Stream Morphology and Water Quality Based Restoration Plan for the Paradise Creek Watershed

Phase I Technical Report for the Paradise Creek Watershed Assessment

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Introduction

This report describes stream morphology and recommends restoration projects in each sub-watershed of the Paradise Creek watershed, Monroe County, Pennsylvania. Projects are shown in Figure 1. Stream classifications (Rosgen 1994, 1996) and restoration sites were identified using topographic maps, Monroe County GIS digital orthophotos issued January 2004, and field reconnaissance. All potential restoration sites were field verified in 2003 and 2004.

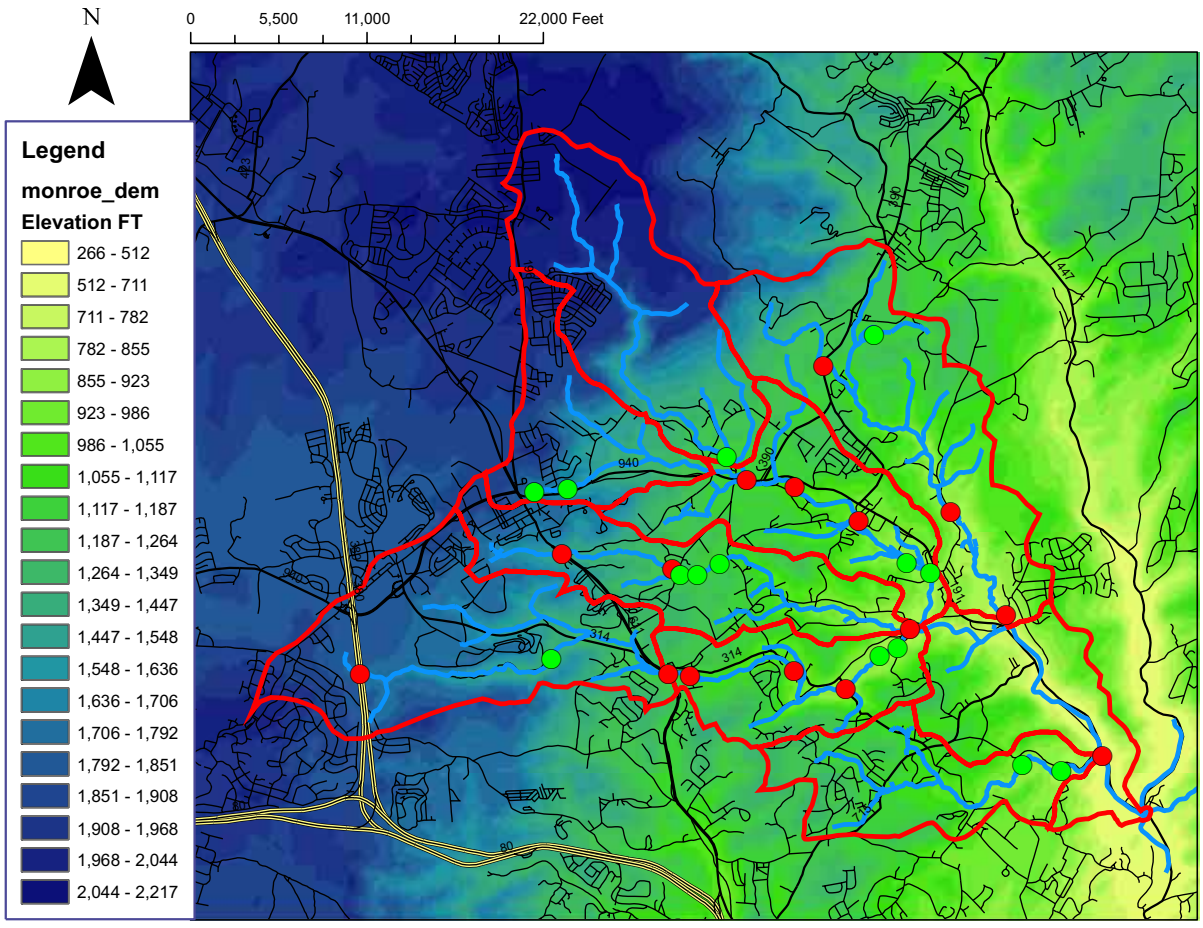

Figure 1. Potential restoration sites in the Paradise Creek watershed. Sites were identified by means of topographic map examination; stream proximity to roads, bridges and culverts; aerial photo examination; and stream reconnaissance. Red dots are projects related to transportation network. Green dots are all others.

Paradise Creek headwaters begin upon the Pocono Plateau in Mount Pocono Borough, and Barrett, Coolbaugh and Tobyhanna Townships in Monroe County, Pennsylvania. Headwater streams flow steeply off of the plateau into the Valley and Ridge physiographic province before joining with the main stem of Paradise Creek. The Brodhead Watershed Association (2002) provided the following introductory description of the Paradise Creek watershed. Draining approximately 44.5 square miles, Paradise Creek is about nine miles long, flowing in a southeasterly direction through Paradise Township before joining Brodhead Creek. Most streams in the watershed are closely paralleled by highways, but the riparian zone is mostly intact as much riparian land is owned by fishing clubs. Major tributaries include Devils Hole Creek, Cranberry Creek, Butz Run, Swiftwater Creek and Forest Hills Run. Paradise Creek boasts a healthy population of native and stocked trout. Streams in the watershed are mostly high-gradient, with the exception of headwater streams atop the Pocono Plateau and those streams within the main Paradise Creek valley bottom. Base flow is plentifully supplied by springs, wetlands, and glacial overburden soils and geology. Devils Hole Creek, a tributary of the Paradise, is designated as Exceptional Value by the Pennsylvania Department of Environmental Protection. The Paradise, along with the Brodhead, is credited as the birthplace of American trout fishing tradition. Paradise Valley is home to the first licensed trout hatchery in Pennsylvania.

Level I Stream Morphology of the Paradise Creek Watershed

Figure 1 displays relative elevations within the Paradise Creek watershed. Paradise Creek sub-watersheds begin atop plateaus in relatively flat and wooded wetland areas, where valleys are wide and streams are very low gradient with multiple small channels. Once channels become well-defined, they exhibit morphology of typical low gradient C or E channels (Figure 2). Development in the watershed has taken place in these headwater areas or in valley bottoms further downstream. In areas of transition between the Pocono Plateau and the Valley and Ridge physiographic provinces, streams spill over an escarpment and enter steep sided and confined V-shaped valleys. Streams in the V-shaped valleys are classified as high-gradient A or B channels (Fig. 2). Within these high-gradient stream sections are numerous short, shelf-like low-gradient stream segments. These are wetland areas perched within the generally steep valleys. Wherever a stream enters these perched wetlands, the stream forms multiple channels, classified as natural D channels (Fig. 2). Further downstream, the stream gradient lessens and the valleys widen into alluvial valleys, where streams are no longer confined within valley walls and depositional soils predominate along stream channels. The meander belt

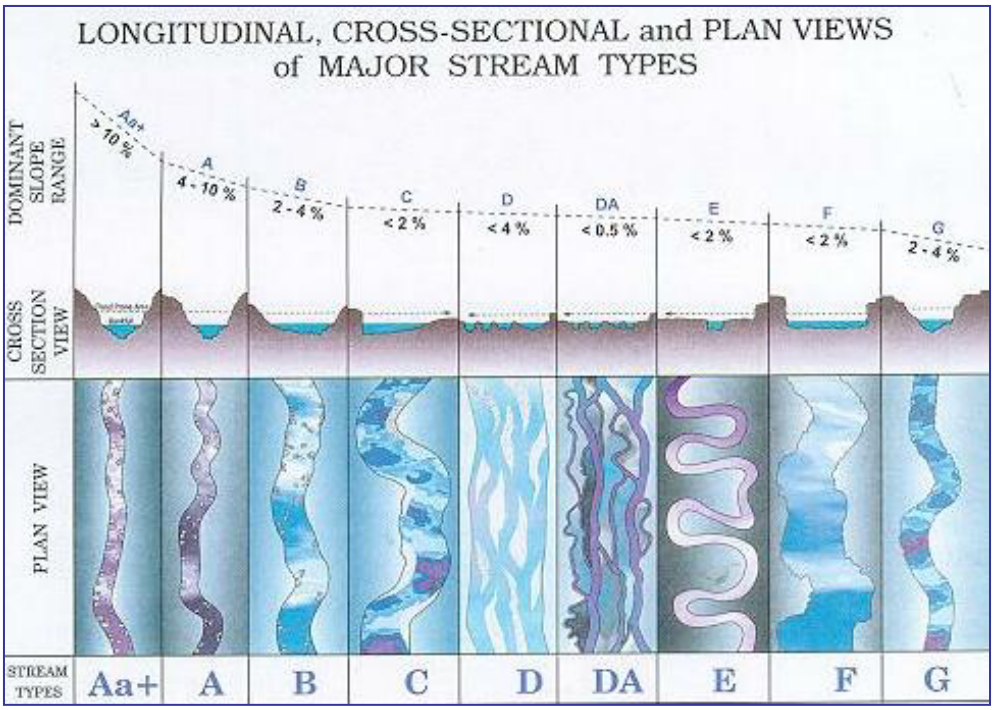

Figure 2. Stream types (from Rosgen 1994, 1996).

width of most streams increases dramatically once the streams are no longer confined by steep-sided valleys. Extensive and probably natural bank erosion was observed in stream segments transitioning from high to low gradient. Dramatic examples of such erosion can be seen on Swiftwater Creek and Devils Hole Creek.

Consult the appendices for a more detailed description of Level I morphology. Appendix A contains longitudinal elevation profiles of Paradise Creek and its tributary streams. Appendix B shows a MS Excel workbook prepared for this study that contains a stream mileage system, various landmarks along stream corridors, and all mapped stream segments with their local slope and predicted stream type. Most segments were field verified by visual observation of stream pattern (Rosgen Level I analysis). Many remote locations were missed by field reconnaissance and stream classification was predicted using only maps and aerial photos. DRBC is completing a GIS layer of Paradise Watershed stream types linked to the National Hydrographic Dataset (NHD). Computer files are available from DRBC upon request.

Stream Channel Stability Assessment and Restoration Opportunities

This survey of Paradise Creek watershed fluvial geomorphology was conducted to identify locations in the watershed where streams are severely unstable. For this report, instability is defined as localized loss of dynamic equilibrium of the stream channel. According to Pennsylvania's Keystone Stream Team (2002) a stream is "in equilibrium" or stable when it can carry the sediment load supplied by the watershed without changing dimension (cross sectional area, width, depth, shape), pattern (sinuosity, meander pattern), or profile (longitudinal pattern and slope) and without aggrading (building up of bottom materials) or degrading (incising into the landscape and abandoning the natural floodplain). At the locations identified in this report, field evidence of instability was verified by observation of channel evolution status (See Figure 3; Schumm, Harvey and Watson 1984; Simon 1989, Simon and Downs 1995).

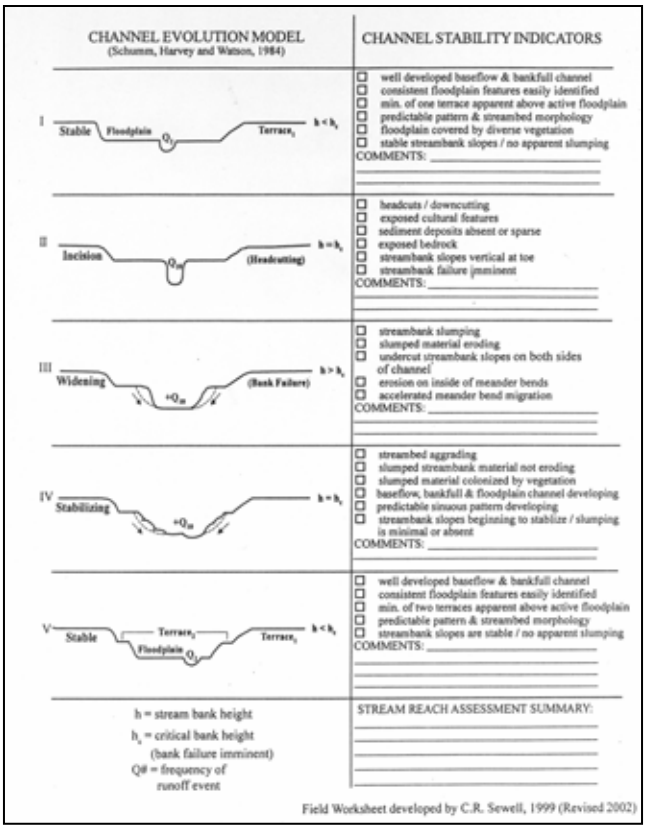

Figure 3. Channel Evolution Model (Schumm, Harvey and Watson 1984; field observation checklist adapted by Randy Sewell, VHB, Inc., Williamsburg, VA)

Verification was performed according to methods described by Thorne et al. (1997, 1998) and Rosgen (2001) and included observation of severity and extent of stream incision or degradation; extreme stream bank or point bar erosion; excess sedimentation or aggradation through interruption of natural sediment transport capacity; over-widening of the channel relative to depth; channel braiding; formation of mid-channel sediment bars; erosion of the stream bed or head-cutting; and leaning or fallen old, large trees. Localized effects of bridge crossings, culverts, dams, stream bank stabilization projects, habitat improvement structures, and some land uses include symptoms mentioned above as well as blockage of fish passage. Many segments of streams were identified where the riparian zone has been reduced due to land use activities.

Diagnosis of instability was begun by visiting the confluence locations of all streams in the watershed. At

these locations, field observation of the relative elevations of the stream beds helped to inform a diagnosis of systemic aggradation or degradation, such as happens in the case of increased watershed imperviousness and modification of the local hydrograph by stormwater runoff. Unless masked by incision due to channelization, cumulative impacts were typically observed at these confluence points at the base of each sub-watershed. Where both tributary channels are in dynamic equilibrium, the bed elevations typically match at the confluence point. If they are not in equilibrium, then one channel was higher or lower than the other. Obvious differences in bed elevations were identified at two locations: at the confluence of Swiftwater Creek and Forest Hills Run; and at the confluence of Butz Run with Paradise Creek. The first may be due partially to systemic stormwater impacts, though locally severe road and channelization impacts are also apparent; the second was due to channelization of Paradise Creek during construction of Route 191 that parallels the stream. Once confluence points were observed, all possible upstream sources of instability – both natural and man-made - were identified during numerous field trips.

Before prioritization, there were about 260 potential restoration projects identified by map and aerial photo examination. Most were discarded as candidates upon field verification, not due to absence of problems, but because many of the problem areas were very localized and contained. Most unstable areas were in later stages of channel evolution, where natural 'healing' of the stream channel is imminent. Many other sites were unstable because of structures such as bridges, culverts, and small dams. Restoration projects near these might serve to somewhat enhance aesthetics and habitat, but such projects might waste resources unless they address the underlying causes of local instability – the bridges, culverts and dams. In the end, patching stream banks didn't count as true restoration opportunities. Thus the projects listed in this document are the top priorities because total restoration can be completed or because instability is so severe that infrastructure is threatened.

> **Restoration** *is defined as the process of converting an unstable, altered, or degraded stream corridor, including adjacent riparian zone and flood-prone areas to its natural or referenced, stable conditions considering recent and future watershed conditions. This process also includes restoring the geomorphic dimension, pattern, and profile as well as biological and chemical integrity, including transport of water and sediment produced by the stream's watershed in order to achieve dynamic equilibrium (Keystone Stream Team 2002).*

Two categories of restoration opportunities are shown in the following watershed assessments: those projects relating to the transportation network – road crossings, bridges, culverts, and close proximity of roads to streams; and all other types of stream restoration or protection projects. Natural impacts were frequently observed in transition areas between changing soil types, abrupt changes in stream gradient, bedrock outcrops and other geological features, woody debris log jams, and confluence points of streams. Projects resulting from natural instability were ignored unless homes or businesses located near these features require additional protection or stream stabilization. Among the other types of restoration projects, objectives are meant to mitigate man-made impacts such as: stream channelization (a well-known hydrologist appropriately refers to this as 'recreational bulldozing'); instream mining; ponds and reservoirs; landscape modification and addition of impervious surfaces; ditching of wetlands; clearing away riparian buffer zones; building in floodplains; disrupting continuity or heterogeneity of habitat; and other interruptions to the natural hydrologic processes of the watershed. Since those who conduct these practices may unknowingly cause problems downstream, a most beneficial project is education of landowners. Table 1 enumerates projects in each sub-watershed of the Paradise Creek watershed.

Table 1. Number of potential stream restoration sites in the Paradise Creek watershed.

	Source of Instability	
Sub-Watershed	Transportation Network	Other Causes
Lower Paradise Creek	1	0
Butz Run	0	1
Cranberry Creek	3	1
Lower Swiftwater Creek	5	2
Upper Swiftwater Creek	1	1
Forest Hills Run	2	3
Upper Paradise Creek	3	2
Devils Hole Creek	1	0
Tank Creek & Yankee Run	0	2
TOTALS	16	12

There are many small projects that have not been listed. Educating and providing resources to landowners about the importance of riparian buffers, native plants, and reduction of impervious surfaces can solve many of the observed but small problems relating to land use in the vicinity of streams. Perhaps the Monroe County Conservation District could provide technical assistance in the form of property audits for this purpose. Of course, strong municipal ordinances and regulations can also help to solve these problems.

Another frequent and cumulatively important problem relates to the many ponds and small dams throughout the watershed. During analysis of water quality data for the Paradise Creek watershed, it was observed that temperature violations are fairly frequent in local waterways. Hundreds of small and shallow impoundments were identified, and these may be a significant contributing factor to elevated temperatures in this important trout fishery. Dams also interrupt fish passage. Future monitoring of water temperature should be conducted upstream, within, and downstream of numerous ponds throughout the watershed, so that the extent of this perceived problem can be quantified. Perhaps the Brodhead Watershed Association can obtain grant funds to provide water temperature loggers to landowners for this purpose.

Dams also have strong impacts upon hydrologic processes and habitat. Impoundments disrupt sediment transport processes and cause abrupt changes in transference of erosive forces from potential energy (the pond) to kinetic energy (the spillway). Erosion was observed just downstream of most spillways. Many landowners have attempted to build in-stream ponds in high-gradient streams, with drastic results. Numerous ponds were observed to have completely filled with coarse sediment, which is the normal bedload sediment transported by natural stream processes. The landowner's maintenance headache includes expenditure of significant funds for dredging and stabilizing the channel. The bigger the dam, the bigger the maintenance problem – see the Lake Crawford dredging project as a case in point. As an example, one property owner on the high-gradient Devils Hole Creek attempted to create a small impoundment which ultimately created a property threat. The pond filled with cobble-sized sediment, and the stream channel was diverted by the sediment bar towards the stream's right bank, the owner's driveway and main building. Stream processes are misunderstood or never even considered by nearly all landowners, so education may save the landowners significant expense. As an alternative to an in-stream structure, landowners could create a small diversion structure that sends floodwaters toward an off-stream pond. This could save the continual dredging costs and providing some storage and recharge benefit to the stream. In general, streams should not be dammed on their main channel, and this especially applies to high gradient streams. Off-stream storage works better for both landowners and aquatic life.

Restoration Options

Several factors were considered during prioritization of projects. First, the solutions should be appropriate to the natural stream characteristics. There are many options. What works best, looks best, and costs least? For example, rip-rap may be unsightly overkill for stabilization of low gradient streams, and bioengineering techniques may be unsuitable in high-velocity streams. Some vendors now offer software providing menus of restoration options according to stream and landscape characteristics. Rosgen (1996) provides a very useful table of stream management characteristics according to observed stream types. The Society for Ecological Restoration also provides excellent guidance for conception, organization, implementation, and assessment of restoration projects (Clewell et al. 2000).

Second, unstable streams can naturally regain equilibrium over time if left alone, so it is possible, and in many cases preferable, to let nature take its course. Examination of the channel evolution status of a stream reach perceived as unstable may reveal that 'healing' is imminent. The 'do nothing' option should be the first consideration. It is critical to ensure that upstream causes and processes are addressed if restoration efforts are to succeed. Unfortunately many funding agencies want immediate action and will not pay for the data collection necessary to verify upstream causes and quantify their effects. It is tempting to address the symptoms of disequilibrium by patching one eroded stream bank, but restoration measures may repeatedly fail if upstream conditions persist or worsen. Properties at high risk obviously get high priority for patching and stabilizing stream banks, but this should be viewed as a temporary measure to be followed by more comprehensive restoration. Using a comprehensive watershed view, it may be possible to save money by grouping a number of contiguous sites into one restoration project.

Within a stream reach targeted for restoration, project planning takes place in consideration of the whole range of hydrologic conditions: channel-forming flows, low flows, and flood conditions. This assessment of equilibrium or natural stability of the stream channel took place by looking at characteristics of the stream formed by the most effective channel-forming flood. This is typically the bankfull flood that occurs at a frequency of about 2 of every 3 years. The bankfull flood is the key to popular natural stream channel design techniques using instream structures constructed to ensure that the stream maintains dynamic equilibrium.

