canopy that extends over the water. Lack of shade may cause thermal pollution.

Water Appearance
List of RSAT Water Clarity and Color Terms
(modified from P.G. County Health Department 1993)

Clarity/Color	General Description
Clear	Smaller objects lying on streambed in deeper pool areas (i.e., > 3 feet deep) clearly visible.
Slightly of Color	Water has slight yellow, brown or greenish hue. Visibility of smaller objects lying on streambed in deeper pool areas are partially obscured. Larger objects still visible.
Off Color/ Turbid	Visibility into water column is nil. Generally attributable to high levels of light scattering/ reflecting particles in water column such as clays, algae, etc.
Tea or Coffee	Self-describing. Generally associated with tannic and fulvic acids from decomposition of leaves or other organic material. More common during fall-winter seasons. May sometimes be associated with seasonal growths of certain algae on streambed.
Bright Green	Most likely source is antifreeze. Note, uranine dye is (bright green) an additive in antifreeze.
Green	Fibrous, slime layers with visible air bubbles may indicate an algae bloom brought on by excess nutrients. The most frequent cause is improper fertilizer or manure storage and/or application.
Yellow-Brown Sudsy	Suds normally observed in slower eddy areas. Origins may be tree resins, gums and/or pollen.
Red-Orange	Filmy deposits along the edge of the stream and bed often associated with greasy rainbow appearance of iron-oxidizing bacteria (which are generally naturally occurring).
9. White, Cloudy	If there are no identifiable solids or odor, it is likely that this problem is run-off from cement cutting or washing activities associated with roadway construction.
10. White, Sudsy	Usually associated with home car washing, or other detergent discharge. Most car washes recycle their wash water and have discharge permits with established limits. Note, car wash discharges will normally have waxy smell.
11. Light to Dark Gray	Strong fetid odor indicates possible sewage overflow or exfiltration. Sewer trunk lines and manholes follow stream valleys to treatment plants and may occasionally leak or overflow with time or during certain large stormflow conditions. Note, sewage fungus growth on rocks in stream provides additional evidence.
12. Brown	Probable discharge of sediment-laden water.
13. Yellow-Brown	Greasy petroleum smelling material that clumps together is likely to be Number 2 fuel oil.
14. Rainbow Sheen	Oils which coalesce together when disturbed indicate a petroleum discharge.

Average Ph and Temperature Data for Spring Creek: 2006-2007

	Segment 1	Segment 2	Segment 3	Segment 4
Fall	No Data	No Data	7.96 Ph	No Data
	No Data	40.96 F	42.15 F	No Data
Winter	7.1 Ph	7.25 Ph	7.54 Ph	6.46 Ph
	34.88 F	34.85 F	44.47 F	35.83 F
Summer	6.87 Ph	7.26 Ph	No Data	6.09 Ph
	66.3 F	64.16 F	No Data	64.03 F
Spring	8.39 Ph	7.95 Ph	No Data	7.86 Ph
	66.92 F	69.71 F	No Data	75.3 F

Assessment Elements Score 1-10	Segment 1	Segment 2	Segment 3	Segment 4
Channel Condition	9.28	8.55	9.20	7.00
Riparian Zone	9.86	6.33	8.20	8.25
Bank Stability	8.71	6.90	9.00	8.00
Water Appearance	7.57	6.90	10.00	8.00
Nutrient Enrichment	8.14	6.33	9.83	8.83
Fish Barriers	9.43	9.55	9.00	6.67
In-stream Fish Cover	8.57	5.33	9.33	7.58
Embeddedness	9.43	7.11	9.20	6.92
Insect/Invert. Habitat	10.00	7.11	8.83	8.17
Canopy Cover	9.00	3.80	7.50	6.67

Study Based on USDA's Stream Visual Assessment Protocol & EPA Rapid Bioassessment Protocol

*Four Season Data Collection at start, middle and end of each segment. Low scores shown in red.

The assessment team was made up of non-professional Brokenstaw Watershed Council members and volunteers.

