# YEAR 1 (2009)
# ANNUAL MONITORING REPORT
# THREE MILE CREEK RESTORATION SITE
# AVERY COUNTY, NORTH CAROLINA
**(Contract #16-D06125-A)**

**FULL DELIVERY PROJECT**
**TO PROVIDE STREAM AND WETLAND MITIGATION**
**IN THE FRENCH BROAD RIVER BASIN**
**CATALOGING UNIT 06010108**


**Prepared for:**

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## EXECUTIVE SUMMARY

Restoration Systems, L.L.C. has completed restoration of streams and wetlands at the Three Mile Creek Restoration Site (hereafter referred to as the "Site") to assist the North Carolina Ecosystem Enhancement Program in fulfilling stream and wetland mitigation goals. The Site, located in southwestern Avery County approximately 5.2 miles northeast of Spruce Pine, North Carolina, provides 8103 stream mitigation units and 3.7 riparian wetland mitigation units as described in the As-Built Mitigation Plan dated April 2009. The Site is located in United States Geological Survey (USGS) Hydrologic Unit and Targeted Local Watershed 06010108010020 (North Carolina Division of Water Quality Subbasin 04-03-06) of the French Broad River Basin. This report serves as the Year 1 (2009) annual monitoring report.

Primary activities at the Site included 1) stream restoration, 2) stream enhancement, 3) stream preservation, 4) wetland restoration and enhancement, 5) soil scarification, and 6) plant community restoration. Project restoration efforts provide 8103 Stream Mitigation Units and 3.7 riverine Wetland Mitigation Units.

Eight vegetation plots (10 meters by 10 meters in size) were established and permanently monumented. These plots were surveyed in September 2009 for the Year 1 (2009) monitoring season. Vegetation sampling across the Site was above the required average density with 708 planted stems per acre surviving. In addition, each individual plot was above success criteria.

Eleven cross-sections and 3000 linear feet of longitudinal profiles were measured for the Year 1 (2009) monitoring. As a whole, monitoring measurements indicate that there have been minimal changes in both the longitudinal profile and cross-sections as compared to as-built data. The as-built channel geometry compares favorably with the emulated, stable E/C type stream reach as set forth in the detailed mitigation plan and construction plans. Current monitoring has demonstrated dimension, pattern, and profile were stable over the course of the monitoring period. No stream problem areas were noted within the Site during the Year 1 (2009) monitoring year.

All three of the monitored gauges within restoration areas were inundated/saturated within 12 inches of the surface for greater than 12.5 percent of the growing season, which extends from May 1 to October 11 (163 days).

In summary, Site vegetation, streams, and wetland hydrology met success criteria for Year 1 (2009) monitoring.

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# 1.0 PROJECT BACKGROUND

## 1.1 Location and Setting

Restoration Systems, L.L.C. (Restoration Systems) has completed restoration of streams and wetlands at the Three Mile Creek Restoration Site (hereafter referred to as the "Site") to assist the North Carolina Ecosystem Enhancement Program (NCEEP) in fulfilling stream and wetland mitigation goals. The Site, The Site, located in southwestern Avery County approximately 5.2 miles northeast of Spruce Pine, North Carolina, provides 8103 stream mitigation units and 3.7 riparian wetland mitigation units as described in the April 2009 As-Built Mitigation Plan(Figures 1 and 2, Appendix A). The Site is located in United States Geological Survey (USGS) Hydrologic Unit and Targeted Local Watershed 06010108010020 (North Carolina Division of Water Quality Subbasin 04-03-06) of the French Broad River Basin.

Directions to the Site:

- From Asheville or Raleigh, take I-40 to Marion; take NC 226 north through Linville Falls; go left on NC 194; site is ~4.5 miles on left
- Or, From Asheville take 19/23 North to 19E through Spruce Pine to NC 194
- Take a right on NC 194 and travel approximately 1.5 miles
- The Site is on the right
- Latitude, Longitude of Site: 35.9827°N, 81.9843°W (NAD83/WGS84)

## 1.2 Project Objectives

The primary components of the restoration project included 1) construction of a stable, riffle-pool stream channel; 2) enhancement of water quality functions within and downstream of the Site; 3) creation of a natural vegetated buffer along restored stream channels; 4) restoration of jurisdictional riverine wetlands in the Site; 5) improvement of aquatic habitat and species diversity by enhancing stream bed variability; and 6) restoration of wildlife functions associated with a riparian corridor/stable stream.

## 1.3 Project Structure, Restoration Type, and Approach

An approximately 26.68-acre conservation easement was placed on the Site to incorporate all restoration activities. The Site contains 4.8 acres of hydric soil, Three Mile Creek, 12 unnamed tributaries (UTs) to Three Mile Creek, Fork Creek, and adjacent floodplains, which represent the primary hydrologic features of the Site. Prior to construction, the project was characterized by agricultural land utilized for Christmas tree and ornamental landscape nursery plant production, timber harvest, and livestock grazing. Agricultural practices included the maintenance and removal of riparian vegetation and relocation, dredging, and straightening of onsite streams. In addition, hydric soils were disturbed due to regular plowing and vegetation maintenance, hoof shear from livestock, and the removal of groundwater hydrology inputs from the rerouting and straightening of Site tributaries.

Restoration of Site streams and wetlands will result in positive benefits for water quality and biological diversity in the Three Mile Creek watershed. Targeted mitigation efforts at the Site were accomplished by:

1. Removing nonpoint and point sources of pollution associated with agricultural practices including a) cessation of broadcasting fertilizer, pesticides, and other agricultural chemicals into and adjacent to the Site and b) provide a forested riparian buffer to treat surface runoff.
2. Reducing sedimentation within onsite and downstream receiving waters by a) reducing bank erosion associated with vegetation maintenance and plowing adjacent to Site streams and wetlands and b) planting a forested riparian buffer adjacent to Site streams and wetlands.
3. Reestablishing stream stability and the capacity to transport watershed flows and sediment loads by restoring a stable dimension, pattern, and profile supported by natural in-stream habitat and grade/bank stabilization structures.

4. Promoting floodwater attenuation by a) reconnecting bankfull stream flows to the abandoned floodplain terrace; b) restoring secondary, dredged, straightened, and entrenched tributaries, thereby reducing floodwater velocities within smaller catchment basins; c) restoration of depressional floodplain wetlands and floodwater storage capacity within the Site, and d) revegetating Site floodplains to increase frictional resistance on floodwaters.
5. Improving aquatic habitat with bed variability and the use of in-stream structures upstream of a reach identified by the North Carolina Wildlife Resources Commission as supporting naturally reproducing rainbow trout populations.
6. Providing a terrestrial wildlife corridor and refuge in an area that is developed for agricultural production.

As constructed, the Site restored historic stream and wetland functions, which existed onsite prior to channel straightening and dredging, agricultural impacts, and vegetation removal. Stream construction of meandering, E/C stream channel resulted in 6057 linear feet of stream restoration, 618 linear feet of stream enhancement (Level I), 875 linear feet of stream enhancement (Level II), 6421 linear feet of stream preservation, 2.5 acres of riverine wetland restoration, and 2.3 acres of riverine wetland enhancement (Table 1).

**Table 1. Site Restoration Structures and Objectives**

| Restoration Segment/ Reach ID* | Station Range | Mitigation Type | Priority Approach | Existing Linear Footage/ Acreage | Designed Linear Footage/ Acreage** | SMU/ WMU | Comment |
|---|---|---|---|---|---|---|---|
| Three Mile Creek | 1+25-37+30 | Restoration | 1 | 3552 | 3495 | 3495 | Restoration of a straightened channel on new location. |
| | 37+30-42+15 | Enhancement I | 2 | 485 | 485 | 323.3 | Restoration of dimension and profile in place. |
| Fork Creek | 0+00-1+58 | Enhancement II | NA | 158 | 158 | 63.2 | Removal of invasive species and supplemental planting. |
| Tributary 1 | 0+00-3+84 | Restoration | 1 | 172 | 384 | 384 | Restoration of a straightened channel on new location. |
| Tributary 2 | 0+00-1+33 | Enhancement I | 2 | 133 | 133 | 88.7 | Restoration of dimension and profile in place. |
| | NA | Enhancement II | NA | 351 | 351 | 140.4 | Removal of invasive species and supplemental planting. |
| Tributary 3 | 0+00-3+40 | Restoration | 1 | 252 | 340 | 340 | Restoration of a ditched and disturbed channel on new location. |
| | NA | Preservation | NA | 1808 | 1808 | 361.6 | Preservation of existing reach |
| Tributary 4 | 0+00-2+28 | Restoration | 1 | 136 | 198 | 198 | Restoration of a ditched and disturbed channel on new location. |
| | NA | Enhancement II | NA | 366 | 366 | 146.4 | Removal of invasive species and supplemental planting. |
| Tributary 5 | 0+00-2+44 | Restoration | 1 | 150 | 214 | 214 | Restoration of a ditched and disturbed channel on new location. |
| | NA | Preservation | NA | 931 | 931 | 186.2 | Preservation of stable, forested stream reaches. |
| Tributary 6a | 0+00-2+44 | Restoration | 1 | 124 | 214 | 214 | Restoration of a ditched and disturbed channel on new location. |
| | NA | Preservation | NA | 681 | 681 | 136.2 | Preservation of stable, forested stream reaches. |

**Table 1. Site Restoration Structures and Objectives (continued)**

| Restoration Segment/ Reach ID* | Station Range | Mitigation Type | Priority Approach | Existing Linear Footage/ Acreage | Designed Linear Footage/ Acreage** | SMU/ WMU | Comment |
|---|---|---|---|---|---|---|---|
| Tributary 7 | 0+00-2+75 | Restoration | 1 | 146 | 245 | 245 | Restoration of a ditched and disturbed channel on new location. |
| Tributary 8 | 0+00-3+43 | Restoration | 1 | 519 | 343 | 343 | Restoration of a ditched and disturbed channel on new location. |
| | 242 | Restoration | 1 | 242 | 242 | 242 | Filling a ditched springhead systems and braiding restoration channel. |
| Tributary 9 | 0+00-0+43 | NA | NA | 0 | 43 | 0 | Tie spring head to design channel. |
| Tributary 11a | 0+00-0+92 | Restoration | 1 | 72 | 92 | 92 | Restoration of a ditched and disturbed channel on new location. |
| | 228 | Restoration | 1 | 228 | 228 | 228 | Braiding surface flow of restoration channel. |
| | NA | Preservation | NA | 49 | 49 | 9.8 | Preservation of stable, forested stream reaches. |
| Tributary 11b | 0+00-0+62 | Restoration | 1 | 51 | 62 | 62 | Restoration of a ditched and disturbed channel on new location. |
| Preservation Tributaries | NA | Preservation | NA | 2952 | 2952 | 590.4 | Preservation of stable, forested stream reaches. |
| | | | | | **TOTAL SMUs** | **8103** | |
| Riparian/ Riverine Wetlands | -- | Restoration | -- | -- | 2.5 | 2.5 | Reconstructing site tributaries, filling ditched channels and ditches, rehydrating floodplain soils, and planting with native forest vegetation. |
| | -- | Enhancement | -- | -- | 2.3 | 1.2 | Planting with native forest vegetation. |
| | | | | | **TOTAL WMUs** | **3.7** | |

* Locations of each tributary and restoration type are depicted on Sheets 1-23 in Appendix A (As-built Survey)
** Constructed linear footage excludes crossings or areas outside of easement; therefore, is slightly shorter than stationing depicts.
Priority Approach 1 – Convert incised stream to stable stream at historic floodplain elevation.
Priority Approach 2 – Convert incised stream to stable stream and reestablish floodplain at present location.

## 1.4 Project History and Background

Completed project activities, reporting history, completion dates, project contacts, and background information are summarized in Tables 2-4.

**Table 2. Project Activity and Reporting History**

| Activity or Report | Data Collection Completion | Actual Completion or Delivery |
|---|---|---|
| Restoration Plan | August 2007 | September 2007 |
| Construction Completion | NA | January 2009 |
| Site Planting | NA | February 2009 |
| Mitigation Plan/As-builts | March 2009 | April 2009 |
| Year 1 Monitoring (2008) | September 2009 | September 2009 |

**Table 3. Project Contacts**

| | |
|---|---|
| **Full Delivery Provider** | Restoration Systems<br>1101 Haynes Street, Suite 211<br>Raleigh, North Carolina 27604<br>George Howard and John Preyer (919) 755-9490 |
| **Designer and<br>Year 1 Monitoring Performer** | Axiom Environmental, Inc.<br>20 Enterprise Street, Suite 7<br>Raleigh, NC 27607<br>Grant Lewis (919) 215-1693 |
| **Construction Contractor** | Land Mechanics Designs, Inc.<br>126 Circle G Lane<br>Willow Spring, North Carolina 27592<br>Lloyd Glover (919) 422-3392 |
| **Planting Contractor** | Carolina Silvics<br>908 Indian Trail Road<br>Edenton, North Carolina 27932<br>Dwight McKinney (252) 482-8491 |
| **Surveying Contractor** | K2 Design Group, PA<br>5758 US Highway 70 East<br>Goldsboro, North Carolina 27534<br>John Rudolph (919) 751-0075 |

**Table 4. Project Background**

| | |
|---|---|
| Project County | Avery County, North Carolina |
| Drainage Area | Three Mile Creek: 5.1 square miles<br>Fork Creek: 1.8 square miles<br>Tributaries: 0.02-0.2 square mile |
| Drainage impervious cover estimate (%) | < 1 |
| Stream Order | Three Mile Creek: Second and Third<br>Fork Creek: Second<br>Tributaries: First and Second |
| Physiographic Region | Blue Ridge |
| Ecoregion | Southern Crystalline Ridges and Mountains |
| Rosgen Classification of As-built | C/E-type |
| Dominant Soil Types | Chandler, Cullowhee, Nikwasi, Micaville, Saunook, Thunder |
| Reference Site ID | Stone Mountain and Cranberry Creek |
| USGS HUC | 06010108010020 |
| NCDWQ Subbasin | 04-03-06 |
| NCDWQ Classification | WS-IV Tr (Stream Index # 7-2-25-(0.7)) |
| Any portion of any project segment 303d listed? | No |
| Any portion of any project segment upstream of a 303d listed segment? | Yes, the receiving water of the North Toe River (Stream Index Number 7-2-[27.7]b) is listed for impaired biological integrity and turbidity |
| Reasons for 303d listing or stressor | Not Applicable |
| % of project easement fenced | +/- 8% |

### 1.5 Monitoring Plan View

Monitoring activities for the Site, including relevant structures and utilities, project features, specific project structures, and monitoring features are detailed in the monitoring plan view in Figure 2 of Appendix A. Site features including vegetation, stream dimension (cross-sections), stream profile and pattern, wetland hydrology, and photographic documentation were monitored in Year 1 (2009).

## 2.0 PROJECT CONDITION AND MONITORING RESULTS

### 2.1 Vegetation Assessment

Following Site construction, eight plots (10 meters by 10 meters in size) were established and monumented with metal fence posts at all plot corners and PVC at each plot origin. Sampling was conducted as outlined in the *CVS-EEP Protocol for Recording Vegetation, Version 4.0* (Lee et al. 2006) (http://cvs.bio.unc.edu/methods.htm); results are included in Appendix B. The taxonomic standard for vegetation used for this document was *Flora of the Carolinas, Virginia, Georgia, and Surrounding Areas* (Weakley 2007). The locations of vegetation monitoring plots were placed to accurately represent the entire Site and are depicted on the monitoring plan view in AppendixA.

#### 2.1.1 Vegetation Success Criteria

Success criteria have been established to verify that the vegetation component supports community elements necessary for forest development. Success criteria are dependent upon density and growth of "Characteristic Tree Species." Characteristic Tree Species include planted species, species identified through inventory of a reference (relatively undisturbed) forest community used to orient the planting plan, and appropriate Schafale and Weakley (1990) community descriptions. All species planted and identified in the reference forest will be utilized to define "Characteristic Tree Species" as termed in the success criteria (Table 5).

**Table 5. Characteristic Tree Species**

| Planted Species | Reference Species |
|---|---|
| Pawpaw (*Asimina triloba*) | Red maple (*Acer rubrum*) |
| Sugarberry (*Celtis laevigata*) | Ironwood (*Carpinus caroliniana*) |
| Redbud (*Cercis canadensis*) | Dogwood (*Cornus florida*) |
| Buttonbush(*Cephalanthus occidentalis*) | Strawberry bush (*Euonymous americana*) |
| Silky dogwood(*Cornus amomum*) | Spice bush (*Lindera benzoin*) |
| Persimmon (*Diospyros virginiana*) | Tulip poplar (*Liriodendron tulipifera*) |
| Green ash (*Fraxinus pennsylvanica*) | Sycamore (*Platanus occidentalis*) |
| Sycamore (*Platanus occidentalis*) | White pine (*Pinus strobes*) |
| Black cherry (*Prunus serotina*) | Black cherry (*Prunus serotina*) |
| White oak (*Quercus alba*) | White oak (*Quercus alba*) |
| Swamp chestnut oak (*Quercus michauxii*) | Red oak (*Quercus* sp.) |
| Cherrybark oak (*Quercus pagoda*) | Rhododendron (*Rhododendron* sp.) |
| Northern red oak (*Quercus rubra*) | Wild azalea (*Rhododendron periclymenoides*) |
| Elderberry(*Sambucus canadensis*) | Black locust (*Robinia pseudoacacia*) |
| | Hemlock (*Tsuga* sp.) |

An average density of 320 stems per acre of Characteristic Tree Species must be surviving at the end of the third monitoring year. Subsequently, 290 Characteristic Tree Species per acre must be surviving at the end of year 4 and 260 Characteristic Tree Species per acre at the end of year 5.

If vegetation success criteria are not achieved, based on average density calculations from combined plots over the entire restoration area, supplemental planting may be performed with tree species approved by regulatory agencies. Supplemental planting will be performed as needed until achievement of vegetation success criteria.

### 2.1.2 Vegetative Problem Areas

No vegetation problem areas were identified within the Site during Year 1 (2009) Monitoring.

## 2.2 Stream Assessment

Eleven permanent cross-sections were established after construction was completed. Measurements of each cross-section include points at all breaks in slope including top of bank, bankfull, and thalweg. Riffle cross-sections are classified using the Rosgen stream classification system. Longitudinal profile measurements of 3000 linear feet of stream include thalweg, water surface, and bankfull; with each measurement taken at the head of facets (i.e. riffle, run, pool, and glide) in addition to the maximum pool depth.

### 2.2.1 Stream Success Criteria

Success criteria for stream restoration will include 1) successful classification of the reach as a functioning stream system (Rosgen 1996) and 2) channel variables indicative of a stable stream system. Annual monitoring will continue until success criteria are met and no less than two bankfull events have occurred, as determined by in situ crest gauge, otherwise monitoring will continue until the second bankfull event has occurred.

Visual assessment of in-stream structures will be conducted to determine if failure has occurred. Failure of a structure may be indicated by collapse of the structure, undermining of the structure, abandonment of the channel around the structure, and/or stream flow beneath the structure.

### 2.2.2 Bankfull Events

No bankfull events were documented during the Year 1 (2009) monitoring period.

**Table 6. Verification of Bankfull Events**

| Date of Data Collection | Date of Occurrence | Method | Photo (if available) |
|---|---|---|---|
| No bankfull events were documented during the Year 1 (2009) monitoring period. | | | |

### 2.2.3 Stream Problem Areas

No stream problem areas were noted within the Site during the Year 1 (2009) monitoring year.

### 2.2.4 Categorical Stream Feature Visual Stability Assessment

The stream was visually inspected during the Year 1 (2009) monitoring period using eight feature categories and various metrics within each category. Assessment features included riffles, pools, thalweg, meanders, channel bed, structures, and root wads/boulders. A table for semi-quantitative assessments of the stream is included in Appendix C (Table C1). The mean percentage of performance for features is summarized in the table below.

**Table 7. Categorical Stream Feature Visual Stability Assessment**

| Feature | Year 1 (2009) | Year 2 (2010) | Year 3 (2011) | Year 4 (2012) | Year 5 (2013) |
|---|---|---|---|---|---|
| A. Riffles | 99% | | | | |
| B. Pools | 100% | | | | |
| C. Thalweg | 100% | | | | |
| D. Meanders | 100% | | | | |
| E. Bed General | 100% | | | | |
| F. Banks | 100% | | | | |
| G. Vanes / J. Hooks, Etc. | 100% | | | | |
| H. Wads and Boulders | NA | | | | |

### 2.2.5 Quantitative Stream Measurements

During the Year 1 (2009) monitoring period 11 cross-sections and 3000 linear feet of longitudinal profile were measured. Permanent cross-sections and longitudinal profiles are included in Appendix C; each is graphically depicted for as-built through Year 1 (2009) for analysis. As a whole, monitoring measurements indicate minimal changes in both the longitudinal profile and cross-sections as compared to as-built data. The channel geometry compares favorably with the emulated, stable E/C type stream reach as set forth in the detailed mitigation plan and as constructed. Current monitoring has demonstrated dimension, pattern, and profile were stable over the course of the monitoring period. Table for baseline data and annual quantitative assessments are included below.

## 2.3 Wetland Assessment

Three groundwater gauges were installed in wetland restoration and enhancement areas to provide representative coverage of the Site. One additional gauge was placed in a reference wetland area. Graphs of groundwater hydrology and precipitation from a nearby rain station (Weather Underground 2009) are included in Appendix D.

### 2.3.1 Wetland Success Criteria

Target hydrological characteristics include saturation or inundation for 5 to 12.5 percent of the growing season, during average climatic conditions. During growing seasons with atypical climatic conditions, groundwater gauges in reference wetlands may dictate threshold hydrology success criteria (75 percent of reference). These areas are expected to support hydrophytic vegetation. If wetland parameters are marginal as indicated by vegetation and/or hydrology monitoring, a jurisdictional determination will be performed.

### 2.3.2 Wetland Problem Areas

No wetland problem areas were identified within the Site during Year 1 (2009) monitoring.

**Table 8. Baseline Morphology and Hydraulic Summary**
**Threemile Creek**

| Parameter | USGS Gage Data | | | Pre-Existing Condition | | | Project Reference Stream | | | Design | | | As-built | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Dimension** | **Min** | **Max** | **Med** | **Min** | **Max** | **Med** | **Min** | **Max** | **Med** | **Min** | **Max** | **Med** | **Min** | **Max** | **Med** |
| BF Width (ft) | USGS gage data is unavailable for this project | | | 17.4 | 23 | 20.7 | 27.2 | 33 | 30.1 | 21 | 29 | 25 | 23.1 | 27.8 | 26.1 |
| Floodprone Width (ft) | | | | 32 | 250 | 100 | | | 100 | 50 | 350 | 250 | | | 250 |
| BF Cross Sectional Area (ft2) | | | | 36.5 | 53 | 43 | | | 46 | 36 | 53 | 45 | 46.5 | 55.3 | 53.1 |
| BF Mean Depth (ft) | | | | 1.5 | 2.8 | 2.2 | 1.4 | 1.7 | 1.6 | 1.5 | 2.1 | 1.8 | 1.8 | 2.2 | 2.1 |
| BF Max Depth (ft) | | | | 1.9 | 3.3 | 2.8 | 2.2 | 2.6 | 2.4 | 2 | 2.7 | 2.3 | 2.2 | 2.7 | 2.5 |
| Width/Depth Ratio | | | | 6.6 | 14.5 | 10 | 16.1 | 23.8 | 20 | 12 | 16 | 14 | 12 | 15 | 12 |
| Entrenchment Ratio | | | | 1.5 | 8 | 6.5 | 3 | 3.7 | 3.4 | 2.2 | 7.4 | 4.4 | 9 | 11 | 10 |
| Bank Height Ratio | | | | 1.9 | 2.5 | 1.8 | 1 | 1.6 | 1.3 | 1 | 1.3 | 1.1 | | | 1 |
| Wetted Perimeter(ft) | | | | | | === | | | === | | | === | 25 | 29 | 28 |
| Hydraulic radius (ft) | | | | | | === | | | === | | | === | 1.8 | 2 | 2 |
| **Pattern** | | | | | | | | | | | | | | | |
| Channel Beltwidth (ft) | | | | No pattern of riffles and pools due to straightening activties | | | 40 | 55 | 46.8 | 27 | 76 | 47 | 27 | 76 | 47 |
| Radius of Curvature (ft) | | | | | | | 62.4 | 312.1 | 94.5 | 45 | 252 | 52 | 45 | 252 | 52 |
| Meander Wavelength (ft) | | | | | | | 101.7 | 273.2 | 199.4 | 136 | 252 | 200 | 136 | 252 | 200 |
| Meander Width ratio | | | | | | | 1.3 | 1.8 | 1.6 | 1.2 | 3 | 2 | 1.2 | 3 | 2 |
| **Profile** | | | | | | | | | | | | | | | |
| Riffle length (ft) | | | | No pattern of riffles and pools due to straightening activties | | | | | === | | | === | 17 | 111 | 51 |
| Riffle slope (ft/ft) | | | | | | | 0.26% | 1.83% | 1.18% | 1.94% | 2.91% | 2.43% | 0.43% | 4.80% | 1.54% |
| Pool length (ft) | | | | | | | | | === | | | === | 26 | 78 | 46 |
| Pool spacing (ft) | | | | | | | 65.2 | 166.7 | 104.3 | 67 | 176 | 115 | 76 | 176 | 126 |
| **Substrate** | | | | | | | | | | | | | | | |
| d50 (mm) | | | | | | === | | | === | | | === | | | === |
| d84 (mm) | | | | | | === | | | === | | | === | | | === |
| **Additional Reach Parameters** | | | | | | | | | | | | | | | |
| Valley Length (ft) | | | | | | === | | | === | | | === | | | 4057 |
| Channel Length (ft) | | | | | | === | | | === | | | === | | | 3528 |
| Sinuosity | | | | | | 1.1 | | | 1.2 | | | 1.15 | | | 1.15 |
| Water Surface Slope (ft/ft) | | | | | | 1.03% | | | 1.21% | | | 0.97% | | | 0.98% |
| BF slope (ft/ft) | | | | | | === | | | === | | | === | | | === |
| Rosgen Classification | | | | | | C/E4 | | | Cb3 | | | Ce4 | | | C/E 3/4 |