When assessing restoration options, however, the hydrologic extremes were also considered. How does the stream channel ecologically function under extreme low-flow conditions? Is there a well-defined low-flow channel? This is important for survival and movement of aquatic species such as the wild populations of trout that inhabit streams of the Paradise Creek watershed. On the other hand, restoration measures tied to bankfull are not meant to protect property damage resulting from larger floods. Hurricane Ivan hit the Paradise Creek watershed in 2003, and extensive damage was observed that cannot be considered simple instability.

For the projects identified in the following watershed assessments, restoration or protection measures should provide three main benefits:

1. Sustain fish passage, refuge and water quality during droughts by restoring habitat at low flow;
2. Maintain equilibrium of the stream channel by creating a natural bankfull flood channel; and
3. Protect homes and businesses from large floods by other means designed well above the bankfull elevation.

Recommendations

1. Gather reference reach data from Butz Run, an E channel, to serve as a design template for future natural stream restoration of low-gradient streams throughout the Poconos. During Spring of 2005, the reference reach will be measured by cooperative efforts of DRBC, MCCD, MCPC, and others using methods described by Harrelson et. al (1994). Reference reach data will be analyzed using RiverMorph Stream Restoration Software (RiverMorph, LLC, Louisville, KY), and distributed to relevant agencies and interested parties.

2. Work with the PA Department of Transportation, Monroe County, and municipal road maintenance agencies to install river-friendly bridges and culverts during future infrastructure maintenance and repair. This has been done in some maintenance districts by members of the Keystone Stream Team.

3. Educate landowners about protection of the riparian corridor, stormwater impacts, and stream channel maintenance. This can be completed as part of the Paradise Creek project or future grant-funded activity (WREN grants, Coldwater Heritage grants, etc.)

4. Improve and share the assessment data set – this Level I survey only begins to document visual observations throughout the watershed. Recommended 'next steps' would be: to collect detailed morphology of known impacted and reference stream segments; improve the GIS layers for the stream network; conduct additional aerial photo surveys; assemble partnerships to design and implement the restoration projects listed herein. It is anticipated that surveys of many impacted segments will be conducted during restoration project implementation throughout Pennsylvania, and these data should be shared among restoration practitioners. It became obvious during this survey that the Commonwealth must improve GIS layers of the stream networks – many unmapped channels were found, and those that have been digitized are highly inaccurate.

5. Implement more intensive water temperature monitoring within a program designed to reduce temperature stress upon trout throughout the watershed. Funding can surely be found to provide water temperature loggers (these are small, dependable, and inexpensive) to landowners. Such temperature data can be assembled and analyzed to quantify and reduce the effects of impoundments, parking lot runoff, and reduced riparian buffers upon water quality of the Paradise Creek. The objective of such an effort is to maintain a healthy and viable trout population in the watershed, and to reduce the frequency of violation of PA water quality standards, and to maintain or improve coldwater fisheries habitat. A similar effort has been successfully implemented by the Pequannock River Coalition in northern New Jersey (http://www.pequannockriver.org).

Lower Paradise Creek Sub-Watershed Potential Restoration Sites

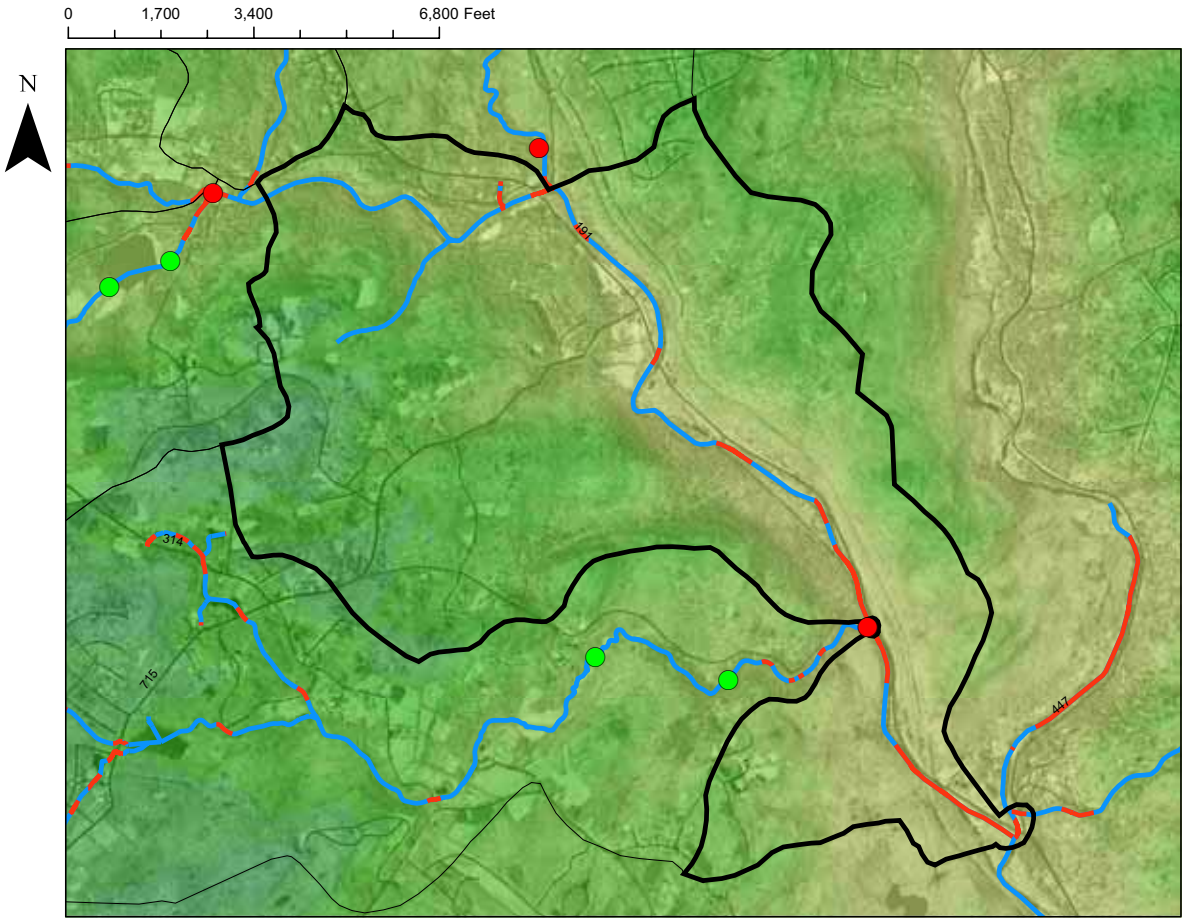

Figure 4 – Potential restoration sites in the Lower Paradise sub-watershed. Sites were identified by means of topographic map examination; stream proximity within 150 feet of roads, bridges and culverts; aerial photo examination and field verification.

Restoration Projects

Road (1 red)

Observation	**Action**
1. Paradise Creek along Route 191 (4 segments): extensive channelization. Improve habitat within incised channel.	Install habitat improvement structures.

Butz Run Sub-Watershed Potential Restoration Sites

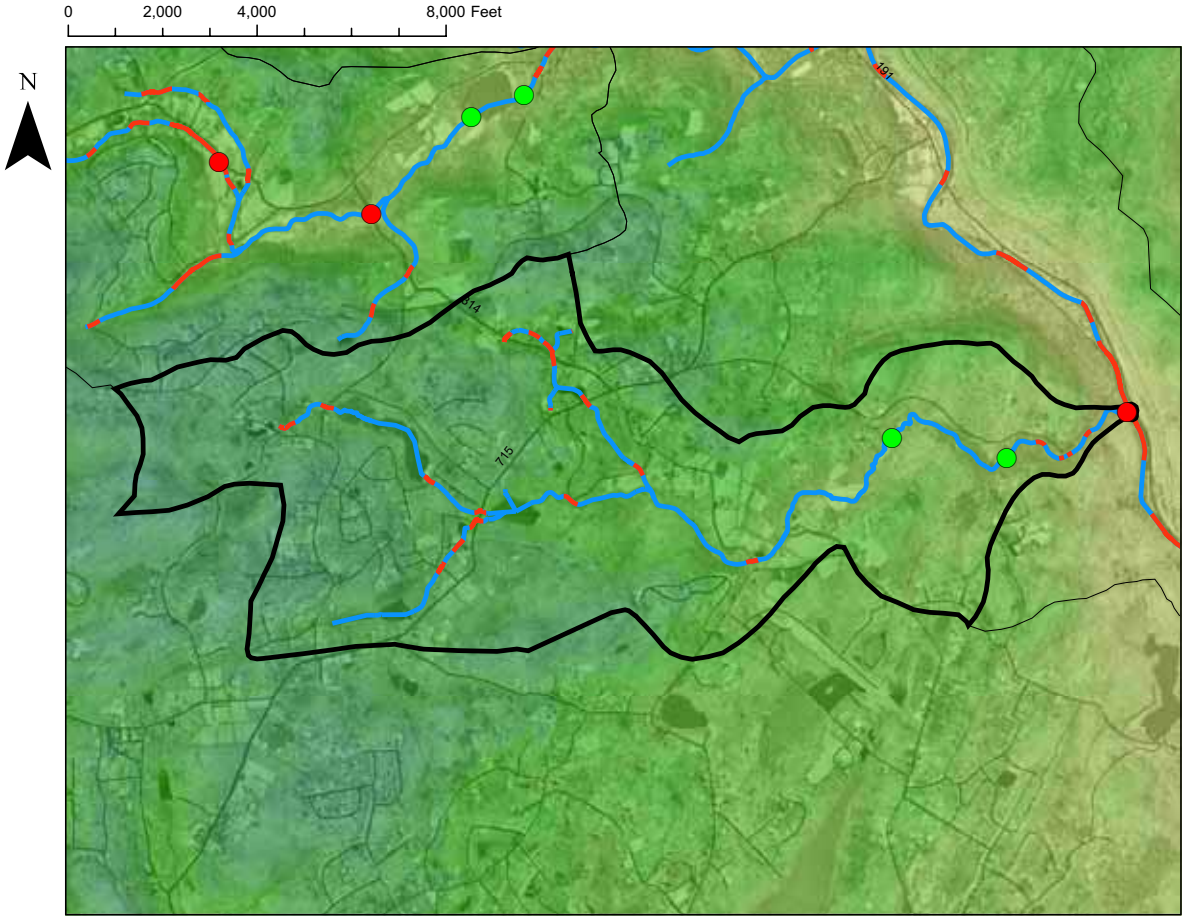

Figure 5 – Potential restoration sites in the Butz Run sub-watershed. Sites were identified by means of topographic map examination; stream proximity within 150 feet of roads, bridges and culverts; aerial photo examination and field verification.

Restoration Projects

Other (1 green)

Observation	Action
1. Butz Run in Parcel 3571 just upstream of forest and abrupt gradient change entering hemlock valley.	Document reference reach morphology of E channel.

Cranberry Creek Sub-Watershed Potential Restoration Sites

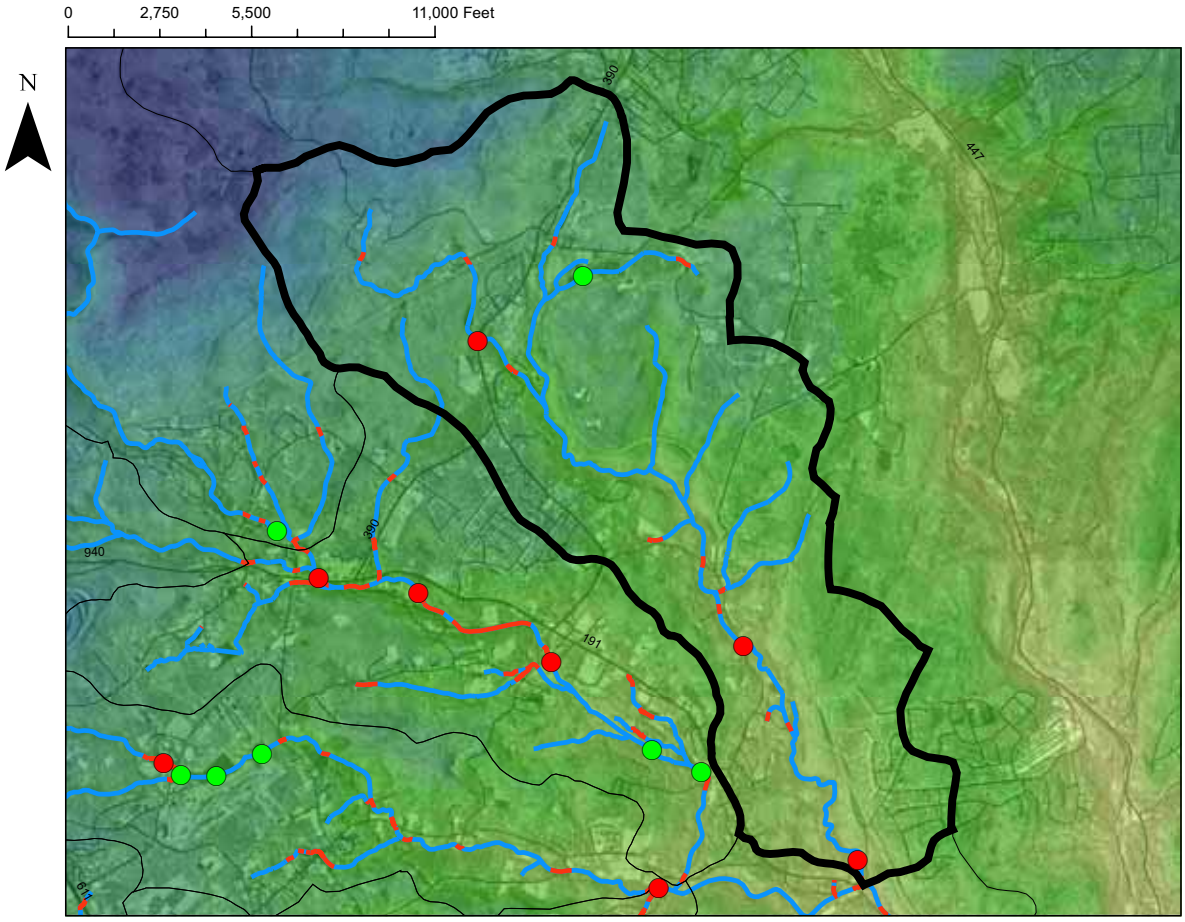

Figure 6 – Potential restoration sites in the Cranberry Creek sub-watershed. Sites were identified by means of topographic map examination; stream proximity within 150 feet of roads, bridges and culverts; aerial photo examination and field verification.

Restoration Projects

Road (3 red)

Observation	**Action**
1. Cranberry Creek at Browns Hill Road crossing – multiple culverts, blockages, undersized.	Road crossing is being renovated (proposed project as of January 2005)
2. Cranberry Ck at Cranberry Creek Road crossing – culvert effects.	Crossing frequently floods, culvert undersized. Road runoff is potential problem. Possible project.
3. Cranberry Ck UNT7 (R) at Route 191 crossing – culvert effects.	Road runoff should be captured and treated.

Other (1 green)

Observation	**Action**
4. Cranberry Ck (L) through parcel 8534 peat mining operation, extreme channelization.	See 8534 Aerial Photo. Extensive disturbance of stream channel, mitigation necessary once mining operation is completed.

Figure 7 - Cranberry Creek at Browns Hill Road: culvert is undersized, threatens road. Culvert should be replaced and sized sufficiently to provide additional cross sectional area and improve fish passage.

Figure 8 - Cranberry Creek at Cranberry Creek Road crossing. Culvert undersized, road frequently floods. Stream receives a large amount of road runoff. Non-point source pollution management recommended here.

Figure 9 - Cranberry Creek at Route 191 crossing. This location receives a large quantity of road runoff, which should be managed to reduce introduction of pollutants to stream.

Figure 10 (left) and Figure 11 (below): headwaters of Cranberry Creek watershed at active peat mining operation. Upon conclusion of peat mining operations, this site will require extensive restoration. Little is presently done to manage water quality impacts at this site.

Lower Swiftwater Creek Sub-Watershed Potential Restoration Sites

Figure 12 – Potential restoration sites in the Lower Swiftwater Creek sub-watershed. Sites were identified by means of topographic map examination; stream proximity within 150 feet of roads, bridges and culverts; aerial photo examination and field verification.

Restoration Projects

Road (5 red)

Observation	**Action**
1. Swiftwater Creek at Parcel 0299 residential – bank gets brunt of erosion effects from sharp turn in creek.	Landowner received disaster recovery funds for bank stabilization. Habitat improvements needed.
2. Swiftwater Creek at Route 314 crossing – bridge effects.	Large restoration project – up to 2 miles of stream affected by backwater flooding & erosion.
3. Swiftwater Creek along Route 314 in Swiftwater, PA – road is undermined.	Stabilization and habitat improvement recommended (large project).
4. Swiftwater Creek at Aventis Pasteur – multiple crossings, proximity to roads and parking lots.	Examine storm water runoff management at site, potential future projects with Aventis (small project).
5. Swiftwater Creek at Route 611 – bridge and urban runoff.	Manage highway runoff (small project).

Other (2 green)

Observation	Action
6. Swiftwater Creek at Lake Swiftwater outlet – dam effects.	Install fish passage structure.
7. Swiftwater Creek upstream of Lake Swiftwater – bar deposition, sediment transport interruption.	Detailed assessment from 314 to Lake Swiftwater, perhaps restore as part of Rt. 314 project #2.

Figure 13: Lower Swiftwater Project 1: Left bank erosion at confluence of Forest Hills Run and Swiftwater Creek. Landowner has received emergency stabilization funding, but post-stabilization habitat improvements and perhaps upstream channel realignment would improve instream conditions. This site was previously channelized, creating a 90-degree confluence of the streams and producing these erosion effects.

Figure 14 - Lower Swiftwater Project #2: Swiftwater Creek upstream of Route 314 crossing – up to 2 miles of severe erosion.

Upper Swiftwater Creek Sub-Watershed Potential Restoration Sites

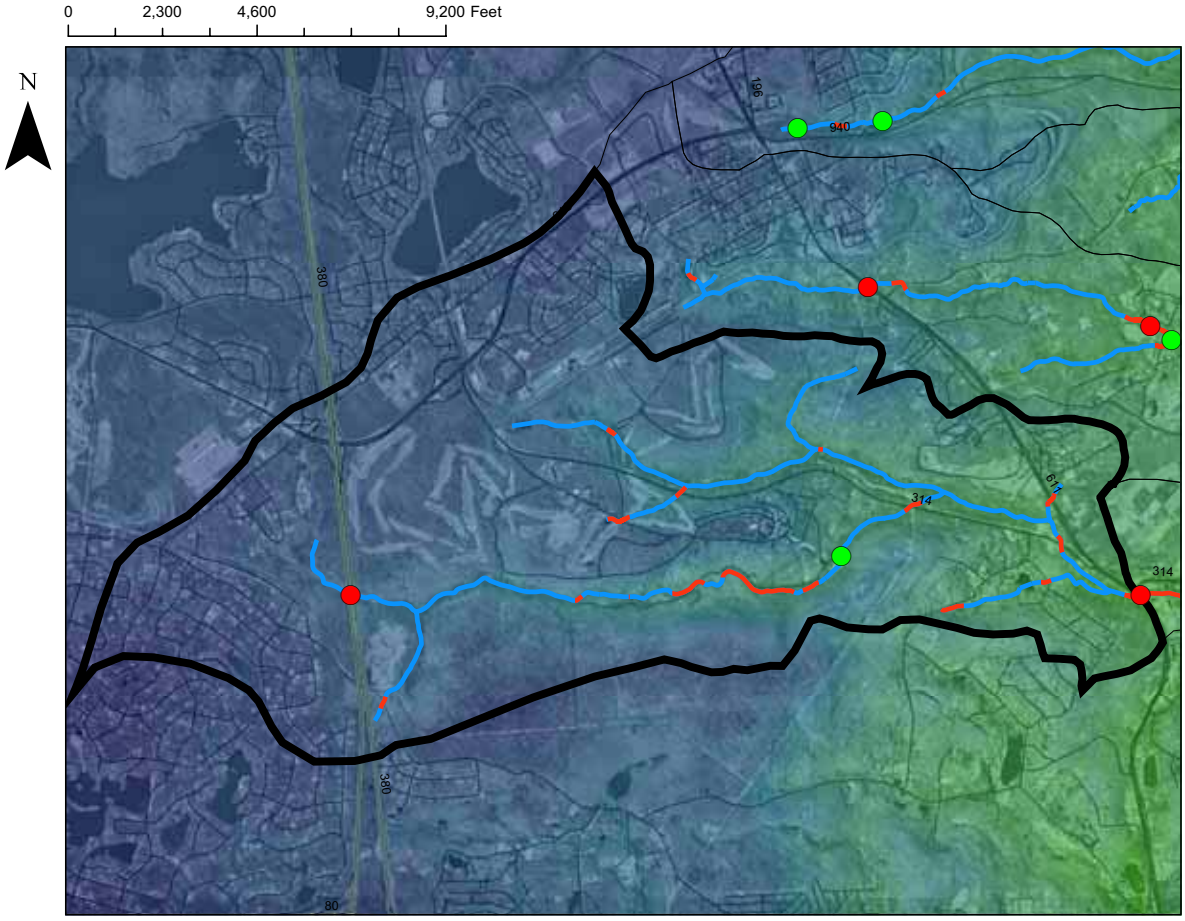

Figure 15 – Potential restoration sites in the Upper Swiftwater Creek sub-watershed. Sites were identified by means of topographic map examination; stream proximity within 150 feet of roads, bridges and culverts; aerial photo examination and field verification.

