Wallacks Branch
Coldwater Conservation Plan

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Prepared by the
Bobs Creek Stream Guardians
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for

Coldwater Heritage Partnership

Foreword

The Bobs Creek Stream Guardians have made it their mission to conserve, protect and rehabilitate the natural resources of the Bobs Creek watershed on both private and public lands so that future generations can enjoy a clean, high-quality watershed for many years to come. Several goals were identified to attain this vision: cleaning up litter and illegal dumps from the waterways and roads; identifying and resolving sedimentation issues from land use by the farmers, businesses, and residents in the region; and monitoring the water chemistry to identify quality problems. The Stream Guardians envision themselves as a catalyst to secure funding for improvements on both public and private lands and attain this by the development of communication links with township, county, state, and federal representatives. The importance of educating the public to resolve septic, solid waste, and nutrient issues as well as the blight of junk vehicles is a continuing focus.

Acknowledgements

Partnerships have developed with agencies and municipalities including: the Bedford County Conservation District, Keep Bedford County Beautiful (formerly PA CleanWays of Bedford County), Blue Knob State Park, the Western Pennsylvania Conservancy, the Pennsylvania Fish and Boat Commission, the Pennsylvania Game Commission, the Pennsylvania Department of Environmental Protection, the U. S. Geological Survey, Pavia, Lincoln, King, East St. Clair and Greenfield Townships, Stroud Water Research Center, the Pennsylvania Council of Trout Unlimited, the Fort Bedford Chapter of Trout Unlimited, the Susquehanna River Basin Commission, and local landowners with a stake in a healthy watershed. All have played a role in the successes of the Bobs Creek Stream Guardians.

In addition, the Bobs Creek Stream Guardians wish to acknowledge the Coldwater Heritage Partnership and the partners who make possible the leadership, coordination, technical assistance, and funding support for the evaluation, conservation and protection of Pennsylvania's coldwater streams.

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Introduction

The Bobs Creek Stream Guardians' motivation to conduct an assessment of Wallacks Branch of Bobs Creek was inspired by a realization that there was a local misunderstanding of the fishery classification status of the stream, by anecdotal evidence of the quality of the fishery, and by a desire to analyze and document not only the trout population but also the water quality and aquatic community of the stream. Concurrent with the undertaking of this project, ownership of several parcels along Wallacks Branch changed, and there also arose opportunities to enhance habitat in and along Wallacks Branch. These changes have importance for the effects, good or bad, that might occur but also complicated development of this conservation plan. The subject became something like a moving target, requiring amendments to the plan if it were to remain relevant.

The Bobs Creek Stream Guardians organized in 2002, largely in response to a need to cleanup litter and illegal dumps in the watershed. With assistance from PA CleanWays of Bedford County (now Keep Bedford County Beautiful), the first annual Bobs Creek Cleanup occurred in April 2002. Through Growing Greener funding and with the assistance of partners including the Susquehanna River Basin Commission, the Western Pennsylvania Conservancy (WPC), the Alliance for Aquatic Resource Monitoring (ALLARM), and Blue Knob State Park (BKSP), the Stream Guardians tackled other projects in the watershed. Watershed education workshops for teachers, stream monitoring by local volunteers and students, removal of illegal dumps and junk cars, road improvement projects to limit sediment pollution from private roadways, stream bank stabilization and aquatic habitat improvement projects, and tree-planting activities have been added to the accomplishments of BCSG. A previous Coldwater Conservation Plan for Rhodes Run, Ciana Run, and Ickes Run in the Bobs Creek watershed was completed in July 2005.

Prior to the time the BCSG began considering the pursuit of funding for the Wallacks Branch study, a property at the mouth of Wallacks Branch be-came available and, with the financial assistance of the WPC, the Griffith tract was added to Blue Knob State Park. This added about 2/10 of a mile of stream and about 20 acres to the public lands portion of the Wallacks Branch watershed. The purchase agreement included the sale of all marketable (>14") timber from the tract with the proceeds due the previous landowner. Through the

influence of the Stream Guardians and James Davis, former manager of Blue Knob State Park, the timber harvest was restricted from a buffer of fifty feet on each side of the streams. This buffer insured that the harvest did not have serious impact to Bobs Creek or Wallacks Branch.

After the Stream Guardians received the funding for the Wallacks Branch Coldwater Conservation Plan, they again contracted with WPC to provide training in visual habitat assessment, as had occurred for the previous plan for Rhodes Run et al. This training took place on July 17, 2008, coincidentally the same day Tim Clingerman, Stream Guardians chairman, received notification of the pending grant round for habitat projects through the Eastern Brook Trout Joint Venture (EBTJV), a Fish Habitat Partnership operating under the National Fish Habitat Action Plan of the US Fish and Wildlife Service. A conversation on that day with WPC staff about this funding opportunity led to a grant proposal from WPC for funding to rehabilitate habitat on Wallacks Branch, primarily on the former Griffith tract. The proposal was approved in August 2009 and work was completed in 2010. In 2010, the Bedford County Conservation District applied for Growing Greener funding to continue habitat improvement work and this proposal was approved with work to commence in 2012.

It is in the context of this narrative that data gathering and development of the Wallacks Branch Coldwater Conservation Plan was undertaken.

Wallacks Branch wild brown trout

Description of Watershed

The Bobs Creek watershed is located in the northwestern corner of Bedford County with portions of the uplands in Blair and Cambria counties. The village of Pavia provides a good delineation point between the headwater sections and the lower valley segments. A short distance upstream of Pavia, near the SR 869 bridge crossing, Wallacks Branch joins Bobs Creek, draining an area of 4.990 square miles in the western part of the Bobs Creek watershed. (See map *Wallacks Branch Location Within Bobs Creek Watershed* in Appendix) The main stem of Wallacks Branch flows for 4.57 miles, in a generally southeasterly course, from an altitude of nearly 2400 feet to an outfall on Bobs Creek at 1464 feet, a basin slope of about 13.5 degrees. This main stem and the two named tributaries, Big Break Hollow Run and Little Break Hollow Run, flow off the Allegheny Front, draining lands along the Bedford-Cambria county boundary. While none of the 11.8 total miles of flowing surface water of the Wallacks Branch watershed lie within Cambria County, there is a small part of the watershed (66.7 acres, 0.269 square miles or 5.3%) in Cambria County, near where SR 869 crosses the county line.

Little Break Hollow Run, Big Break Hollow Run, and the unnamed tributary that enters Wallacks Branch near the Burnt House Picnic Area have stream sections with high gradients flowing off the steep easterly facing front of the Alleghenies. Portions of Big Break Hollow Run flow down terrain with gradients exceeding 30%. To the east, Forks Ridge confines the Wallacks Branch drainage with many small, steep, and seasonal cascades, as well as seeps, draining this upland. State Route 869 follows the same course as the stream through the valley with two bridged stream crossings, but over most of the length of stream and road, the separation is 75 to 400 feet.

Morphological classification of the streams in the watershed by the Rosgen system would designate the upstream two-thirds of Wallacks as A2 or A3 sections; steep, structurally controlled, low sinuosity, entrenched streams with low width to depth ratios and channels dominated by boulders (A2) or cobble (A3). Most of the tributaries would also be so classified but with some sections of A1 type (dominantly bedrock channel) or A1a+, A2a+, or A3a+, very steep (>10% slope) with bedrock, boulder or cobble as dominant bed materials. The lower third of Wallacks Branch flows with much less gradient and a greater width to depth ration and is primarily of B3 type, cobble dominated, but with small sections of A type characteristics.

There are no areas of interest within the Wallacks Branch watershed cited in the Bedford County Natural Inventory (WPC, 1998). However, there are remarks that note the presence of numerous hemlock-dominated, high-altitude wetlands on the slopes and shallow benches of the Allegheny Front. Unfortunately, within the Bedford County portion of the Bobs Creek watershed, the survey notes that historic logging altered these ecological niches and that recovery is uncertain.

Geology

Bedford County is primarily in the Valley and Ridge Physiographic Province with a smaller area along the western border and in the far northwestern corner being part of the Appalachian Plateau Physiographic Province. From the village of Pavia downstream, Bobs Creek flows through a moderately broad valley but the headwaters flow through a jumble of narrow valleys and steep ridges lying between the escarpment of the Allegheny Front (forming the boundary between the two provinces) to the west and the mass of Blue Knob Mountain (3136 feet) to the east.

The bedrock in the valleys of the Bobs creek watershed consists of the Upper Devonian Catskill Formation, consisting of sequences of sandstone, siltstone, and shale. The mountains in the park are capped by the Mississippian Burgoon Sandstone, which is underlain by the transitional Devonian-Mississippian Rockwell Formation, consisting of cross-bedded sandstone with some shale beds. See the maps from Map 61 - Atlas of Preliminary Geologic Quadrangle Maps of Pennsylvania for the Beaverdale and Blue Knob quadrangles in the Appendix.

Marcellus shales underlie the entire Wallacks Branch watershed. The Pennsylvania Geological Survey of the DCNR has mapped the shale layer and shows a depth of 75 feet to 125 feet for the thickness of the shale in the upper Bobs Creek area.

Soils

Soils in the headwater areas of Bobs Creek have weathered from the sandstone, siltstone, conglomerate, and shale rocks that were formed during the Mississippian and Devonian ages. As calculated by the US Geological Survey's

StreamStats on-line application, the mean soil depth to rock in the Wallacks Branch watershed is 4.08 feet.

Maps of the soils in the Wallacks Branch study area are included in the Appendix in two forms: the Web Soil Survey version from the US Department of Agriculture National Resources Conservation Service, and a GIS color-coded version prepared by the Bedford County Conservation District. The main stem of Wallacks flows through Albrights and Basher-Birdsboro complex soils from gentler slopes of BbB to moderately steep AbC units. The Albrights soils are characteristic of drainageways dissected by intermittent streams and are deep with seasonally high water table and moderate erosion hazard. There is a reddish brown silt loam surface layer of about 5 inches with subsoil of reddish brown silt loam, mottled reddish brown clay loam. The Basher soils have reddish brown silt loam at the surface of about 8 inches depth with reddish brown and yellowish brown subsoil layers. The Birdsboro soil has a dark brown silt surface layer of about ten inches. Both Basher and Birdsboro soils have seasonal high water tables with slight to moderate erosion hazard. While Albrights, Basher and Birdsboro soils are suitable for crop and pasture uses; the high water table and occasional flooding may limit operations. The soils are suitable for woodland with potential for moderately high productivity. For most other uses (roads, home sites, and onsite waste disposal), these soils have limitations.

The upper part of Wallacks Branch flows through areas of Buchanan cobbly loams (BwC and BwD units). These steeper soil units are very deep, moderately well drained and are typical of the lower and middle slopes of mountains and ridges. They are extremely stony, large stones covering 3 to 15 of the surface. These soils usually have a surface layer of very dark grayish brown cobbly loam about 3 inches thick and subsoil layers of yellowish brown gravelly loam over mottled pale brown gravelly clay loam. These soils are suitable for woodland with limitations for most other uses, though with clearing unimproved pasture is possible. Permeability is moderate as is water capacity. Surface runoff is medium and the erosion hazard is moderate.

A significant portion (14.3%) of the watershed has soils of Klinesville and Calvin soil group (KmE) and these are shallow to moderately deep, steep soils of 25 to 50% slopes. Both Linesville soils have dark reddish brown silt loam surface layers about 2 inches thick. Klinesville subsoils are reddish brown, very channery silt loam about 18 deep over shale and

siltstone bedrock. Calvin soils have a dark brown channery silt loam surface layer over a deeper reddish brown, channery silt loam subsoil and a reddish brown, extremely channery substratum. Shale bedrock is at a depth of about 40 inches. Permeability is moderately rapid in these soils with low water capacity, very rapid runoff and a severe hazard of erosion. Suitable uses are limited to woodland by the steep slope and shallow depth to bedrock.

Meckesville soils comprise about 20% of the watershed on steep slopes of 15 to 25% slope (MdD) and 25 to 35% slope (MdE). Many of the tributaries flow over these very deep, well drained soils that are typical of foot slopes, side slopes and benches of major ridges. Large stones cover up to 3% of the surface with a dark reddish brown, gravelly loam surface layer about one inch thick over a reddish brown, gravelly loam subsurface layer of three inches. Subsoil layers of reddish brown, gravelly loam of about 26 inches over a brittle, reddish brown, gravelly loam to a depth of 60 inches. Included within this soil in mapping are areas of extremely stony soils. Permeability is moderate as is water capacity. Runoff is rapid and the erosion hazard is very severe. The soils are not suited for crops and only MdD areas can possibly be used for unimproved pasture with clearing. The steep slopes and large stones limit other uses except woodland.

The Dystrochrepts-Rock outcrop complex (DkF) of very steep (35-70%) slopes is found near the top and along the upper side slopes of the Allegheny Front. Surface stones and boulders cover 15 to 90 % of the area; and rock outcrops are on the upper side slopes of ridges and on ridge tops, about 15% of the map unit. Dystrochrepts comprise about 65% of the area. The surface layer is usually under a layer of stones and boulders and is very channery loamy sand. The subsoil is pale brown to yellowish brown, very channery, sandy loam. The soil layers are shallow to very deep (10 – 60+ inches), well drained to excessively drained with rapid permeability, low water capacity, rapid runoff and severe erosion threat. The soils are unsuitable for farming and most uses other than woodland.

Klinesville–Rock outcrop complex (KoF) consist of shallow, well drained Klinesville soils and rock outcrops on sides slopes of ridges and hills. These are very steep (35-80%) slopes with about 10 rock outcrop and flat stones covering 3 to 15 % of the surface.. The soils surface layer is about two inches of dark reddish brown, channery silt loam over a subsurface layer of reddish brown, channery silt loam about 4 inches thick. The subsoil of reddish brown, very channery silt loam is about

18 inches over shale bedrock. Permeability is moderately rapid, water capacity is low, surface runoff is very rapid and erosion hazard is severe.

Hazleton-Clymer association soils, (HTC), comprise a significant portion of the ridge tops of the Allegheny Front. These soils are sloping to moderately steep, deep and well drained. The map unit is 50% Hazleton and 40% Clymer with inclusions of Meckesville, Buchanan, and Ungers soils. Theses are extremely stony soils with stones covering up to 80% of the surface and some areas may have sandstone bedrock less than 40 inches deep though generally its greater than 4 feet deep. Hazelton soils has a black channery, sandy loam surface layer about two inches thick and a subsurface layer of yellowish brown, channery sandy loam about four inches thick. The subsoil extends to a depth of 33 inches; there is yellowish brown loam in the upper subsoil and brown channery sandy loam in the lower part. The substratum to 60 inches is light yellowish brown, channery sandy loam.

Other soils units making up smaller portions of the watershed will not be described here. It should be noted that all of the above noted soil types are moderately to extremely acidic, either throughout or in at least the surface layers. The Albrights and Basher-Birdsboro complex soils are slightly to strongly acidic in the substratum layers.

Climate

Temperatures in the study area are a few degrees cooler than the averages for Bedford County due to the altitude and the Wallacks Branch watershed receives a greater average annual precipitation than the county overall annual average (41.42 inches vs. 40.01 inches). Blue Knob Mountain to the east of the study area receives an average of 160 inches of snow annually and in the Wallacks Branch watershed, fallen snow can persist on north facing slopes and protected hollows late into the spring. Thunderstorms and occasional heavy rains can cause flash floods and damaging stream flows in the narrow valleys.

Land Use

A quick glance at the *Public Lands in Wallacks Branch Watershed* map in the Appendix is all that is needed to learn that watershed is largely comprised of public lands. Nearly 76% of the 4.99 square miles are either part of State Game

Lands 26 (2.37 square miles or 47.5%) or Blue Knob State Park (1.41 square miles or 28.3%). The portion of the watershed in Summerhill Township, Cambria County is wholly within the State Game Lands. The two watershed townships in Bedford County, Lincoln and Pavia, each have portions of private land as well as Blue Knob State Park and State Game Lands 26.

USGS *StreamStats* calculates that the Wallacks Branch watershed is 97.5% forested; the *Land Use in Wallacks Branch Watershed* map in the Appendix visually conforms this assessment. The public lands are predominantly forested; the recreational segments in Blue Knob State Park are the locations of the picnic areas at Burnt House Picnic Area. Sections labeled as "veg" by the PAMAP Land Cover GIS database are largely pasture or hay fields. In the western parts of the watershed, on State Game Lands, there are some larger plots labeled "meadow" that are clear-cut timber harvest areas that were fenced for forest regeneration experiments and some food plots at the King Cabin fields.

Recreation

Outdoor recreation is understandably an important feature of the Wallacks Branch watershed. Hunting for a variety of game animals on State Game Lands, certain areas of Blue Knob State Park, and on private property is vital to the residents and attracts many visitors to the area. Fishing pressure is relatively light on Wallacks Branch since it is not a stocked trout fishery and the heavily stocked waters of lower Bobs Creek are nearby. The facilities at Burnt House Picnic Area are popular with visitors through the summer season.

Lost Turkey Trail, a popular hiking destination, covers over 26 miles in Bedford, Cambria, and Somerset counties. The eastern terminus is about 3 miles to the east of Wallacks Branch on Herman Point, a satellite peak of the Blue Knob massif. The trail enters the Wallacks watershed after climbing the eastern face of Forks Ridge from the Ickes Run Hollow. Following the ridgeline south, Lost Turkey Trail skirts the edge of the watershed before descending, and crossing Wallacks Branch and State Route 869 a short distance north of the Burnt House Picnic Area. From here the trail enters Big Break Hollow and follows upstream to the west, beginning the climb of the Allegheny Front. The trail includes several footbridges and passes stream improvement structures, all built by the Youth Conservation Corps during trail construction in the late 1970s. After several switchbacks the trail leaves the Big Break

Hollow turning north to cross Little Break Hollow, climbing a long traversing route before turning south for a final switchback that brings the trail to a major bench of the Allegheny Front above Big Break Hollow. Here the trail follows an old logging road that is used by the Pennsylvania Game Commission on SGL 26 and leaves the Wallacks Branch watershed. The Wallacks Branch portions of the Lost Turkey Trail are presented on two maps in the Appendix.

Habitat Assessment

As mentioned in the Introduction, habitat assessment training was provided by WPC in July 2008, using a modified version of the Stream Visual Assessment Protocol developed by the NRCS of the USDA. The surveys were undertaken in four sections: 1) from the mouth to the SR 869 bridge upstream of the Burnt House Picnic Area, 2) from the SR 869 bridge at Burnt House Picnic Area to the lower boundary of the private property north of Little Break Hollow, 3) from the upper boundary of the private property to the upper extent of the main stem near the Cambria County line, and 4) Big Break Hollow Run.