**Table 9A. Morphology and Hydraulic Monitoring Summary**
**Threemile Creek - Stream and Wetland Restoration Site**

| Parameter | Cross Section 1 Riffle (UT 8) | | | | | | Cross Section 2 Pool (UT 8) | | | | | | Cross Section 3 Riffle | | | | | | Cross Section 4 Pool | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Dimension** | **MY 0** | **MY1** | **MY2** | **MY3** | **MY4** | **MY5** | **MY 0** | **MY1** | **MY2** | **MY3** | **MY4** | **MY5** | **MY 0** | **MY1** | **MY2** | **MY3** | **MY4** | **MY5** | **MY 0** | **MY1** | **MY2** | **MY3** | **MY4** | **MY5** |
| BF Width (ft) | 4.8 | 4.8 | | | | | 6.3 | 7.5 | | | | | 27.8 | 30.3 | | | | | 27.9 | 27.8 | | | | |
| Floodprone Width (ft) | 250 | 250 | | | | | ---- | ---- | | | | | 250 | 250 | | | | | ---- | ---- | | | | |
| BF Cross Sectional Area (ft2) | 1.8 | 2.3 | | | | | 4.8 | 5.4 | | | | | 51.1 | 51.9 | | | | | 63.4 | 62.8 | | | | |
| BF Mean Depth (ft) | 0.4 | 0.5 | | | | | 0.8 | 0.7 | | | | | 1.8 | 1.7 | | | | | 2.3 | 2.3 | | | | |
| BF Max Depth (ft) | 0.6 | 0.8 | | | | | 1.3 | 1.2 | | | | | 2.2 | 2.3 | | | | | 3.7 | 3.6 | | | | |
| Width/Depth Ratio | 12.8 | 10.2 | | | | | ---- | ---- | | | | | 15.1 | 17.7 | | | | | ---- | ---- | | | | |
| Entrenchment Ratio | 52.1 | 51.6 | | | | | ---- | ---- | | | | | 9.0 | 8.2 | | | | | ---- | ---- | | | | |
| Bank Height Ratio | 1.0 | 1.0 | | | | | ---- | ---- | | | | | 1.0 | 1.0 | | | | | ---- | ---- | | | | |
| Wetted Perimeter (ft) | 5.1 | 5.1 | | | | | 6.9 | 8.0 | | | | | 29.0 | 31.2 | | | | | 29.6 | 29.6 | | | | |
| Hydraulic Radius (ft) | 0.4 | 0.4 | | | | | 0.7 | 0.7 | | | | | 1.8 | 1.7 | | | | | 2.1 | 2.1 | | | | |
| **Substrate** | | | | | | | | | | | | | | | | | | | | | | | | |
| d50 (mm) | ---- | 12.9 | | | | | ---- | NA | | | | | ---- | 23.4 | | | | | ---- | 2.4 | | | | |
| d84 (mm) | ---- | 22 | | | | | ---- | 12 | | | | | ---- | 54 | | | | | ---- | 16 | | | | |

| Parameter | MY-00 (2008) | | | MY-01 (2009) | | | MY-02 (2010) | | | MY-03 (2011) | | | MY-04 (2012) | | | MY-05 (2013) | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **Min** | **Max** | **Med** | **Min** | **Max** | **Med** | **Min** | **Max** | **Med** | **Min** | **Max** | **Med** | **Min** | **Max** | **Med** | **Min** | **Max** | **Med** |
| **Pattern** | | | | | | | | | | | | | | | | | | |
| Channel Beltwidth (ft) | 30 | 76 | 50 | 30 | 76 | 50 | | | | | | | | | | | | |
| Radius of Curvature (ft) | 50 | 252 | 101 | 50 | 252 | 101 | | | | | | | | | | | | |
| Meander Wavelength (ft) | 151 | 252 | 214 | 151 | 252 | 214 | | | | | | | | | | | | |
| Meander Width Ratio | 1.2 | 3 | 2 | 1.2 | 3 | 2 | | | | | | | | | | | | |
| **Profile** | | | | | | | | | | | | | | | | | | |
| Riffle Length (ft) | 17 | 111 | 51 | 21 | 121 | 53 | | | | | | | | | | | | |
| Riffle Slope (ft/ft) | 0.43% | 4.80% | 1.54% | 0.15% | 3.08% | 1.43% | | | | | | | | | | | | |
| Pool Length (ft) | 26 | 78 | 46 | 24 | 69 | 39 | | | | | | | | | | | | |
| Pool Spacing (ft) | 76 | 176 | 126 | 76 | 176 | 126 | | | | | | | | | | | | |
| **Additonal Reach Parameters** | | | | | | | | | | | | | | | | | | |
| Valley Length (ft) | 4057 | | | 4080 | | | | | | | | | | | | | | |
| Channel Length (ft) | 3,528 | | | 3,548 | | | | | | | | | | | | | | |
| Sinuosity | 1.15 | | | 1.15 | | | | | | | | | | | | | | |
| Water Surface Slope (ft/ft) | 0.0098 | | | 0.0097 | | | | | | | | | | | | | | |
| BF Slope (ft/ft) | ------ | | | ------ | | | | | | | | | | | | | | |
| Rosgen Classification | C/E 3/4 | | | C/E 3/4 | | | | | | | | | | | | | | |

**Table 9B. Morphology and Hydraulic Monitoring Summary**
**Threemile Creek - Stream and Wetland Restoration Site**

| Parameter | Cross Section 5 Riffle | | | | | | Cross Section 6 Pool | | | | | | Cross Section 7 Riffle | | | | | | Cross Section 8 Pool | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Dimension** | **MY 0** | **MY1** | **MY2** | **MY3** | **MY4** | **MY5** | **MY 0** | **MY1** | **MY2** | **MY3** | **MY4** | **MY5** | **MY 0** | **MY1** | **MY2** | **MY3** | **MY4** | **MY5** | **MY 0** | **MY1** | **MY2** | **MY3** | **MY4** | **MY5** |
| BF Width (ft) | 26.4 | 28.6 | | | | | 21.6 | 21.2 | | | | | 23.1 | 23.6 | | | | | 25.7 | 27.2 | | | | |
| Floodprone Width (ft) | 250 | 250 | | | | | ---- | ---- | | | | | 250 | 250 | | | | | ---- | ---- | | | | |
| BF Cross Sectional Area (ft2) | 55 | 60.6 | | | | | 49.9 | 48.1 | | | | | 46.5 | 49.9 | | | | | 52.1 | 52.4 | | | | |
| BF Mean Depth (ft) | 2.1 | 2.1 | | | | | 2.3 | 2.3 | | | | | 2.0 | 2.1 | | | | | 2.0 | 1.9 | | | | |
| BF Max Depth (ft) | 2.6 | 2.8 | | | | | 3.5 | 3.6 | | | | | 2.4 | 2.6 | | | | | 3.4 | 3.5 | | | | |
| Width/Depth Ratio | 12.7 | 13.5 | | | | | ---- | ---- | | | | | 11.5 | 11.2 | | | | | ---- | ---- | | | | |
| Entrenchment Ratio | 9.5 | 8.7 | | | | | ---- | ---- | | | | | 10.8 | 10.6 | | | | | ---- | ---- | | | | |
| Bank Height Ratio | 1.0 | 1.0 | | | | | ---- | ---- | | | | | 1.0 | 1.0 | | | | | ---- | ---- | | | | |
| Wetted Perimeter (ft) | 27.9 | 30 | | | | | 23.5 | 23.4 | | | | | 24.7 | 25.5 | | | | | 27.1 | 28.7 | | | | |
| Hydraulic Radius (ft) | 2.0 | 2.0 | | | | | 2.1 | 2.1 | | | | | 1.9 | 2.0 | | | | | 1.9 | 1.8 | | | | |
| **Substrate** | | | | | | | | | | | | | | | | | | | | | | | | |
| d50 (mm) | ---- | ---- | | | | | ---- | ---- | | | | | ---- | ---- | | | | | ---- | 8.7 | | | | |
| d84 (mm) | ---- | ---- | | | | | ---- | ---- | | | | | ---- | ---- | | | | | ---- | 64 | | | | |

| Parameter | MY-00 (2008) | | | MY-01 (2009) | | | MY-02 (2010) | | | MY-03 (2011) | | | MY-04 (2012) | | | MY-05 (2013) | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **Min** | **Max** | **Med** | **Min** | **Max** | **Med** | **Min** | **Max** | **Med** | **Min** | **Max** | **Med** | **Min** | **Max** | **Med** | **Min** | **Max** | **Med** |
| **Pattern** | | | | | | | | | | | | | | | | | | |
| Channel Beltwidth (ft) | 30 | 76 | 50 | 30 | 76 | 50 | | | | | | | | | | | | |
| Radius of Curvature (ft) | 50 | 252 | 101 | 50 | 252 | 101 | | | | | | | | | | | | |
| Meander Wavelength (ft) | 151 | 252 | 214 | 151 | 252 | 214 | | | | | | | | | | | | |
| Meander Width Ratio | 1.2 | 3 | 2 | 1.2 | 3 | 2 | | | | | | | | | | | | |
| **Profile** | | | | | | | | | | | | | | | | | | |
| Riffle Length (ft) | 17 | 111 | 51 | 21 | 121 | 53 | | | | | | | | | | | | |
| Riffle Slope (ft/ft) | 0.43% | 4.80% | 1.54% | 0.15% | 3.08% | 1.43% | | | | | | | | | | | | |
| Pool Length (ft) | 26 | 78 | 46 | 24 | 69 | 39 | | | | | | | | | | | | |
| Pool Spacing (ft) | 76 | 176 | 126 | 76 | 176 | 126 | | | | | | | | | | | | |
| **Additonal Reach Parameters** | | | | | | | | | | | | | | | | | | |
| Valley Length (ft) | 4057 | | | 4080 | | | | | | | | | | | | | | |
| Channel Length (ft) | 3,528 | | | 3,548 | | | | | | | | | | | | | | |
| Sinuosity | 1.15 | | | 1.15 | | | | | | | | | | | | | | |
| Water Surface Slope (ft/ft) | 0.0098 | | | 0.0097 | | | | | | | | | | | | | | |
| BF Slope (ft/ft) | ------ | | | ------ | | | | | | | | | | | | | | |
| Rosgen Classification | C/E 3/4 | | | C/E 3/4 | | | | | | | | | | | | | | |

**Table 9C. Morphology and Hydraulic Monitoring Summary**
**Threemile Creek - Stream and Wetland Restoration Site**

| Parameter | Cross Section 9 Riffle | | | | | | Cross Section 10 Pool (UT 1) | | | | | | Cross Section 11 Riffle (UT1) | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Dimension** | **MY 0** | **MY1** | **MY2** | **MY3** | **MY4** | **MY5** | **MY 0** | **MY1** | **MY2** | **MY3** | **MY4** | **MY5** | **MY 0** | **MY1** | **MY2** | **MY3** | **MY4** | **MY5** |
| BF Width (ft) | 25.7 | 26 | | | | | 9.5 | 9.7 | | | | | 6.4 | 6.2 | | | | |
| Floodprone Width (ft) | 250 | 250 | | | | | ---- | ---- | | | | | 150 | 150 | | | | |
| BF Cross Sectional Area (ft2) | 55.3 | 53.7 | | | | | 6.1 | 6.4 | | | | | 5.3 | 6.2 | | | | |
| BF Mean Depth (ft) | 2.2 | 2.1 | | | | | 0.6 | 0.7 | | | | | 0.8 | 0.6 | | | | |
| BF Max Depth (ft) | 2.7 | 2.6 | | | | | 1.1 | 1 | | | | | 1.2 | 1 | | | | |
| Width/Depth Ratio | 11.9 | 12.6 | | | | | ---- | ---- | | | | | 7.7 | 10.3 | | | | |
| Entrenchment Ratio | 9.7 | 9.6 | | | | | ---- | ---- | | | | | 23.4 | 24.1 | | | | |
| Bank Height Ratio | 1.0 | 1.0 | | | | | ---- | ---- | | | | | 1.0 | 1.0 | | | | |
| Wetted Perimeter (ft) | 27.1 | 27.4 | | | | | 9.6 | 10.1 | | | | | 7.1 | 6.6 | | | | |
| Hydraulic Radius (ft) | 2.0 | 2.0 | | | | | 0.6 | 0.6 | | | | | 0.7 | 0.6 | | | | |
| **Substrate** | | | | | | | | | | | | | | | | | | |
| d50 (mm) | ---- | 34.8 | | | | | ---- | NA | | | | | ---- | 87 | | | | |
| d84 (mm) | ---- | 114 | | | | | ---- | NA | | | | | ---- | 152 | | | | |
| **Parameter** | **MY-00 (2008)** | | | **MY-01 (2009)** | | | **MY-02 (2010)** | | | **MY-03 (2011)** | | | **MY-04 (2012)** | | | **MY-05 (2013)** | | |
| | **Min** | **Max** | **Med** | **Min** | **Max** | **Med** | **Min** | **Max** | **Med** | **Min** | **Max** | **Med** | **Min** | **Max** | **Med** | **Min** | **Max** | **Med** |
| **Pattern** | | | | | | | | | | | | | | | | | | |
| Channel Beltwidth (ft) | 30 | 76 | 50 | 30 | 76 | 50 | | | | | | | | | | | | |
| Radius of Curvature (ft) | 50 | 252 | 101 | 50 | 252 | 101 | | | | | | | | | | | | |
| Meander Wavelength (ft) | 151 | 252 | 214 | 151 | 252 | 214 | | | | | | | | | | | | |
| Meander Width Ratio | 1.2 | 3 | 2 | 1.2 | 3 | 2 | | | | | | | | | | | | |
| **Profile** | | | | | | | | | | | | | | | | | | |
| Riffle Length (ft) | 17 | 111 | 51 | 21 | 121 | 53 | | | | | | | | | | | | |
| Riffle Slope (ft/ft) | 0.43% | 4.80% | 1.54% | 0.15% | 3.08% | 1.43% | | | | | | | | | | | | |
| Pool Length (ft) | 26 | 78 | 46 | 24 | 69 | 39 | | | | | | | | | | | | |
| Pool Spacing (ft) | 76 | 176 | 126 | 76 | 176 | 126 | | | | | | | | | | | | |
| **Additonal Reach Parameters** | | | | | | | | | | | | | | | | | | |
| Valley Length (ft) | 4057 | | | 4080 | | | | | | | | | | | | | | |
| Channel Length (ft) | 3,528 | | | 3,548 | | | | | | | | | | | | | | |
| Sinuosity | 1.15 | | | 1.15 | | | | | | | | | | | | | | |
| Water Surface Slope (ft/ft) | 0.0098 | | | 0.0097 | | | | | | | | | | | | | | |
| BF Slope (ft/ft) | ------ | | | ------ | | | | | | | | | | | | | | |
| Rosgen Classification | C/E 3/4 | | | C/E 3/4 | | | | | | | | | | | | | | |

### 2.3.3 Wetland Criteria Attainment

All three of the monitored gauges within restoration areas were inundated/saturated within 12 inches of the surface for greater than 12.5 percent of the growing season, which extends from May 1 to Ocober 11 (163 days). Hydrographs containing groundwater and precipitation data for each gauge can be found in Appendix D.

**Table 10. Wetland Criteria Attainment for Year 1 (2009)**

| Gauge ID | Hydrology Threshold Met? | Hydrophytic Vegetation Criteria Met? /Max Consecutive Days During Growing Season (Percentage) | Site Mean | Vegetation Plot ID | Vegetation Survival Threshold Met? | Site Mean |
|---|---|---|---|---|---|---|
| 1 | Yes | Yes/101 days (62.0 percent) | 100 % | 1 | Yes | 100 % |
| 2 | Yes | Yes/131 days (100 percent) | | 2 | Yes | |
| 3 | Yes | Yes/131 days (100 percent) | | 3 | Yes | |
| | | | | 4 | Yes | |
| | | | | 5 | Yes | |
| | | | | 6 | Yes | |
| | | | | 7 | Yes | |
| | | | | 8 | Yes | |

## 3.0 CONCLUSIONS

All three of the monitored gauges within restoration areas were inundated/saturated within 12 inches of the surface for greater than 12.5 percent of the growing season, which extends from May 1 to Ocober 11 (163 days). A summary of groundwater gauge data for the Year 1 (2009) is included in Table 11.

**Table 11. Summary of Groundwater Gauge Results**

| Gauge | Success Criteria Achieved/Max Consecutive Days During Growing Season (Percentage) | | | | |
|---|---|---|---|---|---|
| | Year 1 (2009)* | Year 2 (2010) | Year 3 (2010) | Year 4 (2012) | Year 5 (2013) |
| 1 | Yes/101 days (62.0 percent) | | | | |
| 2 | Yes/131 days (100 percent) | | | | |
| 3 | Yes/131 days (100 percent) | | | | |
| Ref | Yes/53 days (32.5 percent) | | | | |

*Data has been collected through September 9, 2009 for the Year 1 (2009) monitoring season; data will continue to be collected throughout the remainder of the growing season and will be available upon request.

Vegetation sampling across the Site was above the required average density with 708 planted stems per acre surviving. In addition, each individual plot was above success criteria (Table 12).

**Table 12. Summary of Planted Vegetation Plot Results**

| Plot | Planted Stems/Acre Counting Towards Success Criteria | | | | |
|---|---|---|---|---|---|
| | Year 1 (2009) | Year 2 (2010) | Year 3 (2011) | Year 4 (2012) | Year 5 (2013) |
| 1 | 405 | | | | |
| 2 | 648 | | | | |
| 3 | 567 | | | | |
| 4 | 931 | | | | |
| 5 | 526 | | | | |
| 6 | 364 | | | | |
| 7 | 1012 | | | | |
| 8 | 1214 | | | | |
| **Average of All Plots (1-15)** | **708** | | | | |

## 4.0 REFERENCES


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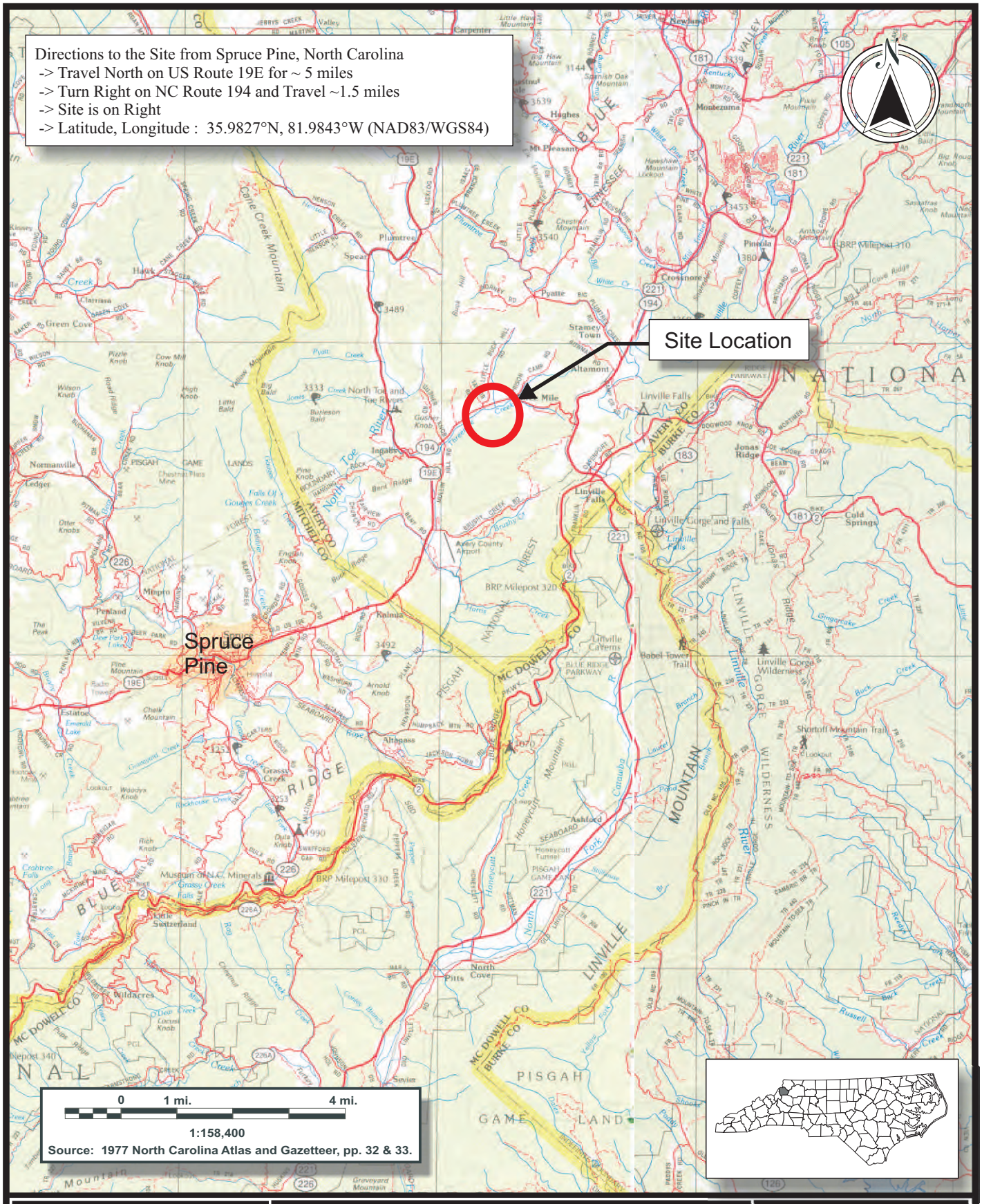
Weakley, Alan S. 2007. Flora of the Carolinas, Virginia, Georgia, and Surrounding Areas (online). Available: http://www.herbarium.unc.edu/WeakleysFlora.pdf [February 1, 2008]. University of North Carolina Herbarium, North Carolina Botanical Garden, University of North Carolina, Chapel Hill, North Carolina.

Weather Underground. 2009. Station in Boone, North Carolina. (online). Available: http://www.wunderground.com/US/NC/Spruce_Pine/KTNB.html [September 16, 2008]. Weather Underground.

# APPENDIX A
# FIGURES

**Figure 1. Site Location**

**Figure 2. Monitoring Plan View**

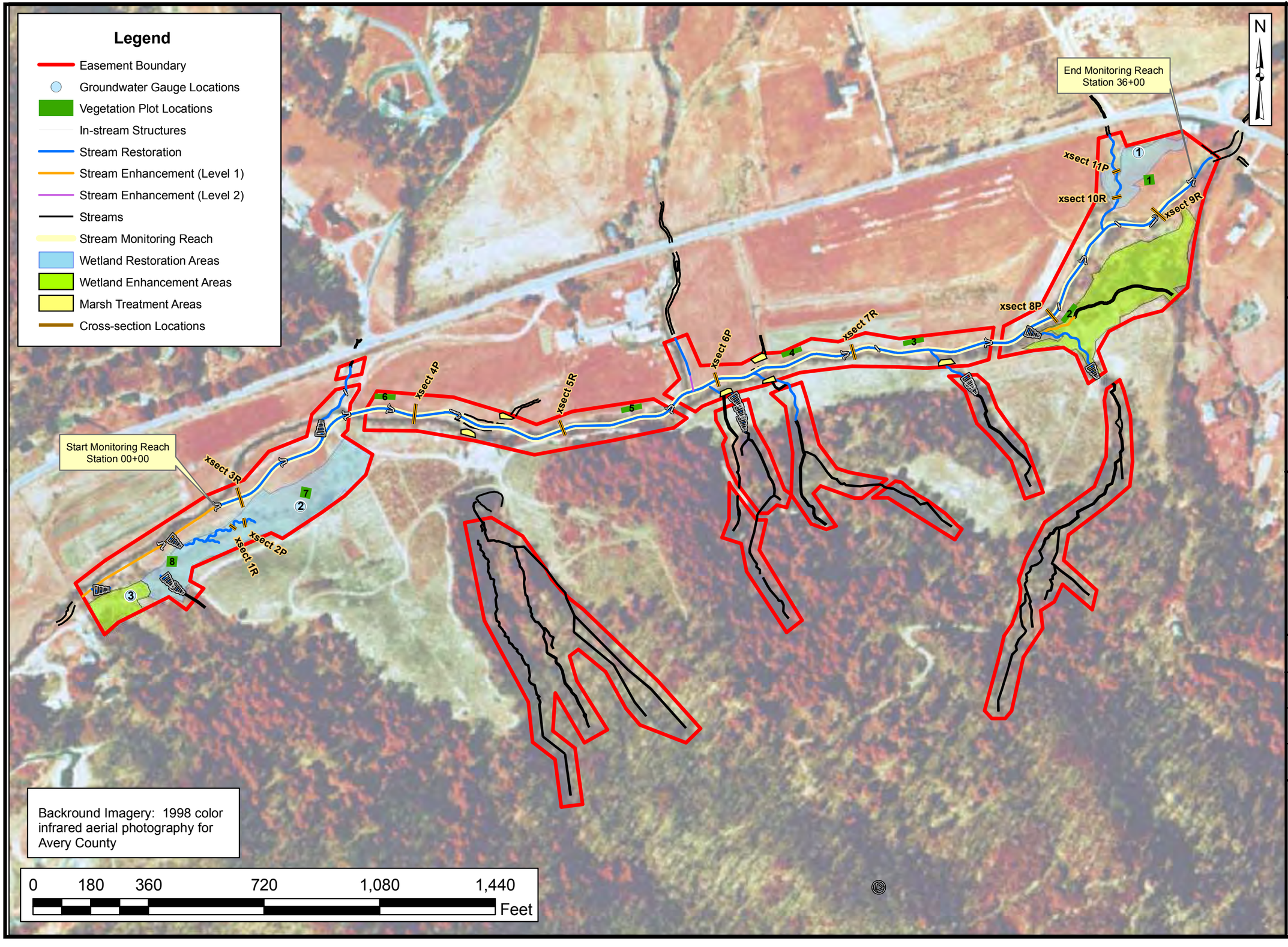



Axiom Environmental
2126 Rowland Pond Dr
Willow Spring, NC 27592
(919) 215-1693
(919) 341-3839 fax

SITE LOCATION
THREE MILE CREEK RESTORATION SITE
Avery County, North Carolina

| | |
|---|---|
| Dwn. by: | CLF |
| Ckd by: | WGL |
| Date: | Nov 2008 |
| Project: | 07-004 |

FIGURE
1




Axiom Environmental, Inc.