Restoration Projects

Road (1 red)

Observation	**Action**
1. Swiftwater Creek headwaters at I-380 N and S: manage runoff from interstate road.	Install BMPs to capture road runoff.

Other (1 green)

Observation	**Action**
2. Swiftwater Creek at Ireland Hotels property – repair old dam effects.	Old dams on property, 1 breached and 1 filled with sediment. Investigate old diversion structure. Possible project: remove small dam and improve local habitat.

Forest Hills Run Sub-Watershed Potential Restoration Sites

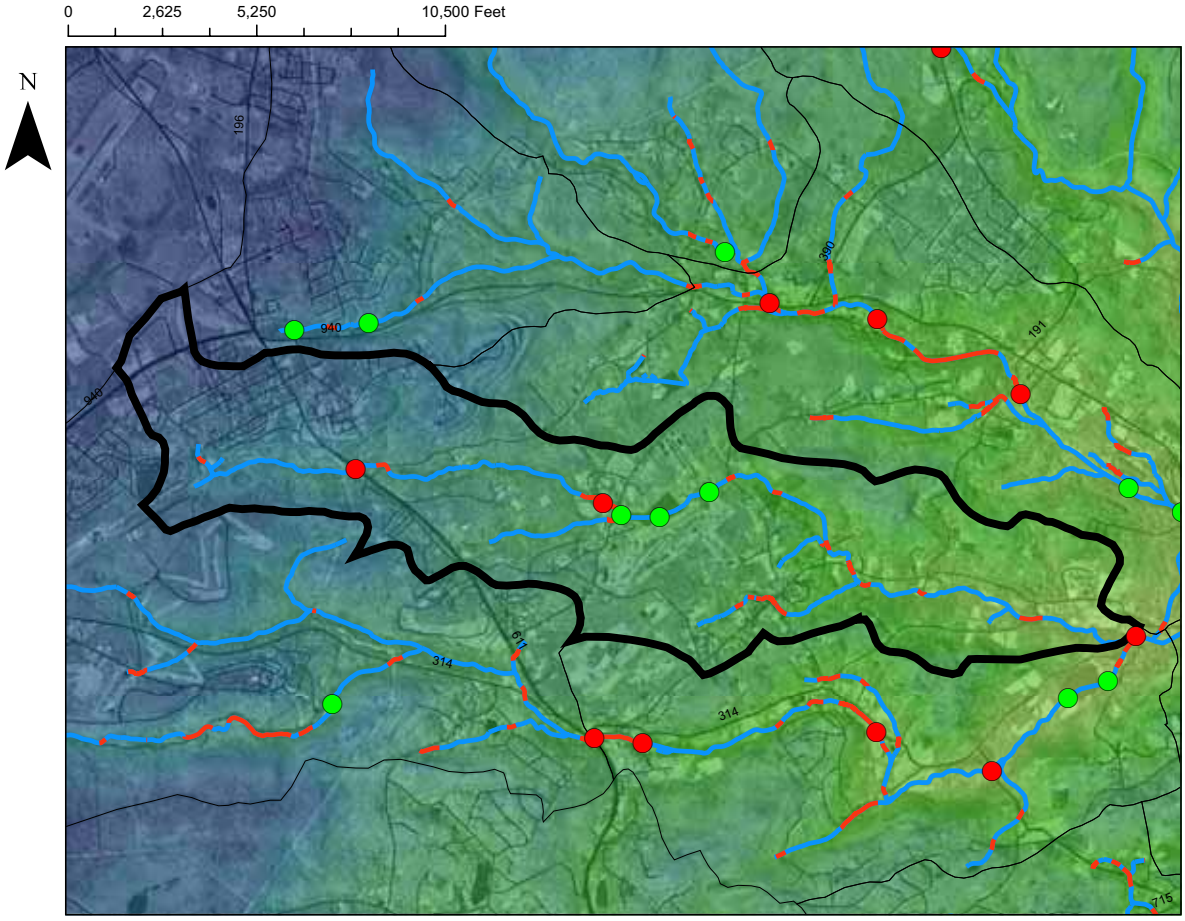

Figure 16 – Potential restoration sites in the Forest Hills Run sub-watershed. Sites were identified by means of topographic map examination; stream proximity within 150 feet of roads, bridges and culverts; aerial photo examination and field verification.

Restoration Projects

Road (2 red)

Observation	**Action**
1. Forest Hills Run at Route 611: culvert effects, road runoff.	Install BMPs to manage road runoff.
2. Forest Hills Run at Mt Airy resort – near Woodland Rd crossing and parking lot runoff.	Improve riparian zone, reduce runoff, manage geese.

Other (3 green)

Observation	**Action**
3. Forest Hills Run at Mt Airy Lake inlet – lawn, beach, no riparian zone.	Manage runoff quality; establish riparian areas.
4. Forest Hills Run at Mt Airy Lake – no riparian zone, golf course impacts, geese, resort runoff.	Establish riparian zone; reduce water quality effects of turfgrass & fertilizers; reduce Canada Goose impacts; prepare storm water plan for site.

Observation
5. Forest Hills Run at Mt Airy golf course DS of dam – high velocity, channelization, no riparian zone, knotweed.

Action
Establish riparian zone as environmentally sensitive area on golf course; remove invasive plants; reconstruct meanders if necessary (detailed survey to determine erosive energy of stream, create restoration plan).

Figure 17 – Forest Hills Run Projects 2,3,4,5: Mount Airy Lodge site, where improvements can be made to the riparian buffer, storm water management for water quality, stream channelization repair, invasive species removal, and Canada Goose management.

Photo 1 – Parking lot upstream of Woodland Road by Forest Hills Run
Photo 2 – Forest Hills Run enters Lake, see sediment deposit, extensive lawn and no buffer.
Photo 3 – Dam and Spillway of Lake, fish passage blocked.
Photo 4 – Downstream of Lake at golf course fairway – channelized, invasive species, poor buffer.

Upper Paradise Creek Sub-Watershed Potential Restoration Sites

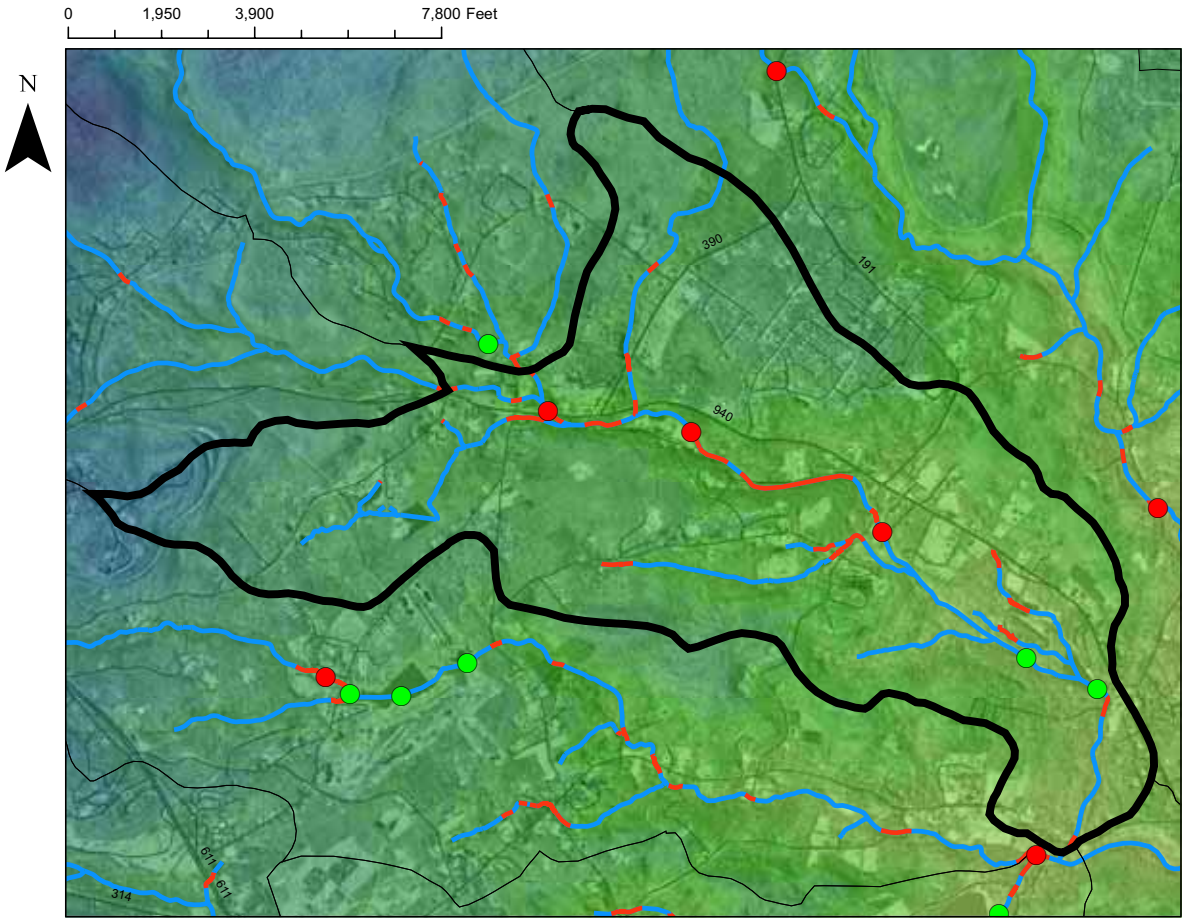

Figure 18 – Potential restoration sites in the Upper Paradise Creek sub-watershed. Sites were identified by means of topographic map examination; stream proximity within 150 feet of roads, bridges and culverts; aerial photo examination and field verification.

Restoration Projects

Road (3 red)

Observation	Action
1. Paradise Creek upstream to downstream of Red Rock Rd crossing – channel migration, incision, widening.	Large project - protect private property and stabilize up to 1 mile of stream.
2. Paradise Creek in vicinity of abandoned Pocono Gardens Resort – runoff, channelized, breached dam, road crossings.	Long channelized reach produces high energy downstream. Improve habitat, reduce energy, restore channel upstream of breached dam, create stormwater management plan, install BMPs.
3. Paradise Creek at Route 940 – road effects, runoff.	Address road runoff and runoff effects of stable.

Other (2 green)

Observation	Action
4. Paradise Creek at Crawford Lake dam – dam effects.	Install fish passage structure. Implement lake management recommendations.
5. Paradise Creek upstream of and entering Lake Crawford – channelization, sediment bar, wandering channel into lake.	Install sediment capture forebay, maintain regularly. Possible large restoration project to ½ mile upstream of lake.

Figure 19 – Upper Paradise Project 1: Paradise Creek from the vicinity of Red Rock Road to Lake Crawford. Previously channelized, this reach is now widening, forming meanders, and threatening private property. Note the telephone pole in background, once about 15 feet from the stream, is now about to be undermined. A more detailed assessment and restoration is recommended from Red Rock Road to Lake Crawford.

Figure 20 – Upper Paradise Project 2: Pocono Gardens Resort Site – upstream view of channelized section (above) and downstream view past breached dam (right).

Figure 21 - Crawford Lake dredging, December 2004: Once the lake is dredged, a sediment forebay could be created for future sediment capture and maintenance, and approximately ½ mile of upstream stabilization of Paradise Creek. Installation of a fish passage structure and additional habitat improvements are recommended. Left – Downstream view toward dam. Right – Upstream view of Paradise Creek entering Lake Crawford. Below – panoramic view of dredging project taken February 2005.

Devils Hole Creek Sub-Watershed Potential Restoration Sites

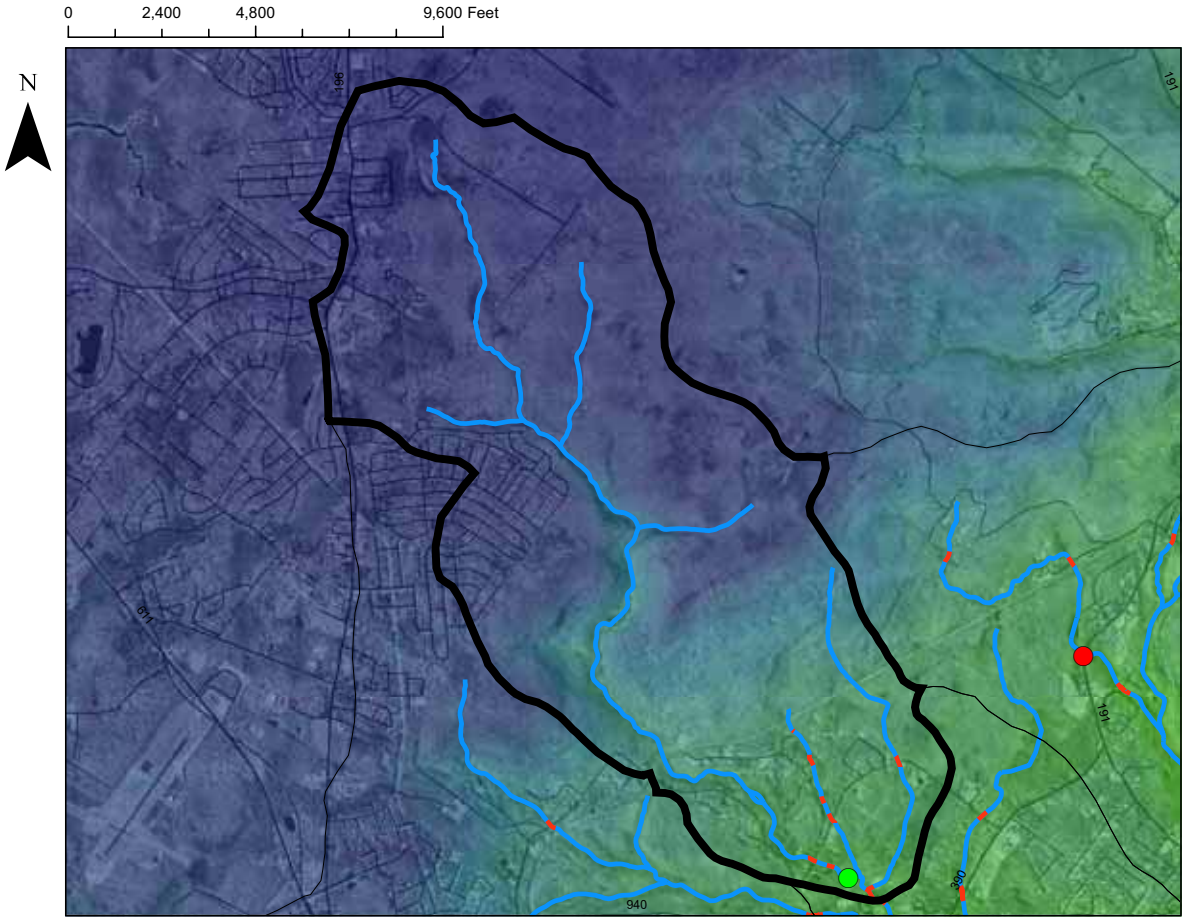

Figure 22 – Potential restoration sites in the Devils Hole Creek sub-watershed. Sites were identified by means of topographic map examination; stream proximity within 150 feet of roads, bridges and culverts; aerial photo examination and field-verification.

Restoration Projects

Other (1 green)

Observation	**Action**
1. Devils Hole Creek at Paradise Stream resort – incision, bank erosion, property threat, sediment in pond.	Major restoration and stabilization project. Recommend dam removal at lower end of reach.

Figure 23 - Devils Hole Creek at upstream end of Ceasar's Paradise Stream Resort. The stream has widened, eroding the stream bank and creating a large bar. The erosion threatens part of the resort property. Emergency stabilization is necessary at this location. Between this location and the dam downstream (see photos below), it is believed that the stream was channelized at some time past. This part of the stream is located in the transition area between high-gradient mountainous terrain and the low-gradient, wide valley of the Paradise Creek.

Figure 24 - Downstream view of sediment-filled small impoundment on Devils Hole Creek. The dam is just upstream of the footbridge in the background, and is located about 100 yards upstream of the confluence of Devils Hole Creek and Paradise Creek. Bank erosion to the right threatens a driveway and building. Dam removal is recommended at this location. Unless such impoundments are maintained frequently, installation of dams in high-energy stream environments is discouraged.

Tank Creek/Yankee Run Sub-Watershed Potential Restoration Sites

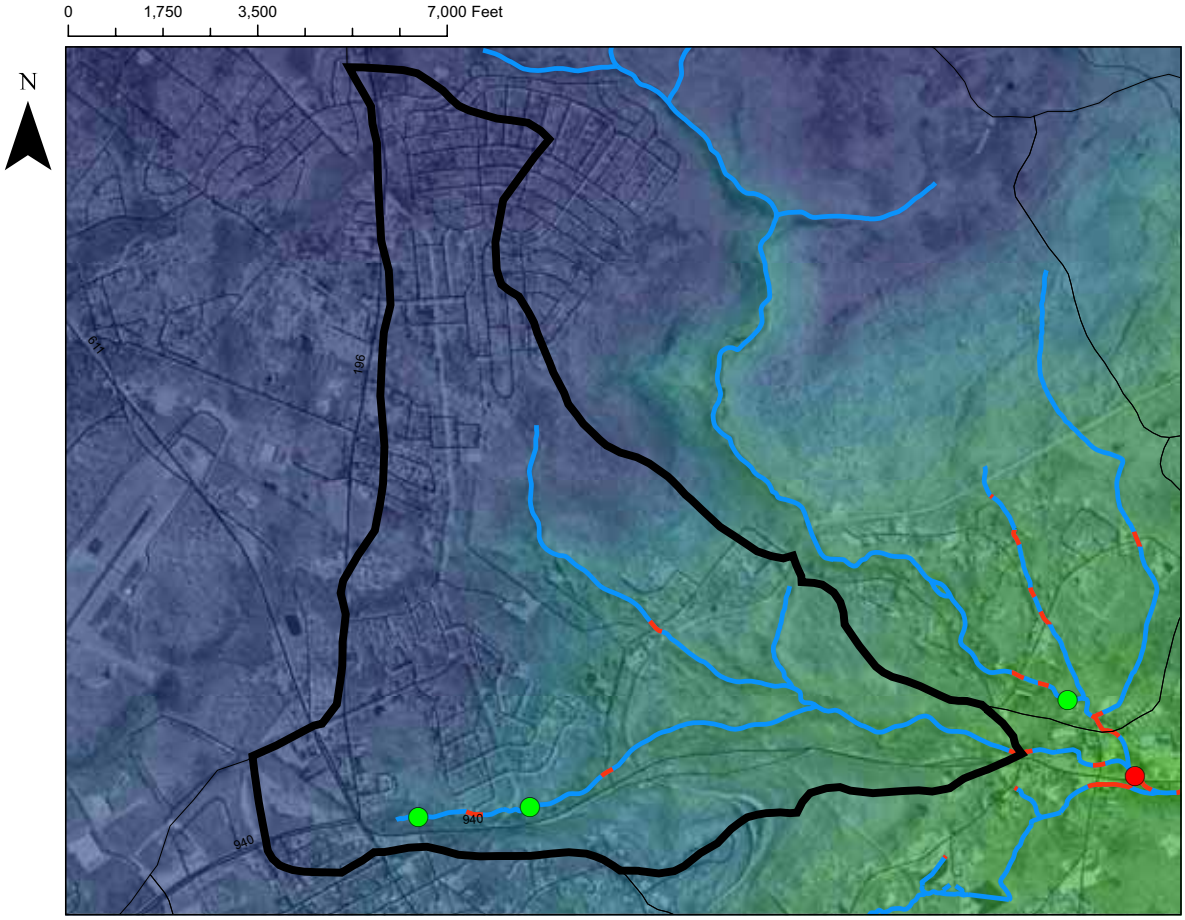

Figure 25 – Potential restoration sites in the Tank Creek and Yankee Run sub-watershed. Sites were identified by means of topographic map examination; stream proximity within 150 feet of roads, bridges and culverts; aerial photo examination and field-verification.

Restoration Projects

Other (2 green dots)

Observation	**Action**
1. Yankee Run at pond upstream of Crestwood Drive – dam effects, stormwater from development.	Stormwater management.
2. Yankee Run headwaters near Route 940, mall – receive stormwater from mall?	Stormwater management.