The Watershed Visual Assessment protocol, as taught and used by the Western Pennsylvania Conservancy, scores stream segments on ten descriptive characters: channel condition, riparian zone, bank stability, water appearance, nutrient enrichment, fish barriers, instream fish cover, embeddedness, insect/invertebrate habitat, and canopy cover. Each of these is scored on a scale of 1 to 10 (assessment of sewage, manure presence, and abandoned mine drainage are added when applicable). A composite score is obtained to compare the segment to a perfect stream reach (score of 100). The assessment survey form also provides for recording information on current weather conditions, local land use, active channel width, dominant channel substrate, invasive species, GPS points, and other notes. Maps illustrating the location of the surveyed reaches are in the Appendix.

Fort Bedford Trout Unlimited volunteers surveyed the first section, from the mouth to the first SR 869 bridge (near Burnt House Picnic Area), during August and September of 2008. The first reach of this section extends upstream from the mouth on Bobs Creek for about 1200 feet. This reach includes most of the Griffith tract section of Wallacks Branch and, while on the southern side of the stream a wooded riparian zone extends to the summit of Bald Ridge, the northern bank was the site of the Griffith house. In the area where the house once

stood, a gravel parking lot was built for anglers and other park visitors to this area. In the grassy 'field' areas between the parking area and the stream, and elsewhere on the Griffith tract, the Stream Guardians are establishing a buffer zone through periodic plantings. Throughout the entire stream section surveyed by FBTU volunteers, the lack of fish habitat and barriers to fish passage during low water were noted as deficiencies.

From the mouth upstream about 200 feet, Wallacks Branch has a steep gradient. The remaining 1000 feet of this reach are flatter but throughout there is some channel braiding that has occurred, likely during high water events when the active channel is overwhelmed or is partially or temporarily blocked by debris. These channels are dry during low water periods but can divert some flow during the channel forming flows.

The summary of the assessment for this first reach follows:

Wallacks Branch Reach 1
From confluence to 1200 feet above confluence
Land use: 90% forest/10% field; 100% conservation reserve (all in Blue Knob State Park)
Length of reach: 1200 feet
Substrate: Cobble dominant (60%), gravel 30%
Active channel width: 18 feet
Total score: 85
All component scores assessed at 9 except "in-stream fish cover" (4)

Reach 2 extended from the 1200 feet marker to the upper end of the clearing known locally as the "skate pond", the site of a former, seasonally flooded skating and surrounding field area, a distance of about 980 feet. This section has minimal high water channel braiding but there was noted one area of severally eroding bank near the lower end of the reach. Also adjacent to the "skate pond" area are sections of stream where the entire streambed is cobble filled with no defined 'thalweg' or low water channel. This would present a challenge to fish passage in low water conditions. Near the top of the reach, there is a water jack/jack dam that partially accounts for the low score for "fish barriers". The reach summary is:

Wallacks Branch Reach 2
From 1200 feet to 2180 feet (top of skate pond clearing)
Land use: 95% forest/5% field; 100% conservation reserve (all in Blue Knob State Park)
Length of reach: 980 feet

Substrate: Cobble dominant (60%), gravel 23%
Active channel width: 20 feet
Total score: 78
All component scores assessed at except “bank stability” (8), “in-stream fish cover” (4), and “fish barriers” (3)

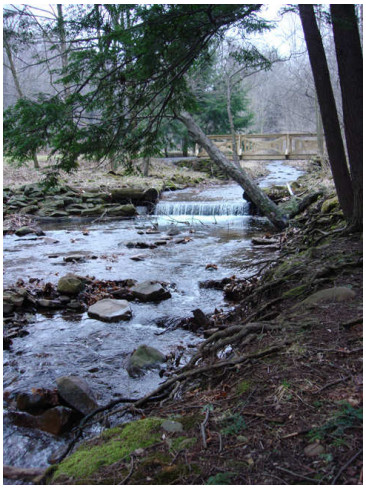
The next reach upstream in the FBTU survey area, Reach 3, is about 1950 feet long and ends within the private property inholding, adjacent to a large clearing along both sides of SR 869. This segment has high water channel braiding throughout, as well as several water jacks and the confluence with the first mapped, unnamed tributary entering from the south off the northern flank of Bald Ridge. The water jacks provided some additional deep pool habitat and the height of the drops off the jack decking was less of a barrier. The reach summary is:

Wallacks Branch Reach 3
From 2180 feet to 4130 feet above confluence
Land use: 90% forest/10% field; 95% conservation reserve (Blue Knob State Park and small segment of private property)
Length of reach: 1950 feet
Substrate: Cobble dominant (60%), gravel 20%
Active channel width: 20 feet
Total score: 82
All component scores assessed at 9 except “fish barriers” (5) and “in-stream fish cover” (5)

Reach 4 includes about 3000 feet of stream, 60% of which is on private property. The upper end of this segment is within the Burnt House Picnic Area, at approximately the lower end of the clearing around the “Deer Lodge” pavilion. This segment includes two water jacks, the remains of an old footbridge, and two significant spring seeps from minor hollows on the slope of Bald Ridge. While the area immediately adjacent to the stream is well vegetated, on north side of the stream on the private property there is a large, overgrown clearing. At the upper end of the private property is a section with significant high water channel braiding and the remains of abandoned channels are found throughout. The reach summary is:

Wallacks Branch Reach 4
From 4130 feet to 7130 feet above confluence
Land use: 80% forest/20% field; 40% conservation reserve (Blue Knob State Park and large segment of private property)
Length of reach: 3000 feet
Substrate: Cobble dominant (60%), gravel 20%
Active channel width: 16-24 feet
Total score: 84

All component scores assessed at 9 except “fish barriers” (6) and “in-stream fish cover” (6)



The last section surveyed by the FBTU volunteers is wholly within the Burnt House Picnic Area and includes several water jacks, two footbridges, and the junction with second mapped, unnamed tributary from the south. An intact vegetated buffer of more than 30 feet extends along the north bank of the stream up as far as the lower footbridge near the restrooms at “Turkey Roost” pavilion. The southern bank is a steep undisturbed lower flank of the ridge. From the lower footbridge upstream, past a water jack and another footbridge, to the bridge crossing of SR 869, there is more modification of the riparian area, with a parking lot and recreational field close to the stream immediately below the SR 869 bridge, albeit with some bank-side trees and other vegetation. There also seems to be some evidence of channel modification and straightening at some time in the past, over most of the upper two-thirds of this reach. With the footpaths, bridges, and picnic areas, this stream section is where most casual visitors will interact with Wallacks Branch.

Wallacks Branch Reach 5
From 7130 feet to 9400 feet (upper limit at 1st SR 869 bridge)
Land use: 80% forest/20% field; 100% conservation reserve (Blue Knob State Park)
Length of reach: 1270 feet
Substrate: Cobble dominant (60%), gravel 20%
Active channel width: 20 feet
Total score: 72
Low score for “channel condition” (3); moderate scores for “fish barriers” (6); “bank stability” (6), “riparian zone” (6) and “embeddedness” (7), other components 8 or 9

The next section of stream was surveyed by Bobs Creek Stream Guardian volunteers in July 2011 and extends from the SR 869 bridge above the Burnt House Picnic Area to the boundary between SGL 26 and the private property inholding. The section was assessed as 3 separate reaches.

Reach 6 starts at the SR 869 bridge and extends upstream about 2700 feet to a point a short distance upstream of the junction with Little Break Hollow Run. This reach is completely on public land, mostly Blue Knob State Park and perhaps 200 feet of the segment is on SGL 26. Within this reach both Big Break Hollow Run and Little Break Hollow Run add to Wallacks Branch, as well as numerous seeps and springs. There are seven stream improvement devices that date from the Youth Conservation Corps work of the 1970s.

The reach is totally forested with mature trees; a mixed hemlock and hardwood stand with maple, oak, ash, sweet birch, hickory, and beech. The understory includes rhododendron, spicebush, witch-hazel and numerous beech saplings. Multi-flora rose is noted as an invasive species present in this section. There is one short stretch of high water channel braiding about 300 yards about the bridge. The summary of this reach follows:

Wallacks Branch Reach 6
From State Route 869 bridge to point 2700 ft upstream in SGL 26
Land use: 100% forest; 100% conservation reserve (Blue Knob State Park and State Game Lands 26)
Length of reach: 2700 feet
Substrate: Cobble dominant (70%), boulder 20%, gravel 10%
Active channel width: 20 - 25 feet below Big Break Hollow and 15 feet above Big Break Hollow
Total score: 92
All scores 8, 9, or 10

The next reach is completely within State Game Lands 26 and in many ways similar to Reach 6. The forest is the same but there is much more fallen timber in the stream channel. Hay-scented fern, an invasive, was present in this section.

Wallacks Branch Reach 7
From 2700 ft above SR 869 bridge to point 4350 feet above bridge
Land use: 100% forest; 100% conservation reserve (State Game Lands 26)
Length of reach: 1650 feet
Substrate: Cobble dominant (50%), gravel 40%, 10% mud
Active channel width: 15 feet
Total score: 86
All scores 8, 9, or 10

Reach 8 is about 720 feet in length and the upper limit is at the boundary between SGL 26 and the private inholding. A segment of stream in this reach, about 100 yards long, is closely adjacent to SR 869 and erosion is occurring along his stream bank. There is Canadian thistle, an invasive, found along the roadway. At the upper end of this section there is household trash items found in and along the stream channel, the apparent source being the private property.

Wallacks Branch Reach 8
From 4500 feet above SR 869 (in SGL 26) to 5250 feet above Bridge (at SGL 26 boundary with private land)
Land use: 90% forest; 10% roadway
Length of reach: 720 feet

Substrate: Cobble dominant (70%), gravel 25%, 5% boulder
Active channel width: 15 feet
Total score: 81
Scores for "channel condition" and "riparian zone" were 7, "bank stability" was 6, all others 8 or 9

The upstream portion of Wallacks Branch, near and above the second SR 869 bridge, was surveyed by Bobs Creek Stream Guardian volunteers in September 2008. This segment is about 4350 feet in length and skirts along the northern edge of a block of SGL 26 that is inserted within the private property. The lower boundary is a short distance below the second/upper SR 869 bridge (formerly known locally as the "singing bridge" because it was of open metal grate decking design). At the time of the survey, one of the two residences in this section was occupied. In this section the southern side of Wallacks Branch is totally forested but the northern bank is mostly fields and residential, with only a small amount of undisturbed vegetation along the north stream bank in some areas. Two unnamed tributaries, one from the north and one from the south, enter Wallacks in this area. There is also one pond near one of the residences.

Wallacks Branch Reach 9
From the 2nd (upper) SR 869 bridge upstream to the former Corle property
Land use: 75% forest; 25% residential
Length of reach: 4350 feet
Substrate: Cobble (40%), boulder (40%), gravel (15%), silt (5%)
Active channel width: 8 - 10 feet
Total score: 70
Low scores for "riparian zone" (4), "fish barriers" (5), and "embeddedness" (5)

(Note: Permission to enter the private inholding between Reach 8 and Reach 9 was not obtained so this area was not surveyed. From SR 869 and from viewing from public property near to the private property, it is apparent that at least one of the occupied residences is placing junk cars, construction/demolition debris, and household items and waste immediately adjacent to the stream.)

Of the larger tributaries, only Big Break Hollow Run was assessed, the assumption being that the two Break Hollows, and the downstream hollows, all flow off similar terrain and geology, with similar soils. Big Break Hollow has more anthropogenic influences, with Lost Turkey Trail and the game land roads above, than the others. Bobs Creek Stream Guardian volunteers surveyed Big Break Hollow Run

in March 2011 and the tributary was separated into four reaches. The entire length of main stem of Big Break Hollow Run assessed is 9910 feet.

The first reach extends from the mouth on Wallacks Branch (in Wallacks Branch Reach 6) upstream to the lower part of the 'canyon' section. This section is 100% forested with intact riparian buffers, with similar tress and understory. There are six intact water jacks and two footbridges, all built in the late 1970s. The Lost Turkey Trail, marked with red blazes, follows Wallacks for about a little more than one half mile before turning to the north into Little Break Hollow. There are numerous seeps, and one mapped intermittent tributary that enters from the north. At the end of this reach, there is another tributary that joins Wallacks, draining a minor hollow to the southwest.

Big Break Hollow Run Reach 1
From mouth to beginning of canyon section
Land use: 100% forest
Length of reach: 4000 feet
Substrate: Cobble (75%), boulder (15%), gravel (10%)
Active channel width: 15 feet
Total score: 86

The next reach covers the canyon section of Big Break Hollow, about 4000 feet to 6270 feet above the mouth. This section is very steep with numerous small waterfalls passing over and between enormous boulders, a Rosgen A2a+ reach. The gradient of the stream here would likely present a natural barrier to fish passage. The sidewalls in this canyon area are steeper yet than the gradient of the waters path and the terrain is difficult to traverse

Big Break Hollow Run Reach 2
Canyon section
Land use: 100% forest
Length of reach: 2270 feet
Substrate: Cobble (25%), boulder (75%)
Active channel width: 4 feet
Total score: 88

Above the steep, narrow canyon section, the hollow opens up with the sidewall gradients easing and the stream path returning to a pool-riffle pattern, though with some steeper steps, and a more cobble dominated substrate. As with all the lower sections of Big Break Hollow, the forest presents

an intact canopy and the riparian zone is undisturbed. It is noted that red maple and striped maple begin to comprise a greater fraction of the hardwood trees in this section.

Big Break Hollow Run Reach 3
Hollow above canyon section
Land use: 100% forest
Length of reach: 1550 feet
Substrate: Cobble (60%), boulder (25%), gravel (10%)
Active channel width: 4 feet
Total score: 90

The last section of Big Break Hollow Run surveyed is flatter than any other section, flowing between small hills on a high bench of the Allegheny Front. The stream is near to open fields, the Kings Cabin Fields, and a game lands road that forms part of the Lost Turkey Trail. There is at least one culvert crossing by the road. Striped maple is more common than on the previous reaches. Finer materials dominate the streambed and embeddedness is significant.

Big Break Hollow Run Reach 4
Stream segment on bench above hollow
Land use: 90% forest, 10% field
Length of reach: 2090 feet
Substrate: Gravel (50%), silt (50%)
Active channel width: 3 feet
Total score: 61

Summary of Habitat Assessment

Overall, the surveyed sections of Wallacks Branch reveal what seems to be a healthy stream with mostly stable banks and channel and intact riparian zones, testament to the value of public property in protecting watersheds and water quality. The lower part, downstream from Burnt House Picnic Area, of Wallacks shows evidence of high water channel migration and braiding, with cobble and gravel bed material moving in substantial quantities.

The private property between the two SR 869 bridges, where household waste and junked cars are adjacent to the stream, is an area of concern. And, like many other areas of Bobs Creek such as the previously assessed Rhodes Run and the headwaters of Bobs Creek itself, the very upper limits of the headwaters of Wallacks, and Big Break Hollow Run, are more severely impacted by human activities than many downstream sections, something of an upside-down situation.

Water Quality Assessment

The Stream Guardians conducted water chemistry sampling and testing for this study but there are two decades of sporadic water chemistry data gathered through efforts of both professionals and grass-root volunteers. The earliest information the Stream Guardians located for this study date from 1991. During January 1991, James Davis, then Park Manager at Blue Knob State Park, contacted Robert Schott, recently retired DEP Water Pollution Biologist, concerning wild trout population estimates for the trout streams in the park. [The PA Fish Commission (now PA Fish and Boat Commission) and the Department of Environmental Resources or DER (now the Department of Environmental Protection or the DEP) did the previous fishery survey jointly in 1981. We do not have data from that time period.] In February 1991, Mr. Schott visited the park and gathered samples and conducted field measurements of temperature, pH, and dissolved oxygen from ten streams in and around the park, including Wallacks Branch near the clearing at the 'skate pond'. In the spring of 1991, Mr. Schott was contacted by Milt Harris, another Water Pollution Biologist working with the Priority Waterbody Team, concerning a request for information relevant to a possible upgrade in classification for the Bobs Creek watershed streams. In May of 1991, the DER biologists returned to sample macroinvertebrates, and this data will be looked at in the next section on Biological Assessment. An attempt to conduct an electro-fishing survey in July 1991 was abandoned due to drought conditions in the area.

The data for Wallacks Branch is presented in the table below.

Parameter	Feb 16	May 28
Temperature (C)	2.0	16.5
pH	6.40	7.36
Dissolved Oxygen (mg/L)	14.2	9.4
Specific Conductance (µmhos/cm)	112	81
Total Dissolved Solids (mg/L)	138	81
Alkalinity (CaCO3) (mg/L)	6	16
Hardness (CaCO3) (mg/L)	21	25
NH3-N (mg/L)	<0.02	<0.02
NO2-N (mg/L)	<0.004	<0.004
NO3-N (mg/L)	1.30	0.92
Total P (mg/L)	0.02	0.04
Total Cu (mg/L)	<0.01	<0.05
Total Fe (mg/L)	0.058	0.218
Total Pb (mg/L)	<0.004	<0.004
Total Mn (mg/L)	<0.01	<0.05
Total Ni (mg/L)	<0.025	<0.05
Total Zn (mg/L)	<0.01	<0.01
Total Al (mg/L)	<0.135	<0.15

During the May 1991 sampling, the laboratory also conducted a BOD, 5D-INH test with a result of <0.04 mg/L. This test is a measure of the Biological Oxygen Demand (BOD) of a water sample. BOD determines the amount of dissolved oxygen needed by aerobic organisms in a sample to break down dissolved organic material at a specific temperature over a specific time period, generally 20 C over five days. Though this is not a precise quantitative test as usually performed, it is used as a robust indicator of the organic quality of water and the degree of organic pollution. Pristine, unpolluted waters will have 5-day BOD levels below 1 mg/L.

Brief explanations of the parameters measured during the 1991 samplings follow. Many are reported in mg/L or milligrams per liter, the equivalent of parts per million (ppm).

Temperature, measured in degrees Celsius, is important for aquatic life; summer high temperatures are often a limiting factor in trout waters. Colder waters can hold more oxygen and there are both seasonal and diel temperature cycles that can influence oxygen concentrations.

The pH is reported on a scale of 0 to 14 and is an expression of the concentration of H_3O+, or hydronium, ions in the water. Values below 7 are increasingly acidic while above 7 the values indicate increasing alkalinity. This is a logarithmic scale, a pH of 4 is 10 times more acidic than pH 5. Most aquatic life requires pH values near neutral 7; the greatest diversity flourishing between 6.5 and 8. Some aquatic insect larvae can tolerate pH as low as 4 and brook trout, evolving in freestone headwater streams, can survive at pH levels slightly below 5. Conversely, clams, snails, isopods, brown trout, and carp can tolerate pH as high as 9. The pH of waters can be influenced by geology of underlying rock and soils, atmospheric deposition (acid rain), abandoned mine drainage, and industrial pollution.