Prepared for:

RESTORATION SYSTEMS | LLC

Project:

**THREE MILE CREEK RESTORATION SITE**

Avery County, NC

Title:

**MONITORING PLAN VIEW**

Drawn by: CLF

Date: OCT 2009

Scale: 1:3400

Project No.: 07-004

FIGURE

**2**

# APPENDIX B
# VEGETATION DATA

1. **Vegetation Survey Data Tables**
2. **Vegetation Monitoring Plot Photos**

| | |
|---|---|
| **Report Prepared By** | Corri Faquin |
| **Date Prepared** | 9/16/2009 9:53 |
| **database name** | RestorationSystems-2009-A-v2.2.7.mdb |
| **database location** | C:\Axiom\Business\CVS database |
| **computer name** | CORRILAPTOP |
| **file size** | 59428864 |

**DESCRIPTION OF WORKSHEETS IN THIS DOCUMENT----------**

| | |
|---|---|
| **Metadata** | Description of database file, the report worksheets, and a summary of project(s) and project data. |
| **Proj, planted** | Each project is listed with its PLANTED stems per acre, for each year. This excludes live stakes. |
| **Proj, total stems** | Each project is listed with its TOTAL stems per acre, for each year. This includes live stakes, all planted stems, and all natural/volunteer stems. |
| **Plots** | List of plots surveyed with location and summary data (live stems, dead stems, missing, etc.). |
| **Vigor** | Frequency distribution of vigor classes for stems for all plots. |
| **Vigor by Spp** | Frequency distribution of vigor classes listed by species. |
| **Damage** | List of most frequent damage classes with number of occurrences and percent of total stems impacted by each. |
| **Damage by Spp** | Damage values tallied by type for each species. |
| **Damage by Plot** | Damage values tallied by type for each plot. |
| **Planted Stems by Plot and Spp** | A matrix of the count of PLANTED living stems of each species for each plot; dead and missing stems are excluded. |
| **ALL Stems by Plot and spp** | A matrix of the count of total living stems of each species (planted and natural volunteers combined) for each plot; dead and missing stems are excluded. |

**PROJECT SUMMARY----------**

| | |
|---|---|
| **Project Code** | Threemile |
| **project Name** | Threemile Stream and Wetland Restoration Site |
| **Sampled Plots** | 8 |

**Living planted stems, excluding live stakes, per acre: Negative (red) numbers indicate the project failed to reach requirements in a particular year.**

| Project Code | Project Name | River Basin | Year 1 |
|---|---|---|---|
| Threemile | Threemile Stream and Wetland Restoration Site | French Broad | 708.20 |

**Total stems, including planted stems of all kinds (including live stakes) and natural/volunteer stems:**

| Project Code | Project Name | River Basin | Year 1 |
|---|---|---|---|
| Threemile | Threemile Stream and Wetland Restoration Site | French Broad | 713.2584458 |

**Plot Data**

| plot | Plot Level | Year | Date Sampled | Planted Living Stems | Planted Living Stems EXCLUDING Live Stakes | Dead/Missing Stems | Natural (Volunteer) Stems | Total Living Stems | Total Living Stems EXCLUDING Live Stakes | Planted Living Stems per ACRE | Planted Living Stems EXCLUDING Live Stakes PER ACRE | Natural (Volunteer) Stems PER ACRE | Total Living Stems PER ACRE | Total Living Stems EXCLUDING Live Stakes PER ACRE | # species |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 2 | 1 | 9/8/2009 | 10 | 10 | 0 | 0 | 10 | 10 | 405 | 405 | 0 | 405 | 405 | 3 |
| 2 | 2 | 1 | 9/8/2009 | 16 | 16 | 0 | 0 | 16 | 16 | 647 | 647 | 0 | 647 | 647 | 5 |
| 3 | 2 | 1 | 9/8/2009 | 14 | 14 | 0 | 0 | 14 | 14 | 567 | 567 | 0 | 567 | 567 | 4 |
| 4 | 2 | 1 | 9/8/2009 | 23 | 23 | 0 | 0 | 23 | 23 | 931 | 931 | 0 | 931 | 931 | 4 |
| 5 | 2 | 1 | 9/8/2009 | 13 | 13 | 0 | 1 | 14 | 14 | 526 | 526 | 40 | 567 | 567 | 3 |
| 6 | 2 | 1 | 9/8/2009 | 9 | 9 | 0 | 0 | 9 | 9 | 364 | 364 | 0 | 364 | 364 | 4 |
| 7 | 2 | 1 | 9/9/2009 | 25 | 25 | 0 | 0 | 25 | 25 | 1012 | 1012 | 0 | 1012 | 1012 | 4 |
| 8 | 2 | 1 | 9/9/2009 | 30 | 30 | 0 | 0 | 30 | 30 | 1214 | 1214 | 0 | 1214 | 1214 | 4 |

## Vigor

| vigor | Count | Percent |
|---|---|---|
| 2 | 16 | 11.4 |
| 3 | 67 | 47.9 |
| 4 | 57 | 40.7 |

## Vigor by Species

| | Species | CommonName | 4 | 3 | 2 | 1 | 0 | Missing | Unknown |
|---|---|---|---|---|---|---|---|---|---|
| | *Asimina triloba* | pawpaw | | 1 | | | | | |
| | *Celtis laevigata* | sugarberry | | 1 | | | | | |
| | *Cephalanthus occidentalis* | common buttonbush | 3 | 1 | | | | | |
| | *Diospyros virginiana* | common persimmon | 6 | 19 | 7 | | | | |
| | *Fraxinus pennsylvanica* | green ash | 4 | 3 | | | | | |
| | *Quercus alba* | white oak | 8 | 4 | | | | | |
| | *Quercus falcata* | southern red oak | 3 | 6 | | | | | |
| | *Quercus michauxii* | swamp chestnut oak | 8 | 11 | | | | | |
| | *Cercis canadensis* | eastern redbud | 1 | 2 | 8 | | | | |
| | *Quercus rubra* | northern red oak | 11 | 13 | | | | | |
| | *Platanus occidentalis* | American sycamore | 13 | 6 | 1 | | | | |
| **TOT:** | **11** | **11** | **57** | **67** | **16** | | | | |

## Damage

| Damage | Count | Percent Of Stems |
|---|---|---|
| (no damage) | 111 | 79.3 |
| Insects | 12 | 8.6 |
| (other damage) | 12 | 8.6 |
| Unknown | 4 | 2.9 |
| Diseased | 1 | 0.7 |

**Damage by Species**

| | Species | CommonName | Count of Damage Categories | (no damage) | Diseased | Insects | Unknown | (other damage) |
|---|---|---|---|---|---|---|---|---|
| | *Asimina triloba* | pawpaw | 0 | 1 | | | | |
| | *Celtis laevigata* | sugarberry | 1 | | | | | 1 |
| | *Cephalanthus occidentalis* | common buttonbush | 0 | 4 | | | | |
| | *Cercis canadensis* | eastern redbud | 8 | 3 | | | 2 | 6 |
| | *Diospyros virginiana* | common persimmon | 10 | 22 | 1 | 4 | 1 | 4 |
| | *Fraxinus pennsylvanica* | green ash | 0 | 7 | | | | |
| | *Platanus occidentalis* | American sycamore | 3 | 17 | | 1 | 1 | 1 |
| | *Quercus alba* | white oak | 1 | 11 | | 1 | | |
| | *Quercus falcata* | southern red oak | 0 | 9 | | | | |
| | *Quercus michauxii* | swamp chestnut oak | 1 | 18 | | 1 | | |
| | *Quercus rubra* | northern red oak | 5 | 19 | | 5 | | |
| **TOT:** | **11** | **11** | **29** | **111** | **1** | **12** | **4** | **12** |

**Damage by Plot**

| | plot | Count of Damage Categories | (no damage) | Diseased | Insects | Unknown | (other damage) |
|---|---|---|---|---|---|---|---|
| | 1 | 3 | 7 | | 3 | | |
| | 2 | 5 | 11 | 1 | 1 | 1 | 2 |
| | 3 | 2 | 12 | | | | 2 |
| | 4 | 2 | 21 | | 1 | | 1 |
| | 5 | 3 | 10 | | 3 | | |
| | 6 | 0 | 9 | | | | |
| | 7 | 12 | 13 | | 3 | 3 | 6 |
| | 8 | 2 | 28 | | 1 | | 1 |
| **TOT:** | **8** | **29** | **111** | **1** | **12** | **4** | **12** |

## Planted Stems by Plot and Species

| | Species | CommonName | Total Planted Stems | # plots | avg# stems | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | *Asimina triloba* | pawpaw | 1 | 1 | 1 | | | 1 | | | | | |
| | *Celtis laevigata* | sugarberry | 1 | 1 | 1 | | | | | | | 1 | |
| | *Cephalanthus occidentalis* | common buttonbush | 4 | 2 | 2 | | | 1 | 3 | | | | |
| | *Cercis canadensis* | eastern redbud | 11 | 4 | 2.75 | | 2 | | | | 2 | 5 | 2 |
| | *Diospyros virginiana* | common persimmon | 32 | 5 | 6.4 | 1 | 6 | 8 | | | 1 | 16 | |
| | *Fraxinus pennsylvanica* | green ash | 7 | 2 | 3.5 | | 4 | | | | | 3 | |
| | *Platanus occidentalis* | American sycamore | 20 | 5 | 4 | | 3 | 4 | 7 | 4 | 2 | | |
| | *Quercus alba* | white oak | 12 | 1 | 12 | | | | | | | | 12 |
| | *Quercus falcata* | southern red oak | 9 | 1 | 9 | | | | | | | | 9 |
| | *Quercus michauxii* | swamp chestnut oak | 19 | 4 | 4.75 | 2 | 1 | | 8 | 8 | | | |
| | *Quercus rubra* | northern red oak | 24 | 5 | 4.8 | 7 | | | 5 | 1 | 4 | | 7 |
| **TOT:** | **11** | **11** | **140** | **11** | | **10** | **16** | **14** | **23** | **13** | **9** | **25** | **30** |

## All Stems by Plot and Species

| | Species | CommonName | Total Stems | # plots | avg# stems | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Asimina triloba | pawpaw | 1 | 1 | 1 | | | 1 | | | | | |
| | Celtis laevigata | sugarberry | 1 | 1 | 1 | | | | | | | 1 | |
| | Cephalanthus occidentalis | common buttonbush | 4 | 2 | 2 | | | 1 | 3 | | | | |
| | Cercis canadensis | eastern redbud | 11 | 4 | 2.75 | | 2 | | | | 2 | 5 | 2 |
| | Diospyros virginiana | common persimmon | 32 | 5 | 6.4 | 1 | 6 | 8 | | | 1 | 16 | |
| | Fraxinus pennsylvanica | green ash | 7 | 2 | 3.5 | | 4 | | | | | 3 | |
| | Platanus occidentalis | American sycamore | 20 | 5 | 4 | | 3 | 4 | 7 | 4 | 2 | | |
| | Quercus alba | white oak | 12 | 1 | 12 | | | | | | | | 12 |
| | Quercus falcata | southern red oak | 9 | 1 | 9 | | | | | | | | 9 |
| | Quercus michauxii | swamp chestnut oak | 19 | 4 | 4.75 | 2 | 1 | | 8 | 8 | | | |
| | Quercus rubra | northern red oak | 24 | 5 | 4.8 | 7 | | | 5 | 1 | 4 | | 7 |
| | Robinia pseudoacacia | black locust | 1 | 1 | 1 | | | | | 1 | | | |
| **TOT:** | **12** | **12** | **141** | **12** | | **10** | **16** | **14** | **23** | **14** | **9** | **25** | **30** |

Threemile Stream and Wetland Restoration Site
Year 1 (2009) Annual Monitoring
Vegetation Plot Photos
Taken September 2009








## APPENDIX C
## GEOMORPHOLOGIC DATA

1. **Table C1. Qualitative Visual Stability Assessment**
2. **Cross-section Plots and Tables**
3. **Longitudinal Profile Plots**
4. **Representative Structure Photographs**

**Table C1. Visual Morphological Stability Assessment**
**Threemile Creek**

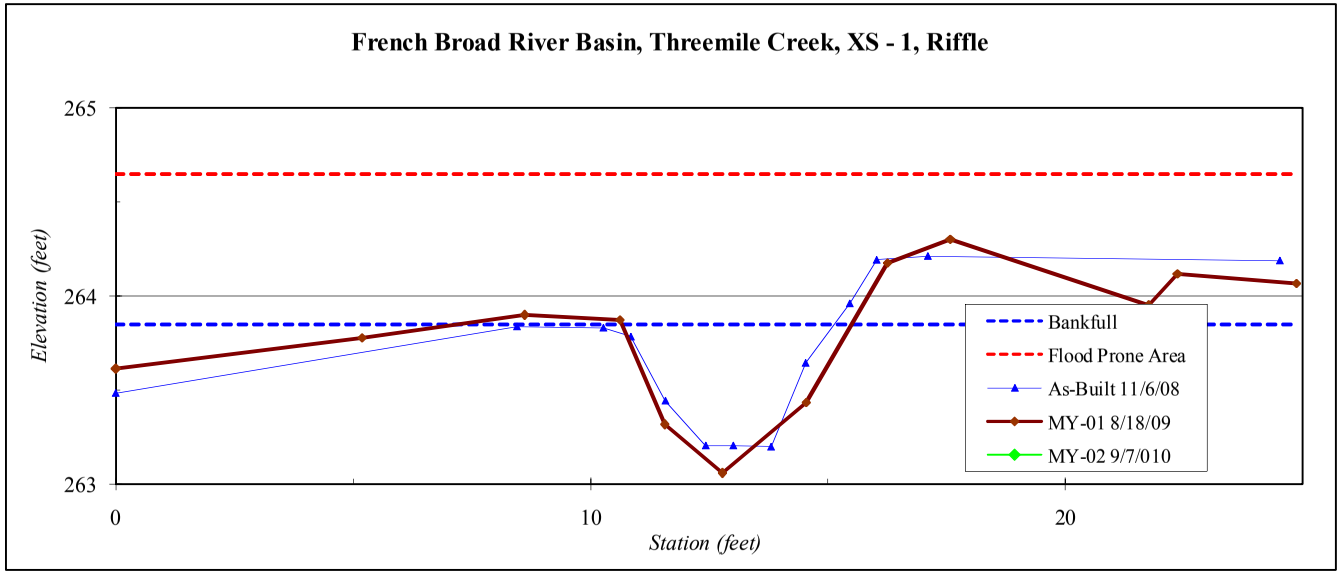
| Feature Category | Metric (per As-built and reference baselines) | (# Stable) Number Performing as Intended | Total number | Number / feet in unstable state | % Perform in Stable Condition | Feature Perform. Mean or Total |
|---|---|---|---|---|---|---|
| | 1. Present | 37 | 37 | NA | 100% | |
| | 2. Armor stable (e.g. no displacement)? | 37 | 37 | NA | 100% | |
| | 3. Facet grade appears stable? | 36 | 3737 | NA | 97% | |
| | 4. Minimal evidence of embedding / fining? | 37 | 37 | NA | 100% | |
| **A. Riffles** | 5. Length appropriate? | 36 | 37 | NA | 97% | 99% |
| | 1. Present? (e.g. not subject to severe aggrad. Or migrat.?) | 38 | 38 | NA | 100% | |
| | 2. Sufficiently deep (Max Pool D:Mean Bkf>1.6?) | 38 | 38 | NA | 100% | |
| **B. Pools** | 3. Length appropriate? | 38 | 37 | NA | 100% | 100% |
| | 1. Upstream of meander bend (run/inflection) centering? | 37 | 37 | NA | 100% | |
| **C. Thalweg** | 2. Downstream of meander (glide/inflection) centering? | 37 | 37 | NA | 100% | 100% |
| | 1. Outer bend in state of limited/controlled erosion? | 38 | 38 | NA | 100% | |
| | 2. Of those eroding, # w/concomitant point bar formation? | NA | NA | 0 | 100% | |
| | 3. Apparent Rc within spec? | 38 | 38 | NA | 100% | |
| **D. Meanders** | 4. Sufficient floodplain access and relief? | 38 | 38 | NA | 100% | 100% |
| | 1. General channel bed aggradation areas (bar formation) | NA | NA | 0 | 100% | |
| **E. Bed General** | 2. Channel bed degradation – areas of increasing down-cutting or head cutting? | NA | NA | 0 | 100% | 100% |
| **F. Bank** | 1. Actively eroding, wasting, or slumping bank | 37 | 37 | 100 | 100% | 100% |
| | 1. Free of back or arm scour? | 14 | 14 | NA | NA | |
| | 2. Height appropriate? | 14 | 14 | NA | NA | |
| | 3. Angle and geometry appear appropriate? | 14 | 14 | NA | NA | |
| **G. Vanes** | 4. Free of piping or other structural failures? | 14 | 14 | NA | NA | 100% |
| | 1. Free of scour? | NA | NA | NA | NA | |
| **H. Wads / Boulders** | 2. Footing stable? | NA | NA | NA | NA | NA |

| | |
|---|---|
| **River Basin:** | French Broad |
| **Watershed:** | Threemile Creek |
| **XS ID** | XS - 1, Riffle |
| **Drainage Area (sq mi):** | 0.05 |
| **Date:** | 8/18/2009 |
| **Field Crew:** | Lewis, Dean, Perkinson |

| Station | Elevation |
|---|---|
| 0.00 | 263.61 |
| 5.18 | 263.78 |
| 8.61 | 263.90 |
| 10.61 | 263.87 |
| 11.56 | 263.32 |
| 12.77 | 263.06 |
| 14.54 | 263.44 |
| 16.26 | 264.18 |
| 17.58 | 264.30 |
| 21.76 | 263.95 |
| 22.37 | 264.12 |
| 24.87 | 264.07 |

| SUMMARY DATA | |
|---|---|
| **Bankfull Elevation:** | 263.9 |
| **Bankfull Cross-Sectional Area:** | 2.3 |
| **Bankfull Width:** | 4.8 |
| **Flood Prone Area Elevation:** | 264.7 |
| **Flood Prone Width:** | >80 |
| **Max Depth at Bankfull:** | 0.8 |
| **Mean Depth at Bankfull:** | 0.5 |
| **W / D Ratio:** | 10.0 |
| **Entrenchment Ratio:** | >5 |
| **Bank Height Ratio:** | 1.0 |


| | |
|---|---|
| **Stream Type** | E |

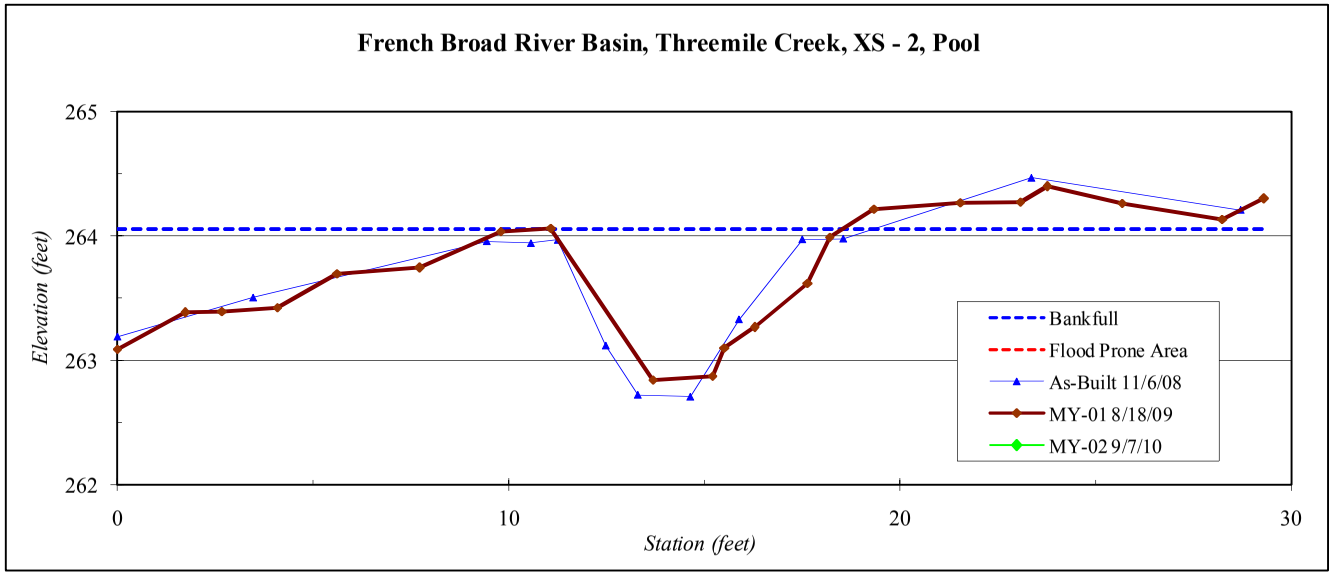


| | |
|---|---|
| **River Basin:** | French Broad |
| **Watershed:** | Threemile Creek |
| **XS ID** | XS - 2, Pool |
| **Drainage Area (sq mi):** | 0.05 |
| **Date:** | 8/18/2009 |
| **Field Crew:** | Lewis, Dean, Perkinson |

| Station | Elevation |
|---|---|
| 0.00 | 263.09 |
| 1.73 | 263.39 |
| 2.67 | 263.39 |
| 4.08 | 263.42 |
| 5.62 | 263.70 |
| 7.73 | 263.75 |
| 9.79 | 264.04 |
| 11.08 | 264.06 |
| 13.69 | 262.84 |
| 15.21 | 262.87 |
| 15.51 | 263.10 |
| 16.29 | 263.27 |
| 17.63 | 263.62 |
| 18.20 | 263.99 |
| 19.33 | 264.22 |
| 21.5 | 264.3 |
| 23.1 | 264.3 |
| 23.8 | 264.4 |
| 25.7 | 264.3 |
| 28.2 | 264.1 |
| 29.3 | 264.3 |
| | |

| SUMMARY DATA | |
|---|---|
| **Bankfull Elevation:** | 264.1 |
| **Bankfull Cross-Sectional Area:** | 5.4 |
| **Bankfull Width:** | 7.5 |
| **Flood Prone Area Elevation:** | - |
| **Flood Prone Width:** | - |
| **Max Depth at Bankfull:** | 1.2 |
| **Mean Depth at Bankfull:** | 0.7 |
| **W / D Ratio:** | - |
| **Entrenchment Ratio:** | - |
| **Bank Height Ratio:** | - |


| | |
|---|---|
| **Stream Type** | E |

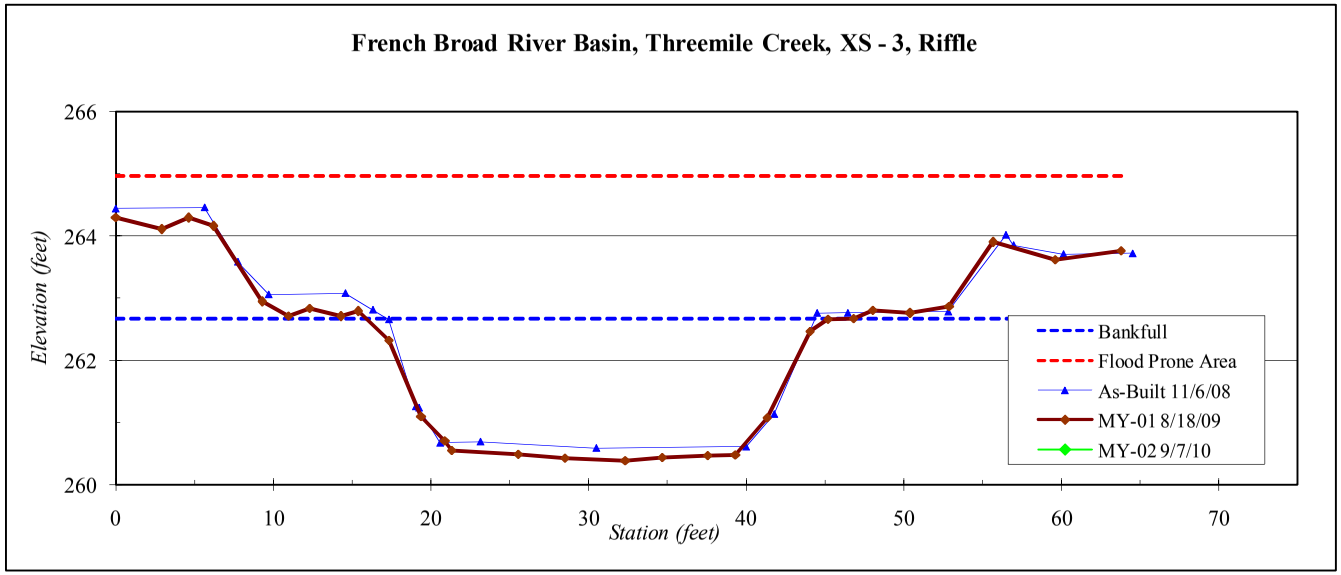


| | |
|---|---|
| **River Basin:** | French Broad |
| **Watershed:** | Threemile Creek |
| **XS ID** | XS - 3, Riffle |
| **Drainage Area (sq mi):** | 4.7 |
| **Date:** | 8/18/2009 |
| **Field Crew:** | Lewis, Dean, Perkinson |

| Station | Elevation |
|---|---|
| 0.00 | 264.30 |
| 2.90 | 264.11 |
| 4.60 | 264.30 |
| 6.18 | 264.16 |
| 9.29 | 262.95 |
| 10.94 | 262.72 |
| 12.30 | 262.84 |
| 14.28 | 262.71 |
| 15.39 | 262.79 |
| 17.32 | 262.33 |
| 19.38 | 261.10 |
| 20.87 | 260.71 |
| 21.30 | 260.55 |
| 25.54 | 260.49 |
| 28.5 | 260.4 |
| 32.3 | 260.4 |
| 34.7 | 260.4 |
| 37.6 | 260.5 |
| 39.3 | 260.5 |
| 41.3 | 261.1 |
| 44.0 | 262.5 |
| 45.2 | 262.7 |
| 46.8 | 262.7 |
| 48.0 | 262.8 |
| 50.4 | 262.8 |
| 52.9 | 262.9 |
| 55.7 | 263.90 |
| 59.6 | 263.62 |
| 63.8 | 263.77 |

| SUMMARY DATA | |
|---|---|
| **Bankfull Elevation:** | 262.7 |
| **Bankfull Cross-Sectional Area:** | 51.9 |
| **Bankfull Width:** | 30.3 |
| **Flood Prone Area Elevation:** | 265.0 |
| **Flood Prone Width:** | >65 |
| **Max Depth at Bankfull:** | 2.3 |
| **Mean Depth at Bankfull:** | 1.7 |
| **W / D Ratio:** | 17.7 |
| **Entrenchment Ratio:** | >5 |
| **Bank Height Ratio:** | 1.0 |


| | |
|---|---|
| **Stream Type** | E/C |

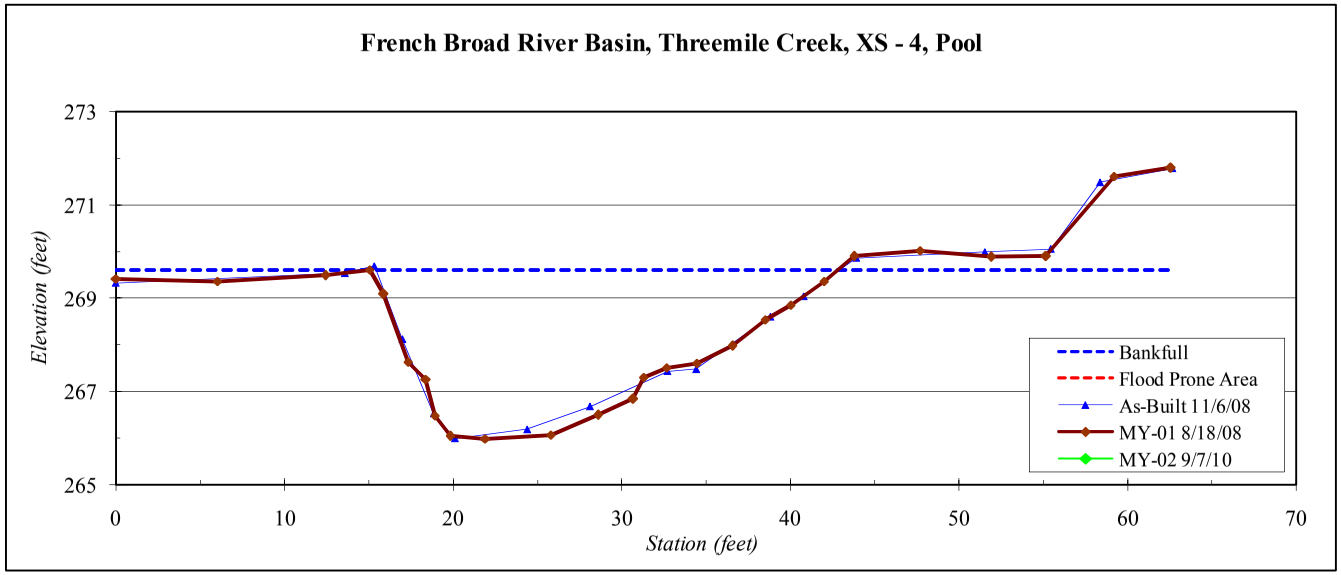


| | |
|---|---|
| **River Basin:** | French Broad |
| **Watershed:** | Threemile Creek |
| **XS ID** | XS - 4, Pool |
| **Drainage Area (sq mi):** | 4.7 |
| **Date:** | 8/18/2009 |
| **Field Crew:** | Lewis, Dean, Perkinson |


| Station | Elevation |
|---|---|
| 0.0 | 269.4 |
| 6.0 | 269.4 |
| 12.4 | 269.5 |
| 15.0 | 269.6 |
| 15.9 | 269.1 |
| 17.3 | 267.6 |
| 18.4 | 267.3 |
| 18.9 | 266.5 |
| 19.8 | 266.0 |
| 21.9 | 266.0 |
| 25.8 | 266.1 |
| 28.6 | 266.5 |
| 30.7 | 266.8 |
| 31.3 | 267.3 |
| 32.7 | 267.51 |
| 34.5 | 267.60 |
| 36.6 | 267.98 |
| 38.5 | 268.54 |
| 40.0 | 268.86 |
| 42.0 | 269.37 |
| 43.8 | 269.90 |
| 47.7 | 270.03 |
| 51.9 | 269.89 |
| 55.2 | 269.90 |
| 59.2 | 271.61 |
| 62.6 | 271.80 |
| | |
| | |

| SUMMARY DATA | |
|---|---|
| **Bankfull Elevation:** | 269.6 |
| **Bankfull Cross-Sectional Area:** | 62.8 |
| **Bankfull Width:** | 27.8 |
| **Flood Prone Area Elevation:** | - |
| **Flood Prone Width:** | - |
| **Max Depth at Bankfull:** | 3.6 |
| **Mean Depth at Bankfull:** | 2.3 |
| **W / D Ratio:** | - |
| **Entrenchment Ratio:** | - |
| **Bank Height Ratio:** | - |