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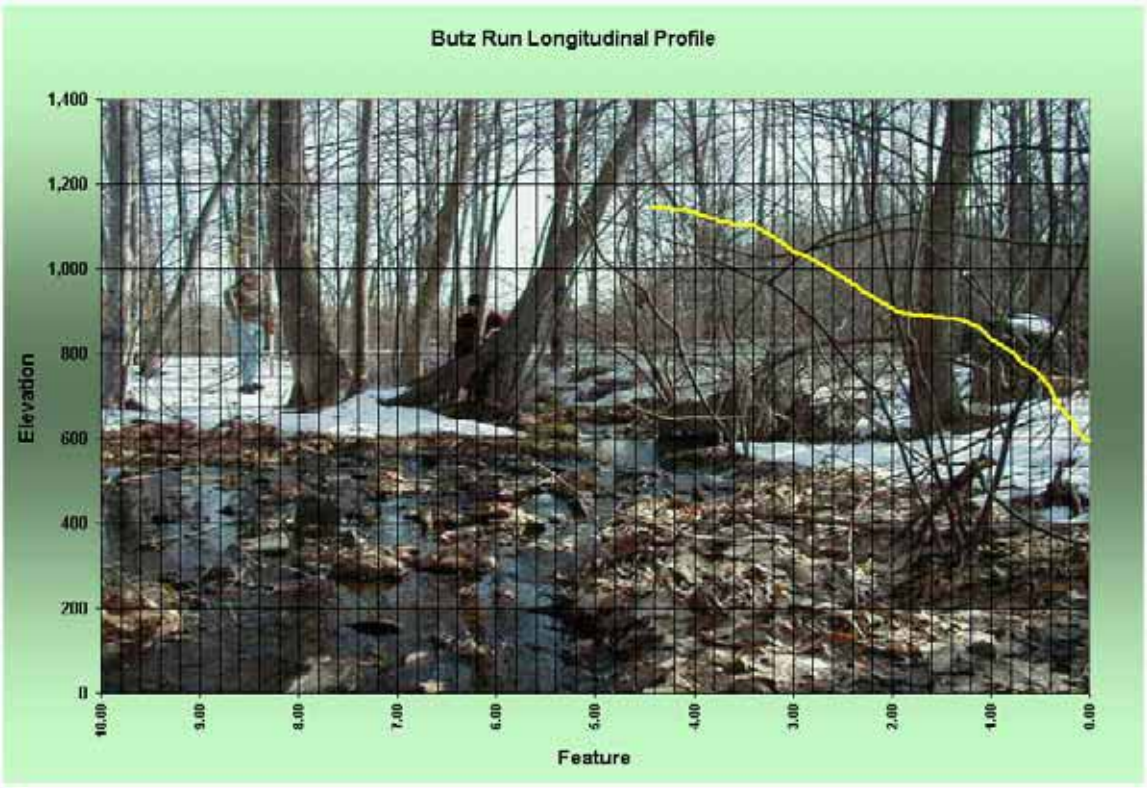
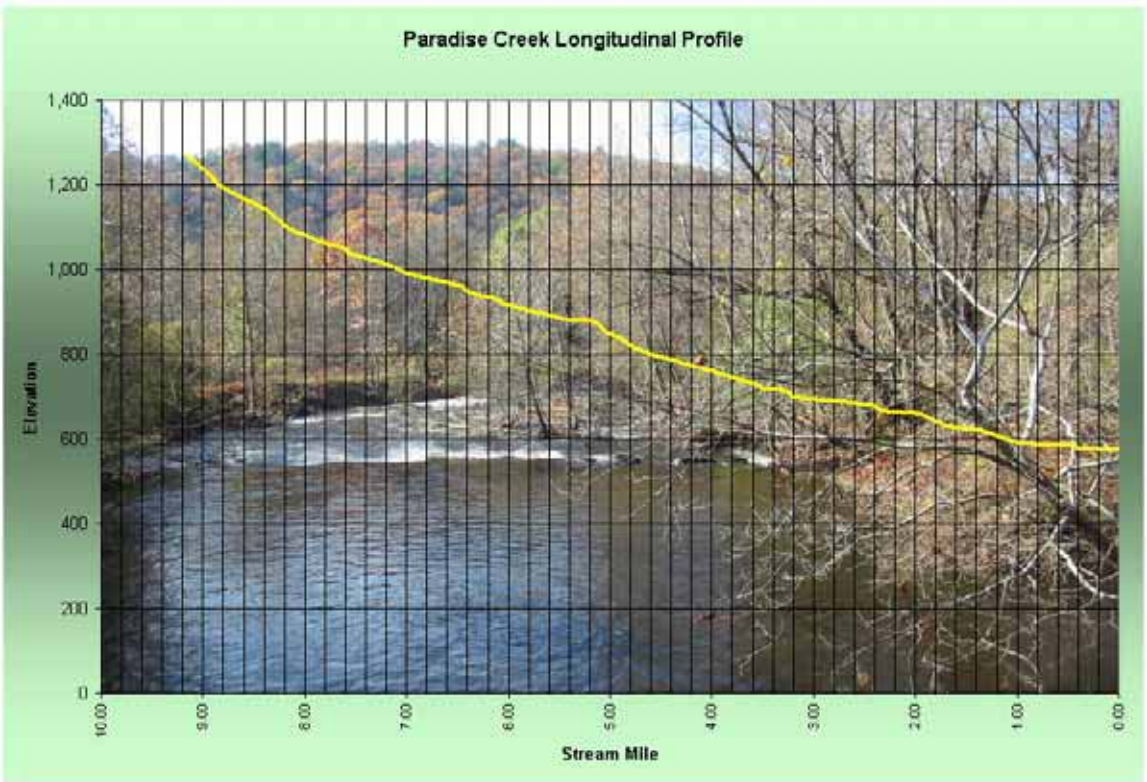
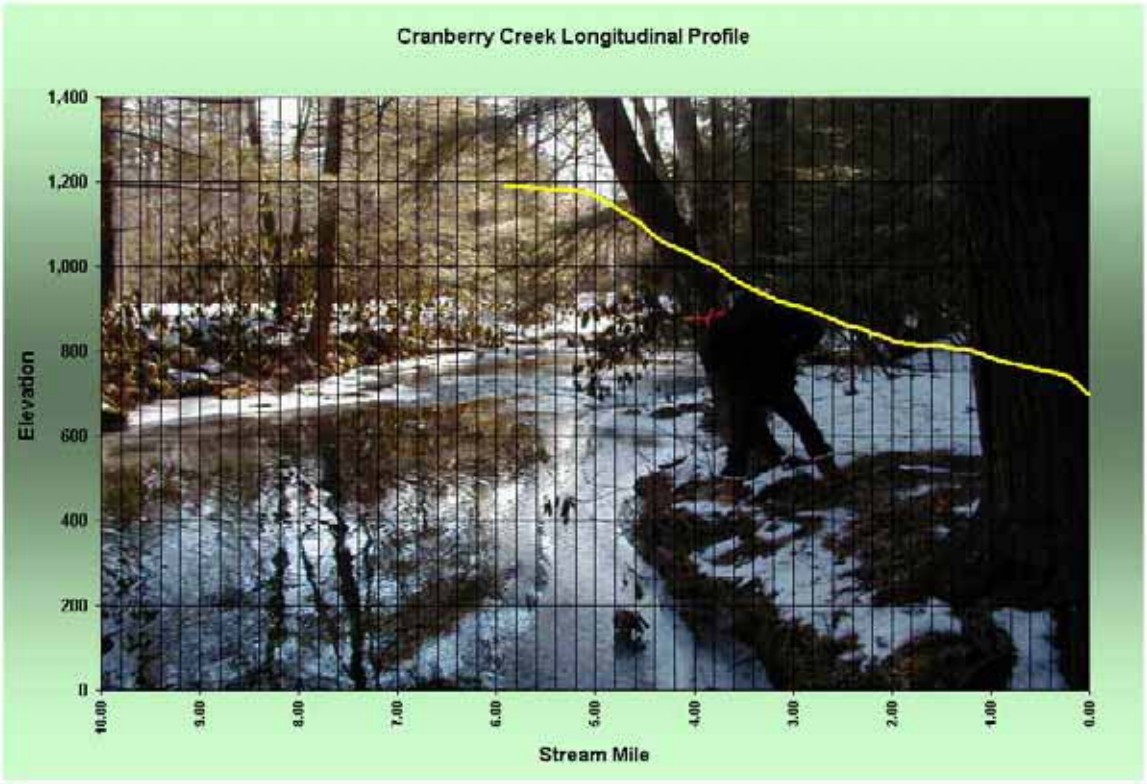
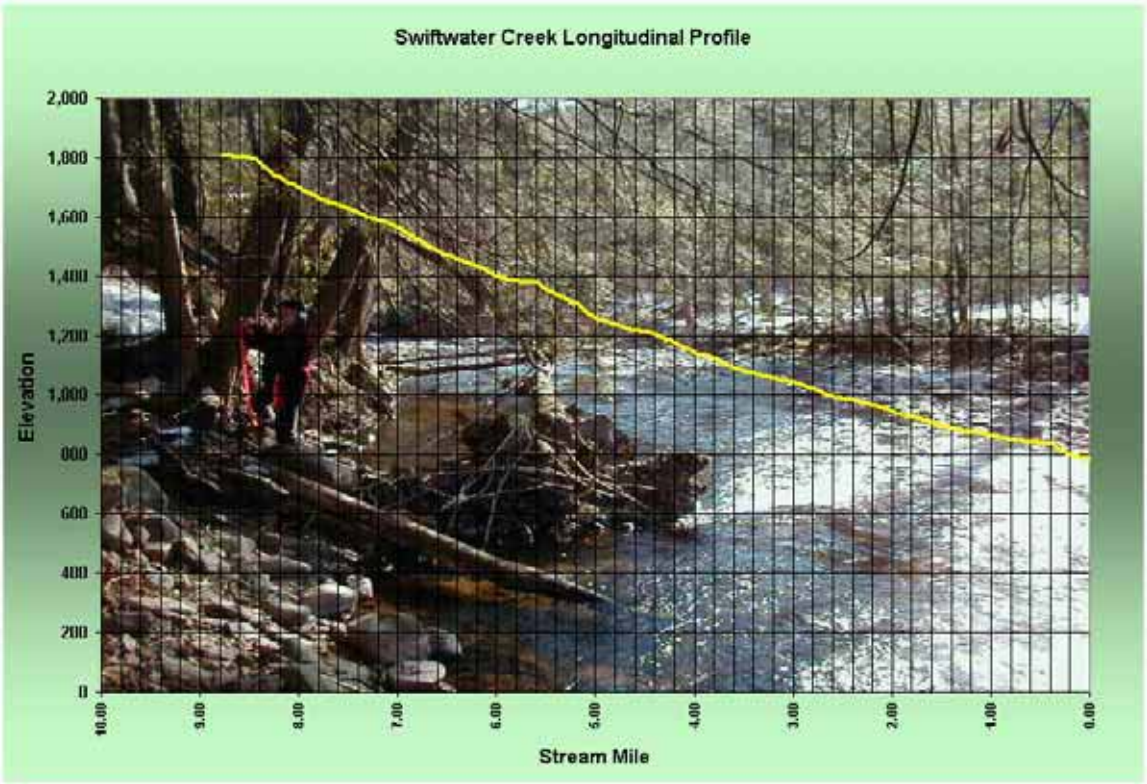
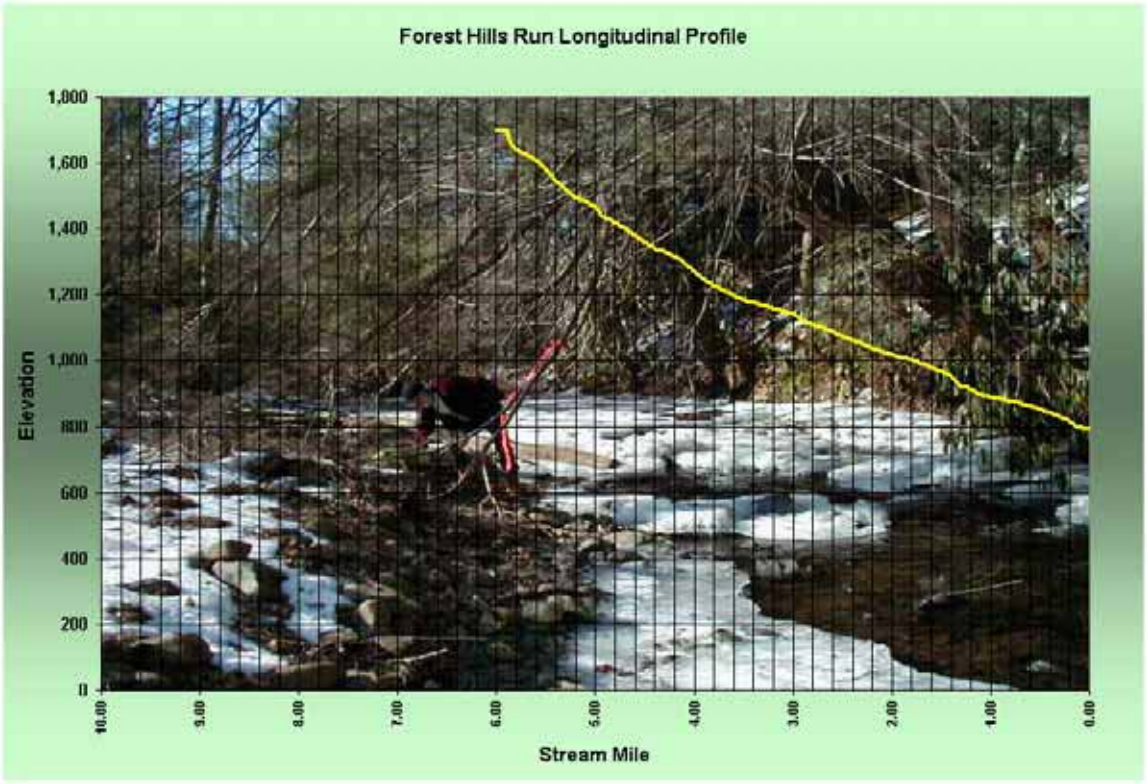
Appendix A: Longitudinal Profiles of Paradise Watershed Streams

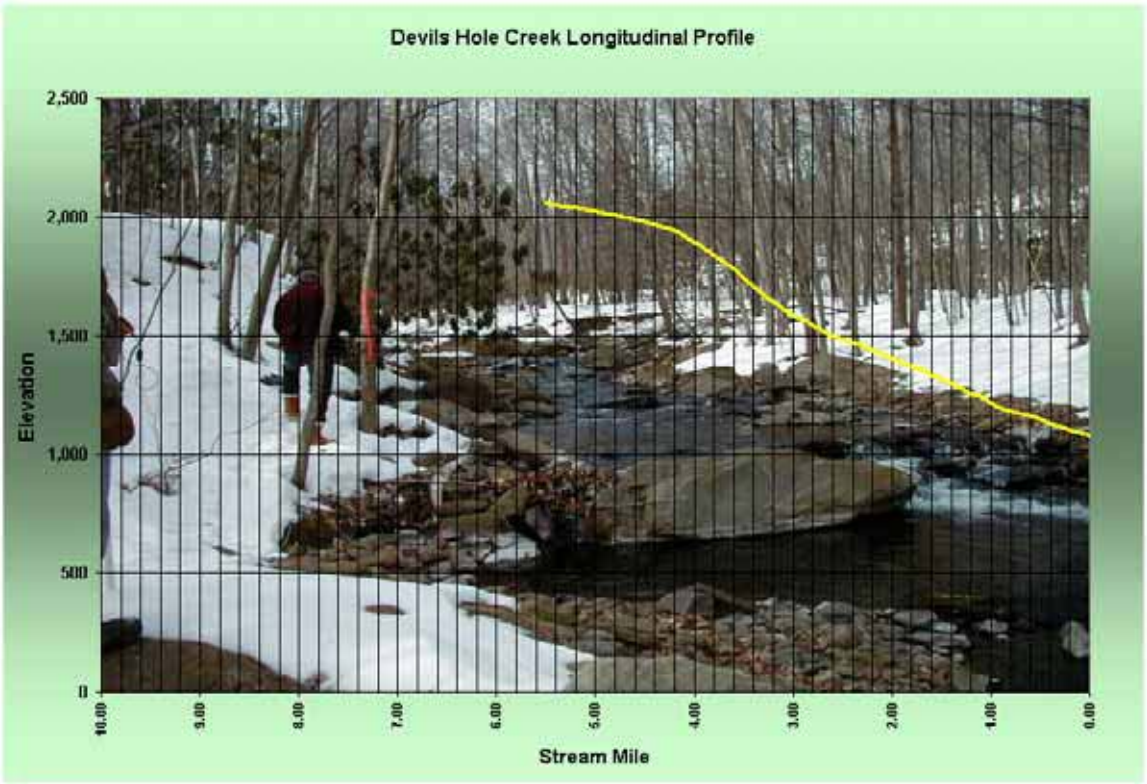

Butz Run Longitudinal Profile
1,400
1,200
1,000
800
600
400
200
0
Elevation
10.00
9.00
8.00
7.00
6.00
5.00
4.00
3.00
2.00
1.00
0.00
Feature

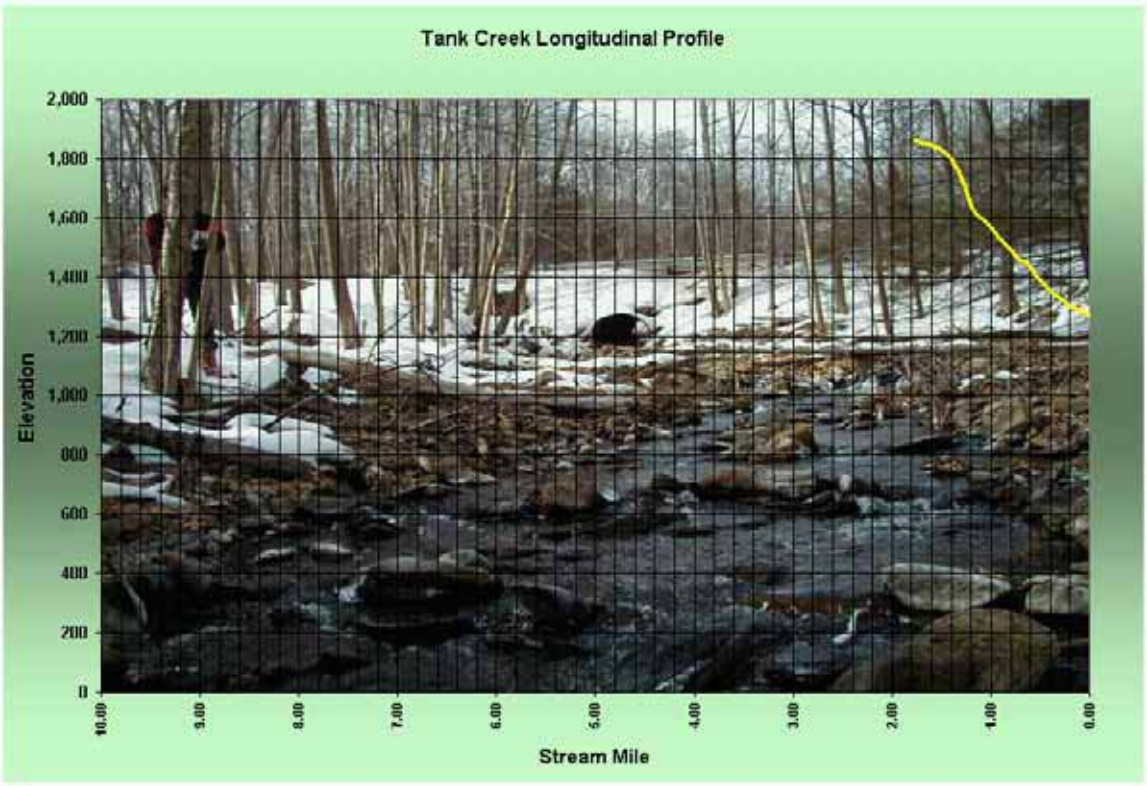

Paradise Creek Longitudinal Profile
1,400
1,200
1,000
800
600
400
200
0
Elevation
10.00
9.00
8.00
7.00
6.00
5.00
4.00
3.00
2.00
1.00
0.00
Stream Mile

