



**pennsylvania**

DEPARTMENT OF ENVIRONMENTAL PROTECTION

BUREAU OF WATER STANDARDS & FACILITY REGULATION

## **Continuous Instream Monitoring Report (CIMR)**

**Most recent revision:** 10/30/2014

**Revised by:** Wertz/Lookenbill

### Station Description

**STREAM CODE:** 56625

**STREAM NAME:** Glad Run

**SITE CODE:** 112378291-001

**SITE NAME:** Forest Highway 186

**COUNTY:** McKean

**LATITUDE:** 41.693911 **LONGITUDE:** -78.743300

**LOCATION DESCRIPTION:** Upstream of Forest Highway 186.

**HUC:** 05010001

**DRAINAGE AREA:** 2.86 sq. miles

**BACKGROUND AND HISTORY:** Glad Run is a freestone tributary to South Branch Kinzua Creek located in the eastern portion of the Allegheny National Forest. Glad Run drains parts of Hamlin and Wetmore Townships, McKean County (Figure 1). The basin upstream of the sonde location is dominated primarily by forested land (74%). The remaining land use characterization includes agriculture (20%), transitional areas (5.7%), and very minor urbanization (<1%). The basin has conventional gas wells throughout, at varying degrees of activity; many of which are currently plugged or inactive. Glad Run has a designated use of High Quality – Cold Water Fishes (HQ-CWF)

The primary objectives of the assessment were to:

1. Characterize seasonal and diel temperature, specific conductance, pH, and flow using 24-hour monitoring.
2. Characterize seasonal water chemistry.
3. Characterize baseline biological communities.



Figure 1. Location of the Glad Run continuous instream monitoring site.

**WATER QUALITY PARAMETERS:**

Parameter	Units
Temperature	°C
Depth	Feet
pH	standard units
Specific Conductance	µS/cm <sup>c</sup>

**EQUIPMENT:**

A single Yellow Springs Instruments (YSI) 6920 water-quality sonde was used at this station. The sonde (Serial #10B101257) was installed on May 26, 2010 and began recording at 16:00.

The sonde was housed in a 24-inch length of 4-inch diameter schedule 80 PVC pipe with holes drilled in it to allow for flow through. One end of the pipe was capped, and a notch was cut to accommodate the metal attachment bar on the top of the sonde. The attachment bar was clipped to an eye-bolt attached to rebar driven into the stream bed. The attachment bar was also clipped to a cable attached to a second piece of rebar located just upstream of the first. The sonde recorded water quality parameters every 60 minutes.

**PERIOD OF RECORD:** May 26, 2010 to July 20, 2011

The station was visited seven times over the fourteen months for the purpose of calibrating, cleaning, and servicing the sonde.

**DATA:**

Water chemistry grab samples were collected ten times throughout the sampling period. Benthic macroinvertebrates were collected on 11/18/2010 and again on 5/19/2011 using the Department's Instream Comprehensive Evaluation (ICE) methods (PA DEP 2009). Continuous data are graded based on a combination of fouling and calibration error. Water temperature and specific conductance data 3/6/2011 through 5/27/2011 were graded unusable and deleted from the final dataset due to erratic readings and unacceptable fouling and calibration check data. pH data 7/19/2010 through 9/1/2010 and 2/15/2011 through 5/27/2011 were also graded unusable and deleted from the final dataset due to a combination of erratic readings and unacceptable fouling and calibration check data.

**Depth:**

Depth measurements from this YSI sonde are actually a measure of water column pressure plus atmospheric pressure. Depth is calibrated or zeroed with the sonde in air in order to subtract the atmospheric pressure during deployment. However, changes in atmospheric pressure while the sonde is deployed appear as changes in depth. The error is equal to 0.045 feet for every 1mm Hg change in atmospheric pressure. This data has not been corrected for confounding changes in atmospheric pressure. For this reason, depth data will be considered qualitative.