| | |
|---|---|
| **Stream Type** | E |

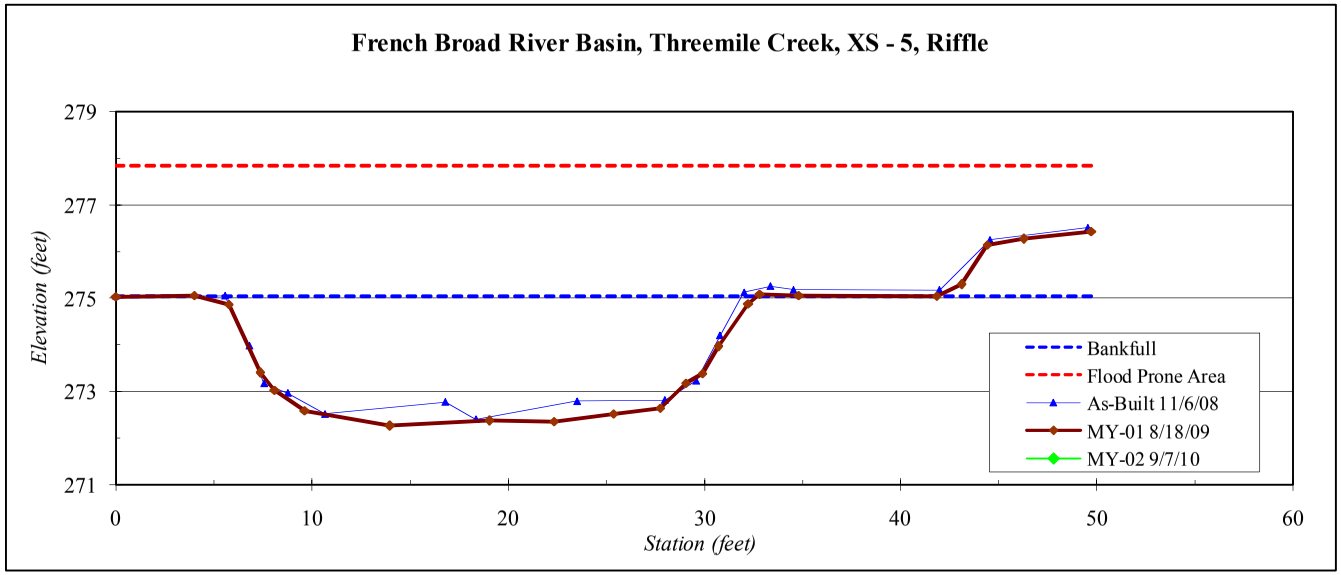


| | |
|---|---|
| **River Basin:** | French Broad |
| **Watershed:** | Threemile Creek |
| **XS ID** | XS - 5, Riffle |
| **Drainage Area (sq mi):** | 4.7 |
| **Date:** | 8/18/2009 |
| **Field Crew:** | Lewis, Dean, Perkinson |

| Station | Elevation |
|---|---|
| 0.0 | 275.0 |
| 4.0 | 275.1 |
| 5.8 | 274.9 |
| 7.4 | 273.4 |
| 8.1 | 273.0 |
| 9.6 | 272.6 |
| 14.0 | 272.3 |
| 19.0 | 272.4 |
| 22.3 | 272.4 |
| 25.4 | 272.5 |
| 27.8 | 272.6 |
| 29.1 | 273.2 |
| 29.9 | 273.4 |
| 30.7 | 274.0 |
| 32.2 | 274.9 |
| 32.8 | 275.1 |
| 34.8 | 275.1 |
| 41.8 | 275.0 |
| 43.1 | 275.3 |
| 44.4 | 276.1 |
| 46.3 | 276.3 |
| 49.7 | 276.4 |
| | |
| | |
| | |

| SUMMARY DATA | |
|---|---|
| **Bankfull Elevation:** | 275.1 |
| **Bankfull Cross-Sectional Area:** | 60.6 |
| **Bankfull Width:** | 28.6 |
| **Flood Prone Area Elevation:** | 277.9 |
| **Flood Prone Width:** | >65 |
| **Max Depth at Bankfull:** | 2.8 |
| **Mean Depth at Bankfull:** | 2.1 |
| **W / D Ratio:** | 13.5 |
| **Entrenchment Ratio:** | >5 |
| **Bank Height Ratio:** | 1.0 |


| | |
|---|---|
| **Stream Type** | E/C |

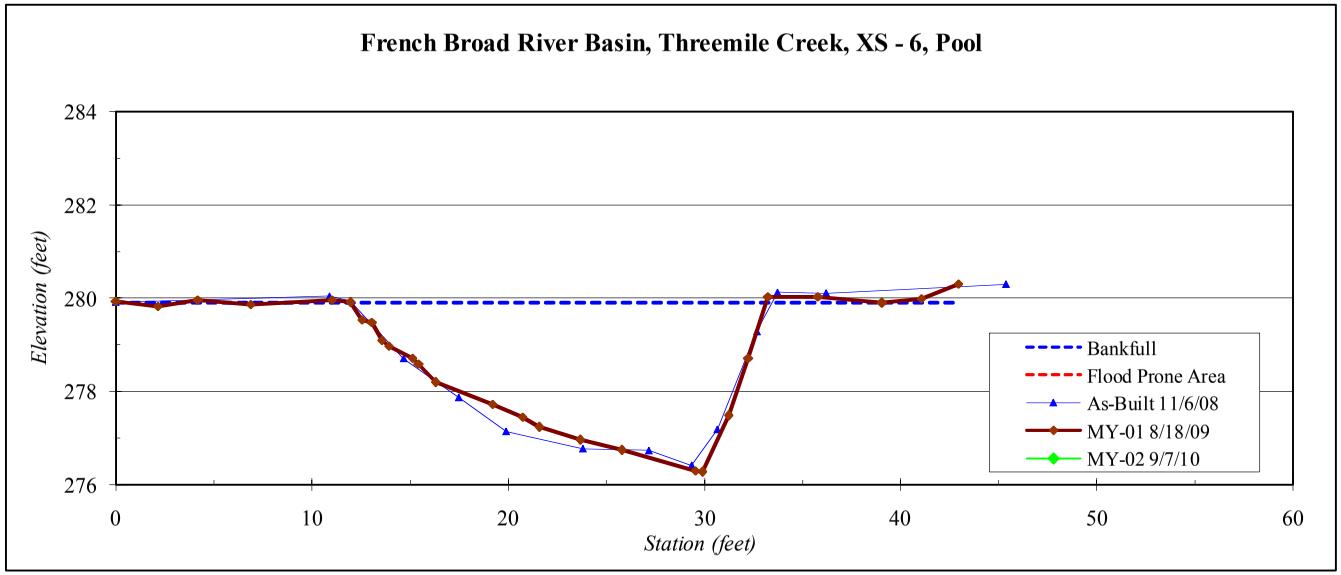


| | |
|---|---|
| **River Basin:** | French Broad |
| **Watershed:** | Threemile Creek |
| **XS ID** | XS - 6, Pool |
| **Drainage Area (sq mi):** | 4.7 |
| **Date:** | 8/18/2009 |
| **Field Crew:** | Lewis, Dean, Perkinson |

| Station | Elevation |
|---|---|
| 0 | 279.94 |
| 2.13324251 | 279.83 |
| 4.17910003 | 279.97 |
| 6.86318245 | 279.87 |
| 11.0103129 | 279.96 |
| 11.9499853 | 279.92 |
| 12.546722 | 279.54 |
| 13.055791 | 279.48 |
| 13.5640749 | 279.10 |
| 13.9120911 | 278.98 |
| 15.1137683 | 278.71 |
| 15.4331112 | 278.59 |
| 16.2942866 | 278.20 |
| 19.2107563 | 277.73 |
| 20.7395304 | 277.46 |
| 21.5876658 | 277.24 |
| 23.664534 | 276.97 |
| 25.7907132 | 276.74 |
| 29.5551972 | 276.30 |
| 29.8977176 | 276.28 |
| 31.2509511 | 277.49 |
| 32.242246 | 278.72 |
| 33.2505018 | 280.04 |
| 35.7901026 | 280.04 |
| 39.0587631 | 279.90 |
| 41.0746348 | 279.99 |
| 42.9654188 | 280.31 |

| SUMMARY DATA | |
|---|---|
| **Bankfull Elevation:** | 279.9 |
| **Bankfull Cross-Sectional Area:** | 48.1 |
| **Bankfull Width:** | 21.2 |
| **Flood Prone Area Elevation:** | - |
| **Flood Prone Width:** | - |
| **Max Depth at Bankfull:** | 3.6 |
| **Mean Depth at Bankfull:** | 2.3 |
| **W / D Ratio:** | - |
| **Entrenchment Ratio:** | - |
| **Bank Height Ratio:** | - |

| | |
|---|---|
| **Stream Type** | E/C |

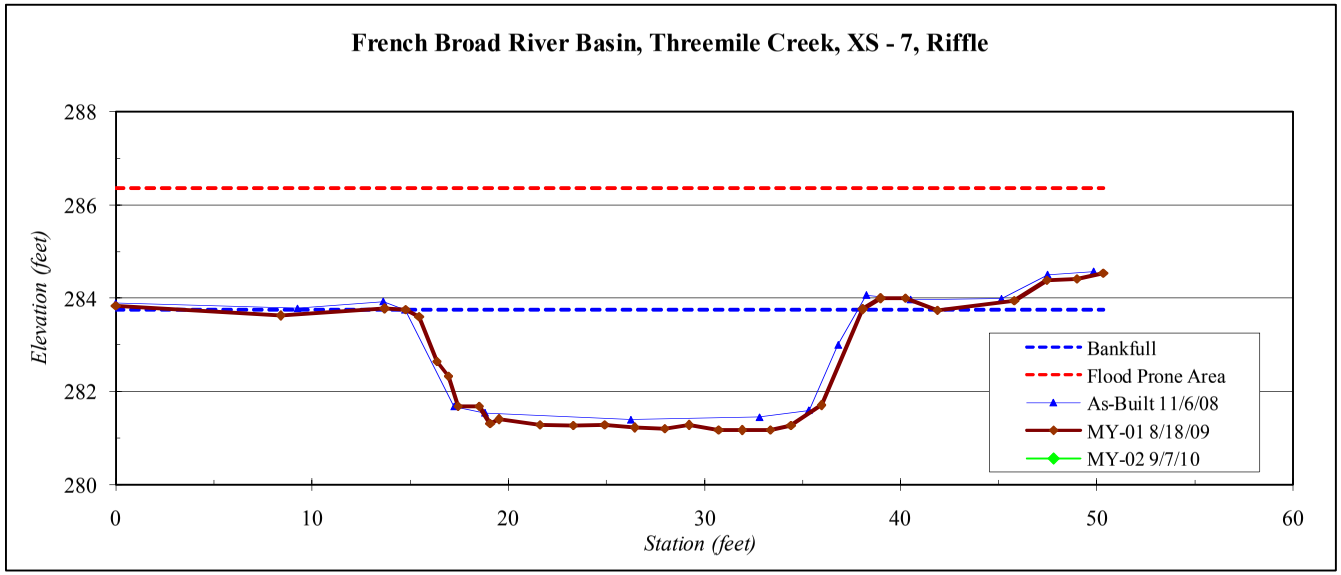


| | |
|---|---|
| **River Basin:** | French Broad |
| **Watershed:** | Threemile Creek |
| **XS ID** | XS - 7, Riffle |
| **Drainage Area (sq mi):** | 4.7 |
| **Date:** | 8/18/2009 |
| **Field Crew:** | Lewis, Dean, Perkinson |

| Station | Elevation |
|---|---|
| 0.0 | 283.8 |
| 8.4 | 283.6 |
| 13.7 | 283.8 |
| 14.8 | 283.8 |
| 15.5 | 283.6 |
| 16.4 | 282.6 |
| 16.9 | 282.3 |
| 17.4 | 281.7 |
| 18.5 | 281.7 |
| 19.1 | 281.3 |
| 19.5 | 281.4 |
| 21.6 | 281.3 |
| 23.3 | 281.3 |
| 24.9 | 281.3 |
| 26.4 | 281.2 |
| 28.0 | 281.2 |
| 29.2 | 281.3 |
| 30.7 | 281.2 |
| 31.9 | 281.2 |
| 33.4 | 281.2 |
| 34.4 | 281.3 |
| 36.0 | 281.7 |
| 38.1 | 283.8 |
| 39.0 | 284.0 |
| 40.3 | 284.0 |
| 41.9 | 283.7 |
| 45.8 | 283.9 |
| 47.5 | 284.4 |
| 49.0 | 284.4 |
| 50.4 | 284.5 |

| SUMMARY DATA | |
|---|---|
| **Bankfull Elevation:** | 283.8 |
| **Bankfull Cross-Sectional Area:** | 49.9 |
| **Bankfull Width:** | 23.6 |
| **Flood Prone Area Elevation:** | 286.4 |
| **Flood Prone Width:** | >65 |
| **Max Depth at Bankfull:** | 2.6 |
| **Mean Depth at Bankfull:** | 2.1 |
| **W / D Ratio:** | 11.2 |
| **Entrenchment Ratio:** | >5 |
| **Bank Height Ratio:** | 1.0 |


| | |
|---|---|
| **Stream Type** | E/C |

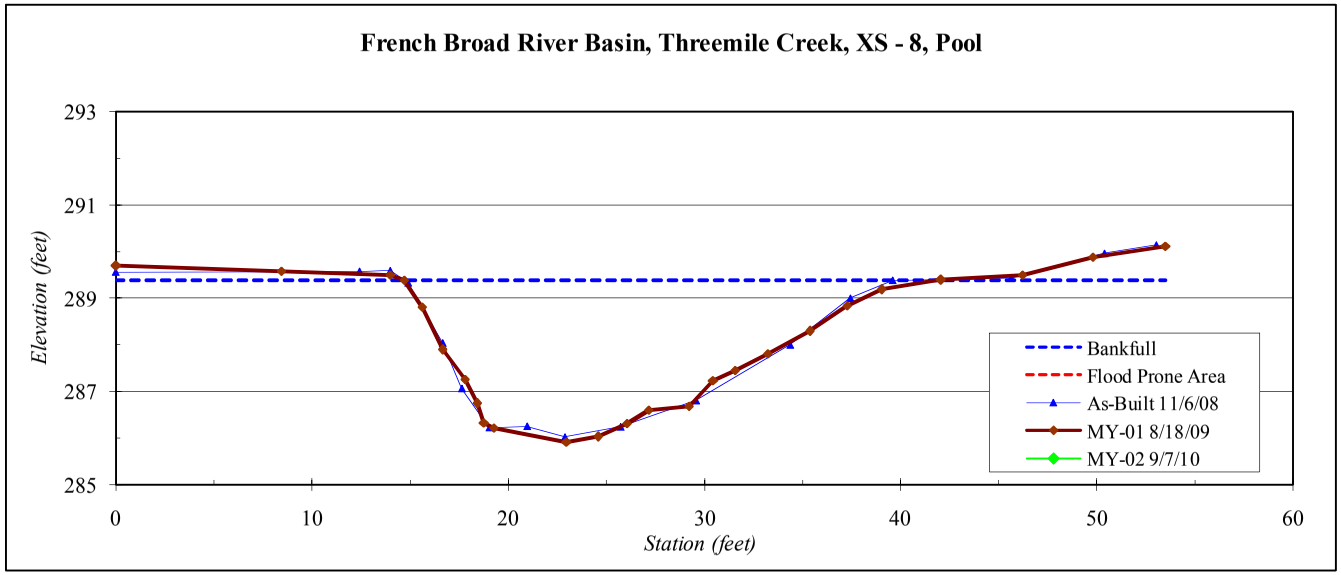


| | |
|---|---|
| **River Basin:** | French Broad |
| **Watershed:** | Threemile Creek |
| **XS ID** | XS - 8, Pool |
| **Drainage Area (sq mi):** | 4.7 |
| **Date:** | 8/18/2009 |
| **Field Crew:** | Lewis, Dean, Perkinson |

| Station | Elevation |
|---|---|
| 0.0 | 289.70 |
| 8.4 | 289.58 |
| 14.0 | 289.50 |
| 14.7 | 289.39 |
| 15.6 | 288.82 |
| 16.7 | 287.90 |
| 17.8 | 287.27 |
| 18.4 | 286.75 |
| 18.8 | 286.33 |
| 19.3 | 286.22 |
| 23.0 | 285.92 |
| 24.6 | 286.04 |
| 26.0 | 286.32 |
| 27.2 | 286.60 |
| 29.2 | 286.69 |
| 30.4 | 287.24 |
| 31.6 | 287.45 |
| 33.2 | 287.81 |
| 35.4 | 288.30 |
| 37.3 | 288.84 |
| 39.1 | 289.19 |
| 42.1 | 289.40 |
| 46.2 | 289.50 |
| 49.8 | 289.89 |
| 53.5 | 290.11 |

| SUMMARY DATA | |
|---|---|
| **Bankfull Elevation:** | 289.4 |
| **Bankfull Cross-Sectional Area:** | 52.4 |
| **Bankfull Width:** | 27.2 |
| **Flood Prone Area Elevation:** | - |
| **Flood Prone Width:** | - |
| **Max Depth at Bankfull:** | 3.5 |
| **Mean Depth at Bankfull:** | 1.9 |
| **W / D Ratio:** | - |
| **Entrenchment Ratio:** | - |
| **Bank Height Ratio:** | - |

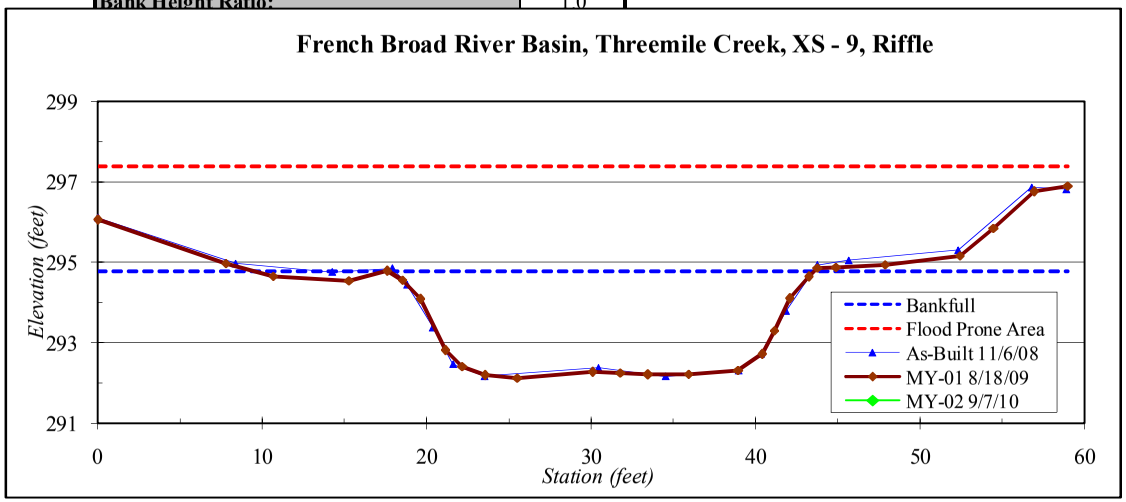

| | |
|---|---|
| **Stream Type** | E/C |



| | |
|---|---|
| **River Basin:** | French Broad |
| **Watershed:** | Threemile Creek |
| **XS ID** | XS - 9, Riffle |
| **Drainage Area (sq mi):** | 4.7 |
| **Date:** | 8/18/2009 |
| **Field Crew:** | Lewis, Dean, Perkinson |


| Station | Elevation |
|---|---|
| 0.0 | 296.1 |
| 7.8 | 295.0 |
| 10.6 | 294.7 |
| 15.3 | 294.5 |
| 17.6 | 294.8 |
| 18.5 | 294.6 |
| 19.6 | 294.1 |
| 21.1 | 292.8 |
| 22.2 | 292.4 |
| 23.5 | 292.2 |
| 25.5 | 292.1 |
| 30.1 | 292.3 |
| 31.8 | 292.3 |
| 33.4 | 292.2 |
| 35.9 | 292.2 |
| 38.9 | 292.3 |
| 40.4 | 292.7 |
| 41.1 | 293.3 |
| 42.1 | 294.1 |
| 43.2 | 294.6 |
| 43.8 | 294.9 |
| 44.9 | 294.9 |
| 47.9 | 294.9 |
| 52.4 | 295.2 |
| 54.5 | 295.8 |
| 56.9 | 296.8 |
| 59.0 | 296.9 |

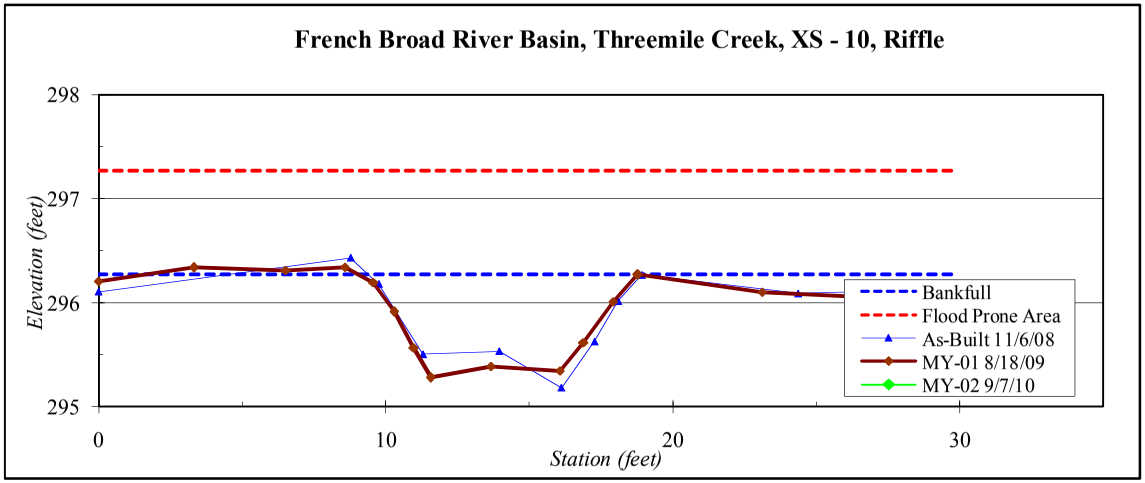
| SUMMARY DATA | |
|---|---|
| **Bankfull Elevation:** | 294.8 |
| **Bankfull Cross-Sectional Area:** | 53.7 |
| **Bankfull Width:** | 26.0 |
| **Flood Prone Area Elevation:** | 297.4 |
| **Flood Prone Width:** | >65 |
| **Max Depth at Bankfull:** | 2.6 |
| **Mean Depth at Bankfull:** | 2.1 |
| **W / D Ratio:** | 12.6 |
| **Entrenchment Ratio:** | >5 |
| **Bank Height Ratio:** | 1.0 |



| | |
|---|---|
| **River Basin:** | French Broad |
| **Watershed:** | Threemile Creek |
| **XS ID** | XS - 10, Riffle |
| **Drainage Area (sq mi):** | 0.05 |
| **Date:** | 8/18/2009 |
| **Field Crew:** | Lewis, Dean, Perkinson |


| Station | Elevation |
|---|---|
| 0.0 | 296.21 |
| 3.3 | 296.34 |
| 6.5 | 296.31 |
| 8.6 | 296.34 |
| 9.6 | 296.20 |
| 10.3 | 295.91 |
| 11.0 | 295.56 |
| 11.6 | 295.28 |
| 13.7 | 295.39 |
| 16.1 | 295.34 |
| 16.9 | 295.62 |
| 17.9 | 296.01 |
| 18.8 | 296.27 |
| 23.1 | 296.10 |
| 29.7 | 296.01 |
| | |
| | |
| | |
| | |
| | |
| | |
| | |
| | |
| | |
| | |

| SUMMARY DATA | |
|---|---|
| **Bankfull Elevation:** | 296.3 |
| **Bankfull Cross-Sectional Area:** | 6.4 |
| **Bankfull Width:** | 9.7 |
| **Flood Prone Area Elevation:** | 297.3 |
| **Flood Prone Width:** | >35 |
| **Max Depth at Bankfull:** | 1.0 |
| **Mean Depth at Bankfull:** | 0.7 |
| **W / D Ratio:** | 14.7 |
| **Entrenchment Ratio:** | >5 |
| **Bank Height Ratio:** | 1.0 |



| | |
|---|---|
| **River Basin:** | French Broad |
| **Watershed:** | Threemile Creek |
| **XS ID** | XS - 11, Pool |
| **Drainage Area (sq mi):** | 0.05 |
| **Date:** | 8/18/2009 |
| **Field Crew:** | Lewis, Dean, Perkinson |


| Station | Elevation |
|---|---|
| 0.0 | 297.6 |
| 7.2 | 297.6 |
| 8.3 | 297.6 |
| 9.0 | 297.3 |
| 9.6 | 296.9 |
| 10.3 | 296.6 |
| 11.3 | 296.7 |
| 12.7 | 297.0 |
| 13.8 | 297.2 |
| 14.3 | 297.5 |
| 14.8 | 297.7 |
| 15.5 | 297.8 |
| 16.6 | 297.8 |
| 21.1 | 297.9 |
| 25.5 | 297.9 |
| | |
| | |
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| | |
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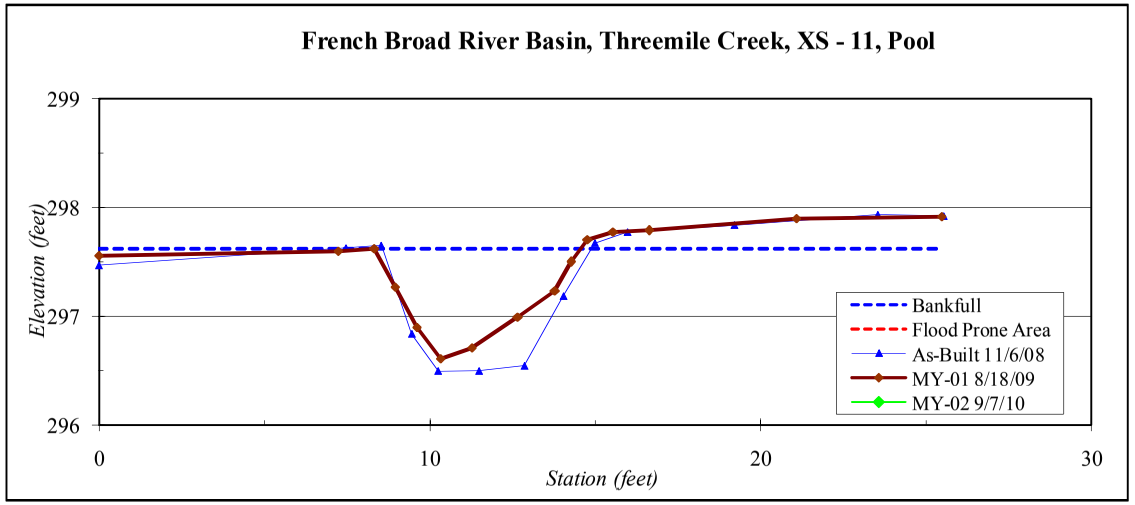
| | |

| SUMMARY DATA | |
|---|---|
| **Bankfull Elevation:** | 297.6 |
| **Bankfull Cross-Sectional Area:** | 3.8 |
| **Bankfull Width:** | 6.2 |
| **Flood Prone Area Elevation:** | - |
| **Flood Prone Width:** | - |
| **Max Depth at Bankfull:** | 1.0 |
| **Mean Depth at Bankfull:** | 0.6 |
| **W / D Ratio:** | - |
| **Entrenchment Ratio:** | - |
| **Bank Height Ratio:** | - |