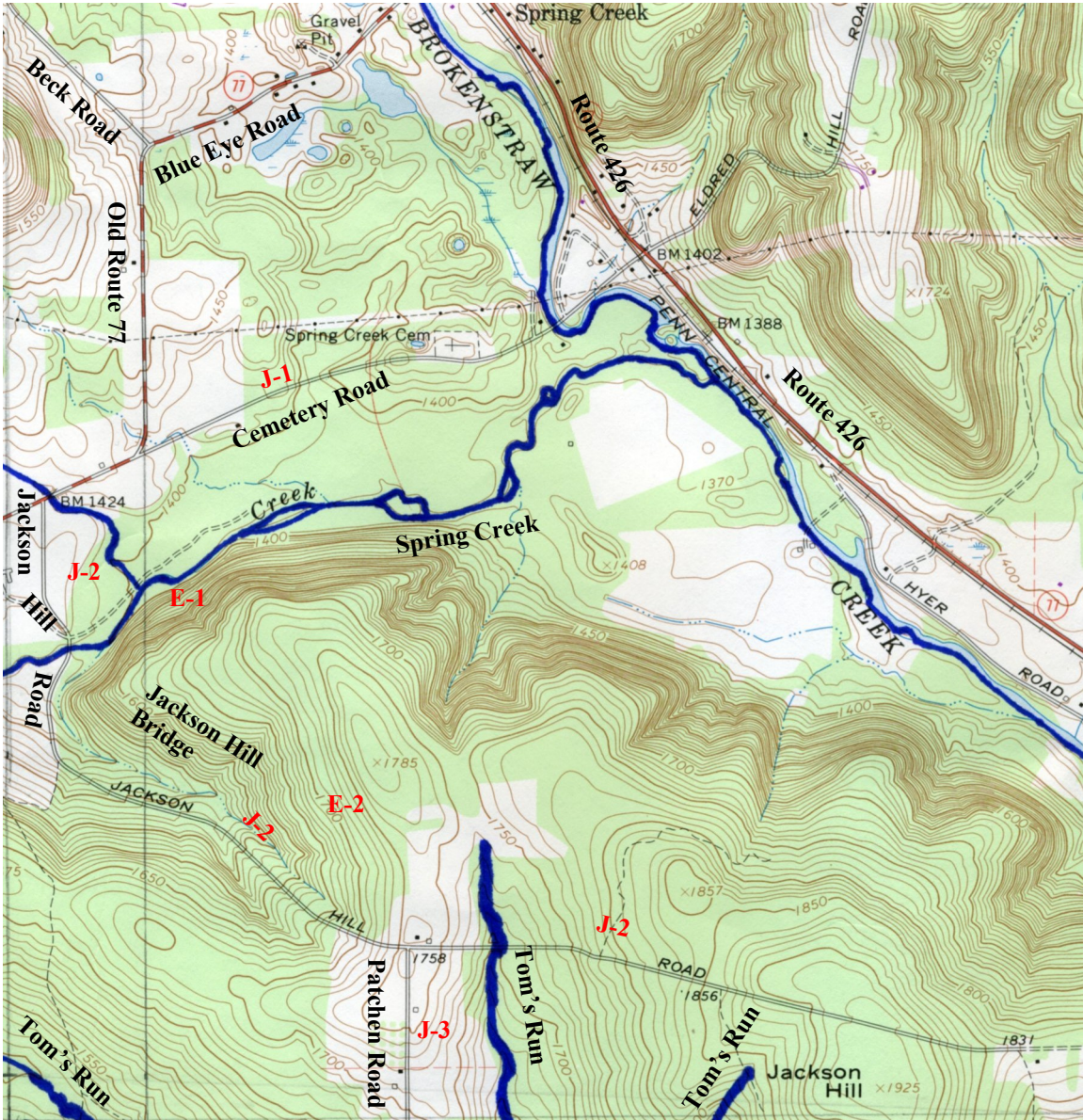
**The team compiled observations and data.
The following MAJOR ACTION ITEMS have been identified
as a result of the assessment of the main stem of Spring Creek.**

- A. Reclassify Spring Creek to Exceptional Value Status.**
- B. Devise a Professional Baseline Water Quality Analysis/Profile.**
- C. Preserve/Protect Areas Critical to Maintaining Healthy Ecological Integrity and Function.**
- D. Establish Monitoring Program.**
- E. Address Restoration of Buffers, Timbering related Bank Stabilization, and Sedimentation.**
- F. Control Invasive Plant Species & Deer Population.**
- G. Address Agricultural High Nutrient Loads & Sedimentation Run-off (lack Of BMP's)**
- H. Reduce Thermal Pollution by Replacing Lawns with Buffer Zones.**
- I. Address Numerous Small Dams Across Spring Creek.**
- J. Minimize Sedimentation from Dirt & Gravel Roads.**
- K. Foster Educational Efforts to Increase Awareness, Knowledge, & Appreciation of Watershed.**
- L. Educate the public about the Development of Gas Bearing Shale Formations and Injection Wells in the Spring Creek Watershed and the potential environmental impact in the Spring Creek Watershed.**