Dissolved oxygen is another vital requirement for aquatic life. Most warmwater fish require at least 5 mg/L and trout and other coldwater fish prefer 6 mg/L or greater. Dissolved oxygen can enter the water through contact with the atmosphere or by photosynthesis by algae and rooted plants but green plant respiration during hours of darkness uses dissolved oxygen. This cycling by photosynthesizing plants and algae, as well as the daily temperature changes, results in a diel cycle DO level. Waterfalls, rapids, and water releases at dams can supersaturate oxygen. Saturation levels between 80 and 120 % are optimal, 60 –79 % is tolerable, and below 60 % or above 125 % are harmful.

Specific conductance or conductivity is a measure of the capacity of water to carry electric current. The presence of dissolved ions in the water increases this capacity. Pure water will have very low conductivity while seawater has much higher specific conductance. The unit for conductance is the Siemens per centimeter, in usage most often microSiemens per centimeter (µS/cm) or milliSiemens per centimeter (mS/cm). Until the late 1970s, the equivalent unit was known as the mho/cm, and so µmho/cm or mmho/cm might still be encountered The Mho and the Siemens are equivalent, the Mho deriving its name from the reverse of Ohm, the unit for resistivity, the opposite of conductivity. Industrial pollution, acid mine drainage, stormwater runoff, or severe agricultural pollution can increase conductivity. Some waters are naturally higher than others without pollutants; limestone spring waters have higher conductivity than freestone waters. The Atlantic Ocean water has a specific conductivity of about 43,000 µS/cm (43 mS/cm), the Great Salt Lake about 158,000 µS/cm (158 mS/cm), a limestone stream such as Penns Creek perhaps 250 µS/cm (0.250 mS/cm), and Bobs Creek main stem, at the Susquehanna River Basin Commission's (SRBC) Remote Water Quality Monitoring Network (RWQMN) station near the mouth of Wallacks Branch, the specific conductance is typically below 100 µS/cm.

Since the specific conductance is a measure to the capacity of water to conduct electrical current, it is directly related to the concentration of salts dissolved in water, and therefore to the Total Dissolved Solids (TDS). Salts dissolve into positively charged ions and negatively charged ions, which conduct electricity. Since it is difficult to measure TDS in the field, the electrical conductivity of the water is used as a measure. In the laboratory, TDS can be measured through evaporation of a sample and weighing of the residue. When using a field meter for specific conductance, a change in the scale setting can convert to TDS on many units, or a conversion factor can be used if the types of dissolved solids are known.

Alkalinity and hardness are sometimes confused and both are typically reported as equivalent units of calcium carbonate ($CaCO_3$). Alkalinity is the capacity of water to neutralize acids, a property imparted by the water's content of carbonate, bicarbonate, hydroxide, and on occasion borate, silicate, and phosphate. It is expressed in milligrams per liter of equivalent calcium carbonate (mg/l CaCO3). Alkalinity is important to a waterbody's ability to neutralize inputs of acidity such as from acid precipitation or abandoned mine drainage. Values above 20 mg/L indicate some buffering capacity but 80-150 mg/L is a

more desirable range, with limestone streams often in the range of 200-300 mg/L.

Nitrogen parameters can be a confusing mess. Total nitrogen is comprised of organic nitrogen, ammonia nitrogen, nitrite and nitrate. The relationships are shown below.

Total Nitrogen = Organic Nitrogen + Ammonia Nitrogen (NH_3-N) + Nitrate Nitrogen (NO_3-N) + Nitrite Nitrogen (NO_2-N)

Total Kjeldahl Nitrogen = Organic Nitrogen + Ammonia Nitrogen (NH_3-N)

Total Nitrogen = Total Kjeldahl Nitrogen + Nitrate Nitrogen (NO_3-N) + Nitrite Nitrogen (NO_2-N)

Water quality standards in Pennsylvania specify limits for the combined total of nitrates and nitrites at 10 mg/L. The specification for ammonia is determined dependent upon pH and water temperature. Organic nitrogen is present in waste as compounds such as urea, a waste product of protein metabolism. When organic nitrogen begins to break down the first step is ammonification, and then ammonia oxidizes into first nitrite and then nitrite to nitrate. Increases in these inorganic forms of nitrogen can lead to eutrophication of lakes and streams, which can lead to oxygen depletion fish kills, and nuisance or hazardous algal blooms. Values above 1 mg/L are reason for investigation into the source.

Total P, or total phosphorus, is another parameter measuring a nutrient with significant impacts on water quality. Phosphorus can be found bound in organic compounds, as polyphosphates in many biological compounds as well as commercial water treatment additives, and as the soluble orthophosphate used in commercial fertilizers. Since phosphorus can exist in several distinct forms in water samples, and the common test method measures only the orthophosphate form, pretreatment methods have been developed to convert the various forms of phosphate-phosphorus to the orthophosphate form. If the only determination to be made is Total Phosphate-Phosphorus, the sample is digested to convert both the polyphosphate and the organic phosphate to the orthophosphate form at the same time. In many waters, phosphate is the limiting nutrient and excess inputs can be the trigger for eutrophication. Unpolluted waters will usually have barely detectable orthophosphate levels. Sources of phosphates can be runoff from agricultural land, mining, and in phosphorus rich rock, and household waste water with high-phosphate detergents.

The remaining parameters listed from the 1991 assay are for metals: copper (Cu), iron (Fe), lead (Pb), manganese (Mn), nickel (Ni), zinc (Zn), and aluminum (Al).

In 2003, the Stream Guardians received a Growing Greener Grant of $50,000 to develop a volunteer monitoring network, to train teachers in stream monitoring protocols and in watershed education practices, to bring groups of students to the Bobs Creek watershed for hands-on experiences in watershed studies, and to conduct local outreach and education. Toward fulfilling these goals, the Stream Guardians partnered with the Alliance for Aquatic Resource Monitoring (ALLARM) of Dickinson College to provide water chemistry monitoring training, to develop a study plan,, and to provide quality assurance/quality control. (Additional assistance came from Stroud Water Research Center for macroinvertebrate monitoring and technical assistance.) Twenty- six monitoring sites were selected throughout the Bobs Creek watershed with three in the Wallacks Branch watershed, one on main stem near the mouth, one on Big Break Hollow Run near SR 869, and one on Little Break Hollow Run where Lost Turkey Trail crosses. The Stream Guardians monitoring protocol included water temperature, dissolved oxygen, alkalinity, pH, and turbidity using Lamotte test kits, and nitrate and orthophosphate using Hach kits. Turbidity is a measure of the ability to transmit light and is negatively affected by suspended solids including silt and clay, as well as some dissolved compounds.

During 2003, Doug Stiffler, a Stream Guardians volunteer, monitored the Wallacks sites and we have the records from one sampling at each site, on two different dates.

Site: Big Break Hollow (Site #11-1)

Date:	6-16-2003
Water temperature:	12.0 C
Dissolved Oxygen:	9.65 mg/L
Nitrate:	0.26 mg/L
Orthophosphate:	not detected
pH:	6.5
Alkalinity:	9 mg/L
Turbidity:	5 JTUs

Site: Wallacks Branch (Site #11-0)

Date:	7-28-2003
Water temperature:	18.5 C
Dissolved Oxygen:	aberrant results
Nitrate:	0.3 mg/L
Orthophosphate:	0.04 mg/L
pH:	6.5
Alkalinity:	22 mg/L
Turbidity:	<5 JTUs

Site: Little Break Hollow (Site #11-2)
Date: 7-28-2003
Water temperature: 17 C
Dissolved Oxygen: 8.0 mg/L
Nitrate: 0.5 mg/L
Orthophosphate: 0.02 mg/L
PH: 6.5
Alkalinity: 18 mg/L
Turbidity: 0 JTUs

Jason Pittman, another Stream Guardians volunteer, monitored seven times at the Wallacks Branch main stem site from December 2003 through August 2004. His data is in the table below.

	Wallacks Branch						
Site:	Site:11-0						
Date:	12/21/2003	1/25/2004	2/23/2004	4/29/2004	5/31/2004	7/22/2004	8/24/2004
Water T	3.0	2.0	2.0	12.5	14.5	17.0	17.0
DO	11.8	12.2	11.8	9.6	8.2	7.8	8.0
NO3-N	0.04	0.04	0.04	0.06	0.12	0.10	0.08
PO4	0.0	0.0	0.0	0.0	0.0	0.0	0.0
pH	6.5	6.5	6.5	6.0	6.0	6.5	6.5
Alk	18.0	18.0	18.0	40.0	20.0	20.0	26.0
Turb	1.0	1.0	1.0	1.0	1.0	1.0	1.0

Between October 2004 and March 2005, volunteer Eric Jacobs monitored at the Little Break Hollow Run site. The data is below.

Site:	Little Break Hollow Run Site 11-2					
Date:	10/20/2004	11/24/2004	12/17/2004	1/18/2005	2/22/2005	3/25/05
Water T	9.0	8.0	4.0	1.0	6.0	5.0
DO	9.0	6.0	11.0	10.0	10.0	10.0
NO3-N	0.30	1.00	0.30	0.40	?	?
PO4	0.05	0.05	0.05	0.01	?	0.00
pH	5.5	3.5	5.5	5.5	6.0	6.0
Alk	8.0	20.0	10.0	40.0	16.0	18.0
Turb	0.5	0.5	0.0	0.0	0.0	5.0

During 2004 ad 2005, student monitoring occurred undertaken by teachers who participated in the training as part of the Growing Greener project and received monitoring equipment through the grant. We have data from four monitoring events.

School: Claysburg-Kimmel Elementary Date: 5-6-04
Site: Wallacks Branch 11-0
Water T: 11.5
DO: 10.25
NO3: 0.04
PO4: 0.11

pH:	6.0
Turb:	12.5
Alk:	10

School: Forest Hills	Site: Big Break Hollow Run 11-1	
Date:	5-13-2004	10-26-2004
Water T:	13.8	8.0
DO:	8.4	10.5
NO3:	0	0.4
PO4	0	0
pH	6.0	6.0
Alk:	20	15
Turb:	<5	<5
Fe:	0.5	0.5
Hardness:	24	25

(Forest Hills additionally tested for iron(Fe) and hardness and those results are reported in the table above.)

School: Everett	Site: Big Break Hollow Run 11-1
Date:	4-22-2005
Water T:	7.5
DO:	10.4
NO3:	2.2
PO4	0.04
pH	6.0
Alk:	54
Turb:	<5
Fe:	<0.5

(Everett conducted a test for iron.)

The Stream Guardians also conducted some monitoring specifically for this plan. The sites chosen for this were labeled Wallacks 1, Wallacks 2, Wallacks 3, and Wallacks 4. Wallacks one is adjacent to he parking lot at the former Griffith tract near the mouth of Wallacks. Wallacks 2 is at about 100 yards below the second SR 869 bridge (the 'singing bridge'). Wallacks 3 is on Big Break Hollow Run, two holes above the SR 869 bridge over Big Break Hollow Run, and Wallacks 4 was far up on the headwaters of the main stem, near the site of the former pull-off illegal dump. This monitoring was performed by Jim Davis and included specific conductance measured by a YSI probe provided by the Bedford County Conservation District.

Site:	Wallacks 1	Wallacks 2	Wallacks 3	Wallacks 4
Date:	8/9/2010	8/9/2010	8/10/2010	8/10/2010
Water T	16.5	17.0	16.5	17.0
DO	7.1	7.8	7.4	8
NO3-N	0.1	0.4	0.4	0.3
PO4	0.02	0.02	0.1	0.1
pH	7	6.75	6.5	6.9
Alk	40	20	12	24
Turb	0	0	0	0
Spec Con	135.2	97.7	39.4	94.5

In 2008 and again in 2010, Western Pennsylvania Conservancy conducted electro-fishing surveys of Wallacks Branch at three sites selected by BKSP staff and Stream Guardian volunteers. At the time of the survey, a minimal set of water quality data was collected and is reported in the table below. Site 1 is near the confluence with Bobs Creek on the former Griffith tract, Site 2 is in the lower part of the Burnt House Picnic Area, and site 3 is upstream from the confluence of Big Break Hollow Run and Wallacks Branch.

Parameter	Site 1		Site 2		Site 3	
	6/2008	6/2010	6/2008	6/2010	6/2008	6/2010
pH	7.7	7.8	7.4	8.0	7.7	7.9
Spec Cond	60	120	60	130	110	160
TDS	80	80	80	80	70	110
DO	9.29	8.13	9.30	9.29	9.55	9.22
Temp	57.4	63.2	57.4	61.1	57.4	63.1
Turb	1	0	2	5	5	1

Interpretation of Water Chemistry Data

In a report to the Program Manager for the Bureau of water Quality, Southcentral Regional office of the DER dated February 3, 1992; Biologist Bob Schott interpreted the results of the water chemistry data collected in February and May of 1991. While none of his comments were specific for Wallacks Branch, he noted for all streams the slightly acidic pH (WB = 6.40) and low alkalinity (WB = 6) attributable to the carbonate-poor geology and acid precipitation. Also noted for all the monitored sites were slightly elevated nitrate-nitrogen (WB = 1.30 mg/L), which for the site monitored on Wallacks Branch would likely be influenced by on-lot septic systems upstream. The May sampling was noted for a slight increase in pH and alkalinity more than doubling, while nitrates decreased slightly, all differences being attributed to reduced runoff after a two-week dry period. Overall, the streams, including

Wallacks Branch, were deemed to have good to excellent water quality.

The volunteer monitoring data reveals some inconsistencies and dubious results. In particular, the nutrient tests present some questionable numbers. Both the nitrate-N and the orthophosphate tests from Hach can be a challenge for minimally trained volunteers and the NO3-N test has been known to give aberrant color results in some cases (color change can be to yellow rather than the expected pink and conversations with Hach technical support has not resolved the issue). Overall, like the 1991 monitoring, the volunteer testing does not indicate anything other than a healthy stream with good to excellent quality, taking into consideration soils and geology.

Biological Assessment

The stream study work undertaken by Schott/DER in 1991 included a macroinvertbrate survey during late May. "Specimens were collected in a 3 feet wide kick screen while disturbing the substrate upstream from the screen. Four samplings were done at each site. Taxa collected were identified in the field to the lowest level possible. A representative sample was preserved in 70% ethanol for further laboratory examination." The Wallacks Branch results from the table provided in the report are reproduced below. Taxa were classified as R (rare - <3 individuals), P (present – 3-9 individuals), C (common – 10-24 individuals), or A (abundant – 25-100 indiviuals).

TAXA	**Wallacks Branch**
Turbellaria (flatworms)	R
Decapoda (Crayfish)	
Cambarus	P
Ephemeroptera (Mayflies)	
Drunella	C
Epeorus	P
Ephemera	R
Ephemerella	P
Paraleptophlebia	C
Stenonema	P
Odonata (Dragonflies)	
Lanthus	R
Plecoptera (Stoneflies)	
Acroneuria	P
Isoperla	P
Pteronarcys	P

Megaloptera	
Nigronia	R
Coleoptera	
Optioservus	R
Trichoptera	
Ceratopsyche	P
Diplectrona	A
Dolopilodes	C
Glossosoma	P
Lepidostoma	R
Neophylax	P
Pycnopsyche	R
Rhyacophila	P
Diptera (Midges, Flies)	
Atherix	R
Chironomidae	P
Hexatoma	R
Pedicia	R
Tipula	P

There were no metrics or indices calculated for the macroinvertebrate data included in the referenced report.

During May of 2008, the Stream Guardians asked the Bedford County Conservation District for assistance in performed a benthic macroinvertbrate survey of Wallacks Branch for this report. With the assistance volunteers from the Stream Guardian and from Fort Bedford Trout Unlimited, a collection was undertaken on May 10, 2008. Three kicks with a one-meter square, 500-µm mesh net were made in a 100 meter section of Wallacks Branch at the Burnt House Picnic Area. Conservation District staff and volunteers made a coarse sorting of the organisms and these were preserved in 95 % ethanol along with the unsorted fine material and some unexamined coarse organic debris (sticks and leaves). The preserved material was sorted and identified at the Conservation District. The Stream Guardians were interested in identifying as much as possible so the sample was not randomly sub-sampled as in the standard protocol, either the PADEP_Rapid Bioassessment Protocol (RBP) or the Instream Comprehensive Evaluation (ICE).

Wallacks Branch Macroinvertebrate Sampling 5-10-2008

		Count	Tolerance value
Annelids	leeches	2	10
	aquatic worms	3	5
Arthropods	mites (Parasitengona)	5	6

Insects			
	Mayflies (Ephemeroptera)	(475)	
	Baetidae		
	Baetis	33	6
	Acentrella	1	4
	Ephemerellidae	51 (uncharacterized)	
	Dannella	2	2
	Drunella	2	0
	Ephemerella	42	1
	Ephemeridae		
	Ephemera	4	2
	Heptageniidae		
	Macaffertium	2	3
	Epeorus	160	0
	Heptagenia	6	4
	Stenacron	2	7
	Stenonema	3	7
	Cinygmula	73	2
	Leptophlebiidae		
	Paraleptophlebia	92	1
	Dragonflies (Anisoptera)		
	Gomphidae		
	Gomphus	1	5
	Stoneflies (Plecoptera)	(88)	
	Capniidae		
	Allocapnia	5	3
	Chloroperlidae		
	Sweltsa	5	0
	Haploperla	35	1
	Leuctridae		
	Leuctra	1	0
	Nemouridae		
	Amphimemura	18	3
	Ostrocerca	1	2
	Peltoperlidae		
	Peltoperla	1	0
	Tallaperla	2	0
	Perlidae		
	Acroneuria	4	0
	Perlodidae		
	Diploperla	4	2
	Unknown	4	2
	Pteronarcyidae		
	Pteronarcys	8	0
	Caddisflies (Trichoptera)	(66)	
	Brachycentridae		
	Brachycentrus	4	2
	Calamoceratidae		
	Heteroplectron	1	3
	Hydropsychidae		
	Ceratopsyche	32	5
	Cheumatopsyche	2	5
	Leptoceridae		
	Ceraclea	1	3
	Limnephilidae		
	Pycnopsyche	3	4
	Polycentropodidae		
	Cernotina	3	6
	Rhyacophildae		
	Rhyacophila	5	1
	Uenoidae		
	Neophylax	15	3

Fishflies (Megaloptera)		
Corydalidae		
Nigronia	1	4
Beetles (Coleoptera)		
Elmidae		
Optioservus	2	4
Psephenidae		
Psephenus	1	4
True Flies (Diptera)		
Blephariceridae		
Agathon	5	0
Ceratopogonidae	1	6
Chironimidae	11	6
Simuliidae		
Unknown	8	6
Prosimulium	2	2
Simulium	1	5
Tipulidae		
Antocha	19	3
Hexatoma	3	2

In the table above, the number of individuals for each taxon is recorded along with the pollution tolerance level for each taxon. These values, on a scale of 0 to 10, rank the sensitivity to pollution, low scores indicating greater sensitivity.