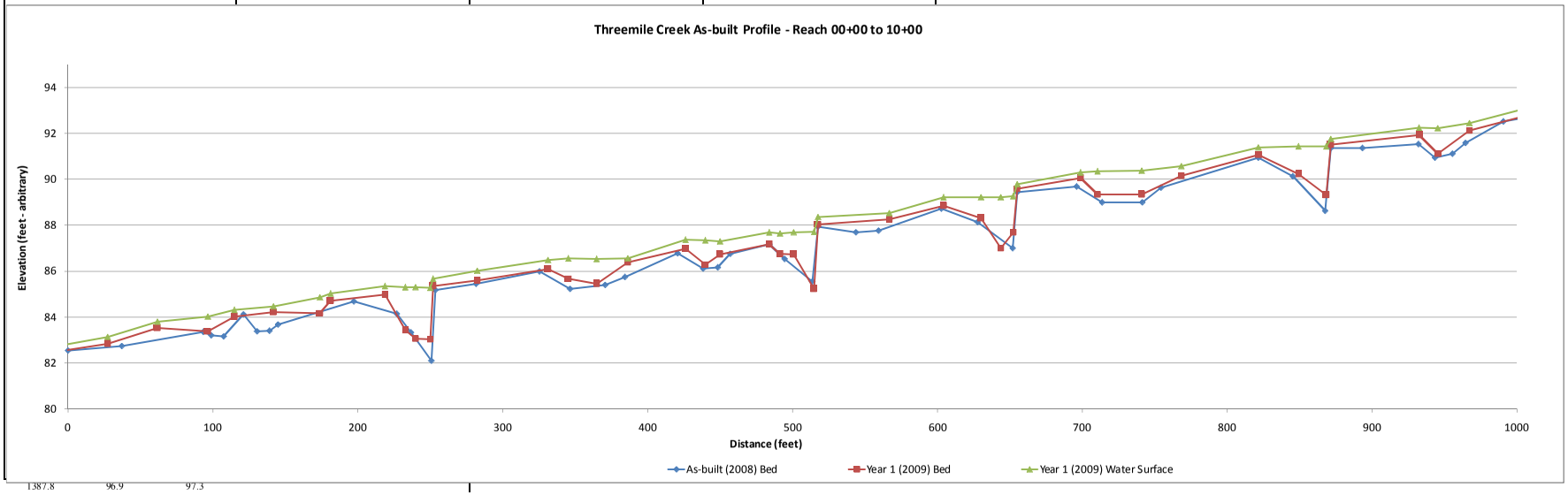
| | |
|---|---|
| **Stream Type** | E/C |



| | |
|---|---|
| **Project Name** | Threemile Creek - Year 1 (2009) Profile |
| **Reach** | 00+00 - 10+00 |
| **Feature** | Profile |
| **Date** | 8/18/09 |
| **Crew** | Lewis, Dean, Perkinson |

| 2008 As-built Survey | | | 2009 Year 1 Monitoring \Survey | | | 2010 Year 2 Monitoring \Survey | | | 2011 Year 3 Monitoring \Survey | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Station | Bed Elevation | Water Elevation | Station | Bed Elevation | Water Elevation | Station | Bed Elevation | Water Elevation | Station | Bed Elevation | Water Elevation |
| 0.0 | 82.5 | 82.6 | -3.3 | 82.5 | 82.8 | | | | | | |
| 37.1 | 82.8 | 83.2 | 27.2 | 82.8 | 83.1 | | | | | | |
| 93.1 | 83.4 | 83.9 | 61.6 | 83.5 | 83.8 | | | | | | |
| 98.8 | 83.2 | 83.9 | 96.5 | 83.4 | 84.0 | | | | | | |
| 107.4 | 83.2 | 83.9 | 114.5 | 84.0 | 84.3 | | | | | | |
| 121.0 | 84.1 | 84.1 | 141.7 | 84.2 | 84.5 | | | | | | |
| 130.4 | 83.4 | 84.3 | 173.8 | 84.2 | 84.9 | | | | | | |
| 138.8 | 83.4 | 84.3 | 181.2 | 84.7 | 85.0 | | | | | | |
| 144.7 | 83.7 | 84.3 | 218.5 | 85.0 | 85.3 | | | | | | |
| 197.0 | 84.7 | 85.1 | 232.7 | 83.4 | 85.3 | | | | | | |
| 226.7 | 84.1 | 85.1 | 239.7 | 83.1 | 85.3 | | | | | | |
| 236.5 | 83.3 | 85.2 | 249.8 | 83.0 | 85.3 | | | | | | |
| 250.9 | 82.1 | 85.2 | 251.9 | 85.4 | 85.7 | | | | | | |
| 253.2 | 85.2 | 85.2 | 282.1 | 85.6 | 86.0 | | | | | | |
| 281.5 | 85.4 | 85.9 | 331.2 | 86.1 | 86.5 | | | | | | |
| 325.5 | 86.0 | 86.4 | 345.4 | 85.7 | 86.6 | | | | | | |
| 346.6 | 85.2 | | 364.7 | 85.5 | 86.5 | | | | | | |
| 370.6 | 85.4 | 86.4 | 386.1 | 86.4 | 86.6 | | | | | | |
| 384.2 | 85.7 | 86.3 | 426.2 | 87.0 | 87.4 | | | | | | |
| 420.6 | 86.8 | 87.0 | 439.9 | 86.3 | 87.3 | | | | | | |
| 438.2 | 86.1 | 87.2 | 449.9 | 86.7 | 87.3 | | | | | | |
| 448.3 | 86.2 | 87.2 | 483.8 | 87.2 | 87.7 | | | | | | |
| 457.1 | 86.8 | 87.2 | 491.2 | 86.8 | 87.7 | | | | | | |
| 484.0 | 87.2 | 87.6 | 500.9 | 86.7 | 87.7 | | | | | | |
| 494.7 | 86.5 | 87.6 | 514.9 | 85.2 | 87.7 | | | | | | |
| 513.8 | 85.6 | 87.6 | 517.6 | 88.1 | 88.4 | | | | | | |
| 517.6 | 87.9 | 88.2 | 566.8 | 88.3 | 88.5 | | | | | | |
| 1387.8 | 96.9 | 97.3 | | | | | | | | | |

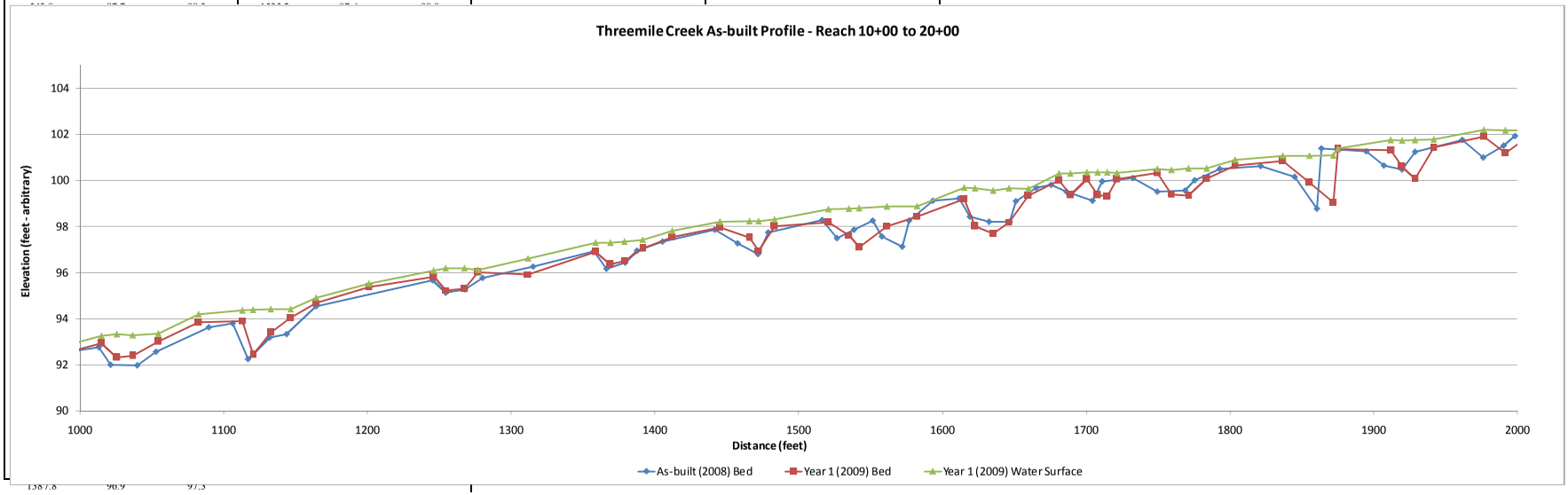
| | As-built | 2009 | 2010 | 2011 |
|---|---|---|---|---|
| **Avg. Water Surface Slope** | 0.0098 | 0.0097 | | |
| **Riffle Length** | 51.0 | 52.9 | | |
| **Avg. Riffle Slope** | 0.0154 | 0.0143 | | |
| **Pool Length** | 46.0 | 38.0 | | |
| **Pool to Pool Spacing** | ------ | 0.0008 | | |



| | |
|---|---|
| **Project Name** | Threemile Creek - Year 1 (2009) Profile |
| **Reach** | 10+00 - 20+00 |
| **Feature** | Profile |
| **Date** | 8/18/09 |
| **Crew** | Lewis, Dean, Perkinson |

| 2008 As-built Survey | | | 2009 Year 1 Monitoring \Survey | | | 2010 Year 2 Monitoring \Survey | | | 2011 Year 3 Monitoring \Survey | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Station | Bed Elevation | Water Elevation | Station | Bed Elevation | Water Elevation | Station | Bed Elevation | Water Elevation | Station | Bed Elevation | Water Elevation |
| 0.0 | 82.5 | 82.6 | 967.1 | 92.1 | 92.5 | | | | | | |
| 37.1 | 82.8 | 83.2 | 1015.0 | 92.9 | 93.2 | | | | | | |
| 93.1 | 83.4 | 83.9 | 1025.6 | 92.3 | 93.3 | | | | | | |
| 98.8 | 83.2 | 83.9 | 1036.6 | 92.4 | 93.3 | | | | | | |
| 107.4 | 83.2 | 83.9 | 1054.6 | 93.0 | 93.3 | | | | | | |
| 121.0 | 84.1 | 84.1 | 1082.7 | 93.8 | 94.2 | | | | | | |
| 130.4 | 83.4 | 84.3 | 1113.0 | 93.9 | 94.4 | | | | | | |
| 138.8 | 83.4 | 84.3 | 1120.3 | 92.4 | 94.4 | | | | | | |
| 144.7 | 83.7 | 84.3 | 1132.9 | 93.4 | 94.4 | | | | | | |
| 197.0 | 84.7 | 85.1 | 1146.8 | 94.0 | 94.4 | | | | | | |
| 226.7 | 84.1 | 85.1 | 1164.5 | 94.7 | 94.9 | | | | | | |
| 236.5 | 83.3 | 85.2 | 1201.0 | 95.4 | 95.5 | | | | | | |
| 250.9 | 82.1 | 85.2 | 1246.3 | 95.8 | 96.1 | | | | | | |
| 253.2 | 85.2 | 85.2 | 1254.6 | 95.2 | 96.2 | | | | | | |
| 281.5 | 85.4 | 85.9 | 1267.6 | 95.3 | 96.2 | | | | | | |
| 325.5 | 86.0 | 86.4 | 1277.0 | 96.0 | 96.1 | | | | | | |
| 346.6 | 85.2 | | 1311.8 | 95.9 | 96.6 | | | | | | |
| 370.6 | 85.4 | 86.4 | 1358.9 | 96.9 | 97.3 | | | | | | |
| 384.2 | 85.7 | 86.3 | 1369.2 | 96.3 | 97.3 | | | | | | |
| 420.6 | 86.8 | 87.0 | 1378.7 | 96.5 | 97.3 | | | | | | |
| 438.2 | 86.1 | 87.2 | 1391.4 | 97.0 | 97.4 | | | | | | |
| 448.3 | 86.2 | 87.2 | 1412.1 | 97.6 | 97.8 | | | | | | |
| 457.1 | 86.8 | 87.2 | 1445.4 | 98.0 | 98.2 | | | | | | |
| 484.0 | 87.2 | 87.6 | 1465.7 | 97.5 | 98.2 | | | | | | |
| 494.7 | 86.5 | 87.6 | 1472.2 | 97.0 | 98.2 | | | | | | |
| 513.8 | 85.6 | 87.6 | 1483.4 | 98.0 | 98.3 | | | | | | |
| 517.6 | 87.9 | 88.2 | 1520.9 | 98.2 | 98.8 | | | | | | |

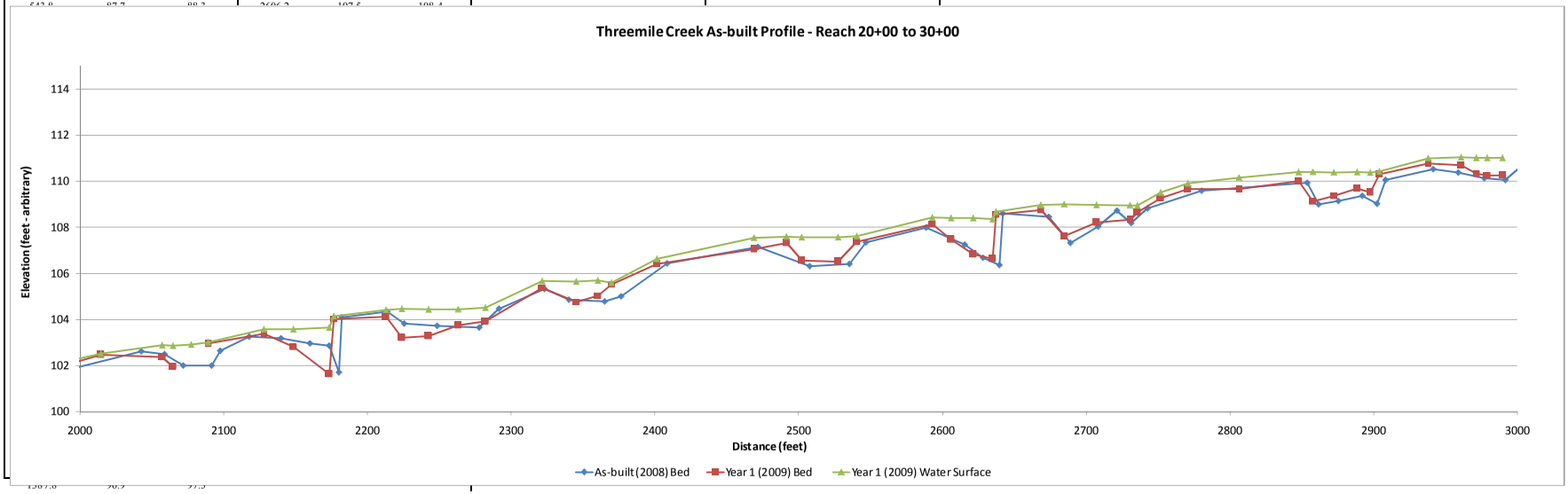
| | As-built | 2009 | 2010 | 2011 |
|---|---|---|---|---|
| **Avg. Water Surface Slope** | 0.0098 | 0.0097 | | |
| **Riffle Length** | 51.0 | 52.9 | | |
| **Avg. Riffle Slope** | 0.0154 | 0.0143 | | |
| **Pool Length** | 46.0 | 38.0 | | |
| **Avg. Pool Slope** | 110.0 | 0.0008 | | |



| | |
|---|---|
| **Project Name** | Threemile Creek - Year 1 (2009) Profile |
| **Reach** | 20+00 - 30+00 |
| **Feature** | Profile |
| **Date** | 8/18/09 |
| **Crew** | Lewis, Dean, Perkinson |

| 2008 As-built Survey | | | 2009 Year 1 Monitoring \Survey | | | 2010 Year 2 Monitoring \Survey | | | 2011 Year 3 Monitoring \Survey | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Station | Bed Elevation | Water Elevation | Station | Bed Elevation | Water Elevation | Station | Bed Elevation | Water Elevation | Station | Bed Elevation | Water Elevation |
| 0.0 | 82.5 | 82.6 | 1971.8 | 101.2 | 102.2 | | | | | | |
| 37.1 | 82.8 | 83.2 | 1990.1 | 102.0 | 102.2 | | | | | | |
| 93.1 | 83.4 | 83.9 | 2014.8 | 102.5 | 102.5 | | | | | | |
| 98.8 | 83.2 | 83.9 | 2057.5 | 102.4 | 102.9 | | | | | | |
| 107.4 | 83.2 | 83.9 | 2064.9 | 101.9 | 102.9 | | | | | | |
| 121.0 | 84.1 | 84.1 | 2077.4 | | 102.9 | | | | | | |
| 130.4 | 83.4 | 84.3 | 2089.1 | 102.9 | 103.0 | | | | | | |
| 138.8 | 83.4 | 84.3 | 2127.9 | 103.4 | 103.6 | | | | | | |
| 144.7 | 83.7 | 84.3 | 2148.5 | 102.8 | 103.6 | | | | | | |
| 197.0 | 84.7 | 85.1 | 2173.6 | 101.6 | 103.6 | | | | | | |
| 226.7 | 84.1 | 85.1 | 2176.6 | 104.0 | 104.1 | | | | | | |
| 236.5 | 83.3 | 85.2 | 2212.9 | 104.1 | 104.4 | | | | | | |
| 250.9 | 82.1 | 85.2 | 2224.2 | 103.2 | 104.5 | | | | | | |
| 253.2 | 85.2 | 85.2 | 2242.6 | 103.3 | 104.4 | | | | | | |
| 281.5 | 85.4 | 85.9 | 2263.2 | 103.7 | 104.4 | | | | | | |
| 325.5 | 86.0 | 86.4 | 2282.2 | 103.9 | 104.5 | | | | | | |
| 346.6 | 85.2 | | 2321.8 | 105.4 | 105.7 | | | | | | |
| 370.6 | 85.4 | 86.4 | 2345.4 | 104.8 | 105.6 | | | | | | |
| 384.2 | 85.7 | 86.3 | 2360.4 | 105.0 | 105.7 | | | | | | |
| 420.6 | 86.8 | 87.0 | 2369.9 | 105.5 | 105.6 | | | | | | |
| 438.2 | 86.1 | 87.2 | 2401.4 | 106.4 | 106.6 | | | | | | |
| 448.3 | 86.2 | 87.2 | 2468.9 | 107.0 | 107.5 | | | | | | |
| 457.1 | 86.8 | 87.2 | 2491.5 | 107.3 | 107.6 | | | | | | |
| 484.0 | 87.2 | 87.6 | 2502.3 | 106.6 | 107.6 | | | | | | |
| 494.7 | 86.5 | 87.6 | 2527.6 | 106.5 | 107.6 | | | | | | |
| 513.8 | 85.6 | 87.6 | 2540.7 | 107.4 | 107.6 | | | | | | |
| 517.6 | 87.9 | 88.2 | 2593.2 | 108.1 | 108.4 | | | | | | |

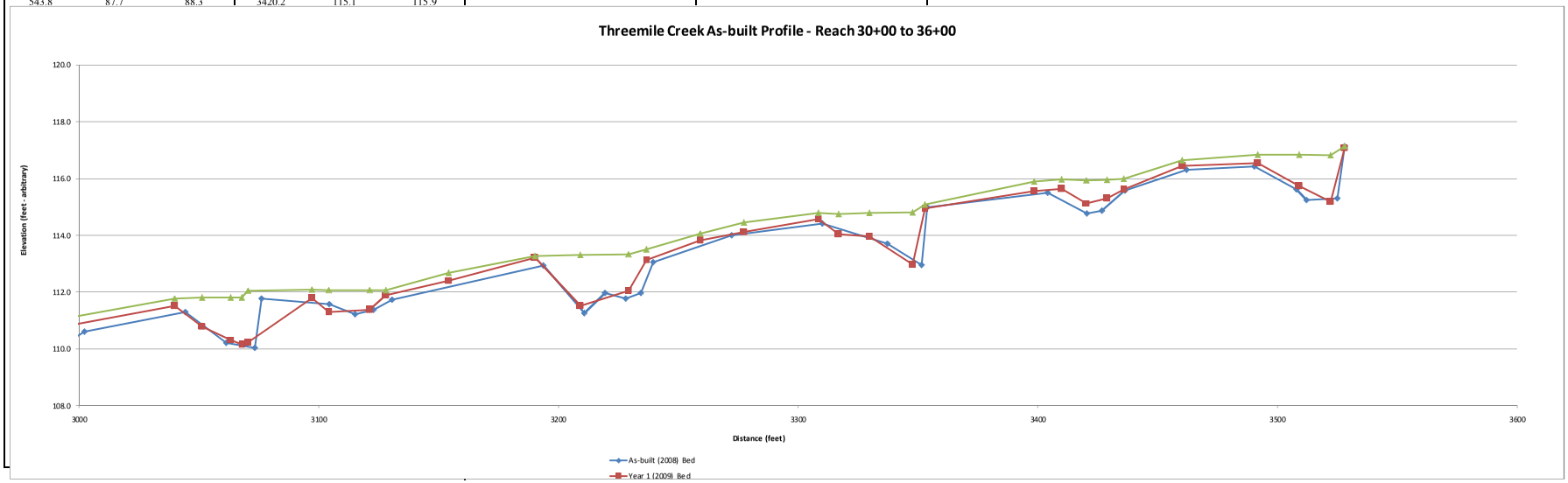
| | As-built | 2009 | 2010 | 2011 |
|---|---|---|---|---|
| **Avg. Water Surface Slope** | 0.0098 | 0.0097 | | |
| **Riffle Length** | 51.0 | 52.9 | | |
| **Avg. Riffle Slope** | 0.0154 | 0.0143 | | |
| **Pool Length** | 46.0 | 38.0 | | |
| **Avg. Pool Slope** | 110.0 | 0.0008 | | |



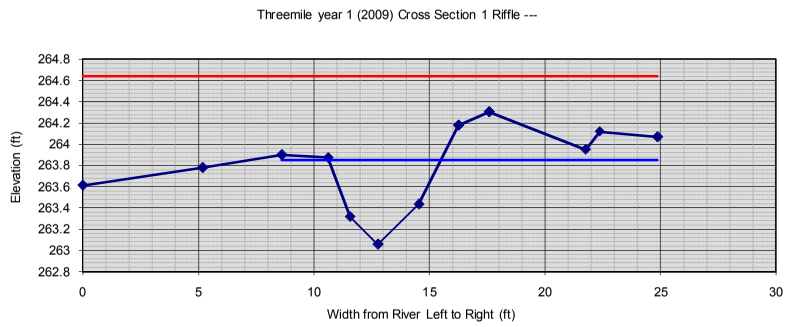
| | |
|---|---|
| **Project Name** | Threemile Creek - Year 1 (2009) Profile |
| **Reach** | 30+00 - 36+00 |
| **Feature** | Profile |
| **Date** | 8/18/09 |
| **Crew** | Lewis, Dean, Perkinson |

| 2008 As-built Survey | | | 2009 Year 1 Monitoring \Survey | | | 2010 Year 2 Monitoring \Survey | | | 2011 Year 3 Monitoring \Survey | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Station** | **Bed Elevation** | **Water Elevation** | **Station** | **Bed Elevation** | **Water Elevation** | **Station** | **Bed Elevation** | **Water Elevation** | **Station** | **Bed Elevation** | **Water Elevation** |
| 0.0 | 82.5 | 82.6 | 2971.4 | 110.3 | 111.0 | | | | | | |
| 37.1 | 82.8 | 83.2 | 2979.2 | 110.3 | 111.0 | | | | | | |
| 93.1 | 83.4 | 83.9 | 2989.8 | 110.2 | 111.0 | | | | | | |
| 98.8 | 83.2 | 83.9 | 2994.6 | 110.8 | 111.1 | | | | | | |
| 107.4 | 83.2 | 83.9 | 3040.0 | 111.5 | 111.8 | | | | | | |
| 121.0 | 84.1 | 84.1 | 3051.5 | 110.8 | 111.8 | | | | | | |
| 130.4 | 83.4 | 84.3 | 3063.4 | 110.3 | 111.8 | | | | | | |
| 138.8 | 83.4 | 84.3 | 3068.0 | 110.2 | 111.8 | | | | | | |
| 144.7 | 83.7 | 84.3 | 3070.6 | 110.2 | 112.1 | | | | | | |
| 197.0 | 84.7 | 85.1 | 3097.3 | 111.8 | 112.1 | | | | | | |
| 226.7 | 84.1 | 85.1 | 3104.2 | 111.3 | 112.1 | | | | | | |
| 236.5 | 83.3 | 85.2 | 3121.4 | 111.4 | 112.1 | | | | | | |
| 250.9 | 82.1 | 85.2 | 3128.2 | 111.9 | 112.1 | | | | | | |
| 253.2 | 85.2 | 85.2 | 3154.3 | 112.4 | 112.7 | | | | | | |
| 281.5 | 85.4 | 85.9 | 3190.3 | 113.2 | 113.3 | | | | | | |
| 325.5 | 86.0 | 86.4 | 3209.2 | 111.5 | 113.3 | | | | | | |
| 346.6 | 85.2 | | 3229.2 | 112.1 | 113.3 | | | | | | |
| 370.6 | 85.4 | 86.4 | 3236.7 | 113.1 | 113.5 | | | | | | |
| 384.2 | 85.7 | 86.3 | 3259.2 | 113.8 | 114.1 | | | | | | |
| 420.6 | 86.8 | 87.0 | 3277.5 | 114.1 | 114.5 | | | | | | |
| 438.2 | 86.1 | 87.2 | 3308.5 | 114.6 | 114.8 | | | | | | |
| 448.3 | 86.2 | 87.2 | 3317.1 | 114.0 | 114.8 | | | | | | |
| 457.1 | 86.8 | 87.2 | 3329.7 | 114.0 | 114.8 | | | | | | |
| 484.0 | 87.2 | 87.6 | 3347.9 | 113.0 | 114.8 | | | | | | |
| 494.7 | 86.5 | 87.6 | 3352.9 | 115.0 | 115.1 | | | | | | |
| 513.8 | 85.6 | 87.6 | 3398.6 | 115.6 | 115.9 | | | | | | |
| 517.6 | 87.9 | 88.2 | 3410.1 | 115.6 | 116.0 | | | | | | |
| 543.8 | 87.7 | 88.3 | 3420.2 | 115.1 | 115.9 | | | | | | |

| | As-built | 2009 | 2010 | 2011 |
|---|---|---|---|---|
| **Avg. Water Surface Slope** | 0.0098 | 0.0097 | | |
| **Riffle Length** | 51.0 | 52.9 | | |
| **Avg. Riffle Slope** | 0.0154 | 0.0143 | | |
| **Pool Length** | 46.0 | 38.0 | | |
| **Avg. Pool Slope** | 110.0 | 0.0008 | | |



## Cross Section




section: Threemile year 1 (2009) Cross Section 1
Riffle
---
---
description: Threemile year 1 (2009) Cross Section 1
height of instrument (ft): 297.11

| notes | omit pt. | distance (ft) | FS (ft) | elevation |
|---|---|---|---|---|
| | ☑ | 0 | 33.49614 | 263.6139 |
| | ☑ | 5.180448 | 33.33139 | 263.7786 |
| | ☐ | 8.612386 | 33.21074 | 263.8993 |
| | ☐ | 10.6142 | 33.23655 | 263.8735 |
| | ☐ | 11.56216 | 33.79194 | 263.3181 |
| | ☐ | 12.77195 | 34.05139 | 263.0586 |
| | ☐ | 14.54458 | 33.67486 | 263.4351 |
| | ☐ | 16.25723 | 32.93212 | 264.1779 |
| | ☐ | 17.58056 | 32.80683 | 264.3032 |
| | ☐ | 21.75607 | 33.15995 | 263.9501 |
| | ☐ | 22.36615 | 32.99053 | 264.1195 |
| | ☐ | 24.86833 | 33.04255 | 264.0674 |

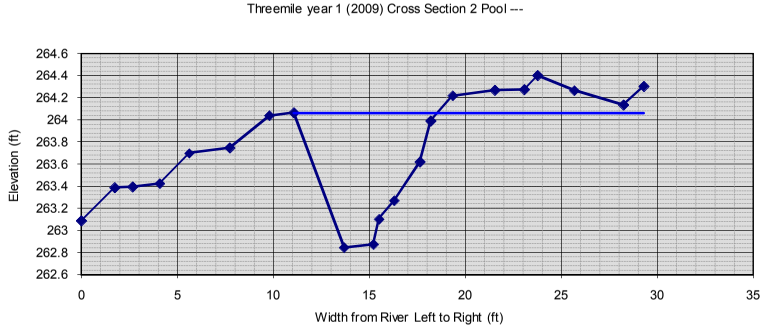
| FS bankfull | FS top of bank | W fpa (ft) | channel slope (%) | Manning's "n" |
|---|---|---|---|---|
| 33.26 | 33.26 | 250.0 | | |
| 263.85 | 263.85 | | | |

| dimensions | | | |
|---|---|---|---|
| 2.3 | x-section area | 0.5 | d mean |
| 4.8 | width | 5.1 | wet P |
| 0.8 | d max | 0.4 | hyd radi |
| 0.8 | bank ht | 10.2 | w/d ratio |
| 250.0 | W flood prone area | 51.6 | ent ratio |

| hydraulics | |
|---|---|
| 0.0 | velocity (ft/sec) |
| 0.0 | discharge rate, Q (cfs) |
| 0.00 | shear stress ((lbs/ft sq) |
| 0.00 | shear velocity (ft/sec) |
| 0.000 | unit stream power (lbs/ft/sec) |
| 0.00 | Froude number |
| 0.0 | friction factor u/u* |
| ~~0.0~~ | threshold grain size (mm) |

| check from channel material | | | |
|---|---|---|---|
| 0 | measured D84 (mm) | | |
| 0.0 | relative roughness | 0.0 | fric. factor |
| 0.000 | Manning's n from channel material | | |