The following four maps will indicate the locations in Segments 1, 2, 3, & 4 where the various **MAJOR ACTION ITEMS**

A. through L. should be implemented

Segment 1 Confluence with Brokenstraw Creek to Jackson Hill bridge



E. Address Restoration of Buffers, Timbering Related Bank Stabilization and Sedimentation.

J. Minimize Sedimentation from Dirt & Gravel Roads.

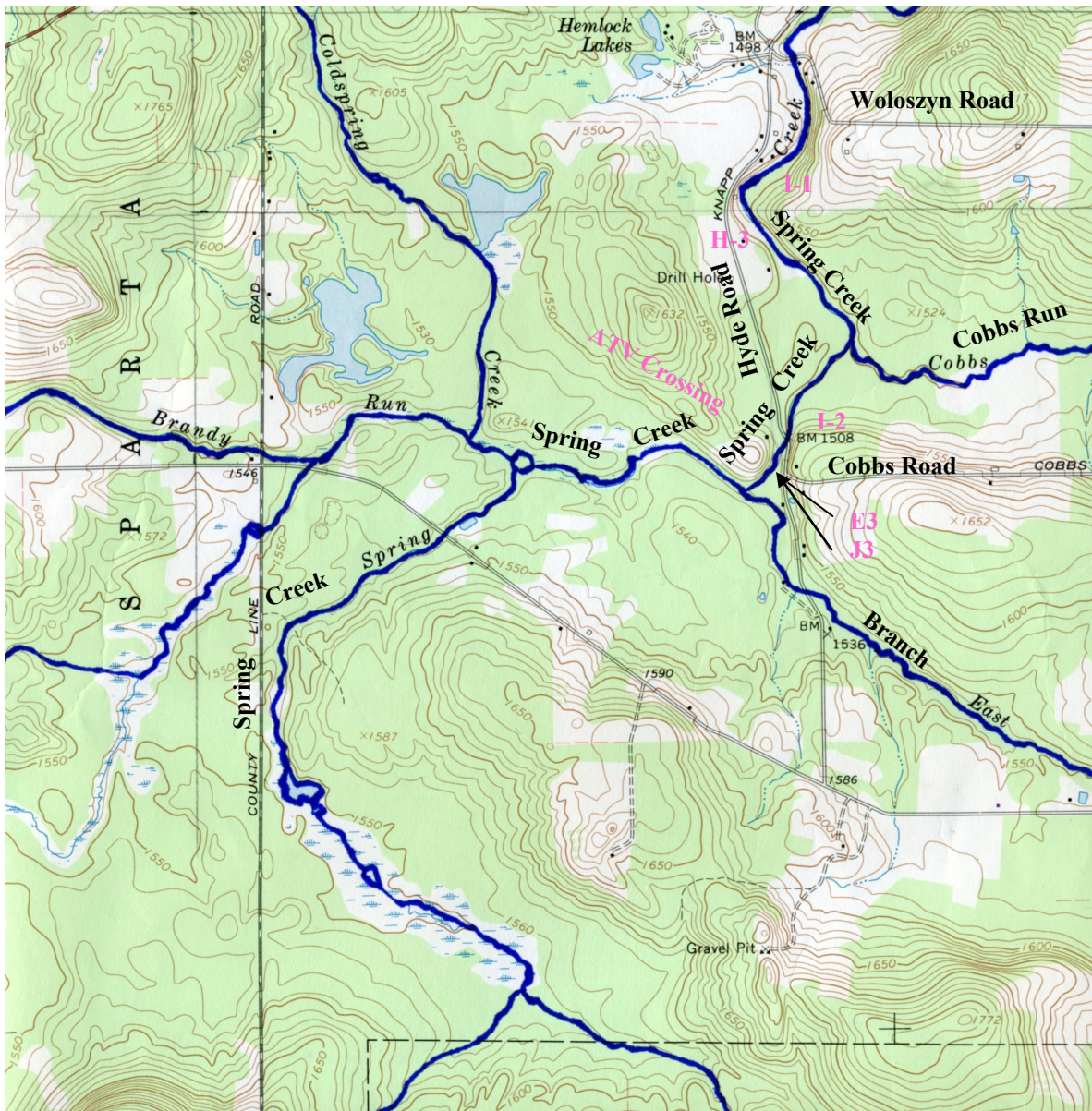
Segment 3 Confluence with Whitney Run to Woloszyn Road Bridge



E. Address Restoration of Buffers, Timbering related Bank Stabilization, and Sedimentation.

G. Address Agricultural High Nutrient Loads & Sedimentation Run-off (lack of BMP's). (In this case, there is also run-off from gravel excavation.) Assess impacts of recent gravel excavation on flood plains

Segment 4 Woloszyn Road Bridge to the headwaters
at the confluence with Coldspring Creek and Brandy Run.