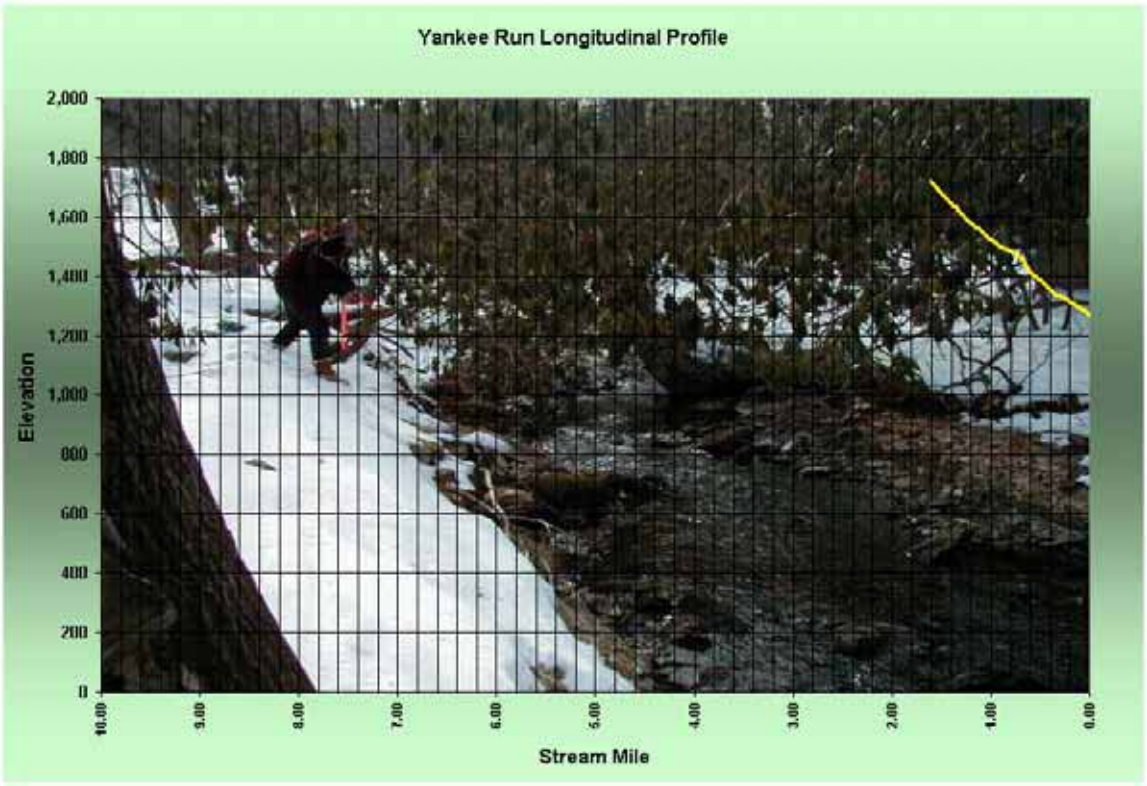

Cranberry Creek Longitudinal Profile
Elevation
1,400
1,200
1,000
800
600
400
200
0
10.00
9.00
8.00
7.00
6.00
5.00
4.00
3.00
2.00
1.00
0.00
Stream Mile


Swiftwater Creek Longitudinal Profile
Elevation
2,000
1,800
1,600
1,400
1,200
1,000
800
600
400
200
0
10.00
9.00
8.00
7.00
6.00
5.00
4.00
3.00
2.00
1.00
0.00
Stream Mile


Forest Hills Run Longitudinal Profile
Elevation
1,800
1,600
1,400
1,200
1,000
800
600
400
200
0
10.00
9.00
8.00
7.00
6.00
5.00
4.00
3.00
2.00
1.00
0.00
Stream Mile


Devils Hole Creek Longitudinal Profile
Elevation
2,500
2,000
1,500
1,000
500
0
10.00
9.00
8.00
7.00
6.00
5.00
4.00
3.00
2.00
1.00
0.00
Stream Mile


Tank Creek Longitudinal Profile
Elevation
2,000
1,800
1,600
1,400
1,200
1,000
800
600
400
200
0
10.00
9.00
8.00
7.00
6.00
5.00
4.00
3.00
2.00
1.00
0.00
Stream Mile


Yankee Run Longitudinal Profile
Elevation
2,000
1,800
1,600
1,400
1,200
1,000
800
600
400
200
0
10.00
9.00
8.00
7.00
6.00
5.00
4.00
3.00
2.00
1.00
0.00
Stream Mile

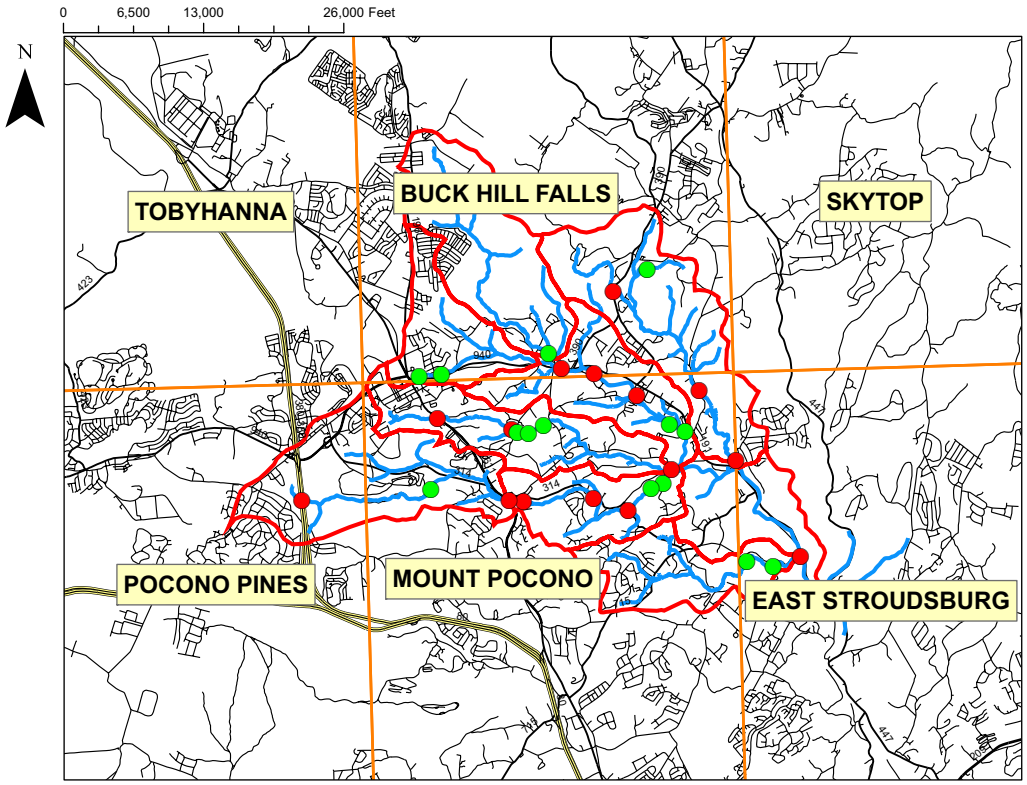
Appendix B: Paradise Creek Watershed Stream Segments and Features.

Explanation of Worksheet:

Stream Mile is in upstream direction from confluence.
Side: Right (R) and Left (L) viewed in downstream direction.
Gradient vs. Classification: L denotes low gradient Rosgens Types C,D,E; H denotes high gradient Rosgen Types A,B.
Features derived from USGS topographic maps, aerial photos, and field verification in 2003-2004

SEG# - unique identifier of stream segment
STREAM MILE (mi) – stream mile location upstream from mouth.
SEGMENT LENGTH (ft) – length of stream segment in feet.
ELEV (ft) – elevation of upstream end of stream segment in feet.
FEATURE – name or description of stream feature or landmark along stream.
SIDE – viewed in downstream direction, side of stream where feature is found.
POSSIBLY UNSTABLE – x means that stream channel instability might be found here.
SLOPE – calculation of rise in elevation (ft) over run in segment length (ft) = percent slope of segment.
GRADIENT – H = high, Rosgen stream types A or B – slope greater than 2%
L = low, Rosgen stream types C, D, E – slope less than 2%

The following 1:24,000 scale USGS topographic maps were used to identify stream features in the Paradise Creek Watershed:



Paradise Creek Watershed: Stream Segments and Features

Stream Mile is in upstream direction from confluence.
Side: Right (R) and Left (L) viewed in downstream direction.
Gradient vs. Classification: L denotes low gradient Rosgens Types C,D,E; H denotes high gradient Rosgen Types A,B.
Features derived from USGS Topographic Maps and field verified in 2003-2004

SEG#	Stream Mile	Segment Length (ft)	ELEV (ft)	Feature	Side	Possibly Unstable	Slope	Gradient
Paradise Creek (R)								
000	0.00	0	575	Paradise Creek enters Brodhead	R	x		
001	0.41	2,191	580	elev		x	0.23%	L
002	0.43	55	585	RR Br - Delaware Lackawanna		x	9.09%	H
003	0.54	583	587	elev			0.34%	L
004	0.70	857	588	twp line			0.12%	L
005	1.00	1,579	590	elev			0.13%	L
006	1.02	121	594	Butz Run enters	R	x	3.32%	H
007	1.36	1,795	620	elev			1.45%	L
008	1.69	1,742	630	elev			0.57%	L
009	1.88	1,003	650	Sylvan Cascade Rd		x	1.99%	L
010	1.94	317	660	elev			3.16%	H
011	2.34	2,112	670	elev by 3 ponds (L)			0.47%	L
012	2.42	422	680	Route 191 crossing		x	2.37%	H
013	2.72	1,584	690	elev by 715/191 int (L) Henryville			0.63%	L
014	3.21	2,587	700	Cranberry Ck enters (L)	L	x	0.39%	L
015	3.23	106	710	Route 191 crossing		x	9.47%	H
016	3.35	634	720	UNT 1 enters (Parkside)	L	x	1.58%	L
017	3.49	739	720	elev			0.00%	L
018	3.58	475	730	UNT 2 enters (Redrock)	R	x	2.10%	H
019	3.73	792	740	elev			1.26%	L
020	4.01	1,478	760	elev			1.35%	L
021	4.28	1,426	780	elev (creek narrows at elev line)			1.40%	L
022	4.44	845	790	Swiftwater Ck enters	R	x	1.18%	L
023	4.52	422	795	Lower Swiftwater Rd Crossing		x	1.18%	L
024	4.60	422	800	elev			1.18%	L
025	4.80	1,056	820	elev			1.89%	L
026	4.90	528	840	Paradise Falls			3.79%	H
027	5.02	634	850	elev			1.58%	L
028	5.08	317	860	elev			3.16%	H
029	5.10	106	870	Summit Drive / Falls Drive crossing		x	9.47%	H

Stream Mile is in upstream direction from confluence.
Side: Right (R) and Left (L) viewed in downstream direction.
Gradient vs. Classification: L denotes low gradient Rosgens Types C,D,E; H denotes high gradient Rosgen Types A,B.
Features derived from USGS Topographic Maps and field verified in 2003-2004

SEG#	Stream Mile	Segment Length (ft)	ELEV (ft)	Feature	Side	Possibly Unstable	Slope	Gradient
030	5.20	528	880	DAM - Lake Crawford		x	1.89%	L
031	5.30	528	880	UNT 3 enters (Fish Hatchery)	L	x	0.00%	L
032	5.40	528	880	UNT 4 enters (Fish Hatchery)	L	x	0.00%	L
033	5.69	1,531	900	elev			1.31%	L
034	5.71	106	900	UNT 5 enters (East of Mt Sophia)	R	x	0.00%	L
035	6.05	1,795	920	elev			1.11%	L
036	6.12	370	930	UNT 6 enters (Gravel Pit)	R	x	2.71%	H
037	6.29	898	940	elev			1.11%	L
038	6.41	634	950	Carlton Road Crossing		x	1.58%	L
039	6.47	317	960	elev			3.16%	H
040	6.62	792	970	unknown crossing (?)		x	1.26%	L
041	6.79	898	980	elev			1.11%	L
042	7.00	1,109	990	Keokee Chapel Lane Crossing		x	0.90%	L
043	7.07	370	1,000	elev			2.71%	H
044	7.29	1,162	1,020	elev			1.72%	L
045	7.57	1,478	1,040	elev			1.35%	L
045a	7.60	158	1,050	UNT 7 enters (Pocono Mission School)	L	x	6.31%	H
046	7.75	792	1,060	elev			1.26%	L
047	7.76	53	1,060	Keokee Chapel Lane Crossing		x	0.00%	L
048	7.86	528	1,070	UNT 8 enters (by Grange Road)	R		1.89%	L
049	7.93	370	1,075	Route 940 Crossing		x	1.35%	L
050	7.98	264	1,080	Devils Hole Ck enters	L		1.89%	L
051	8.10	634	1,090	Unclassified Road crossing		x	1.58%	L
052	8.17	370	1,100	DAM		X	2.71%	H
053	8.27	528	1,120	elev			3.79%	H
054	8.37	528	1,140	elev			3.79%	H
055	8.39	106	1,143	Devils Hole Road Crossing		x	2.84%	H
056	8.55	845	1,160	elev			2.01%	H
057	8.70	792	1,180	elev			2.53%	H
058	8.85	792	1,200	elev			2.53%	H
059	8.92	370	1,220	elev			5.41%	H
060	9.01	475	1,240	elev			4.21%	H
061	9.11	528	1,260	elev			3.79%	H

Stream Mile is in upstream direction from confluence.
Side: Right (R) and Left (L) viewed in downstream direction.
Gradient vs. Classification: L denotes low gradient Rosgens Types C,D,E; H denotes high gradient Rosgen Types A,B.
Features derived from USGS Topographic Maps and field verified in 2003-2004

SEG#	Stream Mile	Segment Length (ft)	ELEV (ft)	Feature	Side	Possibly Unstable	Slope	Gradient
062	9.17	317	1,270	Tank Creek enters	**L**	x	3.16%	H
062	9.17	0	1,270	Yankee Run enters	**R**			
062	9.17	0	1,270	End Paradise Main Stem				
		48,418	**675**				**1.39%**	
Paradise Creek (R) 1.02 Butz Run (R)								
006	0.00	0	594	Butz Run confluence with Paradise Ck	**R**	x		
063	0.06	320	600	elev			1.88%	L
064	0.14	425	620	elev			4.71%	H
065	0.17	159	640	elev			12.58%	H
066	0.24	355	660	elev			5.63%	H
067	0.32	405	680	elev			4.94%	H
068	0.36	213	700	elev			9.39%	H
069	0.40	245	720	elev			8.16%	H
070	0.48	390	740	elev			5.13%	H
071	0.56	427	760	elev			4.68%	H
072	0.70	741	780	elev			2.70%	H
073	0.76	307	800	elev			6.51%	H
074	0.90	746	820	elev			2.68%	H
075	1.02	653	840	elev			3.06%	H
076	1.10	422	860	elev			4.73%	H
077	1.31	1,109	880	elev			1.80%	L
078	1.86	2,904	895	Dirt Road or Trail Crossing		x	0.52%	L
079	1.93	370	900	elev			1.35%	L
080	2.09	845	920	elev			2.37%	H
081	2.24	792	940	elev			2.53%	H
082	2.29	264	945	Pond Outlet		x	1.89%	L
083	2.31	106	950	Route 314 Crossing		x	4.73%	H
084	2.37	317	960	elev			3.16%	H
085	2.50	686	980	elev			2.91%	H
086	2.64	739	1,000	elev			2.71%	H
087	2.79	792	1,020	elev			2.53%	H
088	2.86	370	1,030	UNT 1 (Meisertown) enters	**L**	x	2.71%	H
089	2.88	106	1,032	Pond Outlet		x	1.89%	L

Stream Mile is in upstream direction from confluence.
Side: Right (R) and Left (L) viewed in downstream direction.
Gradient vs. Classification: L denotes low gradient Rosgens Types C,D,E; H denotes high gradient Rosgen Types A,B.
Features derived from USGS Topographic Maps and field verified in 2003-2004

SEG#	Stream Mile	Segment Length (ft)	ELEV (ft)	Feature	Side	Possibly Unstable	Slope	Gradient
090	2.98	528	1,040	elev			1.52%	L
091	3.10	634	1,060	elev			3.16%	H
092	3.24	739	1,080	elev			2.71%	H
093	3.38	739	1,100	elev			2.71%	H
094	3.39	53	1,103	Freeland Pond Outlet		x	5.68%	H
095	3.47	422	1,105	UNT 2 (small pond) enters Freeland Pond	**L**		0.47%	L
096	3.56	475	1,105	Alpine Lake Trib enters Freeland Pond	**L**		0.00%	L
097	3.58	106	1,105	Freeland Pond Inlet			0.00%	L
098	3.63	264	1,108	Route 715 Crossing		x	1.14%	L
099	3.65	106	1,109	Road Crossing (in development)		x	0.95%	L
100	3.68	158	1,110	Pond Outlet		x	0.63%	L
101	3.74	317	1,110	Pond Inlet			0.00%	L
102	3.77	158	1,115	Road Crossing (in development)		x	3.16%	H
103	3.81	211	1,120	elev			2.37%	H
104	3.89	422	1,125	Road Crossing (in development)		x	1.18%	L
105	4.10	1,109	1,140	elev			1.35%	L
106	4.11	53	1,141	Pond Outlet		x	1.89%	L
107	4.24	686	1,141	Pond Inlet			0.00%	L
108	4.26	106	1,145	Pond Outlet		x	3.79%	H
109	4.44	950	1,145	Pond Inlet (END)			0.00%	L
		23,443	**551**				**2.53%**	**H**
Paradise Creek (R) 1.02 Butz Run (R) 2.86 UNT 1 from Meisertown (L)								
088	0.00	0	1,030	UNT 1 (Meisertown) enters Paradise Ck	**L**	x		
110	0.10	527	1,035	Road Crossing (near Cherry Ln & SR 1002)		x	0.95%	L
111	0.13	165	1,040	elev			3.03%	H
112	0.14	61	1,042	Pond Outlet		x	3.28%	H
113	0.18	181	1,043	Pond Inlet			0.55%	L
114	0.31	710	1,060	elev			2.39%	H
115	0.46	771	1,075	Route 715 Crossing		x	1.95%	L
116	0.47	77	1,080	Pond Outlet		x	6.49%	H
117	0.60	671	1,080	UNT 1 enters Pond	**R**		0.00%	L
118	0.70	525	1,080	Pond Inlet			0.00%	L
119	0.73	140	1,085	Route 314 Crossing		x	3.57%	H

Stream Mile is in upstream direction from confluence.
Side: Right (R) and Left (L) viewed in downstream direction.
Gradient vs. Classification: L denotes low gradient Rosgens Types C,D,E; H denotes high gradient Rosgen Types A,B.
Features derived from USGS Topographic Maps and field verified in 2003-2004

SEG#	Stream Mile	Segment Length (ft)	ELEV (ft)	Feature	Side	Possibly Unstable	Slope	Gradient
120	0.75	149	1,088	UNT 2 enters	L	x	2.01%	H
121	0.85	517	1,093	Road Crossing (driveway?)		x	0.97%	L
122	0.91	335	1,095	Pond Outlet		x	0.60%	L
123	0.94	154	1,095	Pond Inlet			0.00%	L
124	0.97	160	1,097	Route 314 Crossing		x	1.25%	L
125	0.99	102	1,098	END			0.98%	L
Paradise Creek (R) 1.02 Butz Run (R) 2.86 UNT 1 from Meisertown (L) 0.60 UNT1 to Pond (R)								
117	0.00	0	1,080	UNT 1 enters Pond	R	x		
126	0.07	390	1,090	Pond Outlet		x	2.56%	H
127	0.09	99	1,090	Pond Inlet (END)			0.00%	L
Paradise Creek (R) 1.02 Butz Run (R) 2.86 UNT 1 from Meisertown (L) 0.75 UNT2 (L)								
120	0.00	0	1,088	UNT 2 enters	L	x		
128	0.08	413	1,090	Pond Outlet		x	0.48%	L
129	0.14	304	1,090	Pond Inlet (END)			0.00%	L
Paradise Creek (R) 1.02 Butz Run (R) 3.47 UNT 2 from Small Pond to Freeland Pond (L)								
095	0.00	0	1,105	UNT 2 (small pond) enters Freeland Pond	L	x		
130	0.02	112	1,110	Pond Outlet		x	4.46%	H
131	0.04	84	1,110	Pond Inlet (END)			0.00%	L
Paradise Creek (R) 1.02 Butz Run (R) 3.56 Alpine Lake Trib to Freeland Pond (L)								
096	0.00	0	1,105	Alpine Lake Trib enters Freeland Pond	L	x		
132	0.04	224	1,110	Route 715 Crossing			2.23%	H
133	0.23	971	1,120	elev			1.03%	L
134	0.30	397	1,125	Camelback Drive Crossing		x	1.26%	L
135	0.32	99	1,128	Alpiine Lake Outlet		x	3.03%	H
136	0.72	2,087	1,129	Alpine Lake Inlet			0.05%	L
137	0.86	777	1,140	elev			1.42%	L
138	0.89	125	1,143	Hillside Drive Crossing		x	2.40%	H
139	1.05	864	1,160	elev			1.97%	L
140	1.13	422	1,180	elev			4.73%	H
141	1.16	158	1,182	Road and Power Line Crossing		x	1.26%	L

Stream Mile is in upstream direction from confluence.
Side: Right (R) and Left (L) viewed in downstream direction.
Gradient vs. Classification: L denotes low gradient Rosgens Types C,D,E; H denotes high gradient Rosgen Types A,B.
Features derived from USGS Topographic Maps and field verified in 2003-2004