## Cross Section




section: Threemile year 1 (2009) Cross Section 2
Pool
---
---
description: Threemile year 1 (2009) Cross Section 2
height of instrument (ft): 297.11

| notes | omit pt. | distance (ft) | FS (ft) | elevation |
|---|---|---|---|---|
| | ☑ | 0 | 34.02108 | 263.0889 |
| | ☑ | 1.734826 | 33.72318 | 263.3868 |
| | ☑ | 2.672092 | 33.71623 | 263.3938 |
| | ☑ | 4.082738 | 33.68659 | 263.4234 |
| | ☑ | 5.618071 | 33.41177 | 263.6982 |
| | ☑ | 7.726443 | 33.36264 | 263.7474 |
| | ☑ | 9.79365 | 33.07096 | 264.039 |
| | ☐ | 11.07581 | 33.04608 | 264.0639 |
| | ☐ | 13.68542 | 34.26601 | 262.844 |
| | ☐ | 15.21043 | 34.23599 | 262.874 |
| | ☐ | 15.50954 | 34.00832 | 263.1017 |
| | ☐ | 16.28688 | 33.84124 | 263.2688 |
| | ☐ | 17.63368 | 33.48998 | 263.62 |
| | ☐ | 18.19849 | 33.12006 | 263.9899 |
| | ☐ | 19.33395 | 32.89181 | 264.2182 |
| | ☐ | 21.54167 | 32.84122 | 264.2688 |
| | ☐ | 23.07104 | 32.8344 | 264.2756 |
| | ☐ | 23.76462 | 32.70901 | 264.401 |
| | ☐ | 25.66854 | 32.84439 | 264.2656 |
| | ☐ | 28.23538 | 32.97403 | 264.136 |
| | ☐ | 29.29614 | 32.8071 | 264.3029 |

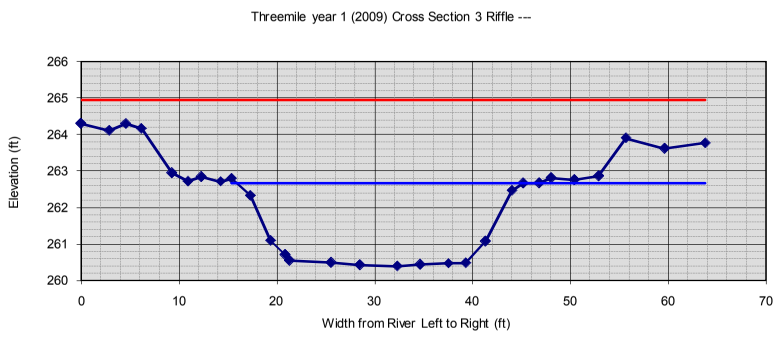
| FS bankfull | FS top of bank | W fpa (ft) | channel slope (%) | Manning's "n" |
|---|---|---|---|---|
| 33.05 | 33.05 | | | |
| 264.06 | 264.06 | | | |

| dimensions | | | |
|---|---|---|---|
| 5.4 | x-section area | 0.7 | d mean |
| 7.5 | width | 8.0 | wet P |
| 1.2 | d max | 0.7 | hyd radi |
| 1.2 | bank ht | ~~10.3~~ | w/d ratio |
| ~~0.0~~ | W flood prone area | ~~0.0~~ | ent ratio |

| hydraulics | |
|---|---|
| ~~0.0~~ | velocity (ft/sec) |
| ~~0.0~~ | discharge rate, Q (cfs) |
| 0.00 | shear stress ((lbs/ft sq) |
| 0.00 | shear velocity (ft/sec) |
| ~~0.000~~ | unit stream power (lbs/ft/sec) |
| ~~0.00~~ | Froude number |
| ~~0.0~~ | friction factor u/u* |
| ~~0.0~~ | threshold grain size (mm) |

| check from channel material | | | |
|---|---|---|---|
| ~~0~~ | measured D84 (mm) | | |
| ~~0.0~~ | relative roughness | ~~0.0~~ | fric. factor |
| ~~0.000~~ | Manning's n from channel material | | |

## Cross Section




section: Threemile year 1 (2009) Cross Section 3
Riffle
---
---
description: Threemile year 1 (2009) Cross Section 3
height of instrument (ft): 297.11

| notes | omit pt. | distance (ft) | FS (ft) | elevation |
|---|---|---|---|---|
| | ☑ | 0 | 32.80914 | 264.3009 |
| | ☑ | 2.898364 | 32.9982 | 264.1118 |
| | ☑ | 4.5979 | 32.81397 | 264.296 |
| | ☑ | 6.183108 | 32.94766 | 264.1623 |
| | ☑ | 9.285146 | 34.16223 | 262.9478 |
| | ☑ | 10.9414 | 34.39228 | 262.7177 |
| | ☑ | 12.29919 | 34.26791 | 262.8421 |
| | ☑ | 14.28288 | 34.39795 | 262.7121 |
| | ☐ | 15.38667 | 34.31681 | 262.7932 |
| | ☐ | 17.32057 | 34.78204 | 262.328 |
| | ☐ | 19.38113 | 36.01183 | 261.0982 |
| | ☐ | 20.87153 | 36.39941 | 260.7106 |
| | ☐ | 21.29646 | 36.55517 | 260.5548 |
| | ☐ | 25.53979 | 36.61861 | 260.4914 |
| | ☐ | 28.48477 | 36.67783 | 260.4322 |
| | ☐ | 32.32751 | 36.71838 | 260.3916 |
| | ☐ | 34.66385 | 36.66937 | 260.4406 |
| | ☐ | 37.55746 | 36.63818 | 260.4718 |
| | ☐ | 39.32057 | 36.62976 | 260.4802 |
| | ☐ | 41.32026 | 36.03406 | 261.0759 |
| | ☐ | 44.0411 | 34.64195 | 262.4681 |
| | ☐ | 45.18027 | 34.44356 | 262.6664 |
| | ☐ | 46.81425 | 34.43788 | 262.6721 |
| | ☐ | 48.03566 | 34.29773 | 262.8123 |
| | ☐ | 50.40319 | 34.34719 | 262.7628 |
| | ☐ | 52.88717 | 34.24246 | 262.8675 |
| | ☐ | | | |

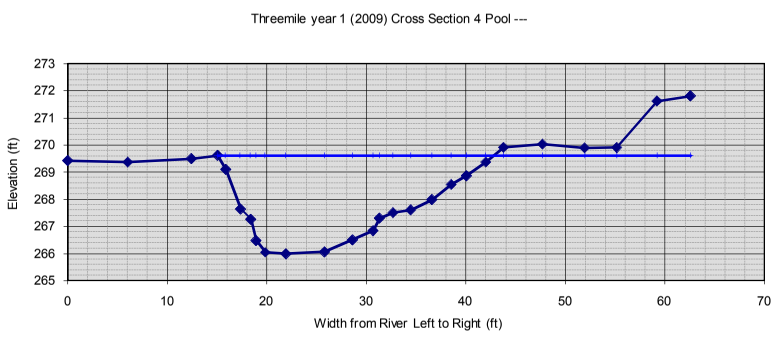
| FS bankfull | FS top of bank | W fpa (ft) | channel slope (%) | Manning's "n" |
|---|---|---|---|---|
| 34.44 | 34.44 | 250.0 | | |
| 262.67 | 262.67 | | | |

| dimensions | | | |
|---|---|---|---|
| 51.9 | x-section area | 1.7 | d mean |
| 30.3 | width | 31.2 | wet P |
| 2.3 | d max | 1.7 | hyd radi |
| 2.3 | bank ht | 17.7 | w/d ratio |
| 250.0 | W flood prone area | 8.2 | ent ratio |

| hydraulics | |
|---|---|
| 0.0 | velocity (ft/sec) |
| 0.0 | discharge rate, Q (cfs) |
| 0.00 | shear stress ((lbs/ft sq) |
| 0.00 | shear velocity (ft/sec) |
| 0.000 | unit stream power (lbs/ft/sec) |
| 0.00 | Froude number |
| 0.0 | friction factor u/u* |
| ~~0.0~~ | threshold grain size (mm) |

| check from channel material | | | |
|---|---|---|---|
| 0 | measured D84 (mm) | | |
| 0.0 | relative roughness | 0.0 | fric. factor |
| 0.000 | Manning's n from channel material | | |

## Cross Section




section: Threemile year 1 (2009) Cross Section 4
Pool
---
---
description: Threemile year 1 (2009) Cross Section 4
height of instrument (ft): 297.11

| notes | omit pt. | distance (ft) | FS (ft) | elevation |
|---|---|---|---|---|
| | ☑ | 0 | 27.69136 | 269.4186 |
| | ☑ | 6.026859 | 27.7439 | 269.3661 |
| | ☑ | 12.42274 | 27.61861 | 269.4914 |
| | ☐ | 15.04958 | 27.49666 | 269.6133 |
| | ☐ | 15.87363 | 28.01504 | 269.095 |
| | ☐ | 17.33881 | 29.47245 | 267.6376 |
| | ☐ | 18.37813 | 29.84562 | 267.2644 |
| | ☐ | 18.91215 | 30.63053 | 266.4795 |
| | ☐ | 19.8446 | 31.06377 | 266.0462 |
| | ☐ | 21.90532 | 31.12153 | 265.9885 |
| | ☐ | 25.79289 | 31.04418 | 266.0658 |
| | ☐ | 28.59684 | 30.61098 | 266.499 |
| | ☐ | 30.67344 | 30.26663 | 266.8434 |
| | ☐ | 31.30087 | 29.81035 | 267.2997 |
| | ☐ | 32.66794 | 29.60444 | 267.5056 |
| | ☐ | 34.45648 | 29.50733 | 267.6027 |
| | ☐ | 36.57906 | 29.12806 | 267.9819 |
| | ☐ | 38.52477 | 28.56626 | 268.5437 |
| | ☐ | 40.04005 | 28.25069 | 268.8593 |
| | ☐ | 42.00091 | 27.74305 | 269.3669 |
| | ☐ | 43.78967 | 27.2053 | 269.9047 |
| | ☐ | 47.70157 | 27.08421 | 270.0258 |
| | ☐ | 51.91782 | 27.2187 | 269.8913 |
| | ☐ | 55.16317 | 27.20641 | 269.9036 |
| | ☐ | 59.19779 | 25.4981 | 271.6119 |
| | ☐ | 62.56316 | 25.30924 | 271.8008 |
| | ☐ | | | |

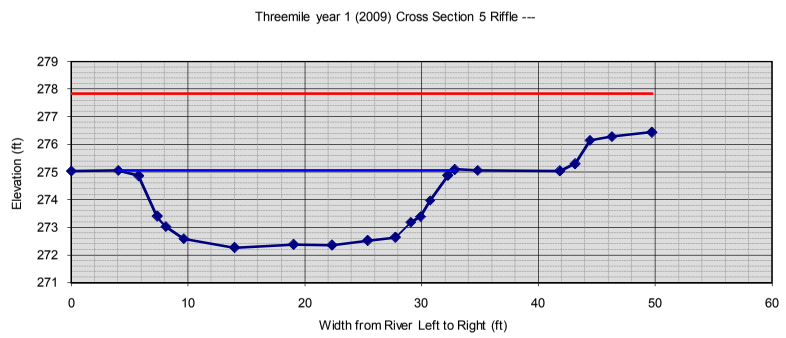
| FS bankfull | FS top of bank | W fpa (ft) | channel slope (%) | Manning's "n" |
|---|---|---|---|---|
| 27.5 | 27.5 | | | |
| 269.61 | 269.61 | | | |

| dimensions | | | |
|---|---|---|---|
| 62.8 | x-section area | 2.3 | d mean |
| 27.8 | width | 29.6 | wet P |
| 3.6 | d max | 2.1 | hyd radi |
| 3.6 | bank ht | ~~12.3~~ | w/d ratio |
| ~~0.0~~ | W flood prone area | ~~0.0~~ | ent ratio |

| hydraulics | |
|---|---|
| ~~0.0~~ | velocity (ft/sec) |
| ~~0.0~~ | discharge rate, Q (cfs) |
| 0.00 | shear stress ((lbs/ft sq) |
| 0.00 | shear velocity (ft/sec) |
| ~~0.000~~ | unit stream power (lbs/ft/sec) |
| ~~0.00~~ | Froude number |
| ~~0.0~~ | friction factor u/u* |
| ~~0.0~~ | threshold grain size (mm) |

| check from channel material | | | |
|---|---|---|---|
| ~~0~~ | measured D84 (mm) | | |
| ~~0.0~~ | relative roughness | ~~0.0~~ | fric. factor |
| ~~0.000~~ | Manning's n from channel material | | |

## Cross Section




| | |
|---|---|
| section: | Threemile year 1 (2009) Cross Section 5 |
| | Riffle |
| | --- |
| | --- |
| description: | Threemile year 1 (2009) Cross Section 5 |
| height of instrument (ft): | 297.11 |

| notes | omit pt. | distance (ft) | FS (ft) | elevation |
|---|---|---|---|---|
| | ☑ | 0 | 22.07576 | 275.0342 |
| | ☐ | 4.00723 | 22.04943 | 275.0606 |
| | ☐ | 5.766635 | 22.24398 | 274.866 |
| | ☐ | 7.35201 | 23.70471 | 273.4053 |
| | ☐ | 8.092253 | 24.08426 | 273.0257 |
| | ☐ | 9.626506 | 24.51944 | 272.5906 |
| | ☐ | 13.96775 | 24.84175 | 272.2683 |
| | ☐ | 19.03156 | 24.73104 | 272.379 |
| | ☐ | 22.33008 | 24.75115 | 272.3588 |
| | ☐ | 25.36486 | 24.584 | 272.526 |
| | ☐ | 27.75958 | 24.46818 | 272.6418 |
| | ☐ | 29.06145 | 23.92632 | 273.1837 |
| | ☐ | 29.90794 | 23.72446 | 273.3855 |
| | ☐ | 30.72831 | 23.14231 | 273.9677 |
| | ☐ | 32.239 | 22.2292 | 274.8808 |
| | ☐ | 32.82436 | 22.01986 | 275.0901 |
| | ☑ | 34.81384 | 22.04822 | 275.0618 |
| | ☑ | 41.83996 | 22.06688 | 275.0431 |
| | ☑ | 43.12862 | 21.80929 | 275.3007 |
| | ☑ | 44.42778 | 20.96098 | 276.149 |
| | ☑ | 46.29633 | 20.83274 | 276.2773 |
| | ☑ | 49.72564 | 20.67267 | 276.4373 |
| | ☐ | | | |
| | ☐ | | | |
| | ☐ | | | |
| | ☐ | | | |
| | ☐ | | | |

| FS bankfull | FS top of bank | W fpa (ft) | channel slope (%) | Manning's "n" |
|---|---|---|---|---|
| 22.06 | 22.06 | 250.0 | | |
| 275.05 | 275.05 | | | |

| dimensions | | | |
|---|---|---|---|
| 60.6 | x-section area | 2.1 | d mean |
| 28.6 | width | 30.0 | wet P |
| 2.8 | d max | 2.0 | hyd radi |
| 2.8 | bank ht | 13.5 | w/d ratio |
| 250.0 | W flood prone area | 8.7 | ent ratio |

| hydraulics | |
|---|---|
| 0.0 | velocity (ft/sec) |
| 0.0 | discharge rate, Q (cfs) |
| 0.00 | shear stress ((lbs/ft sq) |
| 0.00 | shear velocity (ft/sec) |
| 0.000 | unit stream power (lbs/ft/sec) |
| 0.00 | Froude number |
| 0.0 | friction factor u/u* |
| ~~0.0~~ | threshold grain size (mm) |

| check from channel material | | | |
|---|---|---|---|
| 0 | measured D84 (mm) | | |
| 0.0 | relative roughness | 0.0 | fric. factor |
| 0.000 | Manning's n from channel material | | |

## Cross Section


| | |
|---|---|
| section: | Threemile year 1 (2009) Cross Section 6 |
| | Pool |
| | --- |
| | --- |
| description: | Threemile year 1 (2009) Cross Section 6 |
| height of instrument (ft): | 297.11 |

| notes | omit pt. | distance (ft) | FS (ft) | elevation |
|---|---|---|---|---|
| | ☑ | 0 | 17.17349 | 279.9365 |
| | ☑ | 2.133243 | 17.27909 | 279.8309 |
| | ☑ | 4.1791 | 17.14192 | 279.9681 |
| | ☑ | 6.863182 | 17.24001 | 279.87 |
| | ☐ | 11.01031 | 17.1473 | 279.9627 |
| | ☐ | 11.94999 | 17.19404 | 279.916 |
| | ☐ | 12.54672 | 17.56856 | 279.5414 |
| | ☐ | 13.05579 | 17.62564 | 279.4844 |
| | ☐ | 13.56407 | 18.01258 | 279.0974 |
| | ☐ | 13.91209 | 18.13191 | 278.9781 |
| | ☐ | 15.11377 | 18.39717 | 278.7128 |
| | ☐ | 15.43311 | 18.51725 | 278.5927 |
| | ☐ | 16.29429 | 18.90872 | 278.2013 |
| | ☐ | 19.21076 | 19.37891 | 277.7311 |
| | ☐ | 20.73953 | 19.65376 | 277.4562 |
| | ☐ | 21.58767 | 19.87157 | 277.2384 |
| | ☐ | 23.66453 | 20.14478 | 276.9652 |
| | ☐ | 25.79071 | 20.36641 | 276.7436 |
| | ☐ | 29.5552 | 20.81489 | 276.2951 |
| | ☐ | 29.89772 | 20.8294 | 276.2806 |
| | ☐ | 31.25095 | 19.62471 | 277.4853 |
| | ☐ | 32.24225 | 18.39097 | 278.719 |
| | ☐ | 33.2505 | 17.07484 | 280.0352 |
| | ☐ | 35.7901 | 17.07381 | 280.0362 |
| | ☑ | 39.05876 | 17.20788 | 279.9021 |
| | ☑ | 41.07463 | 17.11947 | 279.9905 |
| | ☑ | | | |

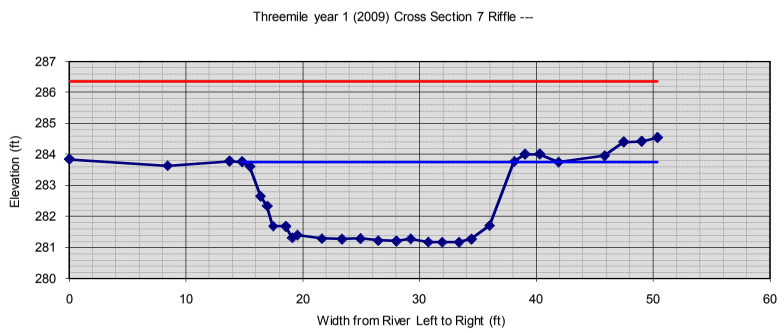
| FS bankfull | FS top of bank | W fpa (ft) | channel slope (%) | Manning's "n" |
|---|---|---|---|---|
| 17.2 | 17.2 | | | |
| 279.91 | 279.91 | | | |

| dimensions | | | |
|---|---|---|---|
| 48.1 | x-section area | 2.3 | d mean |
| 21.2 | width | 23.4 | wet P |
| 3.6 | d max | 2.1 | hyd radi |
| 3.6 | bank ht | ~~9.3~~ | w/d ratio |
| ~~0.0~~ | W flood prone area | ~~0.0~~ | ent ratio |

| hydraulics | |
|---|---|
| ~~0.0~~ | velocity (ft/sec) |
| ~~0.0~~ | discharge rate, Q (cfs) |
| 0.00 | shear stress ((lbs/ft sq) |
| 0.00 | shear velocity (ft/sec) |
| ~~0.000~~ | unit stream power (lbs/ft/sec) |
| ~~0.00~~ | Froude number |
| ~~0.0~~ | friction factor u/u* |
| ~~0.0~~ | threshold grain size (mm) |

| check from channel material | | | |
|---|---|---|---|
| ~~0~~ | measured D84 (mm) | | |
| ~~0.0~~ | relative roughness | ~~0.0~~ | fric. factor |
| ~~0.000~~ | Manning's n from channel material | | |

## Cross Section




For additional cross sections make a copy of the "Dimension" worksheet.
To create a copy "right click" on the dimension tab below.

| | |
|---|---|
| section: | Threemile year 1 (2009) Cross Section 7 |
| | Riffle |
| | --- |
| | --- |
| description: | Threemile year 1 (2009) Cross Section 7 |
| height of instrument (ft): | 297.11 |

| notes | omit pt. | distance (ft) | FS (ft) | elevation |
|---|---|---|---|---|
| | ☑ | 0 | 13.26538 | 283.8446 |
| | ☑ | 8.41103 | 13.48261 | 283.6274 |
| | ☑ | 13.70801 | 13.33254 | 283.7775 |
| | ☐ | 14.77937 | 13.35069 | 283.7593 |
| | ☐ | 15.46751 | 13.50408 | 283.6059 |
| | ☐ | 16.3549 | 14.46199 | 282.648 |
| | ☐ | 16.94966 | 14.77645 | 282.3336 |
| | ☐ | 17.44694 | 15.42034 | 281.6897 |
| | ☐ | 18.52357 | 15.42766 | 281.6823 |
| | ☐ | 19.08722 | 15.794 | 281.316 |
| | ☐ | 19.52385 | 15.7062 | 281.4038 |
| | ☐ | 21.61273 | 15.82423 | 281.2858 |
| | ☐ | 23.32428 | 15.83233 | 281.2777 |
| | ☐ | 24.9265 | 15.8259 | 281.2841 |
| | ☐ | 26.43714 | 15.88528 | 281.2247 |
| | ☐ | 27.98856 | 15.90063 | 281.2094 |
| | ☐ | 29.21696 | 15.82744 | 281.2826 |
| | ☐ | 30.73399 | 15.93167 | 281.1783 |
| | ☐ | 31.91888 | 15.94001 | 281.17 |
| | ☐ | 33.36079 | 15.93352 | 281.1765 |
| | ☐ | 34.42504 | 15.83197 | 281.278 |
| | ☐ | 35.97125 | 15.40475 | 281.7053 |
| | ☐ | 38.08264 | 13.34186 | 283.7681 |
| | ☐ | 38.99551 | 13.10852 | 284.0015 |
| | ☐ | 40.25268 | 13.10521 | 284.0048 |
| | ☐ | 41.87662 | 13.36245 | 283.7475 |
| | ☐ | | | |

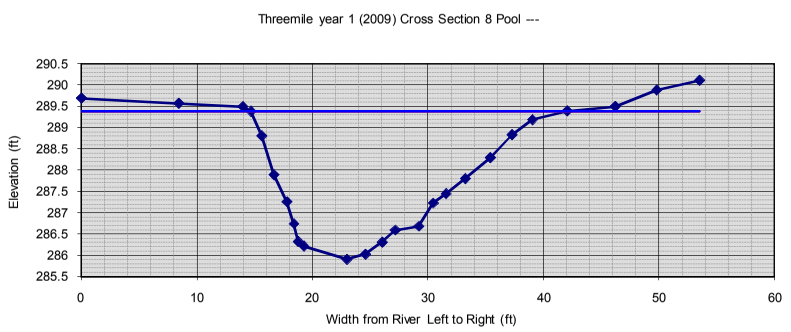
| FS bankfull | FS top of bank | W fpa (ft) | channel slope (%) | Manning's "n" |
|---|---|---|---|---|
| 13.35 | 13.35 | 250.0 | | |
| 283.76 | 283.76 | | | |

| dimensions | | | |
|---|---|---|---|
| 49.9 | x-section area | 2.1 | d mean |
| 23.6 | width | 25.5 | wet P |
| 2.6 | d max | 2.0 | hyd radi |
| 2.6 | bank ht | 11.2 | w/d ratio |
| 250.0 | W flood prone area | 10.6 | ent ratio |

| hydraulics | |
|---|---|
| 0.0 | velocity (ft/sec) |
| 0.0 | discharge rate, Q (cfs) |
| 0.00 | shear stress ((lbs/ft sq) |
| 0.00 | shear velocity (ft/sec) |
| 0.000 | unit stream power (lbs/ft/sec) |
| 0.00 | Froude number |
| 0.0 | friction factor u/u* |
| ~~0.0~~ | threshold grain size (mm) |

| check from channel material | | | |
|---|---|---|---|
| 0 | measured D84 (mm) | | |
| 0.0 | relative roughness | 0.0 | fric. factor |
| 0.000 | Manning's n from channel material | | |

## Cross Section




| | |
|---|---|
| section: | Threemile year 1 (2009) Cross Section 8 |
| | Pool |
| | --- |
| | --- |
| description: | Threemile year 1 (2009) Cross Section 8 |
| height of instrument (ft): | 297.11 |

| notes | omit pt. | distance (ft) | FS (ft) | elevation |
|---|---|---|---|---|
| | ☐ | 0 | 7.40975 | 289.7003 |
| | ☐ | 8.431225 | 7.531417 | 289.5786 |
| | ☐ | 13.98247 | 7.609438 | 289.5006 |
| | ☐ | 14.68971 | 7.721459 | 289.3885 |
| | ☐ | 15.60898 | 8.29432 | 288.8157 |
| | ☐ | 16.66791 | 9.208151 | 287.9018 |
| | ☐ | 17.80582 | 9.844535 | 287.2655 |
| | ☐ | 18.41205 | 10.36225 | 286.7478 |
| | ☐ | 18.76776 | 10.78088 | 286.3291 |
| | ☐ | 19.26799 | 10.88823 | 286.2218 |
| | ☐ | 22.96951 | 11.19449 | 285.9155 |
| | ☐ | 24.58129 | 11.07466 | 286.0353 |
| | ☐ | 26.04885 | 10.79319 | 286.3168 |
| | ☐ | 27.17301 | 10.50997 | 286.6 |
| | ☐ | 29.21818 | 10.41999 | 286.69 |
| | ☐ | 30.44951 | 9.871509 | 287.2385 |
| | ☐ | 31.5692 | 9.656852 | 287.4531 |
| | ☐ | 33.23712 | 9.299262 | 287.8107 |
| | ☐ | 35.3965 | 8.809993 | 288.3 |
| | ☐ | 37.27535 | 8.269918 | 288.8401 |
| | ☐ | 39.05104 | 7.916901 | 289.1931 |
| | ☐ | 42.06031 | 7.710571 | 289.3994 |
| | ☐ | 46.21342 | 7.608499 | 289.5015 |
| | ☐ | 49.81002 | 7.224875 | 289.8851 |
| | ☐ | 53.51349 | 6.995403 | 290.1146 |
| | ☐ | | | |
| | ☐ | | | |
| | ☐ | | | |

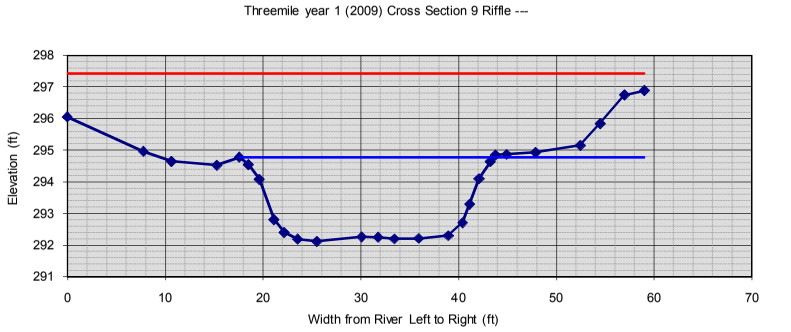
| FS bankfull | FS top of bank | W fpa (ft) | channel slope (%) | Manning's "n" |
|---|---|---|---|---|
| 7.72 | 7.72 | 250.0 | | |
| 289.39 | 289.39 | | | |

| dimensions | | | |
|---|---|---|---|
| 52.4 | x-section area | 1.9 | d mean |
| 27.2 | width | 28.7 | wet P |
| 3.5 | d max | 1.8 | hyd radi |
| 3.5 | bank ht | 14.2 | w/d ratio |
| 250.0 | W flood prone area | 9.2 | ent ratio |

| hydraulics | |
|---|---|
| 0.0 | velocity (ft/sec) |
| 0.0 | discharge rate, Q (cfs) |
| 0.00 | shear stress ((lbs/ft sq) |
| 0.00 | shear velocity (ft/sec) |
| 0.000 | unit stream power (lbs/ft/sec) |
| 0.00 | Froude number |
| 0.0 | friction factor u/u* |
| 0.0 | threshold grain size (mm) |

| check from channel material | | | |
|---|---|---|---|
| 0 | measured D84 (mm) | | |
| 0.0 | relative roughness | 0.0 | fric. factor |
| 0.000 | Manning's n from channel material | | |