Each May during the last four years, the Bedford County Conservation District Watershed Specialist assisted Allegany College of Maryland (ACM), Everett Campus classes taught by Assistant Professor Stacie Rafter with annual stream studies that include chemistry tests and macroinvertebrate sampling. While the Stream Guardians do not have the data from the ACM efforts, the Watershed Specialist has reported that the parameters measured and methods used are identical or very similar to those the Stream Guardians were trained to employ.

Interpretation of Macroinvertebrate Data

The 1991 and the 2008 macroinvertebrate studies, and the ACM class visits, have in common the month of May, not the best time of the year to be sampling benthic macros. By May many of the early emerging species are no longer present in the stream as identifiable life stages.

Bob Schott concludes in the 'RESULTS" section of the February 1992 report that the streams of the Bobs Creek watershed all contain "highly diverse macroinvertebrate communities." Wallacks Branch actually had the fewest taxa, recorded at 27 in the 1991 collection, but two mayfly genera (*Drunella* and *Paraleptophlebia*) reported as 'common' are considered very sensitive with pollution tolerance levels of 1,

two caddisfly genera (*Diplectrona* reported as abundant and *Dolophilodes* reported as common) have pollution tolerance levels of 0, and all three of the stoneflies listed have low tolerance levels (0, 0, and 2). Wallacks Branch, like the other surveyed streams, was "dominated by mayflies, stoneflies and caddisflies reflecting the near pristine nature of the watershed and the good water quality." There is no record in the February 1992 report that any metrics or indices were calculated with the 1991 data.

Because the 2008 macroinvertebrate collection was not randomly sub-sampled, comparison of the results to a reference stream, using the metrics of the Index of Biotic Integrity (IBI) is not meaningful. Though we cannot compare, in a statistically relevant manner, the score to other streams, real or idealized, the six metric scores that comprise the composite IBI score were calculated for the 2008 collection. Five of the six metrics show an increase in value with less anthropogenic impacts; higher scores reflect a more 'pristine' condition. The Hilsenhoff Biotic Index, however, increases in value with more impacts from degraded water quality and habitat. To make it possible to combine the various scores for the composite IBI, the scores are standardized to the dataset of 451 samples used in developing the IBI. The Hilsenhoff Biotic Index is standardized to the 5th percentile of this dataset while the other five metrics are standardized to the 95th percentile, thus adjusting for the 'reverse' nature of the Hilsenhoff metric. The six metrics are:

1. Modified Beck's Index is a weighted count of the taxa with pollution tolerance levels of 0, 1, or 2. It is calculated as:

> Modified Beck's Index = 3 x number of taxa with pollution tolerance value of 0
> + 2 x number of taxa with pollution tolerance value of 1
> + 1 x number of taxa with pollution tolerance value of 0

2. EPT Taxa Richness is a community structure metric composed of the total count of taxa belonging to the orders of mayflies (E = Ephemeroptera), stoneflies (P = Plecoptera), and caddisflies (T = Trichoptera).

3. Total Taxa Richness is a community structure metric composed of the total count of taxa.

4. Shannon Diversity Index is a taxonomic composition metric that scores for both taxa richness and evenness. Few taxa dominated by large numbers of individuals in tolerant taxa would yield low

scores; many taxa with each having similar numbers of individuals would give higher scores. The formula is:

Shannon Diversity Index (H) = $\mathbf{\Sigma\ (n_i/N) * ln(n_i/N)}$

Where n_i =number of individuals in each of taxa

N = total number of individuals

Or, calculate the number that represents the relative abundance of individuals for each taxa, multiply by the natural logarithm of that number, then calculate the sum of all these products for each taxa in the sample

5. Hilsenhoff Biotic Index is a taxonomic composition metric representing an average pollution tolerance level for the sample, calculated by summing a weighted tolerance for each taxa, and dividing by total number of individuals in the sample.

Hilsenhoff Biotic Index (BI) = $\mathbf{\Sigma\ [(i * nindvPTV_i)]/N,\ i = 0}$

Where $nindvPTV_i$ = number of individuals with pollution tolerance level of i

N = total number of individuals
(The Hilsenhoff Biotic Index is often used alone to characterize water quality and the table below illustrates the interpretation of calculated values as suggested by Hilsenhoff.)

Table 1. Water quality classifications for the Hilsenhoff Biotic Index (BI) (Hilsenhoff 1987)

BI Value	Water Quality	Degree of Organic Pollution
0.00-3.50	Excellent	No apparent organic pollution
3.51-4.50	Very Good	Slight organic pollution
4.51-5.50	Good	Some organic pollution
5.51-6.50	Fair	Fairly significant organic pollution
6.51-7.50	Fairly Poor	Significant organic pollution
7.51-8.50	Poor	Very significant organic pollution
8.51-10.00	Very Poor	Severe organic pollution

6. Percent Intolerant Individuals is a taxonomic composition metric is the percentage of individuals with pollution tolerance levels of 5 or less.

% Tolerant Individuals = $\sum_{i=0}^{} (\text{nindvPTV}_i)/N * 100$

Standardization formulas for the six metrics are:

Modified Beck's:	observed value/39 = standardized metric
EPT Taxa Richness:	observed value/23 = standardized metric
Total Taxa Richness:	observed value/35 = standardized metric
Shannon Diversity Index:	observed value/2.90 = standardized metric
Hilsenhoff Biotic Index:	(10 – observed value)/(10 - 1.78) = standardized metric
% Intolerant Individuals:	observed value/92.5

For all standardized scores, the maximum (adjusted score) is 1.00. The Index of Biotic Integrity (IBI) is the average of the adjusted scores multiplied by 100.

For the 2008 benthic macroinvertebrate survey, the scores for the six composite metrics and calculations for the standardized and adjusted scores, as well as IBI score, are presented in the table below.

	Obs Score	Std Calculation	Adj Std Score
Modified Beck's Index	44	44/39	1.00
EPT Taxa Richness	36	36/20	1.00
Total Taxa Richness	50	50/35	1.00
Shannon Diversity Index	2.83	2.83/2.90	0.976
Hilsenhoff Biotic Index	1.82	8.18/8.22	0.995
% Intolerant Individuals	87.3	87.3/92.5	0.944
IBI = Average adjusted standardized score x 100 =			98.6

Though the IBI calculated from the 2008 data is possibly skewed higher by not having randomly sub-sampled the collection, the IBI of 98.6 is still impressive. The dominance of very sensitive mayfly taxa and the diversity of stoneflies are readily apparent, even without statistical calculations. This is even more impressive when considering that the most numerous mayfly genus, *Epeorus*,

was likely under-represented in the sample compared to a collection that might have been made at a more productive time of the year, March or early April, before the Quill Gordon *(Epeorus pleuralis)* emergence, a event well known by fly-fishing anglers in the Bobs Creek fishery.

The community composition documented in the 1991 and 2008 collections is very similar to what the BCCD Watershed Specialist has informally observed during the ACM stream studies.

Fish Surveys

As described in the introduction to the Water Quality Assessment chapter, DER biologists attempted to conduct an electro-fishing survey in streams of the Bobs Creek watershed in July 1991 but were thwarted by low water levels due to drought conditions. In June 1992, a survey crew returned to the watershed. Two stations were established on Wallacks Branch; Station 1 was near the Burnt House Picnic Area approximately 1.3 miles from the confluence with Bobs Creek and Station 2 was about 0.3 mile upstream from the confluence. Each station was 300 feet in length and the trout population was assessed using the removal method (Zippin method) with three passes. Species collected included: Brook trout (*Salvelinus fontinalis*), brown trout (*Salmo trutta*), and rainbow trout (*Oncorhynchus mykiss).*

At Station 1, the results were as below:

	Count	% sublegal	Estimated #/hectare	Estimated biomass/hectare
Brook trout	46	91	2150	43.95 kg
Brown trout	7	43	205	7.79 kg
Rainbow trout	23	91	948	20.41

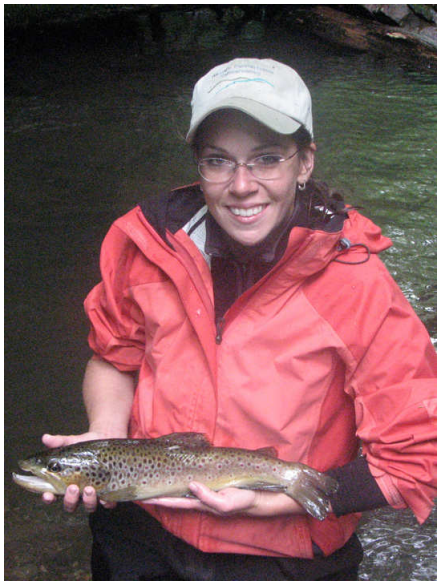
At Station 2:

	Count	% sublegal	Estimated #/hectare	Estimated biomass/hectare
Brook trout	60	92	3119	40.23 kg
Brown trout	16	13	418	46.95 kg

Both sites had similar accessibility and at both the numbers of brook and brown trout were similar. Most brook trout were sub-legal while most brown trout were of legal size, at both sites again. The most striking difference between the two sites is the presence of young-of-year (YOY) rainbow trout at the upstream site. At the time of the survey, Schott noted

that Jim Davis, Park Manager, suggested that the rainbow trout could be the result of a stocking program by the Pavia Sportsmen. Based on the contemporary criteria of trout population biomass classes, the lower station (Station 2) on Wallacks met the requirements to be designated a Class A mixed wild brook/brown trout fishery, and the upper Station 1 met the requirements for a Class A wild brook trout fishery. Also noted, if the rainbow population was found to be due to natural reproduction, the upper site met the criteria for a Class A wild rainbow trout fishery.

As noted in the water chemistry section, Western Pennsylvania Conservancy biologists conducted fishery surveys in 2008 and 2010. The 2008 effort took place on June 18 with two sites sampled and a third site surveyed on June 25. Each site was 250 meters long and a two-pass removal protocol was employed.



At Site 1, the downstream site near the former Griffith tract, 24 brook trout and 5 brown trout were captured. The largest brook trout was 8.00 inches and the smallest was 2.50 inches. Among the brown trout, the largest was 7.50 inches and the smallest measured 4.25 inches. At Site 2 near the Burnt House Picnic Area, 39 brook trout between 4.00 inches and 10.25 inches were captured. Site 2 yielded 29 brown trout from 4.50 to 19.00 inches. Site 3 was just upstream of the confluence of Big Break Hollow Run and Wallacks Branch and the capture here was 42 brook trout and 21 brown trout. The brook trout ranged from 2.25 inches to 9.00 inches, and the brown trout, from 2.50 inches and 13.00 inches. Among all three sites, 86 trout that were too small to identify to species were also collected. Other fish collected included 24 mottled sculpins *(Cottus bairdii),* 357 slimy sculpins (*C. cognatus),* 1 unknown sculpin, 52 blacknose dace *(Rhinichthys atratulus),* and 7 longnose dace *(R. catarctae).* In the conclusions, WPC staff described the trout populations of Wallacks Branch as being in "excellent condition…with no fin abnormalities, tumors, or lesions identified." Also noted; "numerous fish were collected that exceeded the minimum size limit for anglers to keep and harvest, which shows that most anglers probably are catch and release fisherman in this section of Wallacks Branch."

On August 25, 2010, electro-fishing surveys were again conducted in the three sections sampled in 2008. This effort occurred about one month after the installation of fish habitat structures as part of the Eastern Brook Trout Joint Venture funding for fish habitat. Again, standard water quality parameters were measured and the

collection was by a two-pass removal method. At Site 1, 12 brook trout and 22 brown trout were captured. Brook trout ranged from 2.75 inches to 9.00 inches while brown trout were captured from 2.50 inches to 11.00 inches. The 27 brook trout at Site 2 ranged from 2.25 inches to 10.00 inches. Among the 24 brown trout, the smallest was 2.25 inches and the largest was 15.50 inches. At Site 3, there were 38 brook trout and 9 brown trout captured. Brook trout ranged from 2.25 inches to 9.25 inches. The largest brown trout was 9.75 inches; the smallest was 3.00 inches. Among all three sites, other species captured included 15 mottled sculpins, 348 slimy sculpins, 1 unidentified juvenile sculpin, 79 blacknose dace, 16 longnose dace, and 1 cutlips minnow *(Exoglossum maxillingua).* As with the 2008 sampling, the trout populations presented a healthy appearance with no apparent disease or deformity.

In considering the data from the 2008 and 2010 surveys, WPC biologists noted that brown trout populations "are not as evenly sized as the brook trout populations." The brown trout captured in 2010 were significantly smaller than in 2008, particularly at Site 2. Angler harvest was offered as a possible explanation. The brook trout population was considered to be "much more robust with a good distribution of all size classes of fish (fingerlings, YOY, and adult fish)." Also noted was the fish survey being conducted just one month after the installation of fish structures and the expectation that a survey a year or two later would yield more significant results.

Fecal Coliform Testing

Fecal coliform bacteria indicate the likely presence of water-borne pathogenic (disease-causing) bacteria or viruses, including E. coli. They are present in the intestinal tracts of all warm-blooded animals, including humans. Fecal coliform levels are measured in fecal colonies (FC) per 100 milliliters (mL).

General Guidelines for Optimal Levels:

Fecal coliform levels in freshwater should not exceed an average count of 100 colonies per mL. Less than 50 FC is optimal. The health standard for drinking water is zero, for swimming 200 FC, and for partial body contact (boating) 1000 FC.

Pennsylvania Water Quality Standards:

PA Code Title 25, Chapter 93, Water Quality Standards, defines acceptable pollutant levels for designated uses of waters of the Commonwealth. Applicable to all waters, the standards for the "water contact" usage (i.e. swimming and related activities) limits fecal coliforms to a geometric mean of 200 per 100 mL based on minimum five samples, collected on different days, in a 30-day period.

Fecal coliform sampling was performed on streams in Blue Knob State Park during a period in August-September 2009 and samples from Wallacks Branch yielded fecal coliform counts of 10 – 20 FC per mL, well within the water contact use criteria.

Threats and Concerns

Wallacks Branch is not a pristine, completely undisturbed stream and, though the watershed is largely publicly owned forestlands, there are threats to the health of the stream. Most readily apparent is the proximity of State Route 869, which nearly parallels Wallacks Branch for its entire length, crossing the stream twice, crossing each of the two larger tributaries, and always within a few hundred feet. Stormwater runoff from this roadway is directly or near directly input to the stream in some locales. This water will carry pollutants from the road surface as well as litter into Wallacks. Additionally, the possibility of a vehicle accident resulting in a spill to the creek is a worry with the roadway so close.

Unpaved roads are also a concern. In the headwaters section of Big Break Hollow Run, the game lands road parallels the small stream and has one crossing. The habitat assessment for this portion of the tributary indicated that the sediment from the road here might be degrading stream habitat. In the upper segment of Wallacks Branch, on a recently transferred property, a landowner constructed a new road and bridge without proper permits that subsequently was removed under orders form the DEP. After obtaining a permit and professionally engineered construction plans, the bridge was again installed. Landowners unaware of environmental protection regulations remain a concern in the watershed.

Illegal dumping was a concern of the Stream Guardians since the group began and several projects that targeted dumps in the watershed will be discussed in the next section.

Currently, the apparent dumping, adjacent to the creek, of household trash and junk cars in the private land area above the Little Break Hollow Run confluence is a concern. Every year during stream cleanups in the downstream public lands area, trash items such as automotive oil jugs, household chemical bottles, and other potential hazardous items are found in and adjacent to the streambed.

During the visual stream assessment, trout habitat (fish cover) was an area of concern, particularly on the lower stream reaches. Long stretches of the stream lack deep water features and inadequate low water channels impede fish passage. The lower sections of Wallacks Branch also exhibit a tendency to develop some braiding of high water channels due to large woody debris blocking active channels, with gravel and cobble then depositing. During site survey and construction activity associated with the installation of the habitat structures mentioned in the introduction and discussed further in the next section, PFBC and WPC staff remarked that the stream seemed to mobilizing large quantities of bed material.

Also during the visual assessment, one survey crew made note of invasive species along the stream. Species noted were hay-scented fern, multiflora rose, and Canada thistle. Not noted during the survey, but detected during the habitat device construction on the lower section was Japanese stilt grass. Other species not yet confirmed in the Wallacks Branch watershed but known from other parts of the Bobs Creek watershed in Blue Knob State Park are Japanese and giant knotweed and Japanese barberry.

There are currently no gas wells permitted or under development in the Wallacks Branch watershed. There is a well site under development in the upper Bobs Creek watershed, in Blair County. The Stream Guardians are monitoring water parameters (temperature, pH, and specific conductance) at sites on Bobs Creek above and below the pad site. At least one landowner in the upper Wallacks Branch watershed has expressed interest in leasing land for gas exploration and development.

Both of the SR 869 bridges over Wallacks Branch, noted previously in the habitat and monitoring sections, were being replaced in 2011. Experience with dewatering of Pavia Run at a recently replaced bridge on Park Road at the village of Pavia is the cause of some concern for Wallacks Branch flows and fish passage should this problem appear at these bridge crossings.

Recent Projects

Among the earliest projects undertaken by the Bobs Creek Stream Guardians were illegal dump cleanups. Two of the larger dumps removed by Stream Guardian projects, largely funded by grants from the SRBC in 2003 and 2004, were located in the upper reaches of the Wallacks Branch watershed. The dumpsite referred to as the SR 869 dump in grant correspondence was a roadside dump at a pull-off along SR 869 near the Cambria County line. Many of the volunteers for this cleanup were Boy Scouts who worked tirelessly to cleanup 3.95 tons of trash and collect 3.08 tons of discarded tires for recycling (photo, top right). Repeat dumping at this site has been occasional and trash is removed during annual cleanups or through ad hoc efforts. The other dump was a "homestead" on private property, the former Corle tract, a short distance down the stream from the SR 869 site. This was a long-established, substantial dump with mounds of trash adjacent to the stream bank. Junk cars and a boat, along with 30.55 tons of household trash and nearly one ton of tires were removed from this site. There has not been repeat dumping since it is not a roadside location and the property has been sold (before and after photos, middle and bottom right).