SEG#	Stream Mile	Segment Length (ft)	ELEV (ft)	Feature	Side	Possibly Unstable	Slope	Gradient
142	1.18	106	1,200	Pond Outlet		x	17.05%	H
143	1.30	634	1,200	Pond Inlet (END)			0.00%	L
Paradise Creek (R) 3.21 Cranberry Ck (L)								
014	0.00	0	700	Cranberry Ck enters (L)	**L**	x		
144	0.02	115	702	elev			1.74%	L
145	0.03	55	705	Browns Hill Road Crossing		x	5.45%	H
146	0.10	375	720	elev			4.00%	H
147	0.22	605	740	elev			3.31%	H
148	0.35	700	750	map edge (Mt Pocono W, E Stroudsburg E)			1.43%	L
149	0.60	1,340	760	elev			0.75%	L
150	0.92	1,670	780	elev			1.20%	L
151	1.17	1,318	800	elev			1.52%	L
152	1.27	528	805	UNT 1	**L**	x	0.95%	L
153	1.32	264	807	Daigle Place - Dead End Road Crossing		x	0.76%	L
154	1.43	581	810	UNT 2	**R**	x	0.52%	L
155	1.53	528	814	Pond Outlet		x	0.76%	L
156	1.70	898	814	Pond Inlet			0.00%	L
157	1.93	1,214	820	elev			0.49%	L
158	1.94	53	821	Cranberry Creek Drive Crossing		x	1.89%	L
159	2.14	1,056	840	elev			1.80%	L
160	2.20	317	843	Dead End Drive Crossing		x	0.95%	L
161	2.30	528	853	UNT 3	**L**	x	1.89%	L
162	2.44	739	860	elev			0.95%	L
163	2.53	475	870	Local Road Crossing		x	2.10%	H
164	2.65	634	880	elev			1.58%	L
165	2.80	792	895	UNT 4	**R**	x	1.89%	L
166	2.83	158	900	elev			3.16%	H
167	2.92	475	905	UNT 5	**L**	x	1.05%	L
168	3.16	1,267	920	elev			1.18%	L
169	3.20	211	925	UNT 6	**L**	x	2.37%	H
170	3.35	792	940	elev			1.89%	L
171	3.53	950	960	elev			2.10%	H

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Features derived from USGS Topographic Maps and field verified in 2003-2004

SEG#	Stream Mile	Segment Length (ft)	ELEV (ft)	Feature	Side	Possibly Unstable	Slope	Gradient
172	3.66	686	980	elev			2.91%	H
173	3.78	634	1,000	elev			3.16%	H
174	3.97	1,003	1,020	elev			1.99%	L
175	4.09	634	1,035	UNT 7	R	x	2.37%	H
176	4.14	264	1,040	elev			1.89%	L
177	4.33	1,003	1,060	elev			1.99%	L
178	4.45	634	1,080	elev			3.16%	H
179	4.52	370	1,100	elev			5.41%	H
180	4.66	739	1,120	elev			2.71%	H
181	4.76	528	1,135	UNT 8	L	x	2.84%	H
182	4.80	211	1,140	elev			2.37%	H
183	4.94	739	1,160	elev			2.71%	H
184	5.11	898	1,175	Erie-Lackawanna Railroad Crossing		x	1.67%	L
185	5.14	158	1,177	Sand Spring Dr Crossing		x	1.26%	L
186	5.22	422	1,180	elev			0.71%	L
187	5.23	53	1,182	Pond Outlet (by 191)		x	3.79%	H
188	5.41	950	1,183	Pond Inlet			0.11%	L
189	5.91	2,640	1,190	END by development		x	0.27%	L
		31,205	**490**				**1.57%**	**L**
Paradise Creek (R) 3.21 Cranberry Ck (L) 1.27 UNT 1 (L)								
152	0.00	0	805	UNT 1	L	x		
190	0.12	614	810	Pond Outlet		x	0.81%	L
191	0.22	556	811	Pond Inlet			0.18%	L
192	0.23	65	817	END			9.23%	H
Paradise Creek (R) 3.21 Cranberry Ck (L) 1.43 UNT 2 (R)								
154	0.00	0	810	UNT 2	R	x		
193	0.12	659	815	Local Road Crossing		x	0.76%	L
194	0.15	142	817	Wetland Outlet		x	1.41%	L
195	0.33	966	819	Wetland Inlet (END)			0.21%	L

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SEG#	Stream Mile	Segment Length (ft)	ELEV (ft)	Feature	Side	Possibly Unstable	Slope	Gradient
Paradise Creek (R) 3.21 Cranberry Ck (L) 2.30 UNT 3 (L)								
161	0.00	0	853	UNT 3	L	x		
196	0.04	190	860	elev			3.68%	H
197	0.05	53	862	Cranberry Creek Drive Crossing		x	3.77%	H
198	0.08	163	875	UNT 1	L	x	7.98%	H
199	0.11	187	880	elev			2.67%	H
200	0.17	282	900	elev			7.09%	H
201	0.22	283	920	elev			7.07%	H
202	0.26	217	940	elev			9.22%	H
203	0.27	35	942	Small Pond #3 Outlet		x	5.71%	H
204	0.28	47	942	Small Pond #3 Inlet			0.00%	L
205	0.29	50	945	Small Pond #2 Outlet		x	6.00%	H
206	0.30	51	945	Small Pond #2 Inlet			0.00%	L
207	0.30	47	948	Small Pond #1 Outlet		x	6.38%	H
208	0.32	77	948	Small Pond #1 Inlet			0.00%	L
209	0.36	242	960	elev			4.96%	H
210	0.42	283	978	Erie Lackawanna Railroad Crossing		x	6.36%	H
211	0.46	199	980	elev			1.01%	L
212	0.46	41	982	4WD Trail Crossing		x	4.88%	H
213	0.52	317	1,000	elev			5.68%	H
214	0.57	270	1,005	Wetland Outlet		x	1.85%	L
215	0.70	645	1,010	Wetland Inlet			0.78%	L
216	0.79	467	1,020	elev			2.14%	H
217	0.90	627	1,040	elev			3.19%	H
218	0.98	399	1,050	END			2.51%	H
Paradise Creek (R) 3.21 Cranberry Ck (L) 2.30 UNT 3 (L) 0.08 UNT 1 (L)								
198	0.00	0	875	UNT 1	L	x		
219	0.13	696	880	elev			0.72%	L
220	0.22	442	900	elev			4.52%	H
221	0.35	694	920	elev			2.88%	H
222	0.38	193	940	elev			10.36%	H
223	0.42	186	950	Erie Lackawanna Railroad Crossing		x	5.38%	H
224	0.46	216	960	4WD Trail Crossing		x	4.63%	H

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SEG#	Stream Mile	Segment Length (ft)	ELEV (ft)	Feature	Side	Possibly Unstable	Slope	Gradient
225	0.52	309	980	elev			6.47%	H
226	0.57	281	1,000	elev			7.12%	H
227	0.68	599	1,005	4WD Trail Crossing		x	0.83%	L
228	0.71	119	1,007	Wetland Outlet		x	1.68%	L
229	0.98	1,465	1,010	Wetland Inlet (END)			0.20%	L
Paradise Creek (R) 3.21 Cranberry Ck (L) 2.80 UNT 4 (R)								
165	0.00	0	895	UNT 4	**R**	x		
230	0.01	69	900	elev			7.25%	H
231	0.09	385	920	elev			5.19%	H
232	0.14	305	930	Pond Outlet (side channel pond?)		x	3.28%	H
233	0.16	96	930	Pond Inlet			0.00%	L
234	0.21	238	940	Pond Outlet		x	4.20%	H
235	0.27	336	940	Pond Inlet			0.00%	L
236	0.29	91	945	Road Crossing (driveway)		x	5.49%	H
237	0.30	43	950	Pond Outlet		x	11.63%	H
238	0.33	164	950	Pond Inlet (END)			0.00%	L
Paradise Creek (R) 3.21 Cranberry Ck (L) 2.92 UNT 5 (L)								
167	0.00	0	905	UNT 5	**L**	x		
239	0.13	699	920	elev			2.15%	H
240	0.15	102	940	elev			19.61%	H
241	0.18	150	960	elev			13.33%	H
242	0.20	118	980	elev			16.95%	H
243	0.22	81	1,000	elev			24.69%	H
244	0.26	231	1,018	Delaware Lackawanna Railroad Crossing		x	7.79%	H
245	0.29	144	1,020	elev			1.39%	L
246	0.31	101	1,030	4WD Trail Crossing		x	9.90%	H
247	0.34	171	1,040	elev			5.85%	H
248	0.40	333	1,060	elev			6.01%	H
249	0.46	307	1,080	elev			6.51%	H
250	0.53	373	1,100	elev			5.36%	H
251	0.61	422	1,120	elev			4.74%	H
252	0.72	568	1,140	elev (END)			3.52%	H

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Paradise Creek (R) 3.21 Cranberry Ck (L) 3.20 UNT 6 (L)								
169	0.00	0	925	UNT 6	**L**	x		
253	0.06	326	940	elev			4.60%	H
254	0.09	128	960	elev			15.63%	H
255	0.11	150	980	elev			13.33%	H
256	0.15	166	1,000	elev			12.05%	H
257	0.20	260	1,018	Railroad Crossing		x	6.92%	H
258	0.23	167	1,020	4WD Trail Crossing		x	1.20%	L
259	0.32	468	1,040	elev			4.27%	H
260	0.52	1,062	1,060	elev			1.88%	L
261	0.66	743	1,080	elev			2.69%	H
262	0.74	451	1,100	elev			4.43%	H
263	0.76	84	1,103	Trail Crossing		x	3.57%	H
264	0.89	720	1,118	END			2.08%	H
Paradise Creek (R) 3.21 Cranberry Ck (L) 4.09 UNT 7 (R)								
175	0.00	0	1,035	UNT 7	**R**	x		
265	0.06	304	1,040	elev			1.64%	L
266	0.17	585	1,060	elev			3.42%	H
266a	0.35	961	1,075	Snow Bird Lane crossing in development		x	1.56%	L
267	0.37	117	1,080	elev			4.27%	H
268	0.51	737	1,100	elev			2.71%	H
269	0.55	197	1,120	elev			10.15%	H
270	0.58	144	1,140	elev			13.89%	H
271	0.60	102	1,150	Route 191 Crossing		x	9.80%	H
272	0.64	215	1,160	elev			4.65%	H
273	0.70	355	1,170	Pond Outlet		x	2.82%	H
274	0.79	472	1,171	Pond Inlet			0.21%	L
275	0.89	490	1,180	elev			1.84%	L
276	1.05	865	1,200	elev			2.31%	H
277	1.08	158	1,207	Railroad Crossing		x	4.42%	H
278	1.10	106	1,210	Hardytown Road Crossing		x	2.84%	H
279	1.16	317	1,220	elev			3.16%	H

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279a	1.30	739	1,230	Driveway Crossing		x	1.35%	L
280	1.50	1,056	1,240	elev			0.95%	L
281	1.66	845	1,260	elev			2.37%	H
282	1.70	211	1,280	elev			9.47%	H
283	1.76	317	1,300	elev			6.31%	H
284	1.82	317	1,320	elev			6.31%	H
285	1.89	370	1,340	elev			5.41%	H
286	1.96	370	1,360	elev			5.41%	H
287	2.00	211	1,380	elev			9.47%	H
288	2.01	53	1,383	Dirt Road Crossing		x	5.68%	H
289	2.04	158	1,400	elev			10.73%	H
290	2.13	475	1,420	elev			4.21%	H
291	2.21	422	1,440	elev			4.73%	H
292	2.26	264	1,460	elev			7.58%	H
293	2.30	211	1,480	elev (END near dirt road)		x	9.47%	H
Paradise Creek (R) 3.21 Cranberry Ck (L) 4.76 UNT 8 (L)								
181	0.00	0	1,135	UNT 8	**L**	x		
294	0.03	140	1,140	elev			3.57%	H
295	0.10	407	1,155	UNT 1	**R**	x	3.69%	H
296	0.12	83	1,160	elev (RR Berm)		x	6.02%	H
297	0.14	91	1,160	Railroad Crossing		x	0.00%	L
298	0.43	1,559	1,170	Peat Mine outlet.		x	0.64%	L
299	0.87	2,314	1,180	elev in Wetland			0.43%	L
300	0.92	246	1,181	Dirt Road Crossing		x	0.41%	L
301	1.02	546	1,184	END in Peat Mine.			0.55%	L
Paradise Creek (R) 3.21 Cranberry Ck (L) 4.76 UNT 8 (L) 0.10 UNT 1 (R)								
295	0.00	0	1,155	UNT 1	**R**	x		
302	0.13	694	1,160	Railroad Crossing		x		
303	0.27	732	1,166	Wetland Outlet		x	0.82%	L
304	0.39	648	1,167	END in Peat mine.			0.15%	L

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SEG#	Stream Mile	Segment Length (ft)	ELEV (ft)	Feature	Side	Possibly Unstable	Slope	Gradient
Paradise Creek (R) 3.35 UNT 1 Parkside (L)								
016	0.00	0	720	UNT 1 enters (Parkside)	**L**	x		
305	0.02	130	740	Road Crossing		x	15.38%	H
306	0.04	66	742	Pond Outlet		x	3.03%	H
307	0.09	305	742	Pond Inlet (END near Route 191)		x	0.00%	L
Paradise Creek (R) 3.58 UNT 2 Redrock (R) - POTENTIAL REFERENCE STREAM								
018	0.00	0	730	UNT 2 enters (Redrock Glen)	**R**	x		
308	0.02	94	740	elev			10.64%	H
309	0.04	92	760	elev			21.74%	H
310	0.08	221	780	elev			9.05%	H
311	0.13	270	800	elev			7.41%	H
312	0.16	194	820	elev			10.31%	H
313	0.19	151	840	elev			13.25%	H
314	0.22	139	860	elev			14.39%	H
315	0.25	165	880	elev			12.12%	H
316	0.28	132	900	elev			15.15%	H
317	0.30	106	920	elev			18.87%	H
318	0.32	120	940	elev			16.67%	H
319	0.33	74	960	elev			27.03%	H
320	0.36	130	980	elev			15.38%	H
321	0.38	134	1,000	elev			14.93%	H
322	0.41	157	1,020	elev			12.74%	H
323	0.46	234	1,040	elev			8.55%	H
324	0.54	457	1,060	elev			4.38%	H
325	0.57	144	1,065	END			3.47%	H
		3,014	**335**				**11.11%**	**H**
Paradise Creek (R) 4.44 Swiftwater Ck (R)								
022	0.00	0	790	Swiftwater Ck	**R**	x		
326	0.09	464	795	Forest Hills Run	**L**	x	1.08%	L
327	0.15	308	798	channel splits		x	0.97%	L
328	0.20	293	800	elev			0.68%	L

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SEG#	Stream Mile	Segment Length (ft)	ELEV (ft)	Feature	Side	Possibly Unstable	Slope	Gradient
329	0.27	383	815	Road Crossing		x	3.92%	H
330	0.30	144	820	elev			3.47%	H
331	0.39	469	840	elev			4.26%	H
332	0.41	82	842	Swiftwater Lake Outlet		x	2.44%	H
333	0.64	1,222	843	Swiftwater Lake Inlet			0.08%	L
334	0.96	1,704	860	elev			1.00%	L
335	1.12	845	875	UNT 1 enters	R	x	1.78%	L
336	1.21	475	878	Road Crossing		x	0.63%	L
337	1.25	211	880	elev			0.95%	L
338	1.53	1,478	900	elev			1.35%	L
339	1.72	1,003	920	elev			1.99%	L
340	1.80	422	930	UNT 2 enters	R	x	2.37%	H
341	1.95	792	940	elev			1.26%	L
342	2.05	528	955	UNT 3 enters	L	x	2.84%	H
343	2.11	317	960	elev			1.58%	L
344	2.13	106	962	Road Crossing		x	1.89%	L
345	2.35	1,162	980	elev			1.55%	L
346	2.46	581	990	Road Crossing		x	1.72%	L
347	2.64	950	1,000	Road Crossing		x	1.05%	L
348	2.77	686	1,020	elev			2.91%	H
349	2.96	1,003	1,040	elev			1.99%	L
350	3.25	1,531	1,060	elev			1.31%	L
351	3.46	1,109	1,080	elev			1.80%	L
352	3.47	53	1,081	UNT 4 enters	R	x	1.89%	L
353	3.66	1,003	1,100	elev			1.89%	L
354	3.77	581	1,120	Road Crossing		x	3.44%	H
355	3.90	686	1,138	Road Crossing		x	2.62%	H
356	3.97	370	1,140	elev			0.54%	L
357	4.04	370	1,155	UNT 5 enters	R	x	4.06%	H
358	4.10	317	1,160	elev			1.58%	L
359	4.23	686	1,180	elev			2.91%	H
360	4.35	634	1,200	elev			3.16%	H
361	4.37	106	1,202	Route 314 Crossing		x	1.89%	L

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362	4.49	634	1,215	UNT 6 enters	L	x	2.05%	H
363	4.62	686	1,220	elev			0.73%	L
364	4.83	1,109	1,240	elev			1.80%	L
365	4.99	845	1,260	elev			2.37%	H
366	5.02	158	1,265	Indian Run	L	x	3.16%	H
367	5.09	370	1,280	elev			4.06%	H
368	5.15	317	1,300	elev			6.31%	H
369	5.19	211	1,310	Route 314 Crossing		x	4.73%	H
370	5.28	475	1,320	elev			2.10%	H
371	5.39	581	1,340	elev			3.44%	H
372	5.52	686	1,360	elev			2.91%	H
373	5.60	422	1,380	Lake Minausin Outlet		x	4.73%	H
374	5.74	739	1,381	Lake Minausin Inlet			0.14%	L
375	6.00	1,373	1,400	elev			1.38%	L
376	6.11	581	1,420	elev			3.44%	H
377	6.23	634	1,440	elev			3.16%	H
378	6.40	898	1,460	elev			2.23%	H
379	6.42	106	1,463	Dirt Road Crossing		x	2.84%	H
380	6.56	739	1,480	elev			2.30%	H
381	6.69	686	1,500	elev			2.91%	H
382	6.76	370	1,520	elev			5.41%	H
383	6.87	581	1,540	elev			3.44%	H
384	6.98	581	1,560	elev			3.44%	H
385	7.10	634	1,580	elev			3.16%	H
386	7.30	1,056	1,600	elev			1.89%	L
387	7.43	686	1,620	elev			2.91%	H
388	7.59	845	1,640	elev			2.37%	H
389	7.77	950	1,660	elev			2.10%	H
390	7.85	422	1,675	UNT 7 enters from Pocono Summit	R	x	3.55%	H
391	7.90	264	1,680	elev			1.89%	L
392	8.02	634	1,700	elev			3.16%	H
393	8.06	211	1,710	Trail Crosssing		x	4.73%	H
394	8.13	370	1,720	elev			2.71%	H
395	8.16	158	1,725	I-380 Northbound Crossing		x	3.16%	H

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Features derived from USGS Topographic Maps and field verified in 2003-2004

SEG#	Stream Mile	Segment Length (ft)	ELEV (ft)	Feature	Side	Possibly Unstable	Slope	Gradient
396	8.21	264	1,735	I-380 Southbound Crossing		x	3.79%	H
397	8.25	211	1,740	elev			2.37%	H
398	8.31	317	1,760	elev			6.31%	H
399	8.39	422	1,780	elev			4.73%	H
400	8.44	264	1,800	elev			7.58%	H
401	8.56	634	1,805	Wetland Outlet		x	0.79%	L
402	8.79	1,214	1,810	Wetland begins (END)			0.41%	L
		46,411	**1,020**				**2.20%**	**H**
Paradise Creek (R) 4.44 Swiftwater Ck (R) 0.09 Forest Hills Run (L)								
326	0.00	0	795	Forest Hills Run	**L**	x		
403	0.01	72	795	Back channel confluence	**R**	x	0.00%	L
404	0.03	89	796	SSR 1004 Crossing		x	1.12%	L
405	0.13	499	800	elev			0.80%	L
406	0.23	572	820	elev			3.50%	H
407	0.39	826	840	elev			2.42%	H
408	0.55	872	860	elev			2.29%	H
409	0.61	296	863	Donaldson Road Crossing		x	1.01%	L
410	0.78	902	878	UNT 1 enters from Donaldson Rd	**R**	x	1.66%	L
411	0.81	131	880	elev			1.53%	L
412	1.11	1,602	900	elev			1.25%	L
413	1.24	686	920	elev			2.91%	H
414	1.29	264	923	Trail Crossing		x	1.14%	L
415	1.36	370	940	elev			4.60%	H
416	1.44	422	960	elev			4.73%	H
417	1.60	845	980	elev			2.37%	H
418	1.63	158	983	Mountain Lane Crossing		x	1.89%	L
419	1.67	211	990	Pond Outlet		x	3.31%	H
420	1.68	53	990	UNT 2 enters from East Swiftwater	**R**	x	0.00%	L
421	1.71	158	991	Pond Inlet			0.63%	L
422	1.74	158	1,000	elev			5.68%	H
423	1.77	158	1,002	Bush Road		x	1.26%	L
424	1.99	1,162	1,018	Dogwood Terrace Rd		x	1.38%	L