## Cross Section




| | |
|---|---|
| section: | Threemile year 1 (2009) Cross Section 9 |
| | Riffle |
| | --- |
| | --- |
| description: | Threemile year 1 (2009) Cross Section 9 |
| height of instrument (ft): | 297.11 |

| notes | omit pt. | distance (ft) | FS (ft) | elevation |
|---|---|---|---|---|
| | ☑ | 0 | 1.053488 | 296.0565 |
| | ☑ | 7.792931 | 2.144301 | 294.9657 |
| | ☑ | 10.64967 | 2.457409 | 294.6526 |
| | ☑ | 15.27349 | 2.574015 | 294.536 |
| | ☐ | 17.58072 | 2.324568 | 294.7854 |
| | ☐ | 18.51264 | 2.557448 | 294.5526 |
| | ☐ | 19.61886 | 3.019953 | 294.09 |
| | ☐ | 21.12248 | 4.292452 | 292.8175 |
| | ☐ | 22.15902 | 4.694821 | 292.4152 |
| | ☐ | 23.5403 | 4.911321 | 292.1987 |
| | ☐ | 25.51128 | 4.979919 | 292.1301 |
| | ☐ | 30.09269 | 4.834283 | 292.2757 |
| | ☐ | 31.77386 | 4.851327 | 292.2587 |
| | ☐ | 33.44406 | 4.895974 | 292.214 |
| | ☐ | 35.92293 | 4.889386 | 292.2206 |
| | ☐ | 38.94177 | 4.797761 | 292.3122 |
| | ☐ | 40.39608 | 4.388638 | 292.7214 |
| | ☐ | 41.12507 | 3.804847 | 293.3052 |
| | ☐ | 42.08121 | 3.003841 | 294.1062 |
| | ☐ | 43.23706 | 2.465502 | 294.6445 |
| | ☐ | 43.76332 | 2.252807 | 294.8572 |
| | ☐ | 44.89533 | 2.230855 | 294.8791 |
| | ☐ | 47.86282 | 2.173293 | 294.9367 |
| | ☐ | 52.43331 | 1.947142 | 295.1629 |
| | ☐ | 54.46752 | 1.261848 | 295.8482 |
| | ☐ | 56.94478 | 0.354578 | 296.7554 |
| | ☐ | 58.97745 | 0.219605 | 296.8904 |

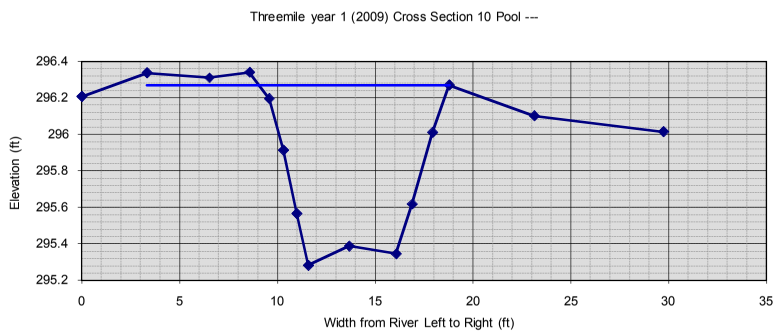
| FS bankfull | FS top of bank | W fpa (ft) | channel slope (%) | Manning's "n" |
|---|---|---|---|---|
| 2.33 | 2.33 | 250.0 | | |
| 294.78 | 294.78 | | | |

| dimensions | | | |
|---|---|---|---|
| 53.7 | x-section area | 2.1 | d mean |
| 26.0 | width | 27.4 | wet P |
| 2.6 | d max | 2.0 | hyd radi |
| 2.6 | bank ht | 12.6 | w/d ratio |
| 250.0 | W flood prone area | 9.6 | ent ratio |

| hydraulics | |
|---|---|
| 0.0 | velocity (ft/sec) |
| 0.0 | discharge rate, Q (cfs) |
| 0.00 | shear stress ((lbs/ft sq) |
| 0.00 | shear velocity (ft/sec) |
| 0.000 | unit stream power (lbs/ft/sec) |
| 0.00 | Froude number |
| 0.0 | friction factor u/u* |
| 0.0 | threshold grain size (mm) |

| check from channel material | | | |
|---|---|---|---|
| 0 | measured D84 (mm) | | |
| 0.0 | relative roughness | 0.0 | fric. factor |
| 0.000 | Manning's n from channel material | | |

## Cross Section




section: Threemile year 1 (2009) Cross Section 10
Pool
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description: Threemile year 1 (2009) Cross Section 10
height of instrument (ft): 297.11

| notes | omit pt. | distance (ft) | FS (ft) | elevation |
|---|---|---|---|---|
| | ☑ | 0 | 0.902819 | 296.2072 |
| | ☐ | 3.322271 | 0.772859 | 296.3371 |
| | ☐ | 6.520456 | 0.79943 | 296.3106 |
| | ☐ | 8.580893 | 0.769922 | 296.3401 |
| | ☐ | 9.574028 | 0.914834 | 296.1952 |
| | ☐ | 10.30568 | 1.196585 | 295.9134 |
| | ☐ | 10.98096 | 1.545023 | 295.565 |
| | ☐ | 11.57294 | 1.828876 | 295.2811 |
| | ☐ | 13.66599 | 1.722747 | 295.3873 |
| | ☐ | 16.07223 | 1.766132 | 295.3439 |
| | ☐ | 16.88897 | 1.493183 | 295.6168 |
| | ☐ | 17.92983 | 1.100356 | 296.0096 |
| | ☐ | 18.78274 | 0.840062 | 296.2699 |
| | ☑ | 23.12602 | 1.009509 | 296.1005 |
| | ☑ | 29.72562 | 1.095358 | 296.0146 |
| | ☐ | | | |
| | ☐ | | | |
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| | ☐ | | | |
| | ☐ | | | |
| | ☐ | | | |
| | ☐ | | | |
| | ☐ | | | |

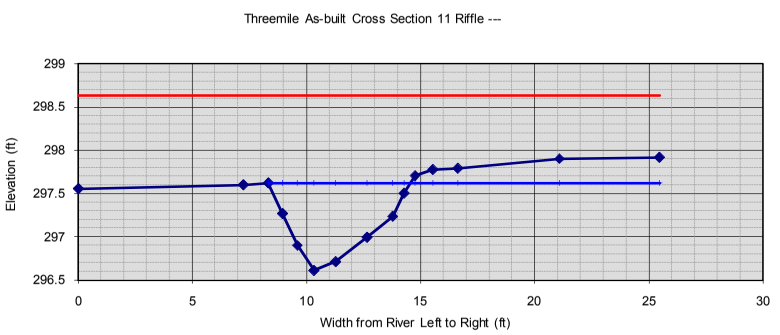
| FS bankfull | FS top of bank | W fpa (ft) | channel slope (%) | Manning's "n" |
|---|---|---|---|---|
| 0.84 | 0.84 | | | |
| 296.27 | 296.27 | | | |

| dimensions | | | |
|---|---|---|---|
| 6.4 | x-section area | 0.7 | d mean |
| 9.7 | width | 10.1 | wet P |
| 1.0 | d max | 0.6 | hyd radi |
| 1.0 | bank ht | 14.8 | w/d ratio |
| 0.0 | W flood prone area | 0.0 | ent ratio |

| hydraulics | |
|---|---|
| 0.0 | velocity (ft/sec) |
| 0.0 | discharge rate, Q (cfs) |
| 0.00 | shear stress ((lbs/ft sq) |
| 0.00 | shear velocity (ft/sec) |
| 0.000 | unit stream power (lbs/ft/sec) |
| 0.00 | Froude number |
| 0.0 | friction factor u/u* |
| 0.0 | threshold grain size (mm) |

| check from channel material | | | |
|---|---|---|---|
| 0 | measured D84 (mm) | | |
| 0.0 | relative roughness | 0.0 | fric. factor |
| 0.000 | Manning's n from channel material | | |

## Cross Section




section: Threemile As-built Cross Section 11
Riffle
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---
description: Threemile As-built Cross Section 11
height of instrument (ft): 297.11

| notes | omit pt. | distance (ft) | FS (ft) | elevation |
|---|---|---|---|---|
| | ☑ | 0 | -0.446312 | 297.5563 |
| | ☑ | 7.230626 | -0.48995 | 297.6 |
| | ☐ | 8.323575 | -0.511326 | 297.6213 |
| | ☐ | 8.950403 | -0.158662 | 297.2687 |
| | ☐ | 9.604127 | 0.208994 | 296.901 |
| | ☐ | 10.32506 | 0.498907 | 296.6111 |
| | ☐ | 11.27761 | 0.398721 | 296.7113 |
| | ☐ | 12.65821 | 0.115811 | 296.9942 |
| | ☐ | 13.77809 | -0.124912 | 297.2349 |
| | ☐ | 14.27146 | -0.392503 | 297.5025 |
| | ☐ | 14.76117 | -0.596315 | 297.7063 |
| | ☐ | 15.53572 | -0.664872 | 297.7749 |
| | ☐ | 16.6277 | -0.680348 | 297.7903 |
| | ☐ | 21.08577 | -0.789971 | 297.9 |
| | ☐ | 25.46904 | -0.806718 | 297.9167 |
| | ☐ | | | |
| | ☐ | | | |
| | ☐ | | | |
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| | ☐ | | | |
| | ☐ | | | |
| | ☐ | | | |
| | ☐ | | | |
| | ☐ | | | |

| FS bankfull | FS top of bank | W fpa (ft) | channel slope (%) | Manning's "n" |
|---|---|---|---|---|
| -0.511 | -0.511 | 150.0 | | |
| 297.621 | 297.621 | | | |

| dimensions | | | |
|---|---|---|---|
| 3.8 | x-section area | 0.6 | d mean |
| 6.2 | width | 6.6 | wet P |
| 1.0 | d max | 0.6 | hyd radi |
| 1.0 | bank ht | 10.3 | w/d ratio |
| 150.0 | W flood prone area | 24.1 | ent ratio |

| hydraulics | |
|---|---|
| 0.0 | velocity (ft/sec) |
| 0.0 | discharge rate, Q (cfs) |
| 0.00 | shear stress ((lbs/ft sq) |
| 0.00 | shear velocity (ft/sec) |
| 0.000 | unit stream power (lbs/ft/sec) |
| 0.00 | Froude number |
| 0.0 | friction factor u/u* |
| 0.0 | threshold grain size (mm) |

| check from channel material | | | |
|---|---|---|---|
| 0 | measured D84 (mm) | | |
| 0.0 | relative roughness | 0.0 | fric. factor |
| 0.000 | Manning's n from channel material | | |

**Threemile**
**Year 1 Profile (2009)**

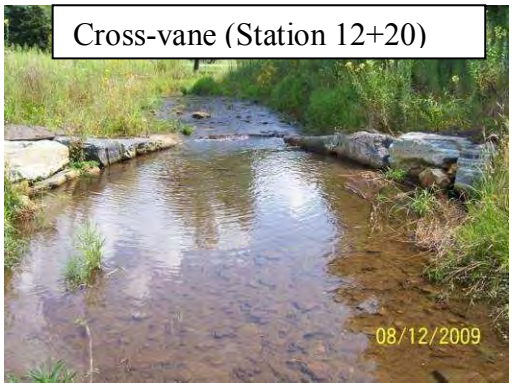
**Average Water Surface Slope**
**0.0096**

| Point | Description | Station | Bed Elevation | Water Elevation | Riffle Length | Pool Length | Riffle Slope | Revised Pool Slope |
|---|---|---|---|---|---|---|---|---|
| 65 | x vane | | 79.27497 | 79.67276 | | | | |
| 67 | mr | | 79.64683 | 79.91413 | | | | |
| 69 | mr | | 79.91014 | 80.2044 | | | | |
| 71 | pool | | 78.82255 | 80.20465 | | | | |
| 73 | br | | 79.93647 | 80.27661 | | | | |
| 75 | mr | | 80.4245 | 80.82032 | | | | |
| 77 | mr | | 81.01379 | 81.26909 | | | | |
| 79 | tr | | 81.44357 | 81.85222 | | | | |
| 81 | pool | | 79.83696 | 81.88807 | | | | |
| 83 | pool | | 79.88996 | 81.93668 | | | | |
| 85 | x vane | -3.30 | 82.54445 | 82.80112 | | | | |
| 87 | mr | 27.17 | 82.83888 | 83.14037 | | | | |
| 89 | riffle | 61.62 | 83.53918 | 83.811 | | | | |
| 91 | mr | 96.53 | 83.38953 | 84.02945 | | | | |
| 93 | mr | 114.52 | 84.02529 | 84.31685 | | | | |
| 95 | riffle | 141.74 | 84.2312 | 84.47071 | | | | |
| 97 | mr | 173.83 | 84.18139 | 84.86695 | | | | |
| 99 | mr | 181.18 | 84.7147 | 85.03407 | | | | |
| 101 | riffle | 218.54 | 84.97681 | 85.34517 | | | | |
| 103 | glidE | 232.67 | 83.42518 | 85.29604 | | | | |
| 105 | pool | 239.66 | 83.06468 | 85.31016 | | | | |
| 107 | pool | 249.82 | 83.04381 | 85.28114 | | | | |
| 109 | x vane | 251.88 | 85.35354 | 85.67618 | 79.35 | 33.34 | 0.0104 | 0.0000 |
| 111 | mr | 282.14 | 85.60045 | 86.03382 | | | | |
| 113 | tr | 331.23 | 86.08633 | 86.49801 | | | | |
| 115 | glidE | 345.36 | 85.67883 | 86.55574 | | | | |
| 117 | glidE ws | 364.69 | 85.4506 | 86.5284 | | | | |
| 119 | br | 386.10 | 86.38153 | 86.56602 | 40.08 | 54.86 | 0.0202 | 0.0012 |
| 121 | tr | 426.17 | 86.97675 | 87.37602 | | | | |
| 123 | pool | 439.93 | 86.30269 | 87.34768 | | | | |
| 125 | br | 449.85 | 86.73269 | 87.30545 | 33.98 | 23.68 | 0.0112 | 0.0000 |
| 127 | tr | 483.84 | 87.17627 | 87.68714 | | | | |
| 129 | glidE | 491.19 | 86.75855 | 87.65397 | | | | |
| 131 | rga | 500.88 | 86.73577 | 87.70322 | | | | |
| 133 | pool | 514.87 | 85.23372 | 87.72245 | | | | |
| 135 | x vane | 517.57 | 88.05511 | 88.37255 | 86.71 | 33.73 | 0.0098 | 0.0011 |
| 137 | mr | 566.77 | 88.26428 | 88.54736 | | | | |
| 139 | tr | 604.27 | 88.85513 | 89.2239 | | | | |
| 141 | glidE | 630.11 | 88.31244 | 89.23534 | | | | |
| 143 | pool | 643.61 | 87.01571 | 89.23833 | | | | |
| 145 | pool ws | 652.34 | 87.70887 | 89.26973 | | | | |
| 147 | x vane | 654.97 | 89.60204 | 89.80413 | 43.87 | 50.70 | 0.0115 | 0.0010 |
| 149 | tr | 698.85 | 90.05745 | 90.30861 | | | | |
| 151 | glidE | 710.47 | 89.3601 | 90.35911 | | | | |
| 179 | run | 740.93 | 89.34772 | 90.39115 | | | | |
| 181 | br | 768.22 | 90.17399 | 90.5937 | 53.36 | 69.37 | 0.0153 | 0.0041 |
| 183 | tr | 821.58 | 91.08592 | 91.40797 | | | | |
| 185 | glidE | 849.21 | 90.22802 | 91.43598 | | | | |
| 187 | pool | 868.43 | 89.32647 | 91.43744 | | | | |
| 189 | x vane | 871.61 | 91.51501 | 91.77849 | 60.97 | 50.03 | 0.0078 | 0.0006 |
| 191 | tr | 932.58 | 91.93175 | 92.25392 | | | | |
| 193 | pool | 945.55 | 91.13836 | 92.24739 | | | | |
| 195 | br | 967.11 | 92.14217 | 92.46001 | 47.93 | 34.53 | 0.0163 | 0.0060 |
| 197 | tr | 1015.04 | 92.92837 | 93.24338 | | | | |
| 199 | pool | 1025.59 | 92.31537 | 93.31631 | | | | |
| 201 | run | 1036.56 | 92.38644 | 93.28654 | | | | |
| 203 | br | 1054.61 | 92.99539 | 93.34163 | 58.36 | 39.57 | 0.0173 | 0.0025 |
| 205 | mr | 1082.72 | 93.84978 | 94.17683 | | | | |
| 207 | tr | 1112.97 | 93.90501 | 94.35113 | | | | |
| 209 | pool | 1120.33 | 92.42683 | 94.38413 | | | | |
| 211 | run | 1132.88 | 93.3887 | 94.41701 | | | | |
| 213 | br | 1146.78 | 94.03577 | 94.41331 | 99.48 | 33.80 | 0.0167 | 0.0018 |
| 215 | mr | 1164.48 | 94.6911 | 94.91464 | | | | |
| 217 | mr | 1200.97 | 95.37004 | 95.52186 | | | | |
| 241 | tr | 1246.26 | 95.81044 | 96.07747 | | | | |
| 243 | glidE | 1254.63 | 95.23424 | 96.18909 | | | | |
| 245 | run | 1267.63 | 95.2952 | 96.19201 | | | | |
| 247 | br | 1277.02 | 96.01117 | 96.11988 | 81.91 | 30.76 | 0.0143 | 0.0014 |
| 249 | mr | 1311.84 | 95.92491 | 96.61601 | | | | |
| 251 | tr | 1358.94 | 96.90661 | 97.28931 | | | | |
| 253 | glidE | 1369.20 | 96.34765 | 97.30127 | | | | |
| 255 | run | 1378.74 | 96.5188 | 97.3413 | | | | |
| 257 | br | 1391.40 | 97.04252 | 97.4292 | 53.97 | 32.46 | 0.0143 | 0.0043 |
| 259 | mr | 1412.09 | 97.55064 | 97.81414 | | | | |
| 261 | tr | 1445.38 | 97.96034 | 98.19931 | | | | |
| 263 | glidE | 1465.66 | 97.50887 | 98.23828 | | | | |
| 265 | mr | 1472.19 | 96.96153 | 98.22954 | | | | |
| 267 | br | 1483.35 | 97.99964 | 98.31259 | 37.59 | 37.98 | 0.0119 | 0.001127 |
| 269 | tr | 1520.94 | 98.18465 | 98.76122 | | | | |
| 271 | glidE | 1535.18 | 97.62462 | 98.76275 | | | | |
| 273 | pool | 1542.22 | 97.08677 | 98.7906 | | | | |
| 275 | run | 1561.49 | 98.01961 | 98.87302 | | | | |
| 277 | riffle | 1582.47 | 98.43943 | 98.88389 | 32.71 | 61.53 | 0.0245 | 0.001994 |
| 279 | tr | 1615.19 | 99.19897 | 99.68584 | | | | |
| 281 | glidE | 1622.63 | 98.01731 | 99.6657 | | | | |
| 283 | br | 1635.54 | 97.68427 | 99.5694 | | | | |
| 285 | run | 1646.26 | 98.19212 | 99.66325 | | | | |
| 287 | br | 1659.99 | 99.33389 | 99.64794 | 21.20 | 44.80 | 0.0308 | 0 |
| 289 | tr | 1681.19 | 100.0043 | 100.3005 | | | | |
| 291 | glidE | 1688.99 | 99.35875 | 100.2938 | | | | |
| 293 | rga | 1700.43 | 100.064 | 100.3441 | | | | |
| 295 | glidE | 1708.20 | 99.36343 | 100.3462 | | | | |
| 297 | run | 1714.83 | 99.30499 | 100.3586 | | | | |
| 299 | br | 1721.65 | 100.0591 | 100.3274 | 27.98 | 40.46 | 0.0063 | 0.000664 |
| 301 | tr | 1749.63 | 100.3396 | 100.5051 | | | | |
| 333 | glidE | 1759.23 | 99.40093 | 100.4633 | | | | |
| 335 | run | 1771.13 | 99.34241 | 100.5215 | | | | |
| 337 | mr | 1784.00 | 100.0715 | 100.5272 | 52.94 | 34.37 | 0.0104 | 0.0006 |
| 339 | mr | 1803.48 | 100.6551 | 100.9045 | | | | |
| 341 | riffle | 1836.94 | 100.8506 | 101.078 | | | | |
| 343 | glidE | 1855.52 | 99.89882 | 101.0797 | | | | |
| 345 | run | 1871.98 | 99.05257 | 101.0901 | | | | |
| 347 | x vane | 1874.99 | 101.3555 | 101.392 | 36.95 | 38.05 | 0.0100 | 0.0003 |
| 349 | tr | 1911.95 | 101.3061 | 101.7611 | | | | |

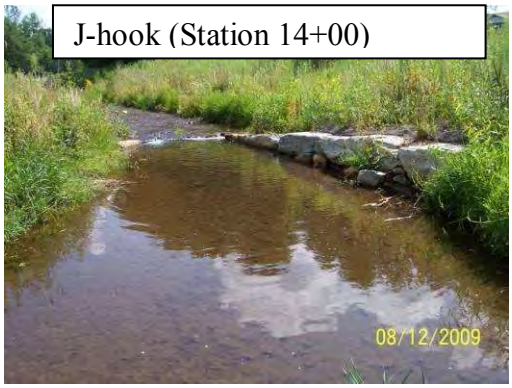
| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 351 | glidE | 1919.81 | 100.5879 | 101.7327 | | | | | |
| 353 | run | 1928.74 | 100.0839 | 101.7642 | | | | | |
| 355 | riffle | 1941.76 | 101.4377 | 101.7857 | | 34.90 | 29.82 | 0.0116 | 0.0008 |
| 357 | tr | 1976.66 | 101.8981 | 102.1918 | | | | | |
| 359 | pool | 1991.82 | 101.1981 | 102.171 | | | | | |
| 361 | br | 2010.11 | 102.0095 | 102.1678 | | 67.35 | 33.45 | 0.0104 | 0.0000 |
| 363 | mr | 2034.76 | 102.4544 | 102.5153 | | | | | |
| 365 | tr | 2077.46 | 102.36 | 102.8706 | | | | | |
| 367 | glidE | 2084.88 | 101.9354 | 102.8564 | | | | | |
| 369 | run | 2097.37 | | 102.9012 | | | | | |
| 371 | br | 2109.14 | 102.9426 | 103.0056 | | 38.74 | 31.67 | 0.0144 | 0.0043 |
| 373 | tr | 2147.87 | 103.3837 | 103.5623 | | | | | |
| 375 | glidE | 2168.50 | 102.8138 | 103.5738 | | | | | |
| 377 | run | 2193.62 | 101.6165 | 103.6496 | | | | | |
| 379 | x vane | 2196.56 | 104.0263 | 104.1402 | | 36.36 | 48.69 | 0.0073 | 0.0019 |
| 413 | top rif | 2232.92 | 104.1086 | 104.4072 | | | | | |
| 415 | glidE | 2244.22 | 103.2076 | 104.4559 | | | | | |
| 417 | pool | 2262.61 | 103.2725 | 104.4354 | | | | | |
| 419 | run | 2283.18 | 103.7486 | 104.4455 | | | | | |
| 421 | br log vain | 2302.19 | 103.9151 | 104.5108 | | 39.56 | 69.28 | 0.0291 | 0.0008 |
| 423 | top rif | 2341.75 | 105.3795 | 105.6611 | | | | | |
| 425 | glidE | 2365.41 | 104.7639 | 105.6428 | | | | | |
| 427 | run | 2380.39 | 105.0336 | 105.6813 | | | | | |
| 429 | br | 2389.94 | 105.5275 | 105.5941 | | 121.52 | 48.19 | 0.0165 | 0.0000 |
| 431 | mr | 2421.41 | 106.4062 | 106.624 | | | | | |
| 433 | mr | 2488.85 | 107.0415 | 107.5493 | | | | | |
| 435 | top rif | 2511.46 | 107.3117 | 107.6003 | | | | | |
| 437 | glidE | 2522.26 | 106.5587 | 107.5562 | | | | | |
| 439 | run | 2547.63 | 106.508 | 107.5701 | | | | | |
| 441 | br | 2560.72 | 107.3643 | 107.6075 | | 52.52 | 49.26 | 0.0155 | 0.0001 |
| 443 | top rif | 2613.24 | 108.1441 | 108.4218 | | | | | |
| 445 | glidE | 2626.24 | 107.455 | 108.4004 | | | | | |
| 447 | pool | 2641.48 | 106.8242 | 108.3958 | | | | | |
| 449 | run | 2654.85 | 106.6247 | 108.3484 | | | | | |
| 451 | xvain | 2657.30 | 108.5589 | 108.6693 | | 31.06 | 44.06 | 0.0098 | 0.0000 |
| 453 | top rif | 2688.35 | 108.759 | 108.9732 | | | | | |
| 455 | glidE | 2704.75 | 107.6088 | 109.0034 | | | | | |
| 457 | pool | 2727.26 | 108.2045 | 108.9607 | | | | | |
| 459 | run | 2750.40 | 108.3297 | 108.956 | | | | | |
| 461 | br | 2755.69 | 108.6472 | 108.9397 | | 112.31 | 67.34 | 0.0272 | 0.0000 |
| 463 | mr | 2771.81 | 109.262 | 109.5117 | | | | | |
| 465 | top rif | 2790.91 | 109.6547 | 109.8961 | | | | | |
| 467 | mr | 2826.27 | 109.6546 | 110.1624 | | | | | |
| 469 | top rif | 2868.00 | 110.0024 | 110.3881 | | | | | |
| 471 | glidE | 2877.81 | 109.1299 | 110.4076 | | | | | |
| 498 | pool | 2892.60 | 109.3757 | 110.3833 | | | | | |
| 500 | pool | 2908.59 | 109.6771 | 110.3903 | | | | | |
| 502 | run | 2917.53 | 109.5091 | 110.38 | | | | | |
| 504 | br log vain | 2924.07 | 110.2931 | 110.4295 | | 56.80 | 56.07 | 0.0107 | 0.0000 |
| 506 | mr | 2957.83 | 110.7652 | 111.0039 | | | | | |
| 508 | top rif | 2980.87 | 110.6982 | 111.0362 | | | | | |
| 510 | glidE | 2991.40 | 110.3383 | 111.0104 | | | | | |
| 512 | pool | 2999.19 | 110.2612 | 111.0057 | | | | | |
| 514 | run | 3009.82 | 110.2499 | 111.0192 | | | | | |
| 516 | br | 3014.60 | 110.8025 | 111.0832 | | 45.38 | 33.72 | 0.0155 | 0.0014 |
| 518 | top rif | 3059.97 | 111.5161 | 111.7852 | | | | | |
| 520 | glidE | 3071.45 | 110.798 | 111.8071 | | | | | |
| 522 | pool | 3083.37 | 110.3245 | 111.8095 | | | | | |
| 524 | run | 3087.96 | 110.163 | 111.8071 | | | | | |
| 526 | xvain | 3090.63 | 110.2331 | 112.0591 | | 26.64 | 30.66 | 0.0015 | 0.0008 |
| 530 | top rif | 3117.28 | 111.7918 | 112.0983 | | | | | |
| 532 | glidE | 3124.18 | 111.305 | 112.0817 | | | | | |
| 534 | run | 3141.38 | 111.3826 | 112.0786 | | | | | |
| 536 | br | 3148.19 | 111.9029 | 112.0708 | | 62.07 | 30.91 | 0.0193 | 0.0000 |
| 538 | mr | 3174.31 | 112.4164 | 112.6876 | | | | | |
| 540 | top rif | 3210.26 | 113.2133 | 113.2673 | | | | | |
| 542 | pool | 3229.17 | 111.5151 | 113.3132 | | | | | |
| 544 | run log | 3249.22 | 112.0527 | 113.3418 | | | | | |
| 546 | br | 3256.70 | 113.1442 | 113.5049 | | 71.76 | 46.44 | 0.0179 | 0.0051 |
| 548 | mr | 3279.16 | 113.8272 | 114.0711 | | | | | |
| 550 | mr | 3297.48 | 114.1305 | 114.4588 | | | | | |
| 552 | top rif | 3328.46 | 114.5785 | 114.7865 | | | | | |
| 554 | glidE | 3337.06 | 114.0461 | 114.7588 | | | | | |
| 556 | pool | 3349.74 | 113.962 | 114.7998 | | | | | |
| 558 | run | 3367.86 | 112.9702 | 114.8154 | | | | | |
| 560 | j hook | 3372.86 | 114.9572 | 115.0809 | | 57.25 | 44.40 | 0.0155 | 0.0007 |
| 589 | mr | 3418.64 | 115.5579 | 115.8975 | | | | | |
| 591 | top rif | 3430.11 | 115.6353 | 115.9686 | | | | | |
| 593 | glidE | 3440.24 | 115.1362 | 115.9478 | | | | | |
| 595 | run | 3448.94 | 115.2974 | 115.9525 | | | | | |
| 597 | br | 3455.87 | 115.6202 | 115.9877 | | 56.02 | 25.76 | 0.0152 | 0.0007 |
| 599 | mr | 3480.31 | 116.4487 | 116.6479 | | | | | |
| 601 | top rif | 3511.89 | 116.5509 | 116.8376 | | | | | |
| 603 | glidE | 3529.15 | 115.7366 | 116.8414 | | | | | |
| 605 | run | 3542.22 | 115.1918 | 116.8292 | | | | | |
| 607 | xvain | 3548.04 | 117.092 | 117.1513 | | | | | |
| | | | | | ave | 54.69 | 42.17 | 0.0146 | 0.0013 |
| | | | | | med | 52.73 | 38.81 | 0.0143 | 0.0008 |
| | | | | | min | 21.20 | 23.68 | 0.0015 | 0.0000 |
| | | | | | max | 121.52 | 69.37 | 0.0308 | 0.0060 |