After the transfer of the Griffith property near the confluence of Wallacks and Bobs Creek, the removal of the house, barn, and associated smaller structures and equipment was accomplished by the DCNR Blue Knob State Park staff but some smaller dumpsites on the property were handled by Stream Guardian volunteers, including sites along both Wallacks Branch and Bobs Creek. Additionally, small, old, inactive home dumps have been located at other private property tracts and have been removed with the cooperation of the current landowners.

In the introduction, the trout habitat project partnership with the PFBC and WPC was briefly mentioned. Though the grant application was submitted prior to the habitat assessment work, the two efforts dovetailed nicely and some of the problem areas on the lower reaches identified in the assessment became worksites in the implementation phase of the habitat project.

Devices were installed to address stream bank erosion, to maintain a low water channel, and create fish habitat including small pools, small boulders, and woody structures. Most installations were single log vanes, some with rock J-hooks (photo at right of a log vane on day of construction), but a saw-tooth bank-full bench was also constructed to stabilize an eroding bank and to reduce the width of a shallow channel devoid of fish cover and passage, creating a series of step-pools. Concurrent with the construction of the habitat devices, several existing water jacks were rehabilitated and modified with removal of decking to eliminate the fish barriers and reinforcing wing walls with rebar.

As mentioned in the introduction, the BCCD was awarded a Growing Greener Grant to construct additional habitat structures. These will be located on two segments of stream that currently lack a deep channel for low flow periods. These installations will include cross vanes with a series of single log vanes to maintain flow energy.

Jim Davis and Tim Clingerman examine saw-tooth structure on day of construction►

Saw-tooth structure nine months after construction ►

Goals and Recommendations

All studies included in this report indicate that the Wallacks Branch watershed remains a healthy system with a highly diverse macroinvertebrate community, robust trout population, and better than expected water quality. The water quality is surprising in the near neutral pH maintained despite acidic soils, geology, and precipitation, with little apparent buffering capacity. Public land and a high degree of forestation are certainly very influential in achieving this status. Except for the problem with solid waste management at the private properties along the mid-section of Wallacks Branch and potential sewage issues, there are no land use practices causing great concern and many of the goals and objectives are focused on protection rather than correction. The goals, objectives and actions steps of the recommended watershed management plan are summarized in the table that follows.

A view looking west from SR 869 across private lands with Allegheny Front in far background. ►

Goal	Objective	Action Step	Key Partners
A. Ensure statutory protection for Wallacks Branch Watershed	1. Petition for redesignation of Wallacks Branch as a Class A Wild Trout Fishery 2. Petition for special protection designated use classification as an Exceptional Value water.	a. Research procedures for petitioning for redesignation b. Investigate status of EV designation for Bobs Creek watershed c. Request agency assistance (PATU, WPC) d. Complete required applications	PA Council of Trout Unlimited PA Fish and Boat Commission PA Department of Environmental Protection Bobs Creek Stream Guardians Western Pennsylvania Conservancy
B. Protect wild trout populations.	1. Improve habitat for trout and prey species 2. Protect trout spawning habitat 3. Remove barriers to fish passage	a. Prioritize stream sections that can benefit from habitat improvement devices b. Monitor installed device for function and durability c. Secure funding and technical assistance for habitat improvement d. Monitor and remove ad hoc dams built by park visitors	PA Council of Trout Unlimited PA Fish and Boat Commission Blue Knob State Park Bobs Creek Stream Guardians Pavia Sportsmen Bedford County Conservation District Fort Bedford Trout Unlimited Western Pennsylvania Conservancy
C. Protect natural areas of Wallacks Branch Watershed	1. Protect vernal pools and seeps especially at parking area above watershed along SR 869 (Cambria County border) 2. Monitor and control invasive plants and insects 3. Promote native vegetation 4. Conduct habitat survey of the smaller unnamed tributaries	a. Train volunteers in visual assessment protocol, wetland monitoring, and invasive species identification b. Document upland wetlands and vernal pools/report to wetlands inventory c. Continue habitat assessments on smaller tributaries while documenting invasive species d. Plant native species with high wildlife value	Blue Knob State Park Bobs Creek Stream Guardians Pavia Sportsmen Bedford County Conservation District Fort Bedford Trout Unlimited Western Pennsylvania Conservancy

Goal	Objective	Action Step	Key Partners
D. Monitor water quality on Wallacks Branch	1. Establish a monitoring program with basic field measurements 2. Conduct additional macroinvertebrate surveys on other reaches & tributaries	a. Create a monitoring program using field probes for pH, dissolved oxygen, specific conductance, temperature b. Secure funding for equipment c. Establish a routine schedule for macroinvertebrate sampling	Blue Knob State Park PA Department of Environmental Protection Bobs Creek Stream Guardians Bedford County Conservation District Fort Bedford Trout Unlimited
E. Pursue improvements to land use management decisions on private property	1. Eliminate stream dumping and remove junk cars from the flood zone 2. Engage municipal officials in oversight of waste management	a. Conduct outreach and education to watershed residents concerning responsible management of waste b. Pursue funding to assist residents in junk car removal, etc. c. Conduct watershed volunteer training on basics of stream and development regulations	PA Department of Environmental Protection Bobs Creek Stream Guardians Pavia Sportsmen Bedford County Conservation District Pavia Township Supervisors
F. Investigate causes of channel braiding and bed material movement on lower Wallacks Branch	1. Establish flow monitoring program 2. Establish physical channel characteristics monitoring program	a. Install staff gauges at selected sites and perform discharge measurements to establish a stream flow curve b. Train volunteers in conducting stage observations and monitor staff gauges during storm events c. Select site and install pins for channel cross-sections, etc. d. Enlist local volunteers to install and monitor rain gauges e. Monitor storm runoff from SR 869	PA Council of Trout Unlimited PA Fish and Boat Commission Blue Knob State Park PA Department of Environmental Protection Bobs Creek Stream Guardians Pavia Sportsmen Bedford County Conservation District Fort Bedford Trout Unlimited Pavia Township/Lincoln Township Western Pennsylvania Conservancy

References

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Western Pennsylvania Conservancy. 1998. Bedford County Natural Heritage Inventory.

Appendix

History of Blue Knob State Park

Maps:

Wallacks Branch Location Within Bobs Creek Watershed

Wallacks Branch Watershed and Municipal Boundaries

Wallacks Branch Watershed Topography

Public Lands in Wallacks Branch Watershed

Map 61 – Pennsylvania Geological Survey – Blue Knob Quadrangle

Map 61 – Pennsylvania Geological Survey – Beaverdale Quadrangle

NRCS Web Soil Survey Map of the Wallacks Branch Area

Wallacks Branch Watershed Soils

Land Use in Wallacks Branch Watershed

Wallacks Branch HUC Stream Reach Codes

Lost Turkey Trail in Wallacks Branch Watershed

Visual Assessment Reaches

Wallacks Branch Monitoring Sites

The following is excerpted from the DCNR Blue Knob State Park website at www.dcnr.state.pa.us/stateparks/parks/blueknob.

History of Blue Knob State Park

The first European settlers to Blue Knob arrived soon after the American Revolution. These Pennsylvania Germans moved from eastern Pennsylvania and cleared and farmed land near the fledgling town of Pavia. Early industries were several distilleries in 1812, followed by a log mill in 1833 and a gristmill in 1843.

In the late 1800s, logging companies, based out of South Fork, clear-cut the forests of hemlock and hauled away the lumber on steam railroads that snaked up the steep hillsides. The lumber company closed from November to March because the railroad could not operate in the severe winter weather.

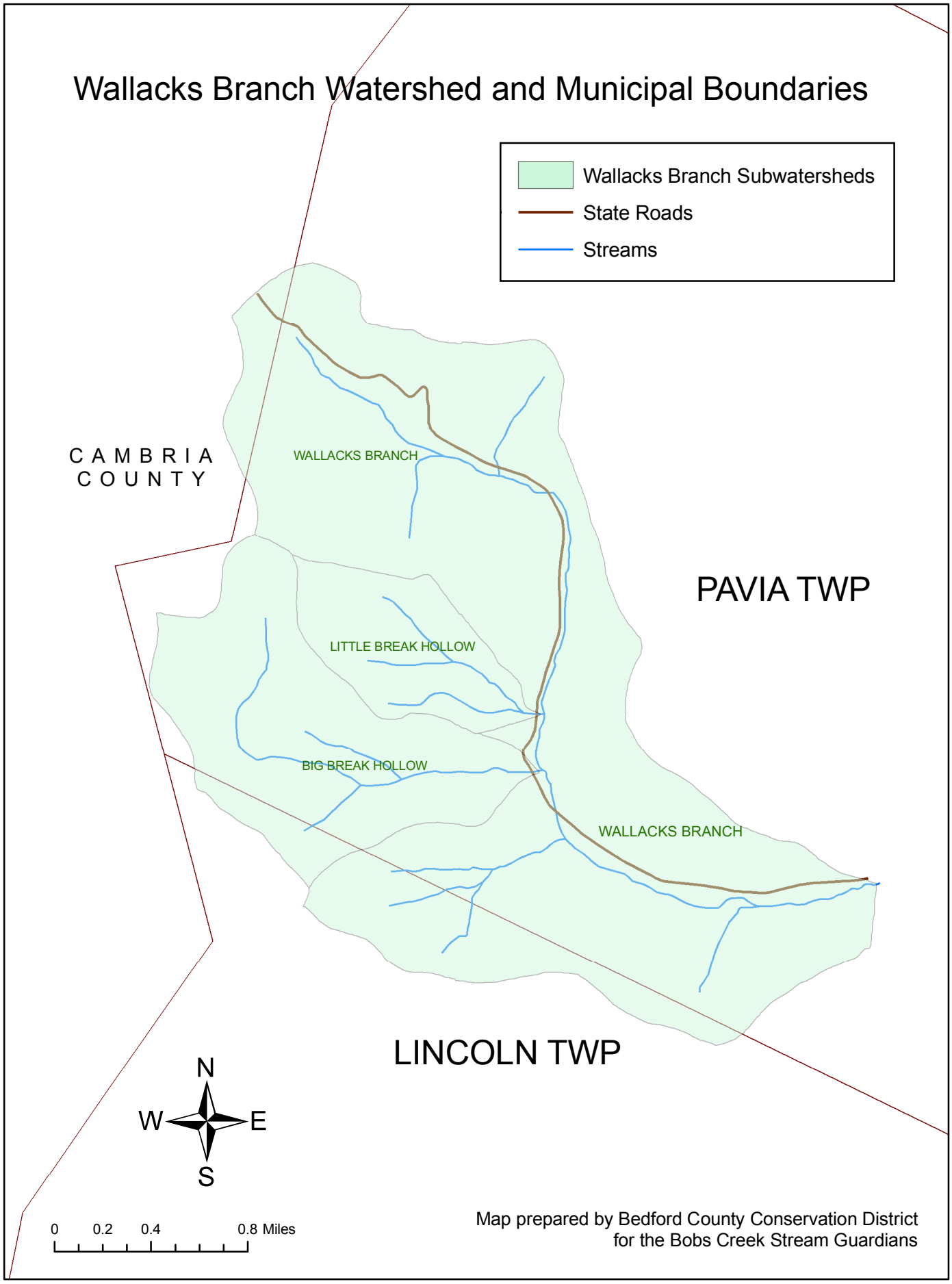
One railroad followed Bobs Creek and needed six switchbacks to descend the rugged grade. A State Game Land 26 service road now follows this old railroad grade. Another steam railroad followed Wallacks Branch through five switchbacks. Lost Turkey Hiking Trail follows this old railroad grade.

In 1935, the National Park Service created the Blue Knob National Recreation Demonstration Area to provide recreation to the people of Altoona and Johnstown. The Works Progress Administration employed local workers to build cabins, hiking trails and roads. Civilian Conservation Corps (CCC) (CCC) Company 2327 arrived in October of 1939. After building Camp NP-7, the young men aided in creating the park recreational facilities. World War II ended the CCC. On September 26, 1945, the National Park Service transferred Blue Knob to the Commonwealth of Pennsylvania and it became Blue Knob State Park.

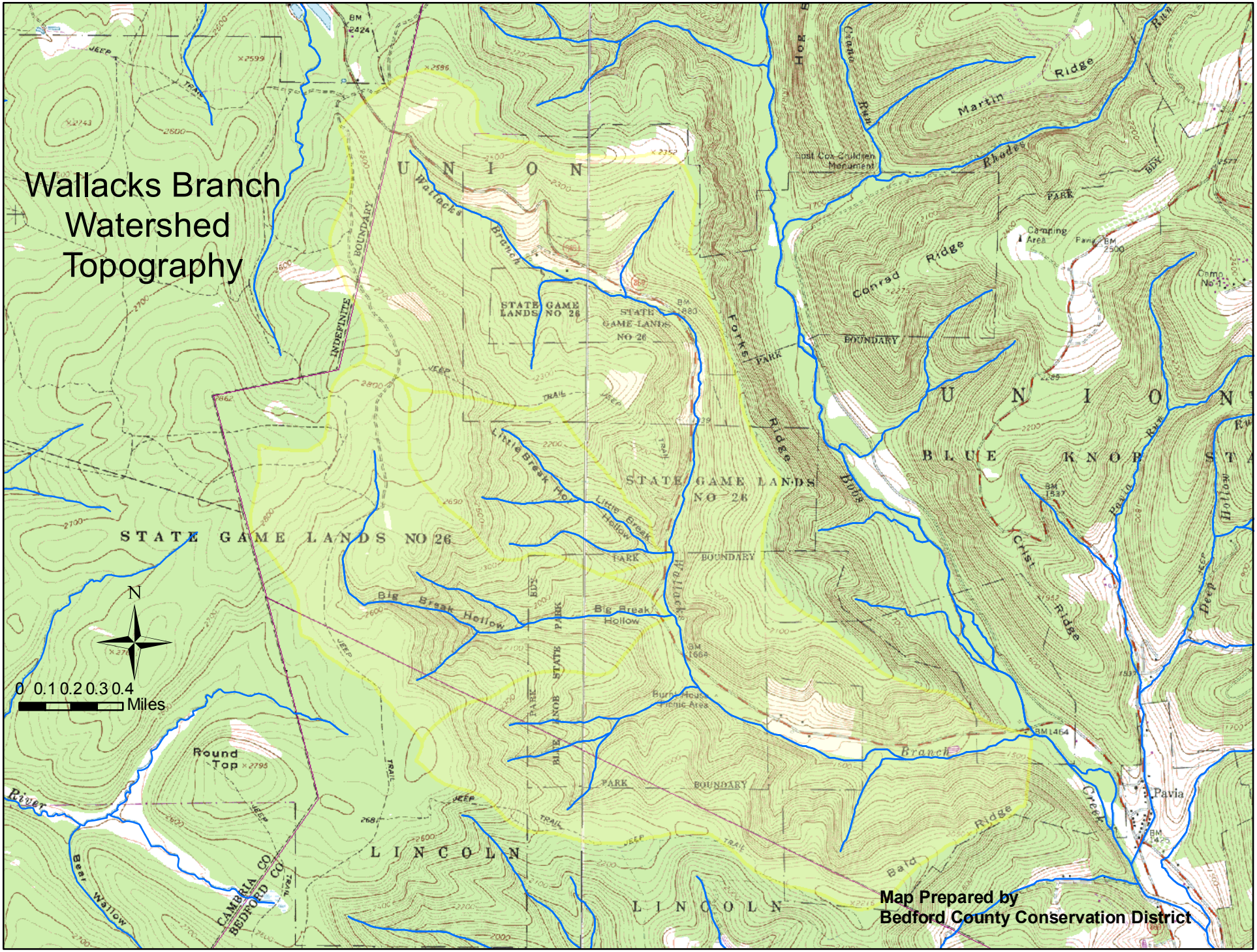
Since the CCC years, facilities of the park have been improved and new facilities built, but the park still retains its rustic, natural character.