E. Address Restoration of Buffers, Timbering related Bank Stabilization, and Sedimentation

H. Reduce Thermal Pollution by Replacing Lawns with Buffer Zones

I. Address Numerous Small Dams Across Spring Creek

J. Minimize Sedimentation from Dirt & Gravel Roads

A. Reclassify Spring Creek to Exceptional Value Status & Place Conservation Easements wherever possible to Preserve/Protect Areas Critical to Maintaining Ecological Integrity Resources and Functions

It has been determined that the top priority for the conservation and preservation of Spring Creek is the **reclassification from High Quality** to a designation of **Exceptional Value**. This conclusion is based, in part, upon the recommendation of the Pennsylvania Natural Heritage Program that states such Biodiversity Area “sites of exceptional significance merit quick, strong, and complete protection.” In addition Spring Creek meets the extensive criteria required for this designation in the Pennsylvania code 93.4b which are summarized below:

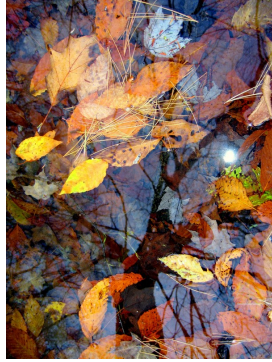
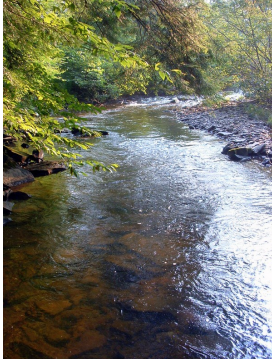
Chemistry– For an extended period of time, at least one year of data, 99% of the time the water has exceeded the criteria necessary to support the propagation of fish, shellfish, and wildlife and recreation in and on the water.

Biology– A peer review assessment must indicate that the creek habitat is sustaining a high quality and quantity of aquatic life including surface water and bottom dwelling (benthic) macroinvertebrates such as insect larvae. The outcome of the review must demonstrate that the water achieves a score of 92% when compared to a reference stream.

Additional Biological Information– The Fish and Boat Commission has designated **Spring Creek as a Class A wild trout stream** with naturally producing eastern brook trout. The surface water is of exceptional recreational and ecological significance.

To complement the **Exceptional Value** classification the Council should prioritize the most biodiverse and pristine sections of Spring Creek for placement of **Conservation Easements** whenever possible.

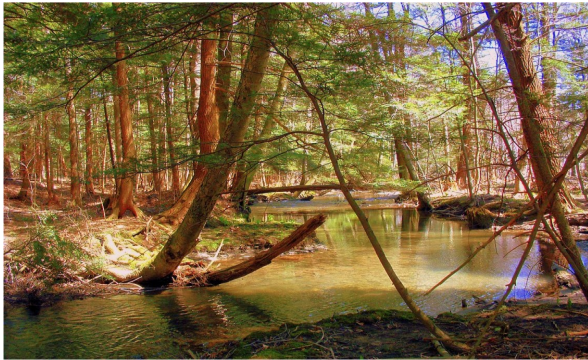
B. Devise a Professional Baseline Water Quality Analysis/Profile.



Main Stem of Spring Creek Autumn Water Reflections

The Brokenstraw Watershed Council must recruit experts in various disciplines to compile this data. Otherwise the information would not be considered legally credible if challenged. In light of the energy exploration emerging in our region, this baseline information is crucial to keep all parties accountable for their actions in regard to our most precious water resource. The data would prove in a measurable way the degree and source of contamination. For example, methane from deep hydrofracturing can be distinguished from shallow gas well methane.