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SEG#	Stream Mile	Segment Length (ft)	ELEV (ft)	Feature	Side	Possibly Unstable	Slope	Gradient
425	2.00	53	1,019	UNT 3 enters from Carlton Road	R	x	1.89%	L
426	2.04	211	1,020	elev			0.47%	L
427	2.22	950	1,040	elev			2.10%	H
428	2.37	792	1,060	elev			2.53%	H
429	2.54	898	1,080	elev			2.23%	H
430	2.70	845	1,100	elev			2.37%	H
431	2.72	106	1,102	Carlton Road Crossing		x	1.89%	L
432	2.91	1,003	1,120	elev			1.79%	L
433	2.98	370	1,140	elev			5.41%	H
434	3.01	158	1,142	Lake Outlet		x	1.26%	L
435	3.41	2,112	1,179	UNT 4 enters below Mt Sophia	R	x	1.75%	L
436	3.42	53	1,179	Lake Inlet			0.00%	L
437	3.43	53	1,180	elev by mall (stream not natural contour)		x	1.89%	L
438	3.47	211	1,183	Woodland Road Crossing		x	1.42%	L
439	3.60	686	1,199	Unclassified Road Crossing		x	2.33%	H
440	3.61	53	1,200	elev			1.89%	L
441	3.75	739	1,220	elev			2.71%	H
442	3.87	634	1,240	elev			3.16%	H
443	3.96	475	1,260	elev			4.21%	H
444	4.05	475	1,280	elev			4.21%	H
445	4.11	317	1,300	elev			6.31%	H
446	4.14	158	1,310	Pond Outlet		x	6.31%	H
447	4.18	211	1,311	Pond Inlet			0.47%	L
448	4.22	211	1,320	elev			4.26%	H
449	4.33	581	1,335	Pond Outlet		x	2.58%	H
450	4.38	264	1,336	Pond Inlet			0.38%	L
451	4.39	53	1,340	elev			7.58%	H
452	4.49	528	1,360	elev			3.79%	H
453	4.61	634	1,380	elev			3.16%	H
454	4.70	475	1,400	elev			4.21%	H
455	4.81	581	1,420	elev			3.44%	H
456	4.83	106	1,422	Grange Road Crossing		x	1.89%	L
457	4.94	581	1,440	elev			3.10%	H
458	4.97	158	1,460	elev			12.63%	H

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Features derived from USGS Topographic Maps and field verified in 2003-2004

SEG#	Stream Mile	Segment Length (ft)	ELEV (ft)	Feature	Side	Possibly Unstable	Slope	Gradient
459	5.02	264	1,470	Route 611 Crossing (4-Lane)		x	3.79%	H
460	5.08	317	1,480	elev, powerline crossing		x	3.16%	H
461	5.22	739	1,500	elev			2.71%	H
462	5.30	422	1,520	elev			4.73%	H
463	5.38	422	1,540	elev			4.73%	H
464	5.44	317	1,560	elev			6.31%	H
465	5.50	317	1,580	elev			6.31%	H
466	5.56	317	1,600	elev, by abandoned railroad line		x	6.31%	H
467	5.66	528	1,620	elev			3.79%	H
468	5.79	686	1,640	elev			2.91%	H
469	5.80	53	1,642	UNT 5 enters south of RR Line	**R**	x	3.79%	H
470	5.83	158	1,650	Railroad Crossing (abandoned)		x	5.05%	H
471	5.84	53	1,655	UNT 6 enters north of RR line	**L**	x	9.47%	H
472	5.86	106	1,660	elev			4.73%	H
473	5.88	106	1,680	elev			18.94%	H
474	5.90	106	1,700	Rear Fairview Avenue Crossing		x	18.94%	H
475	5.91	53	1,702	Pond Outlet		x	3.79%	H
476	6.00	475	1,702	Pond Inlet (END)		x	0.00%	L
		31,680	**907**				**2.86%**	**H**
Paradise Creek (R) 4.44 Swiftwater Ck (R) 0.09 Forest Hills Run (L) 0.78 UNT 1 from Donaldson Road (R)								
410	0.00	0	878	UNT 1 enters from Donaldson Rd	**R**	x		
477	0.01	59	880	elev			3.39%	H
478	0.10	495	900	elev			4.04%	H
479	0.12	100	915	Pond Outlet		x	15.00%	H
480	0.15	118	916	Pond Inlet (END)			0.85%	L
Paradise Creek (R) 4.44 Swiftwater Ck (R) 0.09 Forest Hills Run (L) 1.68 UNT 2 from East Swiftwater (R)								
420	0.00	0	990	UNT 2 enters from East Swiftwater	**R**	x		
481	0.02	122	1,000	elev			8.20%	H
482	0.10	414	1,020	elev			4.83%	H
483	0.19	493	1,040	elev			4.06%	H
484	0.27	396	1,060	elev			5.05%	H

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SEG#	Stream Mile	Segment Length (ft)	ELEV (ft)	Feature	Side	Possibly Unstable	Slope	Gradient
485	0.38	569	1,080	elev			3.51%	H
486	0.44	353	1,100	elev by road		x	5.67%	H
487	0.49	236	1,120	elev by road		x	8.47%	H
488	0.50	67	1,122	Pond Outlet		x	2.99%	H
489	0.53	141	1,123	Pond Inlet			0.71%	L
490	0.54	69	1,125	Upper Swiftwater Road Crossing		x	2.90%	H
491	0.55	36	1,127	Pond Outlet		x	5.56%	H
492	0.57	125	1,128	Pond Inlet			0.80%	L
493	0.59	78	1,130	Unclassified Road Crossing		x	2.56%	H
494	0.60	89	1,132	Pond Outlet		x	2.25%	H
495	0.68	390	1,133	Pond Inlet			0.26%	L
496	0.75	359	1,140	Unclassified Road Crossing		x	1.95%	L
497	0.75	28	1,142	Pond Outlet		x	7.14%	H
498	0.78	173	1,143	Pond Inlet			0.58%	L
499	0.86	421	1,155	Pond Outlet		x	2.85%	H
500	0.87	53	1,156	Pond Inlet			1.89%	L
501	0.89	73	1,158	Unclassified Road Crossing		x	2.74%	H
502	0.96	364	1,160	elev at powerline crossing		x	0.55%	L
503	0.96	20	1,165	Pond Outlet		x	25.00%	H
504	1.00	211	1,166	Pond Inlet (END by Bowman Road)			0.47%	L
Paradise Creek (R) 4.44 Swiftwater Ck (R) 0.09 Forest Hills Run (L) 2.00 UNT 3 from Carlton Road (R)								
425	0.00	0	1,019	UNT 3 enters from Carlton Road	**R**	x		
505	0.01	68	1,020	Pond Outlet		x	1.47%	L
506	0.06	225	1,021	Pond Inlet			0.44%	L
507	0.10	255	1,040	elev			7.45%	H
508	0.21	571	1,060	elev			3.50%	H
509	0.27	295	1,080	elev			6.78%	H
510	0.29	107	1,100	elev			18.69%	H
511	0.30	49	1,105	Pond Outlet		x	10.20%	H
512	0.34	235	1,105	Pond Inlet (END)			0.00%	L
Paradise Creek (R) 4.44 Swiftwater Ck (R) 0.09 Forest Hills Run (L) 3.41 UNT 4 below Mt Sophia (R)								
435	0.00	0	1,179	UNT 4 enters below Mt Sophia	**R**	x		

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SEG#	Stream Mile	Segment Length (ft)	ELEV (ft)	Feature	Side	Possibly Unstable	Slope	Gradient
513	0.01	73	1,179	Pond Inlet			0.00%	L
514	0.02	26	1,180	elev			3.85%	H
515	0.07	264	1,183	Woodland Road Crossing		x	1.14%	L
516	0.26	1,029	1,200	elev between large buildings		x	1.65%	L
517	0.35	468	1,220	elev			4.27%	H
518	0.45	495	1,240	elev			4.04%	H
519	0.68	1,244	1,260	elev			1.61%	L
520	0.74	319	1,270	END			3.13%	H
Paradise Creek (R) 4.44 Swiftwater Ck (R) 0.09 Forest Hills Run (L) 5.80 UNT 5 south of Railroad Line (R)								
469	0.00	0	1,642	UNT 5 enters south of RR Line	**R**	x		
521	0.06	294	1,660	elev		x	6.12%	H
522	0.10	255	1,680	elev		x	7.84%	H
523	0.12	91	1,690	END		x	10.99%	H
Paradise Creek (R) 4.44 Swiftwater Ck (R) 0.09 Forest Hills Run (L) 5.84 UNT 6 north of Railroad Line (L)								
471	0.00	0	1,655	UNT 6 enters north of RR line	**L**	x		
524	0.02	119	1,660	elev		x	4.20%	H
525	0.06	217	1,670	Pond Outlet		x	4.61%	H
526	0.09	139	1,671	Pond Inlet (END)		x	0.72%	L
Paradise Creek (R) 4.44 Swiftwater Ck (R) 1.12 UNT 1 by Route 314 (R)								
335	0.00	0	875	UNT 1 enters	**R**	x		
527	0.07	385	880	elev			1.30%	L
528	0.14	335	900	elev			5.97%	H
529	0.18	216	920	elev			9.26%	H
530	0.22	238	940	elev			8.40%	H
531	0.31	463	960	elev			4.32%	H
532	0.35	192	980	elev			10.42%	H
533	0.37	105	1,000	Route 314 Crossing		x	19.05%	H
534	0.40	200	1,020	elev			10.00%	H
535	0.44	211	1,040	elev			9.48%	H
536	0.49	245	1,060	elev			8.16%	H
537	0.53	195	1,080	elev			10.26%	H

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SEG#	Stream Mile	Segment Length (ft)	ELEV (ft)	Feature	Side	Possibly Unstable	Slope	Gradient
538	0.56	153	1,100	elev			13.07%	H
539	0.58	102	1,120	elev			19.61%	H
540	0.59	61	1,130	Road Crossing		x	16.39%	H
541	0.60	77	1,140	elev			12.99%	H
542	0.62	72	1,160	elev			27.78%	H
543	0.63	92	1,180	elev			21.74%	H
544	0.65	102	1,200	elev			19.61%	H
545	0.70	264	1,220	elev			7.58%	H
546	0.76	328	1,230	Pond Outlet		x	3.05%	H
547	0.78	100	1,231	Pond Inlet (END)			1.00%	L
Paradise Creek (R) 4.44 Swiftwater Ck (R) 1.80 UNT 2 (R)								
340	0.00	0	930	UNT 2 enters	**R**	x		
548	0.09	463	940	elev			2.16%	H
549	0.16	399	960	elev by Evergreen Lane		x	5.01%	H
550	0.22	278	975	Trail Crossing		x	5.40%	H
551	0.24	121	980	elev			4.13%	H
552	0.32	447	1,000	elev			4.47%	H
553	0.39	340	1,020	elev			5.88%	H
554	0.44	256	1,040	elev			7.81%	H
555	0.49	285	1,060	elev			7.02%	H
556	0.55	308	1,080	elev			6.49%	H
557	0.62	385	1,100	elev			5.19%	H
558	0.66	217	1,120	elev			9.22%	H
559	0.69	145	1,130	Sunlight Drive Crossing		x	6.90%	H
560	0.71	92	1,140	elev			10.87%	H
561	0.73	101	1,143	END			2.97%	H
Paradise Creek (R) 4.44 Swiftwater Ck (R) 2.05 UNT 3 (L)								
342	0.00	0	955	UNT 3 enters	**L**	x		
562	0.04	224	960	Pond Outlet		x	2.23%	H
563	0.11	355	961	Pond Inlet			0.28%	L
564	0.13	87	965	Lower Swiftwater Road Crossing		x	4.60%	H
565	0.36	1,220	980	elev			1.23%	L

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SEG#	Stream Mile	Segment Length (ft)	ELEV (ft)	Feature	Side	Possibly Unstable	Slope	Gradient
566	0.50	767	990	Road Crossing (driveway?)		x	1.30%	L
567	0.65	780	1,000	elev			1.28%	L
568	0.69	232	1,005	Donaldson Road Crossing		x	2.16%	H
569	0.73	200	1,007	Olde Schoolhouse Road Crossing		x	1.00%	L
570	0.83	521	1,019	END			2.30%	H
Paradise Creek (R) 4.44 Swiftwater Ck (R) 3.47 UNT 4 (R)								
352	0.00	0	1,081	UNT 4 enters	**R**	x		
571	0.04	207	1,100	elev			9.18%	H
572	0.06	91	1,103	Pond Outlet		x	3.30%	H
573	0.09	168	1,104	Pond Inlet (END)		x	0.60%	L
Paradise Creek (R) 4.44 Swiftwater Ck (R) 4.04 UNT 5 (R)								
357	0.00	0	1,155	UNT 5 enters	**R**	x		
574	0.12	627	1,160	elev			0.80%	L
575	0.23	587	1,180	elev			3.41%	H
576	0.35	648	1,198	Road Crossing		x	2.78%	H
577	0.37	87	1,200	elev			2.30%	H
578	0.40	142	1,220	elev			14.08%	H
579	0.41	56	1,240	Pond Outlet		x	35.71%	H
580	0.47	335	1,241	Pond Inlet			0.30%	L
581	0.57	550	1,260	elev			3.45%	H
582	0.65	396	1,280	elev			5.05%	H
583	0.74	475	1,300	Road Crossing		x	4.21%	H
584	0.80	299	1,320	elev			6.69%	H
585	0.83	187	1,340	elev			10.70%	H
586	0.86	161	1,360	elev			12.42%	H
587	0.88	111	1,370	Summit Road Crossing, END		x	9.01%	H
Paradise Creek (R) 4.44 Swiftwater Ck (R) 4.49 UNT 6 (L)								
362	0.00	0	1,215	UNT 6 enters	**L**	x		
588	0.02	95	1,220	elev			5.26%	H
589	0.08	352	1,240	elev			5.68%	H
590	0.10	75	1,250	Road Crossing		x	13.33%	H

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591	0.14	218	1,257	Pond Outlet		x	3.21%	H
592	0.19	277	1,258	Pond Inlet, END			0.36%	L
Paradise Creek (R) 4.44 Swiftwater Ck (R) 5.02 Indian Run (L)								
366	0.00	0	1,265	Indian Run	**L**	x		
593	0.10	510	1,280	elev			2.94%	H
594	0.21	618	1,300	elev			3.24%	H
595	0.36	750	1,320	elev			2.67%	H
596	0.47	606	1,340	elev			3.30%	H
597	0.53	301	1,355	Trail Crossing		x	4.98%	H
598	0.57	248	1,360	elev			2.02%	H
599	0.61	189	1,370	Power Line Crossing		x	5.29%	H
600	0.65	185	1,375	UNT 1 from Kirk in the Woods	**L**	x	2.70%	H
601	0.67	156	1,380	elev			3.21%	H
602	0.78	541	1,400	elev			3.70%	H
603	0.84	336	1,420	elev			5.95%	H
604	0.92	394	1,440	elev			5.08%	H
605	1.00	446	1,460	elev			4.48%	H
606	1.09	475	1,480	elev			4.21%	H
607	1.18	475	1,500	elev			4.21%	H
608	1.25	370	1,520	elev			5.41%	H
609	1.28	158	1,530	UNT 2 from Pocono Manor Golf Course	**R**	x	6.31%	H
610	1.33	264	1,540	elev			3.79%	H
611	1.42	475	1,560	elev			4.21%	H
612	1.54	634	1,580	elev			3.16%	H
613	1.60	317	1,600	elev			6.31%	H
614	1.65	264	1,620	elev			7.58%	H
615	1.70	264	1,640	elev			7.58%	H
616	1.73	158	1,650	Road Crossing		x	6.31%	H
617	1.79	317	1,660	elev			3.16%	H
618	1.86	370	1,680	elev			5.41%	H
619	1.93	370	1,700	elev			5.41%	H
620	2.01	422	1,720	elev			4.73%	H
621	2.10	475	1,740	elev			4.21%	H

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622	2.12	106	1,757	Pond Outlet		x	16.10%	H
623	2.21	475	1,758	Pond Inlet, END			0.21%	L
		11,669	**493**				**4.22%**	**H**
Paradise Creek (R) 4.44 Swiftwater Ck (R) 5.02 Indian Run (L) 0.65 UNT 1 from Kirk in the Woods (L)								
600	0.00	0	1,375	UNT 1 from Kirk in the Woods	**L**	x		
624	0.02	92	1,380	elev			5.43%	H
625	0.08	340	1,400	elev			5.88%	H
626	0.14	313	1,420	elev			6.39%	H
627	0.21	348	1,440	elev			5.75%	H
628	0.27	318	1,460	elev			6.29%	H
629	0.33	352	1,480	elev			5.68%	H
630	0.39	321	1,500	elev			6.23%	H
631	0.43	181	1,520	elev			11.05%	H
632	0.47	192	1,540	elev			10.42%	H
633	0.50	206	1,560	elev			9.71%	H
634	0.57	325	1,580	elev			6.15%	H
635	0.57	43	1,582	Pond Outlet		x	4.65%	H
636	0.63	300	1,583	Pond Inlet, END		x	0.33%	L
Paradise Creek (R) 4.44 Swiftwater Ck (R) 5.02 Indian Run (L) 1.28 UNT 2 from Pocono Manor Golf Course (R)								
609	0.00	0	1,530	UNT 2 from Pocono Manor Golf Course	**R**	x		
637	0.02	90	1,540	elev			11.11%	H
638	0.03	79	1,560	elev			25.32%	H
639	0.04	62	1,565	Route 314 Crossing		x	8.06%	H
640	0.08	208	1,580	elev			7.21%	H
641	0.15	348	1,600	elev			5.75%	H
642	0.19	239	1,620	elev			8.37%	H
643	0.24	217	1,640	elev			9.22%	H
644	0.27	189	1,660	elev			10.58%	H
645	0.31	191	1,680	elev			10.47%	H
646	0.33	120	1,700	elev			16.67%	H
647	0.36	167	1,715	Fairview & Mt Pocono Ave Crossing		x	8.98%	H
648	0.39	144	1,720	elev			3.47%	H

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SEG#	Stream Mile	Segment Length (ft)	ELEV (ft)	Feature	Side	Possibly Unstable	Slope	Gradient
649	0.41	136	1,725	Pond Outlet		x	3.68%	H
650	0.43	90	1,726	Pond Inlet, END			1.11%	L
Paradise Creek (R) 4.44 Swiftwater Ck (R) 7.85 UNT 7 from Pocono Summit (R)								
390	0.00	0	1,675	UNT 7 enters from Pocono Summit	**R**	x		
651	0.03	161	1,680	elev			3.11%	H
652	0.07	221	1,700	elev			9.05%	H
653	0.19	632	1,720	elev			3.16%	H
654	0.34	805	1,740	elev			2.48%	H
655	0.39	262	1,750	Trail Crossing		x	3.82%	H
656	0.48	428	1,760	elev			2.34%	H
657	0.49	91	1,762	Sullivan Trail Crossing		x	2.20%	H
658	0.59	498	1,780	END near I-380 merge lane		x	3.61%	H
Paradise Creek (R) 5.30 UNT 3 to Lake Crawford from Fish Hatchery (L)								
031	0.00	0	880	UNT 3 enters (Fish Hatchery)	**L**	x		
659	0.07	379	900	elev			5.28%	H
660	0.08	31	902	Pond Outlet		x	6.45%	H
661	0.20	636	903	Pond Inlet			0.16%	L
662	0.20	28	905	Pond Outlet		x	7.14%	H
663	0.26	324	906	Pond Inlet			0.31%	L
664	0.27	39	910	Hatchery Road Crossing		x	10.26%	H
665	0.51	1,230	920	END near Route 191		x	0.81%	L
Paradise Creek (R) 5.40 UNT 4 to Lake Crawford from Fish Hatchery (L)								
032	0.00	0	880	UNT 4 enters (Fish Hatchery)	**L**	x		
666	0.21	1,088	900	elev			1.84%	L
667	0.26	267	905	Hatchery Road Crossing by small ponds		x	1.87%	L
668	0.41	818	915	END parallel to Paradise Cr at small ponds		x	1.22%	L
Paradise Creek (R) 5.71 UNT 5 East of Mt Sophia (R)								
034	0.00	0	900	UNT 5 enters (East of Mt Sophia)	**R**	x		
669	0.36	1,920	920	elev			1.04%	L
670	0.46	504	940	elev			3.97%	H