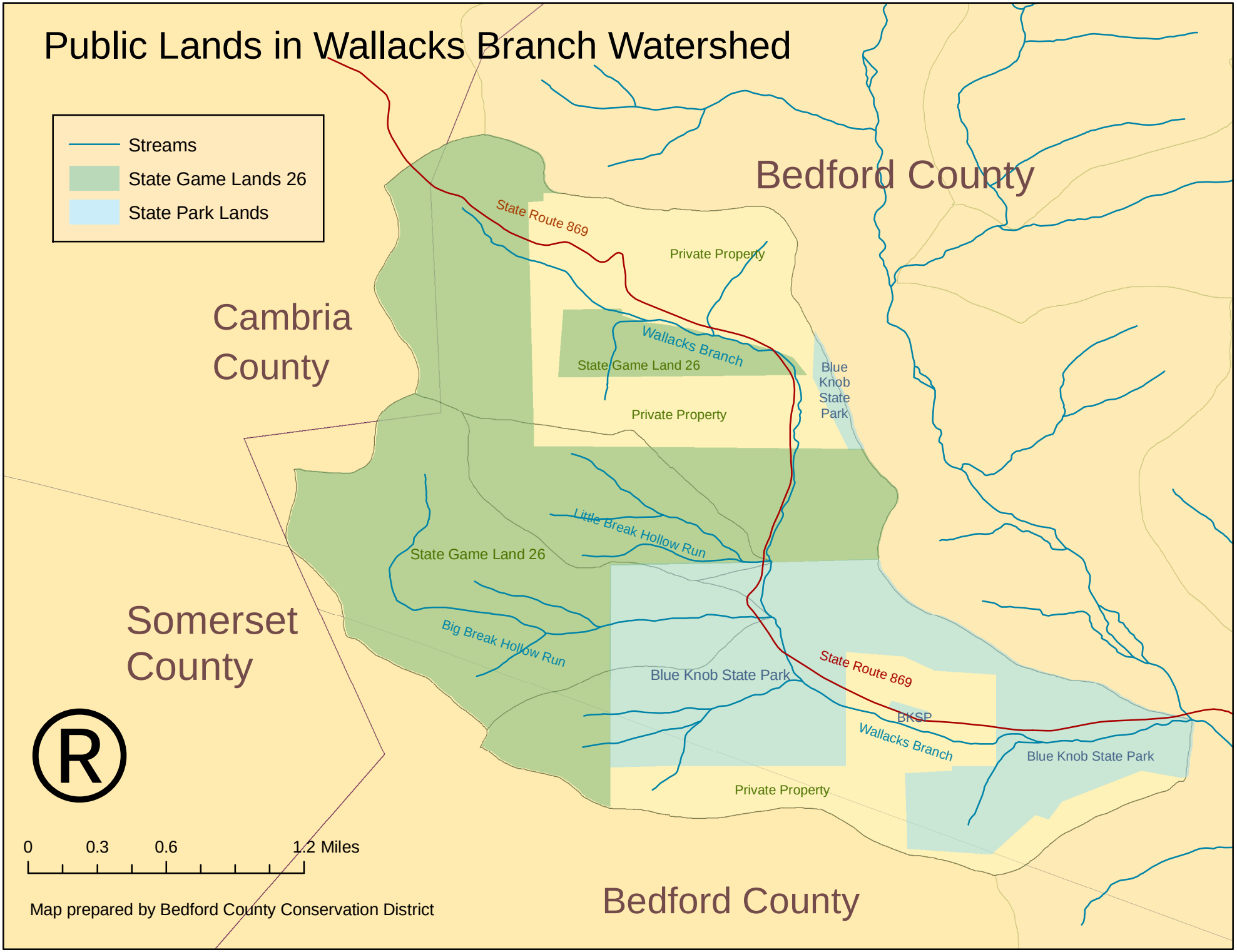
Wallacks Branch Location Within Bobs Creek Watershed

Wallacks Branch Watershed and Municipal Boundaries



Map prepared by Bedford County Conservation District
for the Bobs Creek Stream Guardians

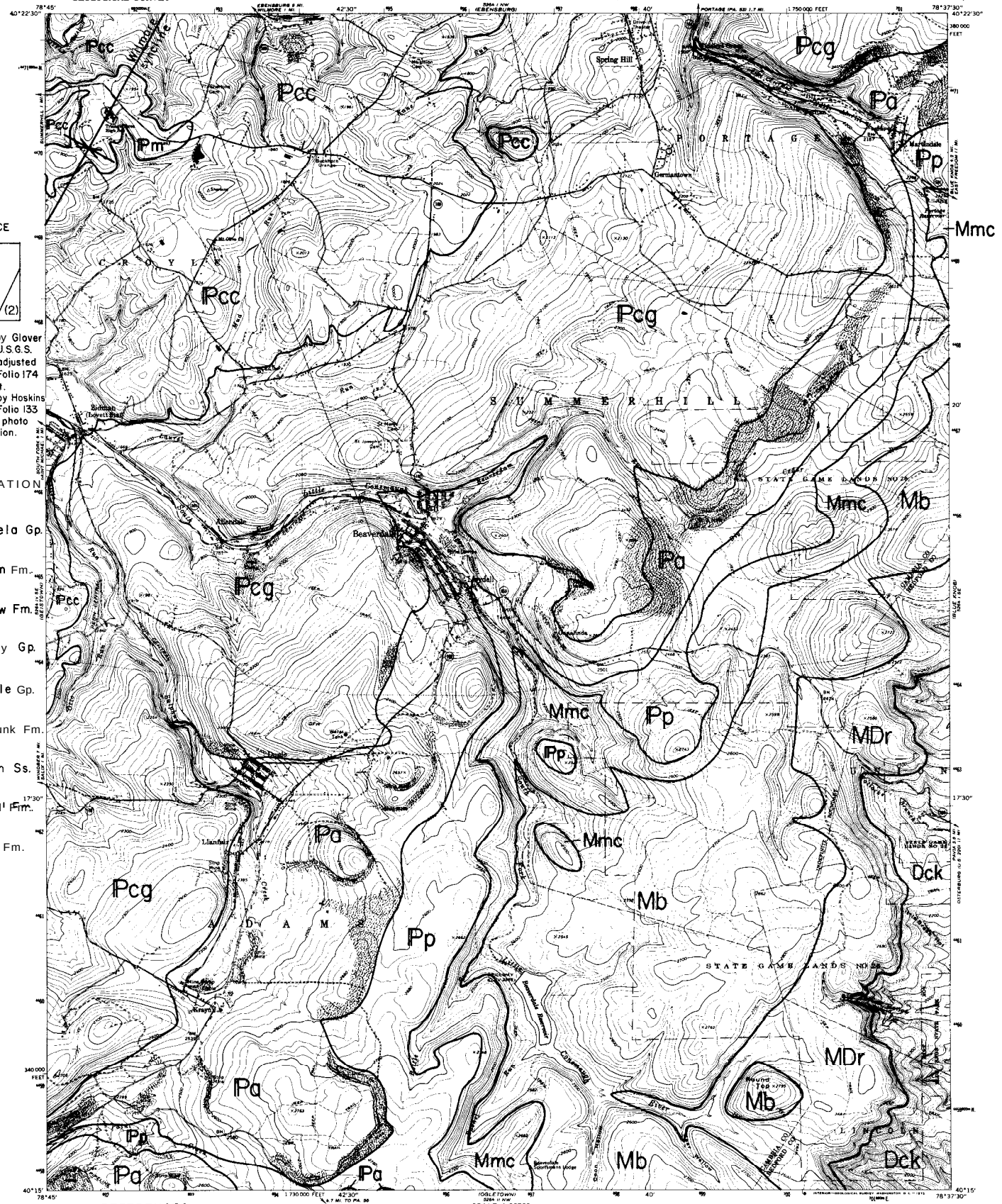

Wallacks Branch
Watershed
Topography
N
0 0.1 0.2 0.3 0.4
Miles
Map Prepared by
Bedford County Conservation District
UNION
LINCOLN
STATE GAME LANDS NO 26
BLUE KNOB STATE PARK
Wallacks Branch
Big Break Hollow
Little Break Hollow
Round Top
Martin Ridge
Rhodes Ridge
Conrad Ridge
Forks Ridge
Christ Ridge
Bald Ridge
Pavia
Bear Wallow
CAMBRIA CO.
BEDFORD CO.


Public Lands in Wallacks Branch Watershed
Streams
State Game Lands 26
State Park Lands
Bedford County
State Route 869
Private Property
Cambria
County
Wallacks Branch
State Game Land 26
Blue
Knob
State
Park
Private Property
Little Break Hollow Run
State Game Land 26
Somerset
County
Big Break Hollow Run
Blue Knob State Park
State Route 869
BKSP
Wallacks Branch
Blue Knob State Park
Private Property
0
0.3
0.6
1.2 Miles
Map prepared by Bedford County Conservation District
Bedford County


UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
BLUE KNOB QUADRANGLE
PENNSYLVANIA
7.5 MINUTE SERIES (TOPOGRAPHIC)
SOURCE
U.S.G.S. Folio 133
Pennsylvanian units by Glover.
Mb-MDr divided by air photo examination by Hoskins.
Df-Ds contact field checked by Hoskins.
EXPLANATION
Pcg Glenshaw Fm.
Pa Allegheny Gp.
Pp Pottsville Gp.
Mmc Mauch Chunk Fm.
Mb Burgoon Ss.
MDr Rockwell Fm.
Dck Catskill Fm.
Df Foreknobs Fm.
Ds Scherr Fm.
Dbh Brallier and Harrell Fms., undiv.
Dh Hamilton Gp.
Pcg
Pp
Pa
Mmc
Mb
MDr
Dck
Df
Ds
Dbh
Dh
Blue Knob
Proctor Mountain
Miller Mountain
Irvin Mountain
Stein Mtn
Spruce Knob
Cattle Knob
Martin Ridge
Postlethwait Mtn
SCALE 1:62500
CONTOUR INTERVAL 20 FEET
DATUM IS MEAN SEA LEVEL
ROAD CLASSIFICATION
Medium-duty
Light-duty
Unimproved dirt
State Route
REFERENCE
Butts, Charles (1905), Ebensburg folio, Pennsylvania, U. S. Geological Survey Geologic Atlas of the U. S., Folio 133, 9 p.
Compiled by D. M. HOSKINS and A. O. GLOVER. 1976
BLUE KNOB

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

BEAVERDALE QUADRANGLE
PENNSYLVANIA
7.5 MINUTE SERIES (TOPOGRAPHIC)



SOURCE

(1)
(2)

(1) Compiled by Glover based on U.S.G.S. Folio 133, adjusted to match Folio 174 to the west.
(2) Compiled by Hoskins based on Folio 133 and aerial photo interpretation.

EXPLANATION

Pm
Monongahela Gp.

Pcc
Casselman Fm.

Pcg
Glenshaw Fm.

Pa
Allegheny Gp.

Pp
Pottsville Gp.

Mmc
Mauch Chunk Fm.

Mb
Burgoon Ss.

MDr
Rockwell Fm.

Dck
Catskill Fm.

REFERENCES

Butts, Charles (1905), *Ebensburg folio, Pennsylvania*, U. S. Geological Survey Geologic Atlas of the U. S., Folio 133, 9 p.
Phalen, W. C. (1910), *Johnstown folio, Pennsylvania*, U. S. Geological Survey Geologic Atlas of the U. S., Folio 174, 15 p.

SCALE 1:62500

CONTOUR INTERVAL 20 FEET
DATUM IS MEAN SEA LEVEL

ROAD CLASSIFICATION
Medium-duty — Light-duty ——
Unimproved dirt - - - - - -
State Route

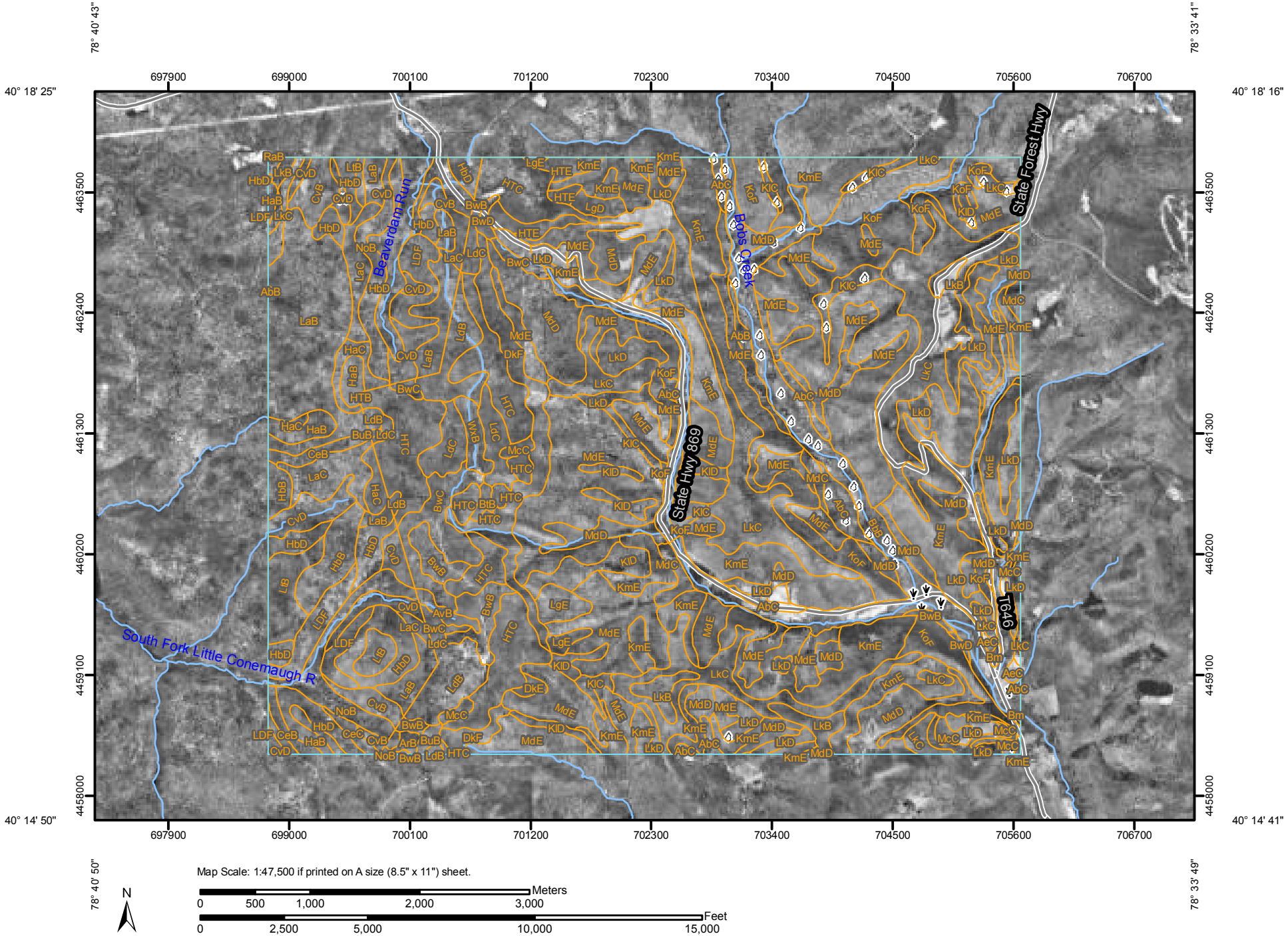
UTM GRID AND 1972 MAGNETIC NORTH DECLINATION AT CENTER OF SHEET

PENNSYLVANIA
QUADRANGLE LOCATION

Compiled by A. D. GLOVER and D. M. HOSKINS, 1976

BEAVERDALE

Soil Map—Bedford County, Pennsylvania, and Cambria County, Pennsylvania
(Wallacks Branch Watershed)



Map Scale: 1:47,500 if printed on A size (8.5" x 11") sheet.

N

Meters
0 500 1,000 2,000 3,000

Feet
0 2,500 5,000 10,000 15,000

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils
- Soil Map Units

Special Point Features
- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other

Special Line Features
- Gully
- Short Steep Slope
- Other

Political Features
- Cities

Water Features
- Oceans
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads

MAP INFORMATION

Map Scale: 1:47,500 if printed on A size (8.5" × 11") sheet.

The soil surveys that comprise your AOI were mapped at scales ranging from 1:20,000 to 1:24,000.

Please rely on the bar scale on each map sheet for accurate map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov
Coordinate System: UTM Zone 17N NAD83

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Bedford County, Pennsylvania
Survey Area Data: Version 4, Jan 30, 2008

Soil Survey Area: Cambria County, Pennsylvania
Survey Area Data: Version 5, Jul 31, 2009

Your area of interest (AOI) includes more than one soil survey area. These survey areas may have been mapped at different scales, with a different land use in mind, at different times, or at different levels of detail. This may result in map unit symbols, soil properties, and interpretations that do not completely agree across soil survey area boundaries.

Date(s) aerial images were photographed: 4/27/1993; 4/8/1993; 4/20/1994

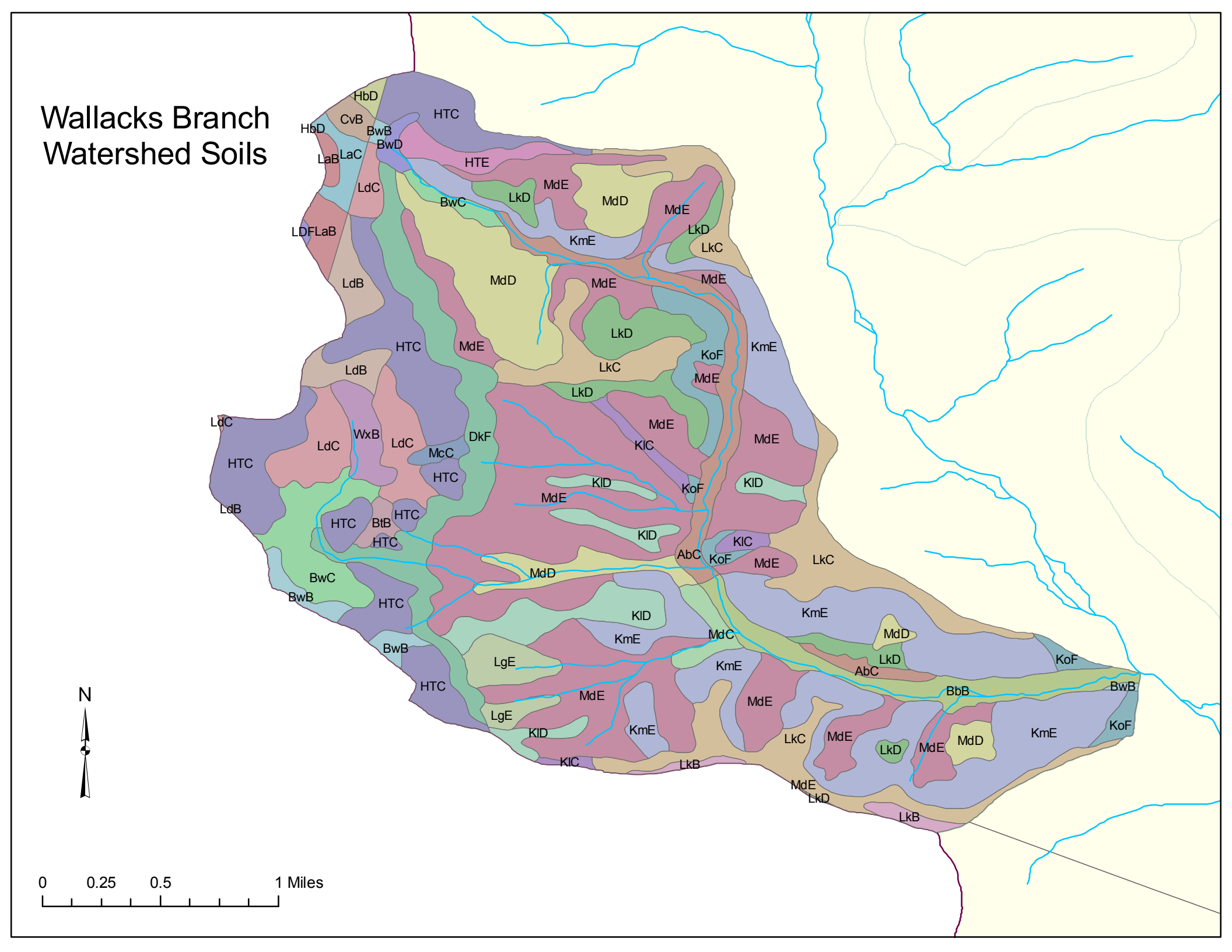
The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