C. Preserve and Protect Areas Critical to Maintaining Healthy Ecological Integrity and Function

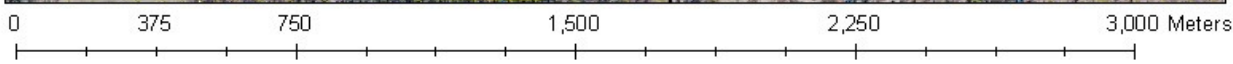
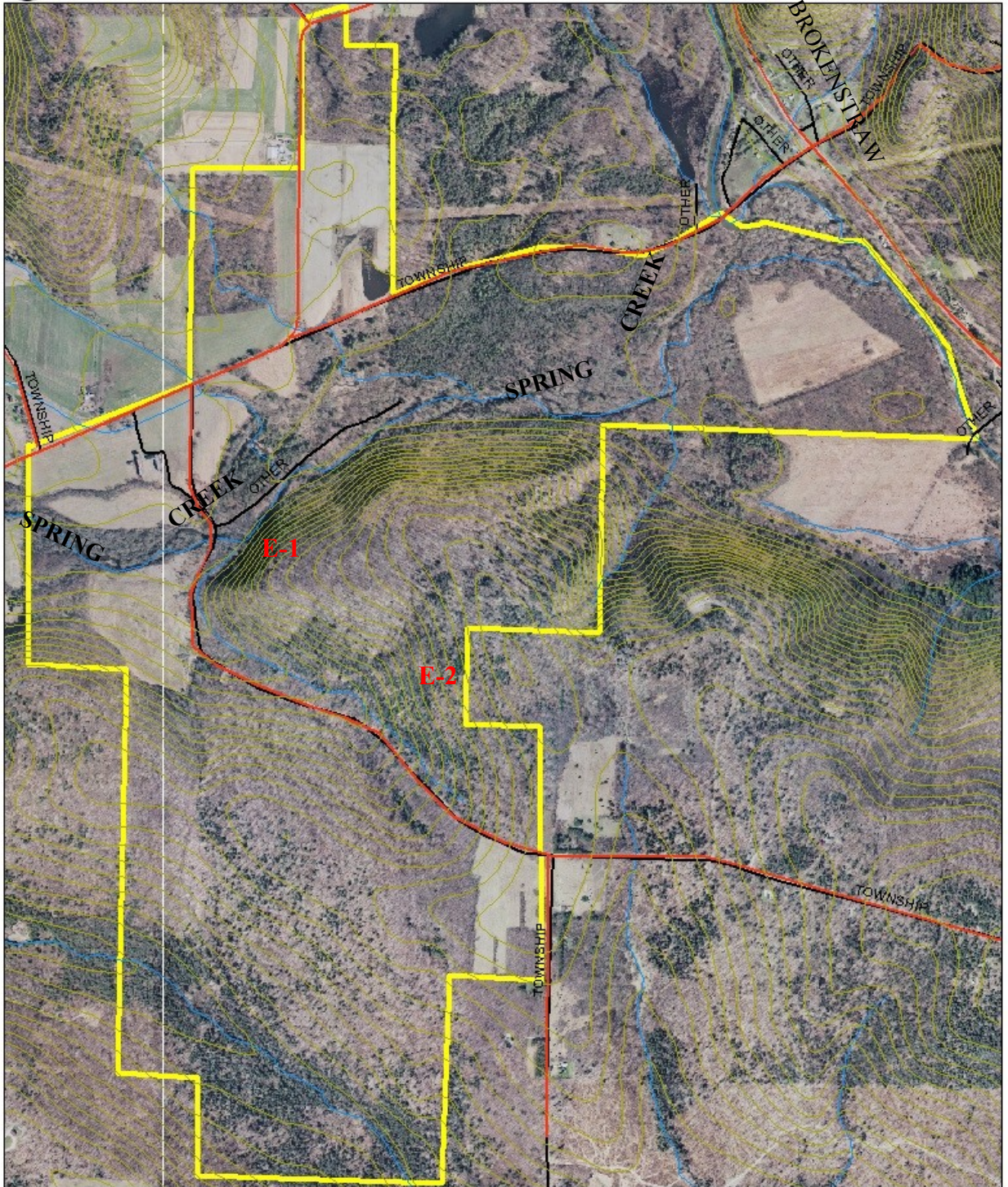


Segment 1 Greeley Run, a tributary of Spring Creek

The Carlisle Estate is in Spring Creek Township, Warren County, 14 miles west of Warren, PA. The 1,130 acre property consists of hemlock, beach, forest, and fens with 2.23 miles of frontage on both sides of Spring Creek, a designated high-quality coldwater wild trout stream. The property is 2.3 miles long and 1.9 miles wide. The property also contains 0.55 miles of frontage along the Brokenstraw Creek. Additionally, the property contains more than 3.3 miles of tributary streams, including 1 mile of frontage on both sides of Tom's Run. The Cleveland Museum of Natural History has been surveying northwestern Pennsylvania since 1984 and ranks the Carlisle property at the top of 100 unprotected properties in northeast Ohio and northwestern PA based upon the number of rare species and the quality of the habitat. There are 39