**Three Mile**
**Year 1 (2009) Annual Monitoring**
**Structure Photographs taken August 2009**

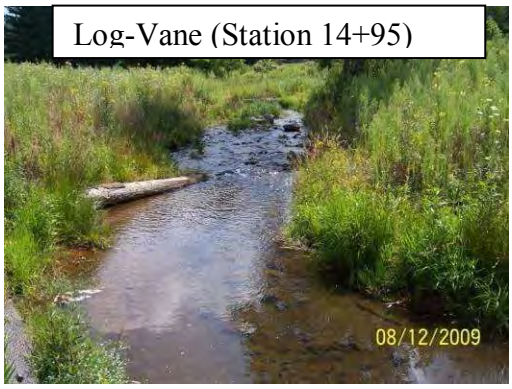
Cross-vane (Station 12+20)



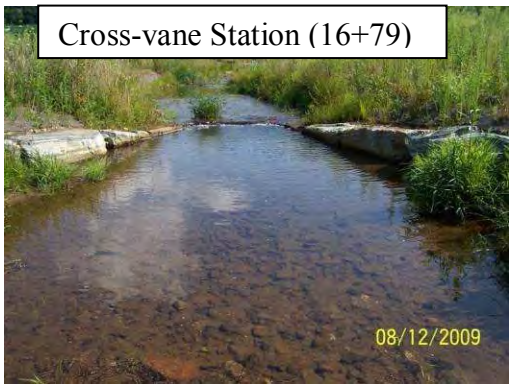

J-hook (Station 14+00)



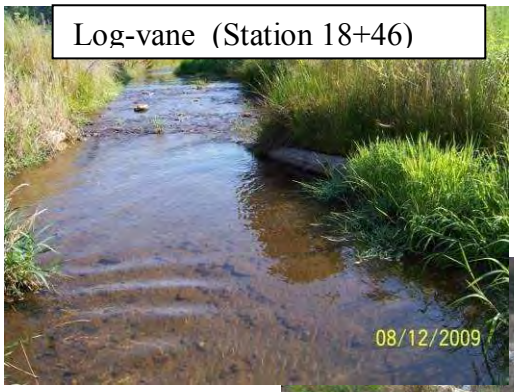

Log-Vane (Station 14+95)




Cross-vane Station (16+79)



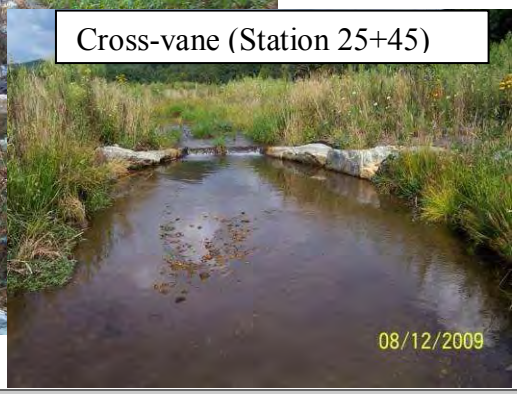

Log-vane (Station 18+46)




Cross-vane (Station 21+05)

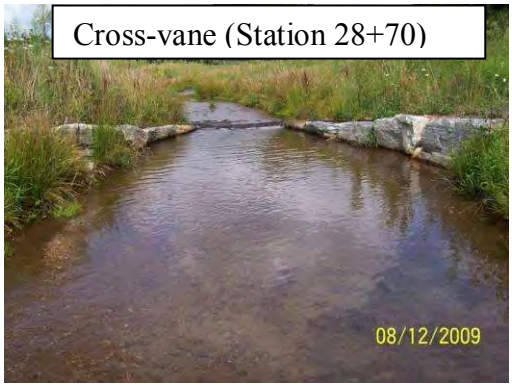

Log-vane (Station 24+44)


Cross-vane (Station 25+45)



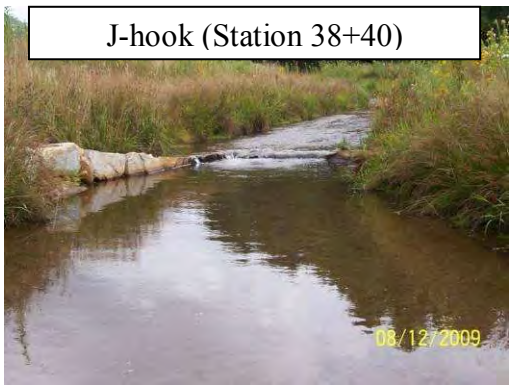
**Three Mile**
**Year 1 (2009) Annual Monitoring**
**Structure Photographs taken August 2009 (continued)**

Cross-vane (Station 28+70)

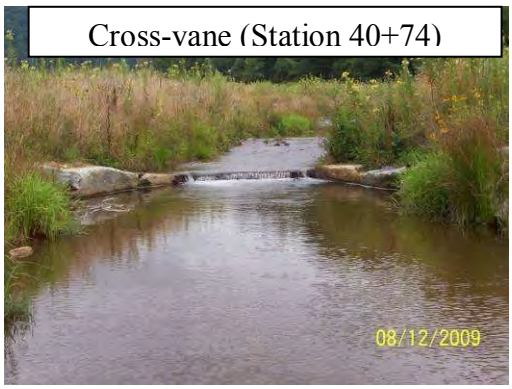



Log-vane (Station 31+42

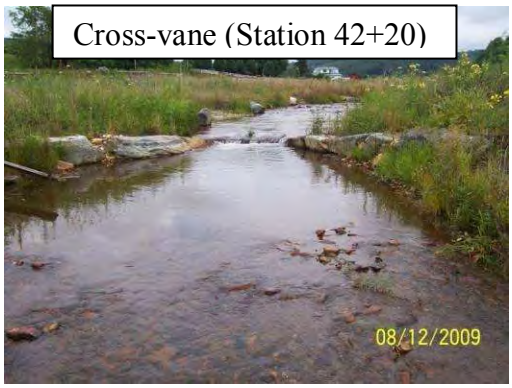

J-hook (Station 38+40)




Cross-vane (Station 40+74)



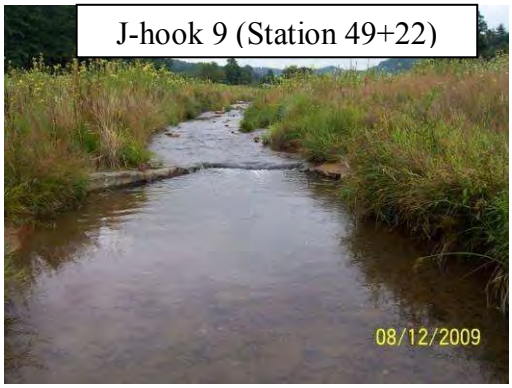

Cross-vane (Station 42+20)



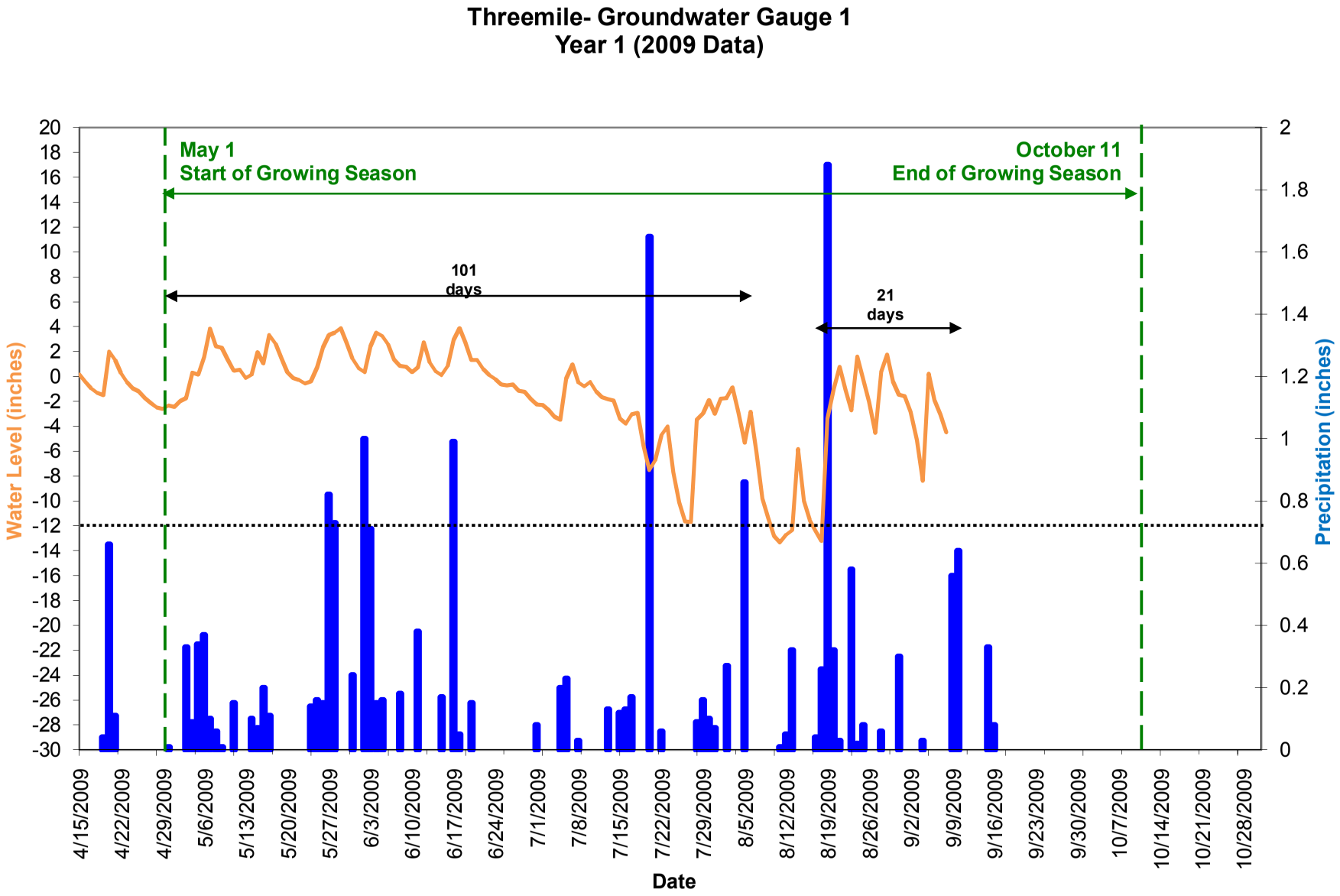

Cross-vane (Station 44+55)

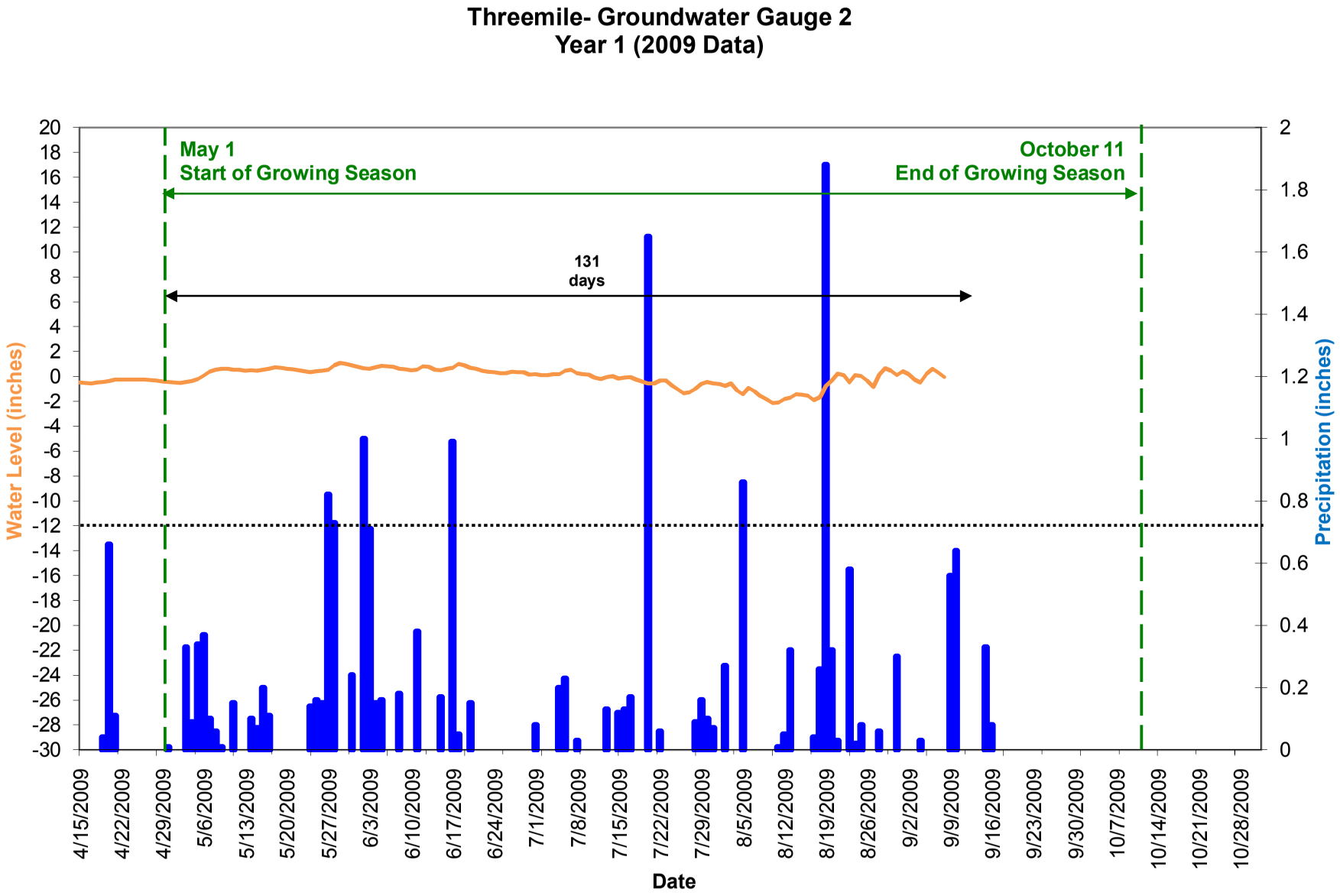

Cross-vane (Station 47+02

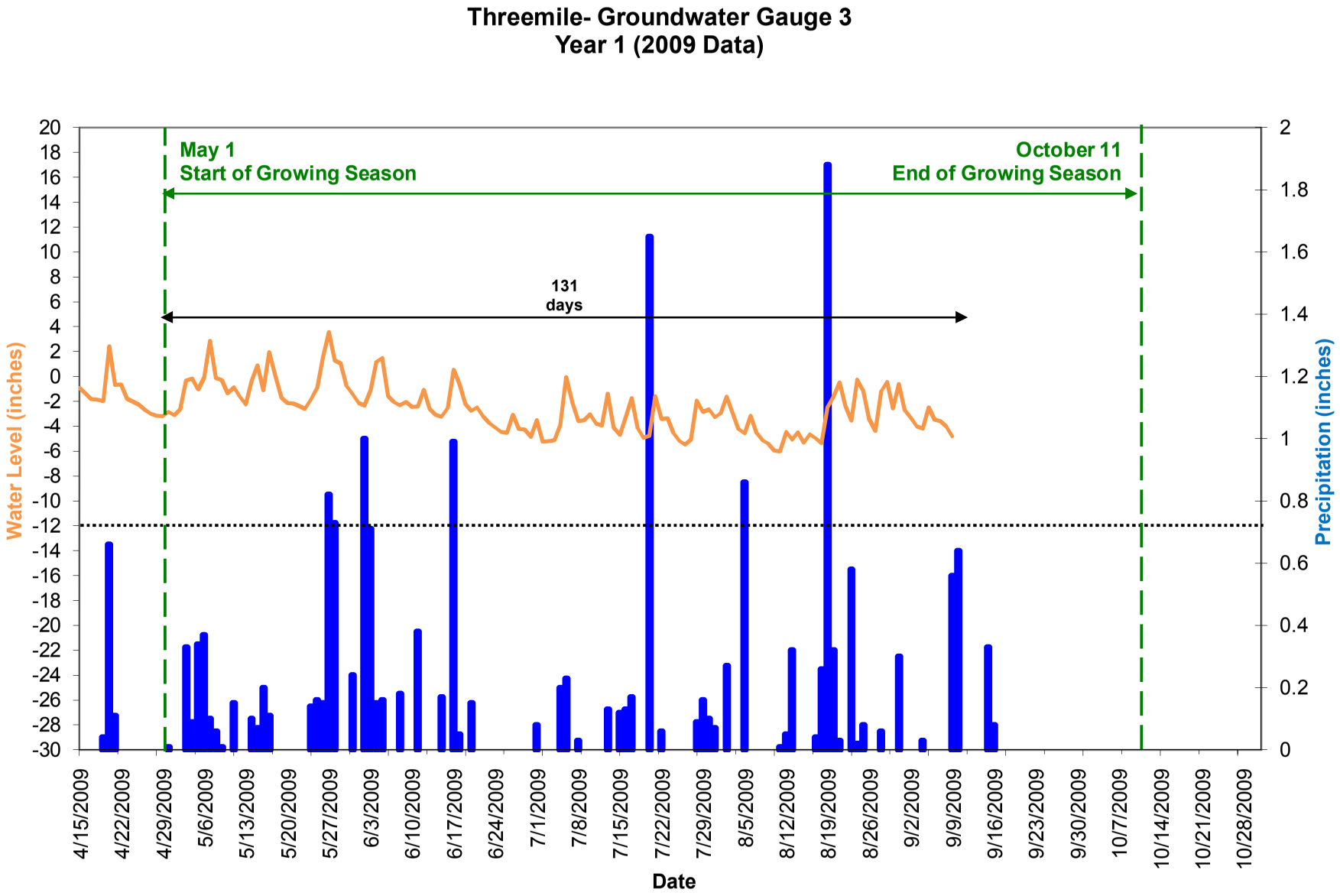

J-hook 9 (Station 49+22)

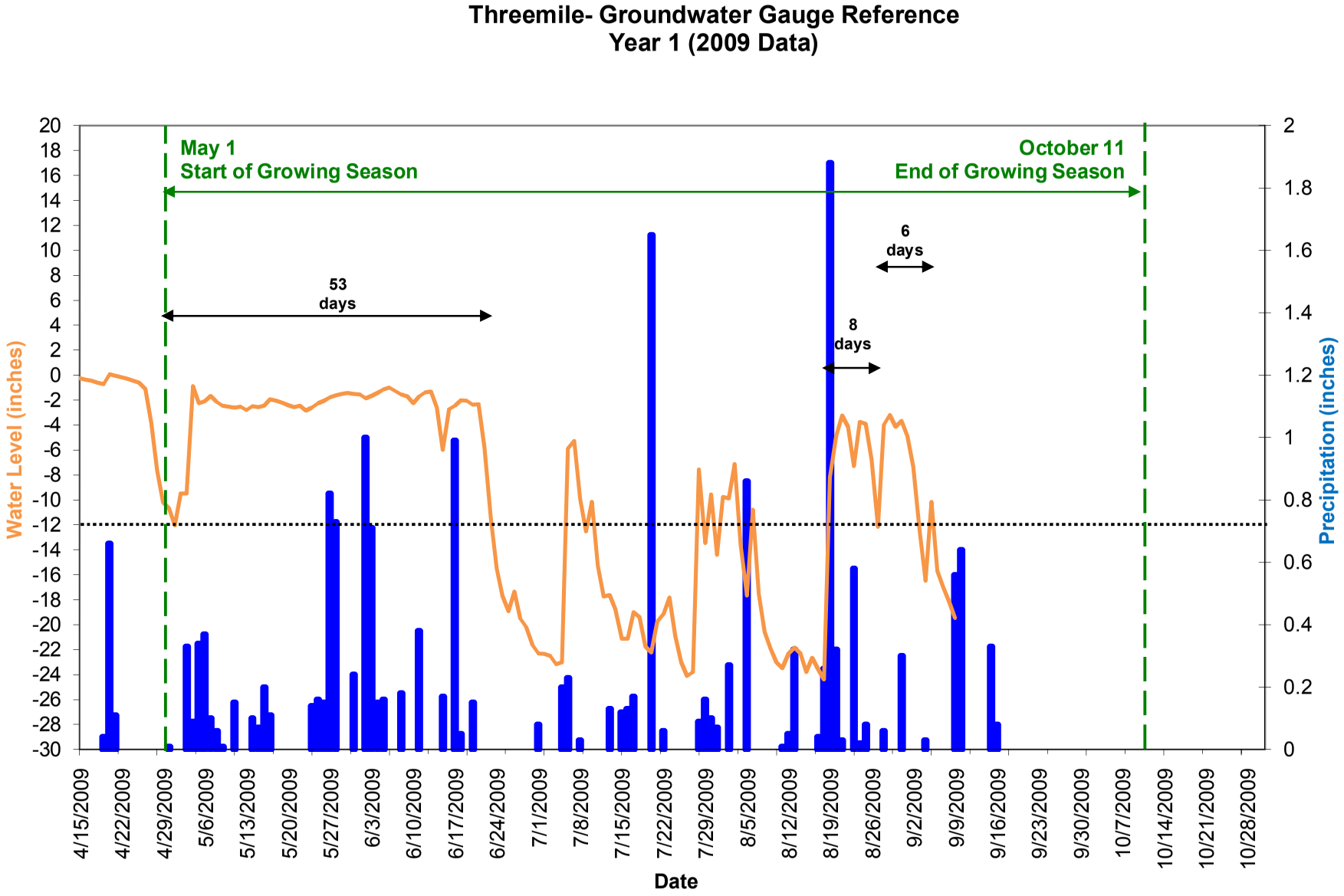


**APPENDIX D**
**HYDROLOGY DATA**
**2009 Groundwater Gauge Graphs**


Threemile- Groundwater Gauge 1
Year 1 (2009 Data)
May 1
Start of Growing Season
October 11
End of Growing Season
101
days
21
days
Water Level (inches)
Precipitation (inches)
Date
20
18
16
14
12
10
8
6
4
2
0
-2
-4
-6
-8
-10
-12
-14
-16
-18
-20
-22
-24
-26
-28
-30
2
1.8
1.6
1.4
1.2
1
0.8
0.6
0.4
0.2
0
4/15/2009
4/22/2009
4/29/2009
5/6/2009
5/13/2009
5/20/2009
5/27/2009
6/3/2009
6/10/2009
6/17/2009
6/24/2009
7/1/2009
7/8/2009
7/15/2009
7/22/2009
7/29/2009
8/5/2009
8/12/2009
8/19/2009
8/26/2009
9/2/2009
9/9/2009
9/16/2009
9/23/2009
9/30/2009
10/7/2009
10/14/2009
10/21/2009
10/28/2009


Threemile- Groundwater Gauge 2
Year 1 (2009 Data)
May 1
Start of Growing Season
October 11
End of Growing Season
131
days
Water Level (inches)
Precipitation (inches)
Date
20
18
16
14
12
10
8
6
4
2
0
-2
-4
-6
-8
-10
-12
-14
-16
-18
-20
-22
-24
-26
-28
-30
2
1.8
1.6
1.4
1.2
1
0.8
0.6
0.4
0.2
0
4/15/2009
4/22/2009
4/29/2009
5/6/2009
5/13/2009
5/20/2009
5/27/2009
6/3/2009
6/10/2009
6/17/2009
6/24/2009
7/1/2009
7/8/2009
7/15/2009
7/22/2009
7/29/2009
8/5/2009
8/12/2009
8/19/2009
8/26/2009
9/2/2009
9/9/2009
9/16/2009
9/23/2009
9/30/2009
10/7/2009
10/14/2009
10/21/2009
10/28/2009


Threemile- Groundwater Gauge 3
Year 1 (2009 Data)
May 1
Start of Growing Season
October 11
End of Growing Season
131
days
Water Level (inches)
Precipitation (inches)
Date
20
18
16
14
12
10
8
6
4
2
0
-2
-4
-6
-8
-10
-12
-14
-16
-18
-20
-22
-24
-26
-28
-30
2
1.8
1.6
1.4
1.2
1
0.8
0.6
0.4
0.2
0
4/15/2009
4/22/2009
4/29/2009
5/6/2009
5/13/2009
5/20/2009
5/27/2009
6/3/2009
6/10/2009
6/17/2009
6/24/2009
7/1/2009
7/8/2009
7/15/2009
7/22/2009
7/29/2009
8/5/2009
8/12/2009
8/19/2009
8/26/2009
9/2/2009
9/9/2009
9/16/2009
9/23/2009
9/30/2009
10/7/2009
10/14/2009
10/21/2009
10/28/2009


Threemile- Groundwater Gauge Reference
Year 1 (2009 Data)
May 1
Start of Growing Season
October 11
End of Growing Season
53
days
6
days
8
days
Water Level (inches)
Precipitation (inches)
Date
20
18
16
14
12
10
8
6
4
2
0
-2
-4
-6
-8
-10
-12
-14
-16
-18
-20
-22
-24
-26
-28
-30
2
1.8
1.6
1.4
1.2
1
0.8
0.6
0.4
0.2
0
4/15/2009
4/22/2009
4/29/2009
5/6/2009
5/13/2009
5/20/2009
5/27/2009
6/3/2009
6/10/2009
6/17/2009
6/24/2009
7/1/2009
7/8/2009
7/15/2009
7/22/2009
7/29/2009
8/5/2009
8/12/2009
8/19/2009
8/26/2009
9/2/2009
9/9/2009
9/16/2009
9/23/2009
9/30/2009
10/7/2009
10/14/2009
10/21/2009
10/28/2009