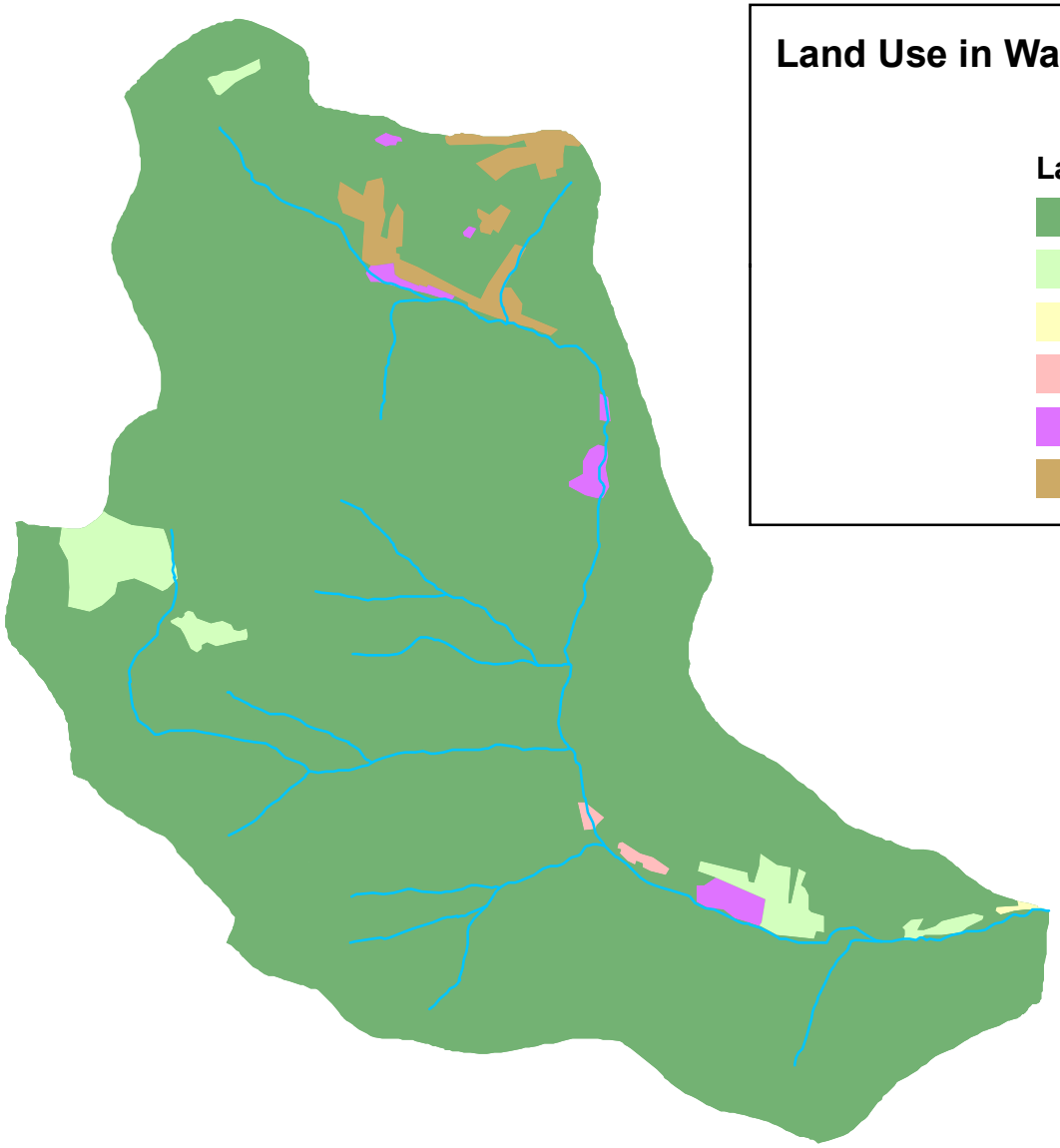
Bedford County, Pennsylvania (PA009)			
Map Unit Symbol	**Map Unit Name**	**Acres in AOI**	**Percent of AOI**
AbB	Albrights silt loam, 3 to 8 percent slopes	11.6	0.1%
AbC	Albrights silt loam, 8 to 15 percent slopes	175.4	1.9%
AeC	Allegheny loam, 8 to 15 percent slopes	9.2	0.1%
ArB	Andover cobbly loam, 3 to 8 percent slopes	8.4	0.1%
AvB	Andover cobbly sandy loam, 0 to 8 percent slopes, very stony	16.9	0.2%
BbB	Basher-Birdsboro complex, 0 to 8 percent slopes	416.8	4.5%
Bm	Birdsboro silt loam, rarely flooded	4.7	0.1%
BtB	Brinkerton silt loam, 3 to 8 percent slopes	9.7	0.1%
BuB	Buchanan cobbly loam, 3 to 8 percent slopes	11.5	0.1%
BuC	Buchanan cobbly loam, 8 to 15 percent slopes	0.0	0.0%
BwB	Buchanan cobbly loam, 3 to 8 percent slopes, extremely stony	98.2	1.1%
BwC	Buchanan cobbly loam, 8 to 15 percent slopes, extremely stony	128.4	1.4%
BwD	Buchanan cobbly loam, 15 to 25 percent slopes, extremely stony	13.0	0.1%
DkE	Dystrocrepts-Rock outcrop complex, 15 to 35 percent slopes	9.0	0.1%
DkF	Dystrocrepts-Rock outcrop complex, 35 to 70 percent slopes	179.0	1.9%
HTB	Hazleton very stony sandy loam, 3 to 8 percent slopes	1.2	0.0%
HTC	Hazleton-Clymer association, 8 to 25 percent slopes, extremely stony	481.4	5.2%
HTE	Hazleton-Clymer association, 25 to 45 percent slopes, extremely stony	51.4	0.6%
KlC	Klinesville channery silt loam, 8 to 15 percent slopes	84.3	0.9%
KlD	Klinesville channery silt loam, 15 to 25 percent slopes	127.3	1.4%
KmE	Klinesville and Calvin soils, 25 to 50 percent slopes	1,313.9	14.3%
KoF	Klinesville-Rock outcrop complex, 35 to 80 percent slopes	783.9	8.5%
LdB	Laidig cobbly loam, 3 to 8 percent slopes	160.3	1.7%
LdC	Laidig cobbly loam, 8 to 15 percent slopes	110.3	1.2%
LgD	Laidig cobbly loam, 15 to 25 percent slopes, extremely stony	19.8	0.2%
LgE	Laidig cobbly loam, 25 to 35 percent slopes, extremely stony	47.2	0.5%
LkB	Leck kill-Calvin complex, 3 to 8 percent slopes	68.2	0.7%

Bedford County, Pennsylvania (PA009)			
Map Unit Symbol	**Map Unit Name**	**Acres in AOI**	**Percent of AOI**
LkC	Leck kill-Calvin complex, 8 to 15 percent slopes	705.9	7.7%
LkD	Leck kill-Calvin complex, 15 to 25 percent slopes	310.7	3.4%
McC	Meckesville gravelly loam, 8 to 15 percent slopes	53.4	0.6%
MdC	Meckesville gravelly loam, 8 to 15 percent slopes, very stony	40.9	0.4%
MdD	Meckesville gravelly loam, 15 to 25 percent slopes, very stony	490.8	5.3%
MdE	Meckesville gravelly loam, 25 to 35 percent slopes, very stony	1,353.0	14.7%
NoB	Nolo loam, 3 to 8 percent slopes	3.7	0.0%
WxB	Wharton channery silt loam, 3 to 8 percent slopes, very stony	29.9	0.3%
Subtotals for Soil Survey Area		**7,329.3**	**79.5%**
Totals for Area of Interest		**9,216.1**	**100.0%**

Cambria County, Pennsylvania (PA021)			
Map Unit Symbol	**Map Unit Name**	**Acres in AOI**	**Percent of AOI**
AbB	Albrights silt loam, 3 to 8 percent slopes	0.7	0.0%
CeB	Cookport and Ernest soils, 3 to 8 percent slopes	40.8	0.4%
CeC	Cookport and Ernest soils, 8 to 15 percent slopes	12.8	0.1%
CvB	Cookport and Ernest very stony soils, 0 to 8 percent slopes	108.4	1.2%
CvD	Cookport and Ernest very stony soils, 8 to 25 percent slopes	170.5	1.9%
HaB	Hazleton channery loam, 3 to 8 percent slopes	64.6	0.7%
HaC	Hazleton channery loam, 8 to 15 percent slopes	55.1	0.6%
HbB	Hazleton very stony loam, 3 to 8 percent slopes	89.0	1.0%
HbD	Hazleton very stony loam, 8 to 25 percent slopes	311.5	3.4%
LaB	Laidig loam, 3 to 8 percent slopes	439.7	4.8%
LaC	Laidig loam, 8 to 15 percent slopes	147.2	1.6%
LDF	Laidig soils, 25 to 70 percent slopes	144.0	1.6%
LkB	Leck kill silt loam, 3 to 8 percent slopes	7.5	0.1%
LkC	Leck kill silt loam, 8 to 15 percent slopes	20.0	0.2%
LtB	Leetonia very stony loamy sand, 3 to 8 percent slopes	101.1	1.1%
NoB	Nolo very stony sandy loam, 0 to 8 percent slopes	170.4	1.8%
RaB	Rayne silt loam, 3 to 8 percent slopes	3.6	0.0%
Subtotals for Soil Survey Area		**1,886.8**	**20.5%**
Totals for Area of Interest		**9,216.1**	**100.0%**


Wallacks Branch
Watershed Soils
HbD
CvB
BwB
BwD
HTC
HTE
LaB
LaC
LdC
LDFLaB
BwC
LkD
MdE
MdD
KmE
LkC
LdB
KoF
WxB
DkF
McC
KlC
KlD
BtB
AbC
LgE
MdC
BbB
N
0
0.25
0.5
1 Miles

Land Use in Wallacks Branch Watershed



Landuse

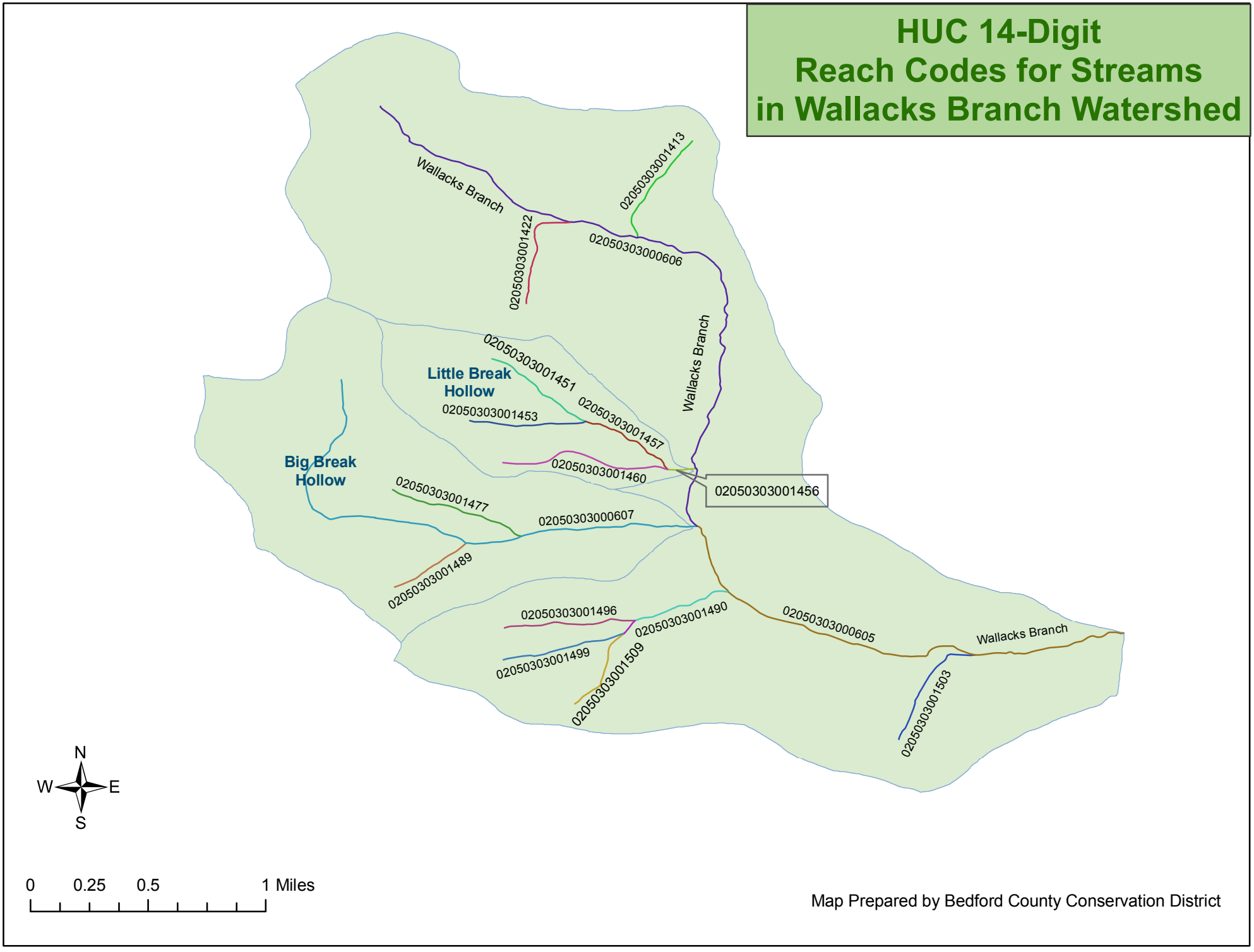
- forest
- meadow
- mixed
- recreational
- residential
- veg

N
W E
S

0 0.25 0.5 1 1.5 2 Miles

Map Prepared by the Bedford County Conservation District

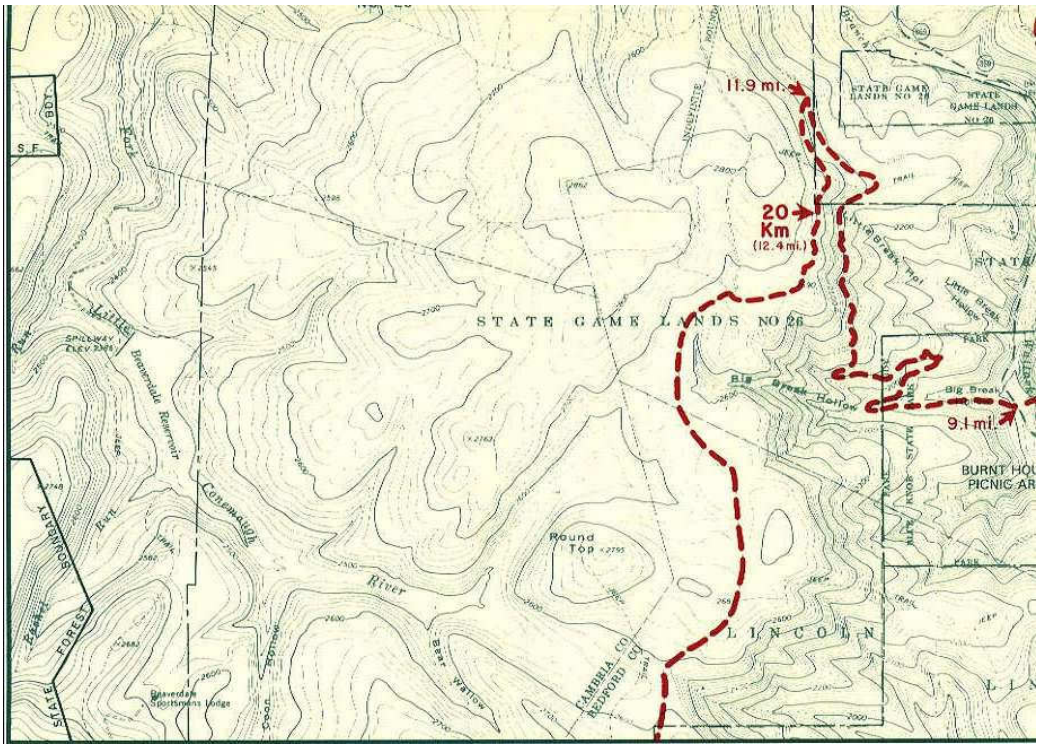
HUC 14-Digit Reach Codes for Streams in Wallacks Branch Watershed



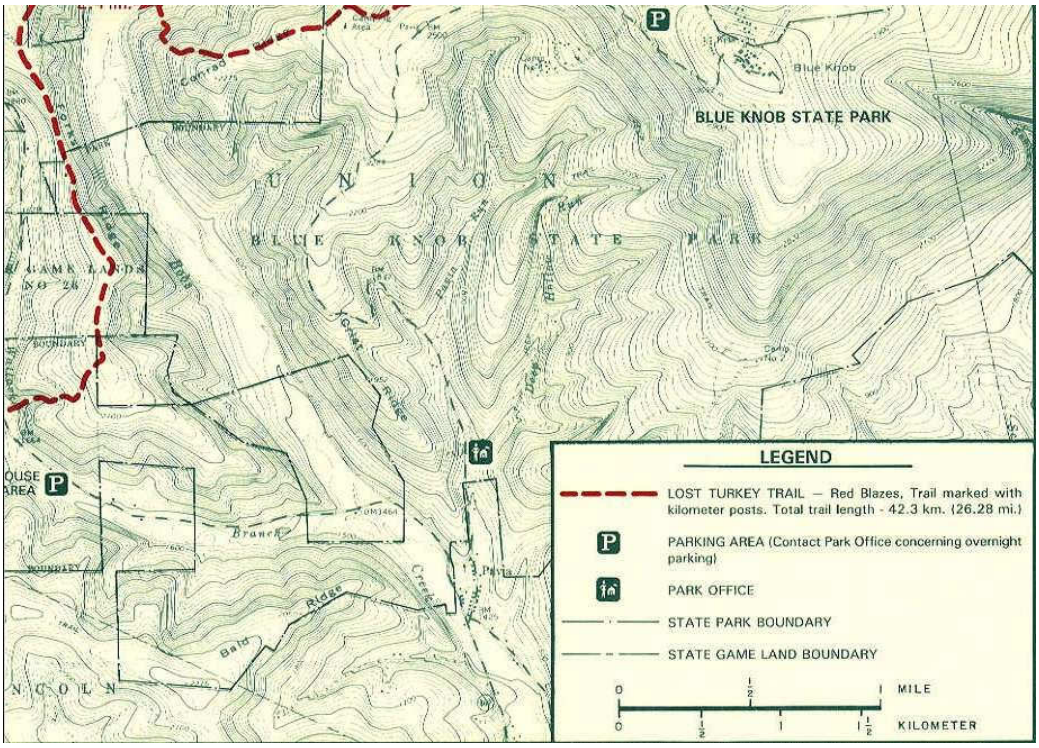
Map Prepared by Bedford County Conservation District

Lost Turkey Trail in the Wallacks Branch Watershed

Western section:



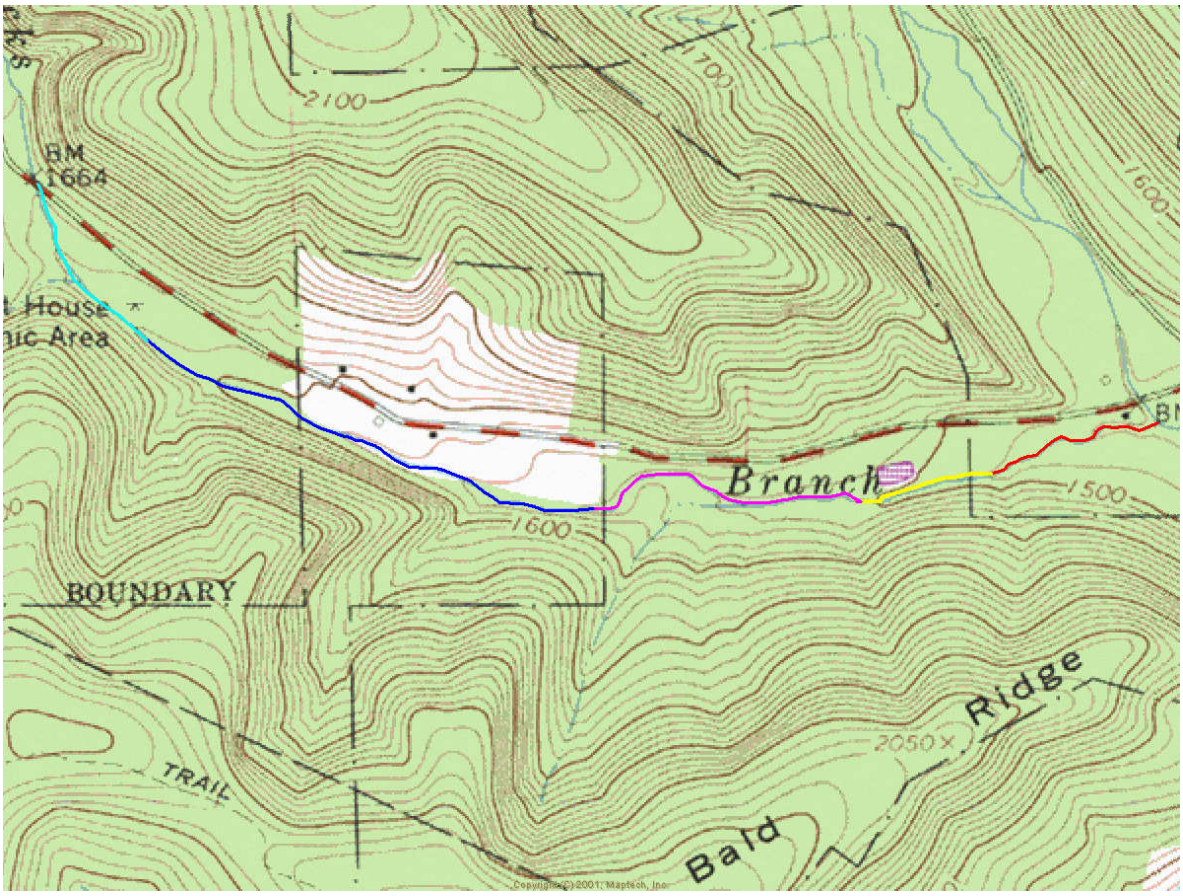
Eastern section:



Visual Habitat Assessment Survey Stream Reaches

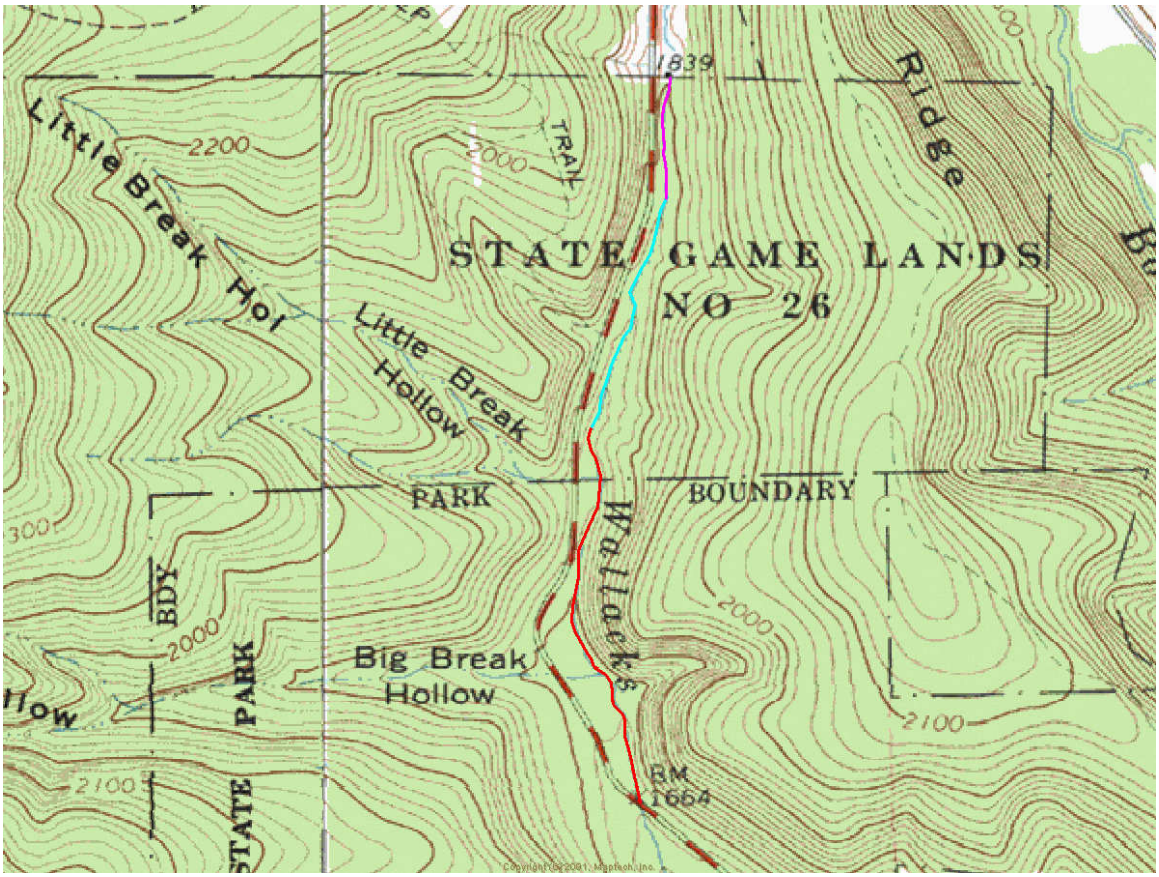
Wallacks Branch Stream Sections Surveyed by Fort Bedford Trout Unlimited Volunteers – August and September 2008

Red - Reach 1
Yellow – Reach 2
Dark Pink – Reach 3
Dark Blue – Reach 4
Pale Blue – Reach 5



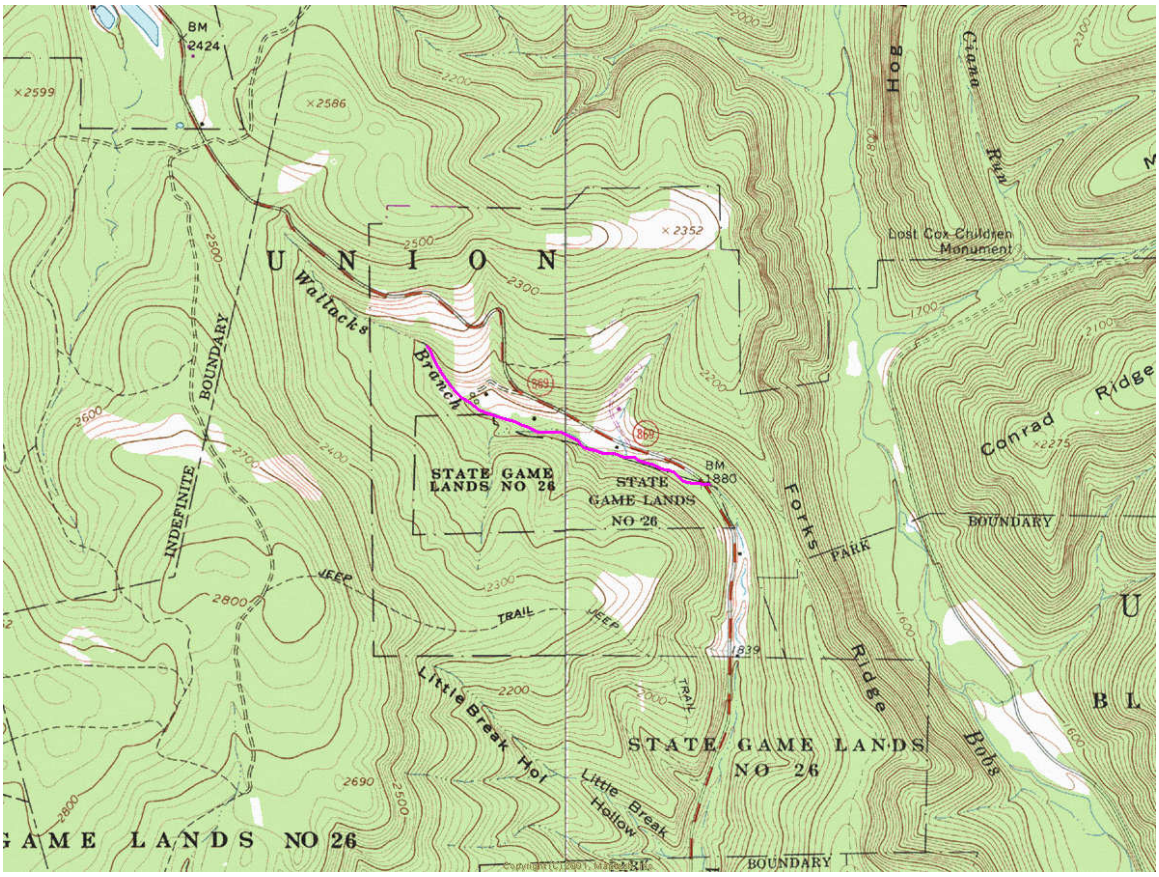
Wallacks Branch Stream Sections Surveyed by Bobs Creek Stream Guardian Volunteers – July 2011

Red – Reach 6 Light Blue – Reach 7 Pink - Reach 8



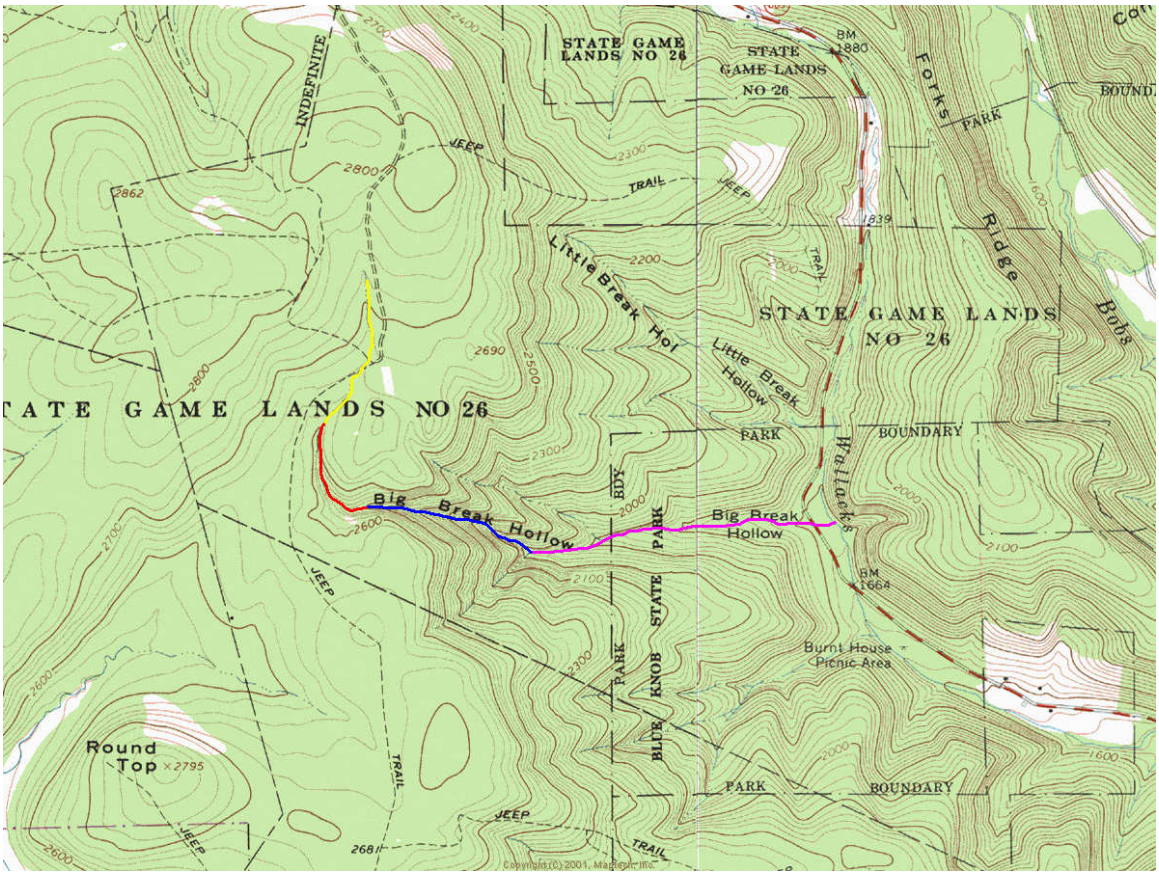
Wallacks Branch Stream Sections Surveyed by Bobs Creek Stream Guardian Volunteers – September 2008

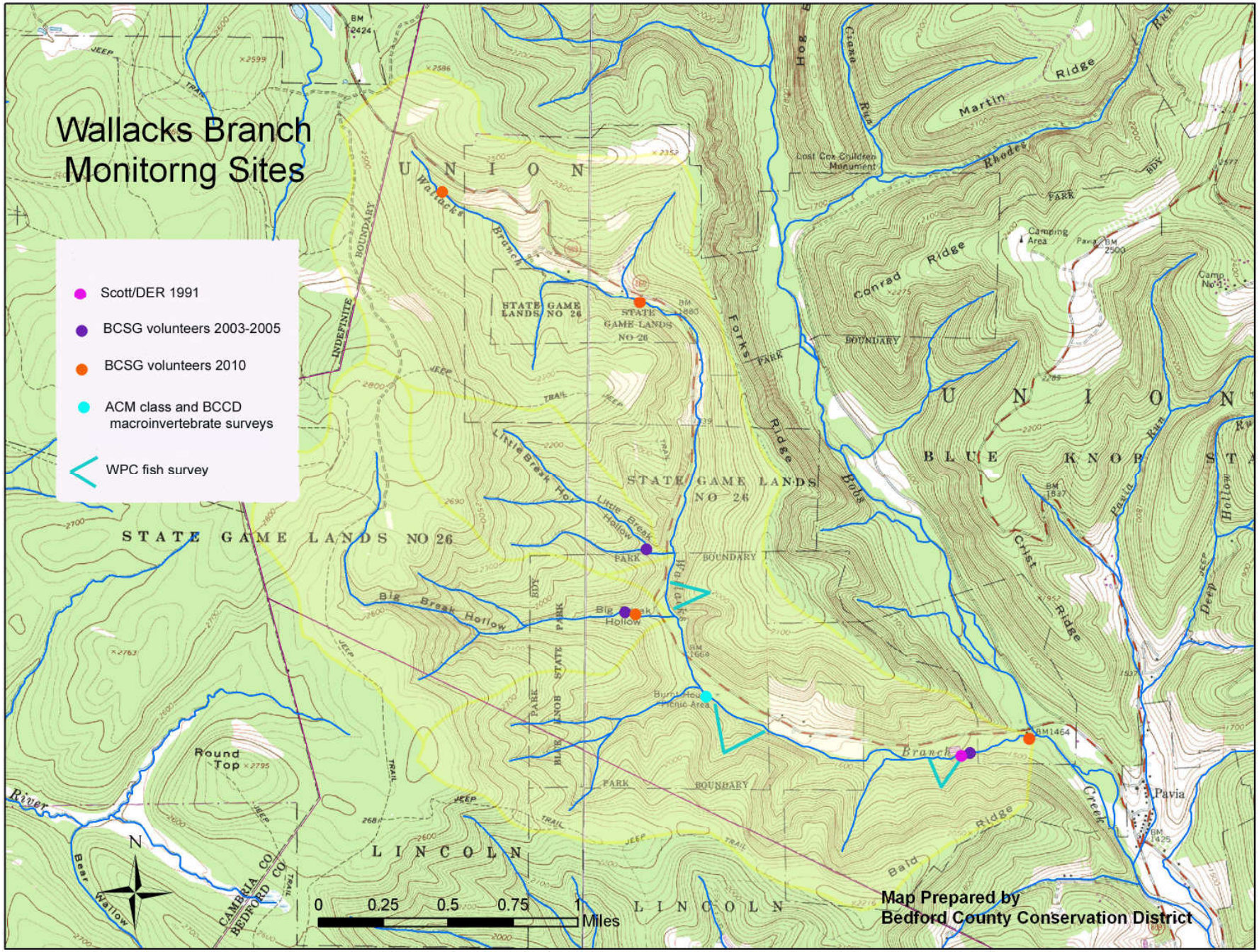
Pink – Reach - 9



Big Break Hollow Run Stream Sections Surveyed by Bobs Creek Stream Guardians Volunteers – March 2011

Pink - Reach 1
Dark Blue – Reach 2
Red – Reach 3
Yellow – Reach 4




Wallacks Branch
Monitorng Sites
Scott/DER 1991
BCSG volunteers 2003-2005
BCSG volunteers 2010
ACM class and BCCD macroinvertebrate surveys
WPC fish survey
STATE GAME LANDS NO 26
UNION
LINCOLN
BLUE KNOB STATE PARK
Wallacks Branch
Little Break Hollow
Big Break Hollow
Round Top
Martin Ridge
Conrad Ridge
Forks Ridge
Bobs Ridge
Christ Ridge
Bald Ridge
Pavia
Camping Area
Lost Cox Children Monument
Burnt Cabin Picnic Area
BOUNDARY
INDEFINITE BOUNDARY
CAMBRIA CO
BEDFORD CO
N
0 0.25 0.5 0.75 1 Miles
Map Prepared by
Bedford County Conservation District