Pennsylvania Natural Heritage Program listed species on the Estate, 13 flora and 26 fauna. The 6.16 miles of streams together support a thriving population of Brook Trout, two native lampreys, and a high diversity of cold-water fish, including the globally vulnerable reddsides. This stretch of Spring Creek also supports an outstanding diversity of caddisflies, more than 80 species, many of which are very rare (two ranked globally vulnerable), and nearly 20 species of stoneflies. A forest fen on this property is considered one of the best examples of this habitat in western Pennsylvania. Many rare plants are found on the Carlisle Estate, including naked miterwort (*Mitella nuda*), backward sedge (*Carex retrorsa*), northern green bog orchid (*Platanthera hyperborea*), Clinton's wood fern (*Dryopteris clintoniana*), Hill's pondweed (*Potamogeton hillii*) and Appalachian violet (*Viola appalachiensis*). The latter two are ranked G3 Globally Vulnerable by NatureServe. Several state-listed dragonflies have also been found on the property. A more comprehensive survey of the area will surely reveal other rare species. The diversity is largely due to the constant abundance of high-quality, pure water from the innumerable springs and seeps. High pH alkaline water is required by many of the rare plants and aquatic insects. 7.2 is the average pH in this region of the watershed.

The major threats to biodiversity on the property are invasive plant species and White-tailed Deer. The most invasive plant species are garlic mustard (*Alliaria petiolata*), Eurasian bush honeysuckles (*Lonicera spp.*), multiflora rose (*Rosa multiflora*), Japanese knotweed (*Polygonum cuspidatum*), and reed canary grass (*Phalaris arundinacea*). The Brokenstraw Watershed Council has an invasive species removal program, and has been most successful with garlic mustard. The Carlisle Estate floodplain habitat supports a healthy population of West Virginia White Butterflies (*Pieris virginianensis*, G3 G4 S2S3) population. An annual garlic mustard pull has been instituted by the Council to maintain this critical spring flower habitat. The CMNH Land Steward has sprayed reed canary grass on the property and the Museum has donated a backpack sprayer to the BWC.



Albert Carlisle Property
Spring Creek Pennsylvania

-  CREEKS & RUNS
-  CARLISLE PROPERTY BOUNDARY
-  ROADS

Listed Rare Species
Compiled by David Kriska
Cleveland Museum of Natural History

BWC Listed Rare Species on Carlisle Land Spring Creek, PA Warren County

1240 acre hemlock beech forest

25 listed species:

12 flora-14 fauna:

Round Pigtoe *Pleurbema sintoxia* S2 G4 G5

Elktoe *Alasmidonta marginata* S4 G4

Mountain Brook Lamprey *Ichthyomyzon greeleyi* G3 G4 S2 T

West Virginia White Butterfly *Pieris virginiensis* G3 G4 S2 S3

Northern Water Shrew *Sorex palustris albibarbis* G5 T5 S3 CR;

Wood Turtle *Glyptemys insculpta* G4 S3S4

Harlequin Darner *Gomphaeschna furcillata* G5 S2

Spatardock Darner *Rhionaeschna mutata* G4 S1

Amber-winged Spreadwing *Lestes eurinus* G4 S3

Baltimore Checkerspot *Euphydryas phaeton* G4 S2 S4

Brook Stickleback *Culaea inconstans* G5 S3 PC CP

10 flora-6E 3T 1R:

Leafy Northern Green Orchid *Platanthera hyperborean* E;

White Adder's-mouth Orchid *Malaxis brachypoda* G4 PE

Naked Mitrewort *Mitella nuda* E

Hill's Pondweed *Potamogeton hillii* G3 E

Backward Sedge *Carex retrorsa* E;

Northern Water-plantain *Alisma triviale* E

Appalachian Blue Violet *Viola appalachiensis* G3 T

Clinton's Wood-fern *Dryopteris clintoniana* T

Red Currant *Ribes triste* T

Meadow Willow *Salix petiolaris* R

Shumard's Oak *Quercus shumardii* PE S1 or S2

16-18 stone fly sp.