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SEG#	Stream Mile	Segment Length (ft)	ELEV (ft)	Feature	Side	Possibly Unstable	Slope	Gradient
671	0.56	547	960	elev			3.66%	H
672	0.57	55	965	END			9.09%	H
Paradise Creek (R) 6.12 UNT 6 by Gravel Pit (R)								
036	0.00	0	930	UNT 6 enters (Gravel Pit)	**R**	x		
673	0.13	671	940	elev			1.49%	L
674	0.29	844	950	Red Rock Rd crossing		x	1.18%	L
675	0.32	187	955	UNT 1	**L**	x	2.67%	H
676	0.35	138	960	elev			3.62%	H
677	0.40	298	975	Merry Hill Road Crossing		x	5.03%	H
678	0.42	100	980	elev			5.00%	H
679	0.44	67	982	Pond Outlet		x	2.99%	H
680	0.47	174	983	Pond Inlet			0.57%	L
681	0.64	925	1,000	elev			1.84%	L
682	0.69	245	1,010	Pond Outlet		x	4.08%	H
683	0.72	139	1,011	Pond Inlet			0.72%	L
684	0.86	778	1,020	elev			1.16%	L
685	0.97	536	1,040	elev			3.73%	H
686	1.03	336	1,060	elev			5.95%	H
687	1.15	634	1,080	elev			3.16%	H
688	1.23	422	1,100	elev			4.73%	H
689	1.40	898	1,120	END by Merry Hill Road		x	2.23%	H
Paradise Creek (R) 6.12 UNT 6 by Gravel Pit (R) 0.32 UNT 1 (L)								
675	0.00	0	955	UNT 1	**L**	x		
690	0.04	233	960	elev			2.15%	H
691	0.10	315	975	Merry Hill Road Crossing		x	4.76%	H
692	0.14	195	980	elev			2.56%	H
693	0.23	449	1,000	elev			4.45%	H
694	0.24	83	1,019	Pond Outlet		x	22.89%	H
695	0.28	189	1,020	Pond Inlet			0.53%	L
696	0.29	68	1,025	Pond Outlet		x	7.35%	H
697	0.33	225	1,026	Pond Inlet, END by driveway		x	0.44%	L

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SEG#	Stream Mile	Segment Length (ft)	ELEV (ft)	Feature	Side	Possibly Unstable	Slope	Gradient
Paradise Creek (R) 7.60 UNT 7 by Pocono Mission School (L)								
045a	0.00	0	1,050	UNT 7 enters (Pocono Mission School)	L	x		
698	0.03	167	1,058	Route 940 Crossing		x	4.79%	H
699	0.05	82	1,060	elev			2.44%	H
700	0.11	314	1,080	elev			6.37%	H
701	0.18	372	1,100	elev			5.38%	H
702	0.22	241	1,110	SR 390 and Peterson Hill Rd Crossing		x	4.15%	H
703	0.23	57	1,115	Pond Outlet by Filtr Plant		x	8.77%	H
704	0.33	498	1,116	Pond Inlet			0.20%	L
705	0.37	225	1,120	elev			1.78%	L
706	0.50	675	1,140	elev			2.96%	H
707	0.61	613	1,160	elev			3.26%	H
708	0.63	77	1,162	Koerners Road Crossing		x	2.60%	H
709	0.90	1,424	1,170	Wetland Outlet		x	0.56%	L
710	1.36	2,436	1,178	Wetland Inlet		x	0.33%	L
711	1.42	317	1,180	elev			0.63%	L
712	1.51	475	1,200	elev			4.21%	H
713	1.59	422	1,220	elev			4.73%	H
714	1.75	845	1,240	elev			2.37%	H
715	1.87	634	1,250	END			1.58%	L
Paradise Creek (R) 7.86 UNT 8 by Grange Road (R)								
048	0.00	0	1,070	UNT 8 enters (by Grange Road)	R	x		
716	0.09	480	1,080	elev			2.08%	H
717	0.22	679	1,097	Carlton Road Crossing		x	2.50%	H
718	0.27	266	1,100	elev			1.13%	L
719	0.35	445	1,117	Pond Outlet		x	3.82%	H
720	0.38	145	1,118	Pond Inlet			0.69%	L
721	0.40	119	1,120	elev			1.68%	L
722	0.43	134	1,130	Pond Outlet		x	7.46%	H
723	0.45	96	1,131	UNT 1 enters Pond	L	x	1.04%	L
724	0.45	31	1,131	Pond Inlet			0.00%	L
725	0.49	175	1,140	elev			5.14%	H
726	0.68	1,008	1,160	elev			1.98%	L

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727	0.79	584	1,180	elev			3.42%	H
728	0.80	74	1,190	Lake Outlet		x	13.51%	H
729	0.95	792	1,191	Lake Inlet			0.13%	L
730	0.97	98	1,193	UNT 2 enters from Pond	L	x	2.04%	H
731	1.04	365	1,196	UNT 3 enters from Pond	L	x	0.82%	L
732	1.06	106	1,200	elev			3.79%	H
733	1.11	264	1,205	UNT 4 enters from large pond	L	x	1.89%	L
734	1.18	370	1,210	Power Line Crossing		x	1.35%	L
735	1.28	528	1,220	elev			1.89%	L
736	1.37	475	1,240	elev			4.21%	H
737	1.38	53	1,255	Pond Outlet		x	28.41%	H
738	1.42	211	1,256	Pond Inlet by Grange Road, END		x	0.47%	L
Paradise Creek (R) 7.86 UNT 8 by Grange Road (R) 0.45 UNT 1 into Pond (L)								
723	0.00	0	1,131	UNT 1 enters Pond	L	x		
739	0.10	547	1,140	elev			1.65%	L
740	0.13	160	1,155	Pond Outlet		x	9.38%	H
741	0.16	119	1,156	Pond Inlet, END by Grange Road		x	0.84%	L
Paradise Creek (R) 7.86 UNT 8 by Grange Road (R) 0.97 UNT 2 from pond (L)								
730	0.00	0	1,193	UNT 2 enters from Pond	L	x		
742	0.01	27	1,194	Pond Outlet		x	3.70%	H
743	0.04	183	1,195	Pond Inlet, END		x	0.55%	L
Paradise Creek (R) 7.86 UNT 8 by Grange Road (R) 1.04 UNT 3 from pond (L)								
731	0.00	0	1,196	UNT 3 enters from Pond	L	x		
744	0.01	43	1,200	elev			9.30%	H
745	0.01	30	1,201	Pond Outlet		x	3.33%	H
746	0.05	173	1,202	Pond Inlet, END		x	0.58%	L
Paradise Creek (R) 7.86 UNT 8 by Grange Road (R) 1.11 UNT 4 from large pond (L)								
733	0.00	0	1,205	UNT 4 enters from large pond	L	x		
747	0.03	154	1,208	Pond Outlet		x	1.95%	L

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748	0.18	822	1,209	Pond Inlet, END		x	0.12%	L
Paradise Creek (R) 7.98 Devils Hole Ck (L)								
050	0.00	0	1,080	Devils Hole Ck	L	x		
749	0.17	892	1,100	Pond Outlet thru resort			2.24%	H
750	0.21	230	1,102	Pond Inlet			0.87%	L
751	0.23	108	1,110	UNT 1 enters	L	x	7.41%	H
752	0.32	457	1,120	elev			2.19%	H
753	0.33	41	1,122	UNT 2 enters	L	x	4.88%	H
754	0.46	727	1,140	elev			2.48%	H
755	0.57	574	1,160	elev			3.48%	H
756	0.59	77	1,163	Koerners Road Crossing		x	3.90%	H
757	0.75	874	1,180	elev			1.95%	L
758	0.94	976	1,200	elev			2.05%	H
759	1.01	377	1,220	elev			5.31%	H
760	1.02	53	1,225	channels converrge		x	9.47%	H
761	1.07	264	1,240	elev			5.68%	H
762	1.11	211	1,245	channel splits		x	2.37%	H
763	1.21	528	1,260	elev			2.84%	H
764	1.30	475	1,280	elev			4.21%	H
765	1.39	475	1,300	elev			4.21%	H
766	1.53	739	1,320	elev			2.71%	H
767	1.62	475	1,340	elev			4.21%	H
768	1.68	317	1,355	Railroad Crossing		x	4.73%	H
769	1.73	264	1,360	elev			1.89%	L
770	1.86	686	1,380	elev			2.91%	H
771	1.98	634	1,400	elev			3.16%	H
772	2.00	106	1,405	Trail Crossing		x	4.73%	H
773	2.07	370	1,420	elev in the Devils Hole			4.06%	H
774	2.19	634	1,440	elev in the Devils Hole			3.16%	H
775	2.30	581	1,460	elev in the Devils Hole			3.44%	H
776	2.46	845	1,480	elev in the Devils Hole			2.37%	H
777	2.61	792	1,500	elev in the Devils Hole			2.53%	H
778	2.70	475	1,520	elev in the Devils Hole			4.21%	H

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779	2.73	158	1,530	Trail Crossing		x	6.31%	H
780	2.79	317	1,540	elev			3.16%	H
781	2.87	422	1,560	elev			4.73%	H
782	2.97	528	1,580	elev			3.79%	H
783	3.05	422	1,600	elev			4.73%	H
784	3.06	53	1,603	UNT 3 enters from Seven Pines Mtn SGL	L	x	5.68%	H
785	3.12	317	1,620	elev			5.37%	H
786	3.19	370	1,640	elev			5.41%	H
787	3.25	317	1,660	elev			6.31%	H
788	3.31	317	1,680	elev			6.31%	H
789	3.38	370	1,700	elev			5.41%	H
790	3.44	317	1,720	elev			6.31%	H
791	3.48	211	1,740	elev			9.47%	H
792	3.54	317	1,760	elev			6.31%	H
793	3.60	317	1,780	elev			6.31%	H
794	3.63	158	1,790	UNT 4 enters from SGL	L	x	6.31%	H
795	3.67	211	1,800	elev			4.73%	H
796	3.73	317	1,820	elev			6.31%	H
797	3.80	370	1,840	elev			5.41%	H
798	3.86	317	1,858	UNT 5 enters from Pocono Farms East	R	x	5.68%	H
799	3.88	106	1,860	elev			1.89%	L
800	3.94	317	1,880	elev			6.31%	H
801	4.02	422	1,900	elev			4.73%	H
802	4.10	422	1,920	elev			4.73%	H
803	4.17	370	1,940	elev			5.41%	H
804	4.35	950	1,960	elev			2.10%	H
805	4.48	686	1,980	elev			2.91%	H
806	4.68	1,056	2,000	elev at State Game Lands boundary			1.89%	L
807	4.95	1,426	2,020	elev in Wetland			1.40%	L
808	5.04	475	2,030	State Game Lands boundary			2.10%	H
809	5.22	950	2,040	elev in Wetland			1.05%	L
810	5.51	1,531	2,055	END in Wetland by Little Billy Lane		x	0.98%	L
		29,093	**975**				**3.35%**	**H**

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Paradise Creek (R) 7.98 Devils Hole Ck (L) 0.23 UNT 1 (L)								
751	0.00	0	1,110	UNT 1	L	x		
811	0.04	215	1,120	elev			4.65%	H
812	0.10	290	1,140	elev			6.90%	H
813	0.24	779	1,160	elev			2.57%	H
814	0.37	657	1,180	elev			3.04%	H
815	0.56	1,007	1,200	elev			1.99%	L
816	0.64	437	1,220	elev			4.58%	H
817	0.71	355	1,240	elev			5.63%	H
818	0.73	103	1,245	Koerners Road Crossing		x	4.85%	H
819	0.85	658	1,260	elev			2.28%	H
820	1.01	832	1,280	elev			2.40%	H
821	1.17	845	1,300	elev			2.37%	H
822	1.20	158	1,320	elev			12.63%	H
823	1.22	106	1,330	Railroad Crossing		x	9.47%	H
824	1.24	106	1,340	elev			9.47%	H
825	1.28	211	1,360	elev			9.47%	H
826	1.33	264	1,380	elev			7.58%	H
827	1.39	317	1,400	elev			6.31%	H
828	1.41	106	1,420	elev			18.94%	H
829	1.42	53	1,440	elev			37.88%	H
830	1.44	106	1,460	elev			18.94%	H
831	1.46	106	1,480	elev			18.94%	H
832	1.50	211	1,500	elev			9.47%	H
833	1.54	211	1,520	elev			9.47%	H
834	1.59	264	1,540	elev			7.58%	H
835	1.63	211	1,560	elev			9.47%	H
836	1.67	211	1,580	elev			9.47%	H
837	1.70	158	1,600	elev			12.63%	H
838	1.73	158	1,620	elev			12.63%	H
839	1.76	158	1,640	elev			12.63%	H
840	1.80	211	1,660	elev			9.47%	H
841	1.84	211	1,680	END			9.47%	H

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Paradise Creek (R) 7.98 Devils Hole Ck (L) 0.33 UNT 2 (L)								
753	0.00	0	1,122	UNT 2	L	x		
842	0.06	310	1,140	elev			5.81%	H
843	0.15	478	1,160	elev			4.18%	H
844	0.22	349	1,180	elev			5.73%	H
845	0.29	405	1,200	elev			4.94%	H
846	0.33	193	1,205	Koerners Road Crossing		x	2.59%	H
847	0.43	511	1,220	elev by Williams Road		x	2.94%	H
848	0.54	588	1,240	elev by Williams Road		x	3.40%	H
849	0.66	671	1,257	Pond Outlet		x	2.53%	H
850	0.68	105	1,258	Pond Inlet			0.95%	L
851	0.69	44	1,260	elev			4.55%	H
852	0.74	232	1,280	elev			8.62%	H
853	0.77	170	1,300	elev			11.76%	H
854	0.83	319	1,320	elev by house, driveway		x	6.27%	H
855	0.86	192	1,340	elev			10.42%	H
856	0.88	82	1,345	Railroad Crossing		x	6.10%	H
857	0.93	235	1,355	END			4.26%	H
Paradise Creek (R) 7.98 Devils Hole Ck (L) 3.06 UNT 3 from Seven Pines Mountain State Game Lands (L)								
784	0.00	0	1,603	UNT 3 enters from Seven Pines Mtn SGL	L	x		
858	0.02	88	1,620	elev			19.32%	H
859	0.03	56	1,640	elev			35.71%	H
860	0.04	66	1,660	elev			30.30%	H
861	0.06	85	1,680	elev			23.53%	H
862	0.07	71	1,700	elev			28.17%	H
863	0.08	54	1,720	elev			37.04%	H
864	0.10	85	1,740	elev			23.53%	H
865	0.11	71	1,760	elev			28.17%	H
866	0.12	81	1,780	elev			24.69%	H
867	0.15	153	1,800	elev			13.07%	H
868	0.18	137	1,820	elev			14.60%	H
869	0.21	180	1,840	elev			11.11%	H
870	0.26	224	1,860	elev			8.93%	H

Stream Mile is in upstream direction from confluence.
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Features derived from USGS Topographic Maps and field verified in 2003-2004

SEG#	Stream Mile	Segment Length (ft)	ELEV (ft)	Feature	Side	Possibly Unstable	Slope	Gradient
871	0.39	726	1,880	elev			2.75%	H
872	0.49	491	1,900	elev			4.07%	H
873	0.58	473	1,920	elev			4.23%	H
874	0.61	177	1,925	END			2.82%	H
Paradise Creek (R) 7.98 Devils Hole Ck (L) 3.63 UNT 4 from State Game Lands (L)								
794	0.00	0	1,790	UNT 4 enters from SGL	**L**	x		
875	0.02	92	1,800	elev			10.87%	H
876	0.03	57	1,820	elev			35.09%	H
877	0.04	48	1,840	elev			41.67%	H
878	0.05	58	1,860	elev			34.48%	H
879	0.06	39	1,880	elev			51.28%	H
880	0.07	83	1,900	elev			24.10%	H
881	0.14	347	1,920	elev			5.76%	H
882	0.25	621	1,940	elev			3.22%	H
883	0.43	927	1,960	elev			2.16%	H
884	0.72	1,526	1,980	elev			1.31%	L
885	0.85	715	2,000	elev			2.80%	H
886	0.96	577	2,018	END below road, houses, Jeep trail		x	3.12%	H
Paradise Creek (R) 7.98 Devils Hole Ck (L) 3.86 UNT 5 from Pocono Farms East (R)								
798	0.00	0	1,858	UNT 5 enters from Pocono Farms East	**R**	x		
887	0.01	55	1,860	elev			3.64%	H
888	0.05	193	1,880	elev			10.36%	H
889	0.10	277	1,900	elev			7.22%	H
890	0.24	763	1,920	elev			2.62%	H
891	0.37	668	1,940	elev			2.99%	H
892	0.49	627	1,955	END by Pocono Farms East development		x	2.39%	H
Paradise Creek (R) 9.17 Yankee Run (R)								
062	0.00	0	1,270	Yankee Run enters	**R**	x		
893	0.03	146	1,280	elev			6.85%	H
894	0.13	559	1,300	elev			3.58%	H
895	0.23	501	1,320	elev			3.99%	H

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Features derived from USGS Topographic Maps and field verified in 2003-2004

SEG#	Stream Mile	Segment Length (ft)	ELEV (ft)	Feature	Side	Possibly Unstable	Slope	Gradient
896	0.27	219	1,330	Power Line Crossing		x	4.57%	H
897	0.35	399	1,340	elev			2.51%	H
898	0.41	328	1,360	elev			6.10%	H
899	0.48	370	1,380	elev			5.41%	H
900	0.55	378	1,400	elev			5.29%	H
901	0.62	375	1,420	elev			5.33%	H
902	0.66	196	1,440	elev			10.20%	H
903	0.68	121	1,460	elev			16.53%	H
904	0.72	196	1,470	Railroad Crossing		x	5.10%	H
905	0.77	289	1,480	elev			3.46%	H
906	0.82	230	1,490	Devils Hole Road Crossing		x	4.35%	H
907	0.91	473	1,500	elev			2.11%	H
908	0.97	333	1,520	elev			6.01%	H
909	1.06	484	1,540	elev			4.13%	H
910	1.11	264	1,560	elev			7.58%	H
911	1.12	53	1,562	Pond Outlet		x	3.79%	H
912	1.15	158	1,563	Pond Inlet			0.63%	L
913	1.20	264	1,580	elev			6.44%	H
914	1.21	53	1,582	Pond Outlet		x	3.79%	H
915	1.22	53	1,583	Pond Inlet, Powerline Crossing		x	1.89%	L
916	1.27	264	1,600	elev			6.44%	H
917	1.32	264	1,620	elev			7.58%	H
918	1.33	53	1,622	Crestwood Drive Crossing		x	3.79%	H
919	1.35	106	1,638	Pond Outlet		x	15.15%	H
920	1.38	158	1,639	Pond Inlet			0.63%	L
921	1.39	53	1,640	elev			1.89%	L
922	1.44	264	1,660	elev			7.58%	H
923	1.51	370	1,680	elev			5.41%	H
924	1.55	211	1,700	elev			9.47%	H
925	1.61	317	1,720	END in Mt. Pocono		x	6.31%	H
		8,501	**450**				**5.29%**	**H**

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SEG#	Stream Mile	Segment Length (ft)	ELEV (ft)	Feature	Side	Possibly Unstable	Slope	Gradient
Paradise Creek (R) 9.17 Tank Creek (L)								
062	0.00	0	1,270	Tank Creek enters	L	x		
926	0.04	220	1,280	elev			4.55%	H
927	0.12	409	1,290	UNT 1 enters	L	x	2.44%	H
928	0.20	407	1,300	elev			2.46%	H
929	0.27	409	1,320	elev			4.89%	H
930	0.35	401	1,340	elev			4.99%	H
931	0.41	302	1,360	elev			6.62%	H
932	0.48	381	1,380	elev			5.25%	H
933	0.54	335	1,400	elev			5.97%	H
934	0.58	198	1,420	elev			10.10%	H
935	0.61	180	1,440	elev			11.11%	H
936	0.63	99	1,450	Railroad Crossing		x	10.10%	H
937	0.68	243	1,455	Devils Hole Road Crossing		x	2.06%	H
938	0.72	232	1,460	elev			2.16%	H
939	0.77	238	1,480	elev			8.40%	H
940	0.82	259	1,500	elev			7.72%	H
941	0.88	320	1,520	elev			6.25%	H
942	0.93	278	1,540	elev			7.19%	H
943	0.99	304	1,560	elev			6.58%	H
944	1.04	276	1,580	elev			7.24%	H
945	1.10	317	1,600	elev			6.31%	H
946	1.16	317	1,620	elev			6.31%	H
947	1.20	211	1,640	elev			9.47%	H
948	1.22	106	1,660	elev			18.94%	H
949	1.24	106	1,680	elev			18.94%	H
950	1.26	106	1,700	elev			18.94%	H
951	1.28	106	1,720	elev			18.94%	H
952	1.31	158	1,740	elev			12.63%	H
953	1.33	106	1,760	elev			18.94%	H
954	1.37	211	1,780	elev			9.47%	H
955	1.40	158	1,800	elev			12.63%	H
956	1.47	370	1,820	elev			5.41%	H
957	1.54	370	1,840	elev			5.41%	H

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SEG#	Stream Mile	Segment Length (ft)	ELEV (ft)	Feature	Side	Possibly Unstable	Slope	Gradient
958	1.77	1,214	1,858	END in wetland by Oberon Road		x	1.48%	L
		9,346	**588**				**6.29%**	**H**
Paradise Creek (R) 9.17 Tank Creek (L) 0.12 UNT 1 (L)								
927	0.00	0	1,290	UNT 1 enters	**L**	x		
959	0.02	127	1,300	elev			7.87%	H
960	0.07	249	1,320	elev			8.03%	H
961	0.12	262	1,340	elev			7.63%	H
962	0.20	401	1,360	elev			4.99%	H
963	0.27	403	1,380	elev			4.96%	H
964	0.34	348	1,400	elev			5.75%	H
965	0.39	259	1,410	END below Railroad		x	3.86%	H