80-90 caddis fly species in the fen several were state and global ranked (3-G1, 3-G2, 40 proposed for listing by PA Fish Commission; (1 of 6 places in PA can get 20 or more caddisflies sp in hour Edwin C. Masteller)

Ohio Lamprey *Ichthyomyzon bdellium* & **Northern Brook Lampreys** *Ichthyomyzon fossor* in Spring Creek seen on property- no voucher; possible

Least Shrew *Cryptotis parva* G5 S1 PE needs determination

Harry Lee has beetle info, 6 sp. significant, carrion beetle

Class A Wild Trout Stream PA State designated Brook Trout *Salvelinus fontinalis*' only native species

Archaeological Native American Site- Paleo polished hematites w/ burials, Part of historic

Cussewago Trail to Meadville, campsites, Glacial Kames people

Goshawk Nesting *Accipiter gentilis* in Spring Creek watershed S2, S3 B S3N

Great Blue Heron 2 Nests *Ardea herodias*

Northern Flying Squirrel *Glaucomys sabrinus* very possible

Smooth Green Snake *Liochlorophis vernalis* G5 S3 S4 seen- no voucher

White-faced Meadowhawk *Sympetrum obtrusum* G5 S3

Northern Bluet *Enallagma annexum* G5 S3

Azure Bluet *Enallagma aspersum* G5 S3 S4

Northern River Otter *Lontra canadensis* G5 S3

Emerald Spreadwing *Lestes dryas* G5 S3

D. Establish Monitoring Program



Ken Hazeltine



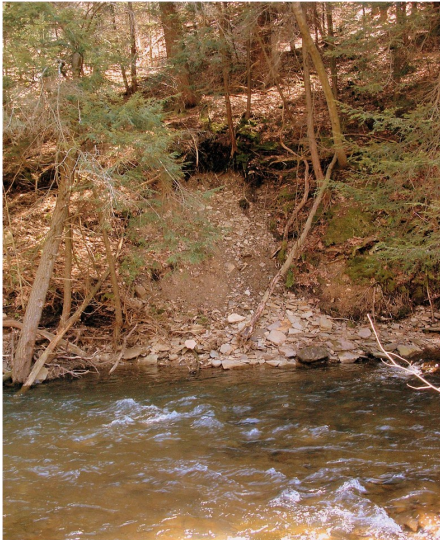
Joan Hamel



Kathy Kosko

An ongoing monitoring program would be an essential part of maintaining these high quality waters that support the remarkable biodiversity of the Spring Creek watershed.

E. Address Restoration of Buffers, Timber related Bank Stabilization & Sedimentation



A major sedimentation event on the Carlisle Estate was caused by a logging operation's failure to implement required sedimentation and erosion practices.

Segment 1 Haul road construction for timbering across the face of a steep slope adjacent to the creek has interrupted the natural drainage flow and concentrated run-off. That in turn is causing slope failure and the periodic deposition of large amounts of sediment into the creek. (See appendix: Oxbow Report, for further description and prescriptive solutions.)



← ↑ Hyde Road timbering

Segment 3

Trees on both sides of the creek were cut at water's edge and dragged through the stream. A large bridge was dragged down a steep slope to a landing area. There were no erosion controls. Consequently, there were deep ruts. The buffers should have been restored and banks stabilized.

No Restoration of Buffer Zones

No Stabilization of Banks

No Bridge Permit Obtained

F. Control Invasive Plant Species & Deer Population

Segment 1,2,3& 4 The Natural Areas Division of the Cleveland Museum of Natural History and the Brokenstraw Watershed Council have targeted the removal of the most invasive plant Species: Tartarian Honeysuckle, Reed Canary Grass, Multiflora Rose, Japanese Knotweed and Garlic Mustard on the Carlisle Estate in Segment 1. These invasive plants are found in all the segments with the exception of knotweed. The Brokenstraw Watershed Council, through public events, has begun to involve and explain how invasive species are affecting our native biodiversity.



Photo by Matthew C. Perry

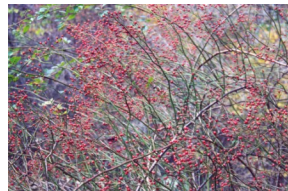


Tartarian Honeysuckle
Lonicera japonica

← **Reed Canary Grass**
Phalaris arundinacea L.



Japanese Knotweed →
Polygonum cuspidatum



↑ **Multiflora Rose** ↓
fall /spring
Rosa multiflora



Garlic Mustard
Alliaria petiolata



G. Address Ag. High Nutrient Loads & Sedimentation Run-Offs, (lack of BMP's)



Segment 2 After Tom's Run, the riparian buffer separating agricultural fields from the stream is restricted to a width of ten to fifteen feet on each side resulting in thermal pollution and agricultural run-off. There is siltation as a result of earth disturbance from an existing ford crossing utilized by the landowner.

Beginning at the Oil Creek Road Bridge, a large, unfenced cow pasture borders Spring Creek on both sides. With no riparian buffer, the cattle freely access the stream. There are government programs that offer advice and incentives to implement Best Management Practices (BMP). The Brokenstraw Watershed Council will offer to help our neighbors establish buffer zones, stream bank fencing, and other BMP's to filter, cool, and preserve the water channel. Such actions will support rare, diverse, coldwater native species as well as human needs for clean water.



Segment 3 Upstream on Spring Creek beyond the confluence with Whitney Run, there are similar issues. The pasture on the right has been fenced to limit horses from accessing the entire stream which is a good practice. It would have been better yet if the fence had been moved farther into the pasture to create a larger riparian buffer to filter the stream from animal waste. Upstream from the pasture, cultivation and an active gravel pit close to the creek poses the threat of chemical and thermal pollution as well as sedimentation.

H. Reduce Thermal Pollution by Replacing Lawns with Buffer Zones

Segment 1 As a result of high grading timber practices without regard for feeder stream buffers on the Carlisle Estate, restoration work is required to reduce sedimentation and thermal pollution from canopy removal. The majority of listed species on the property are associated with these waterways.



Segment 2

Along this more agricultural segment, cows have direct access to the stream. There is a need for buffer restoration. A planting of native shrubs and trees would reduce thermal pollution and minimize runoff. By cooling the creek, this practice will also deter the excessive nutrient enrichment that caused the above algae growth.

Segment 4

Some residents mow their lawns to the edge of the stream. Planting trees, shrubs, and native ground cover will keep yards and harmful sediment from eroding into the creek. The vegetation forms a shady canopy that cools the water and prevents thermal pollution. They serve preserve the coldwater stream habitat that support our rare flora and fauna.

I. Address Numerous Small Dams Across Spring Creek



Segment 4 Small homemade dams are a pervasive problem in this section of Spring Creek from Hemlock Lakes Campground to Hyde Road Bridge. By blocking the natural flow of the stream, slow moving water gathers in warm pools that deter the free migration of coldwater aquatic life and the upstream spawning of our native Brook Trout (*Salvelinus fontinalis*).

J. Minimize Sedimentation from Dirt and Gravel Roads

Segment 1 Township dirt and gravel roads (Cemetery Road, Jackson Hill Road and Bridge, and Patchen Road) are sources of silt and sedimentation in feeder streams of Spring Creek.

Segment 4

Downstream from the confluence with East Branch, Spring Creek flows over an impoundment and under the Knapp Road Bridge. Chuck Keeports, Allegheny National Forest hydrologist, noted road salt, mud, and dirt enter the creek as a result of the open sides and gridded road bed design.



The bridge above is temporary. Spring Creek Township Supervisors have finished the bidding process and have chosen a construction firm from Franklin, PA. At the December Township meeting, supervisors and the firm will be discussing the bridge construction details.



This private dirt road runs along a slope that parallels Spring Creek on the left and a steep, rocky cliff on the right.

To the right, the dirt road has been buttressed with logs on the Spring Creek slope in an unsuccessful attempt at stabilization. The timbers, rocks, and loose soil are falling into the creek. The situation needs further examination to ascertain if there are plausible options to mitigate the problem.

K. Foster Educational Efforts to Increase Awareness, Knowledge, & Appreciation of the Watershed



BEAR LAKE FIELD TRIP Organized by Tom Stroup, a BWC member who knows the natural areas in the Watershed, and James Bissell, PhD from the Cleveland Museum of Natural History.

Other Examples of Opportunities to Gain Knowledge and Appreciation of the Watershed

- The Council invited Alan Hillyard, Public Outreach Educator for Allegheny National Forest to present a National Wildlife Federation Program on **how to attract wildlife year round by creating habitat in backyards, schoolyards and community spaces**. In conjunction with the program, we had a **native plant sale**.
- Shayne Hoachlander, Pennsylvania Game Commission Land Management Group Supervisor, presented a program entitled **Habitat in the Brokenstraw Watershed**.
- Tom Stroup arranged for Roger Roth, owner of the **Corry Bog**, to invite the Council and the community to **tour the bog** with James Bissell, PH.D. Curator of Botany, Coordinator of Natural Areas... The Cleveland Museum of Natural History.
- James Hall, Forestry Consultant, presented a program on **Best Management Timbering Practices**.

L. Be Prepared and Informed about Anticipated Development of Gas Bearing Shale Formations and Wastewater Injection Wells in the Brokenstraw Watershed

Pennsylvania's **oil and gas industries** has moved forward with **fracturing and wastewater disposal**. The Brokenstraw Watershed Council's **mission is to empower our watershed community to promote and protect the health and wealth of the watershed**.