**Temperature:** Average: 8.02°C; Maximum: 18.77°C; Minimum: 0.01°C

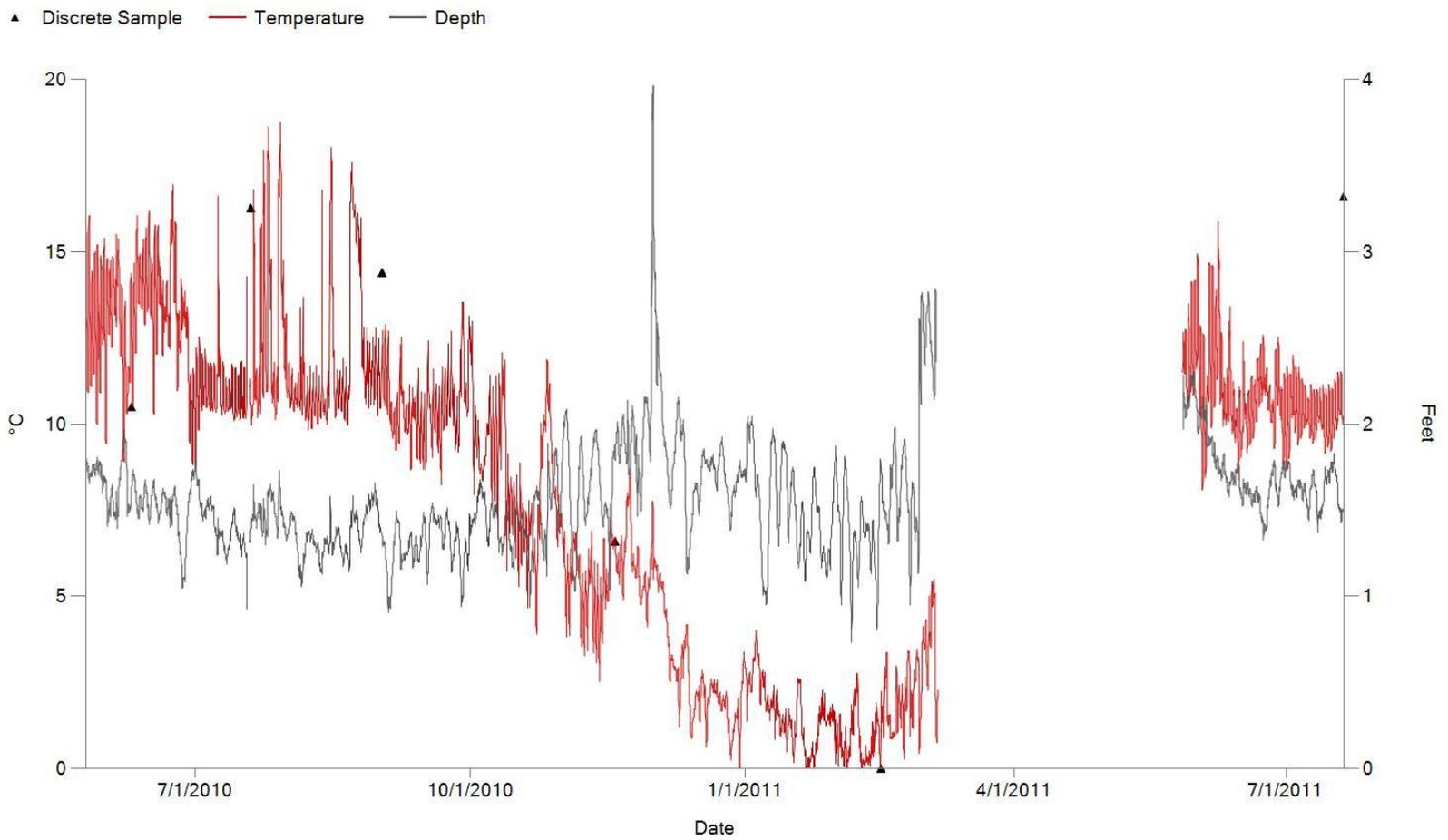


Figure 2. Continuous water temperature, continuous depth (not corrected), and discrete samples from May 26, 2010 to July 20, 2011.

**Specific Conductance:** Average: 61.2  $\mu\text{S}/\text{cm}$ ; Maximum: 113.0  $\mu\text{S}/\text{cm}$ ; Minimum: 28.0  $\mu\text{S}/\text{cm}$ .

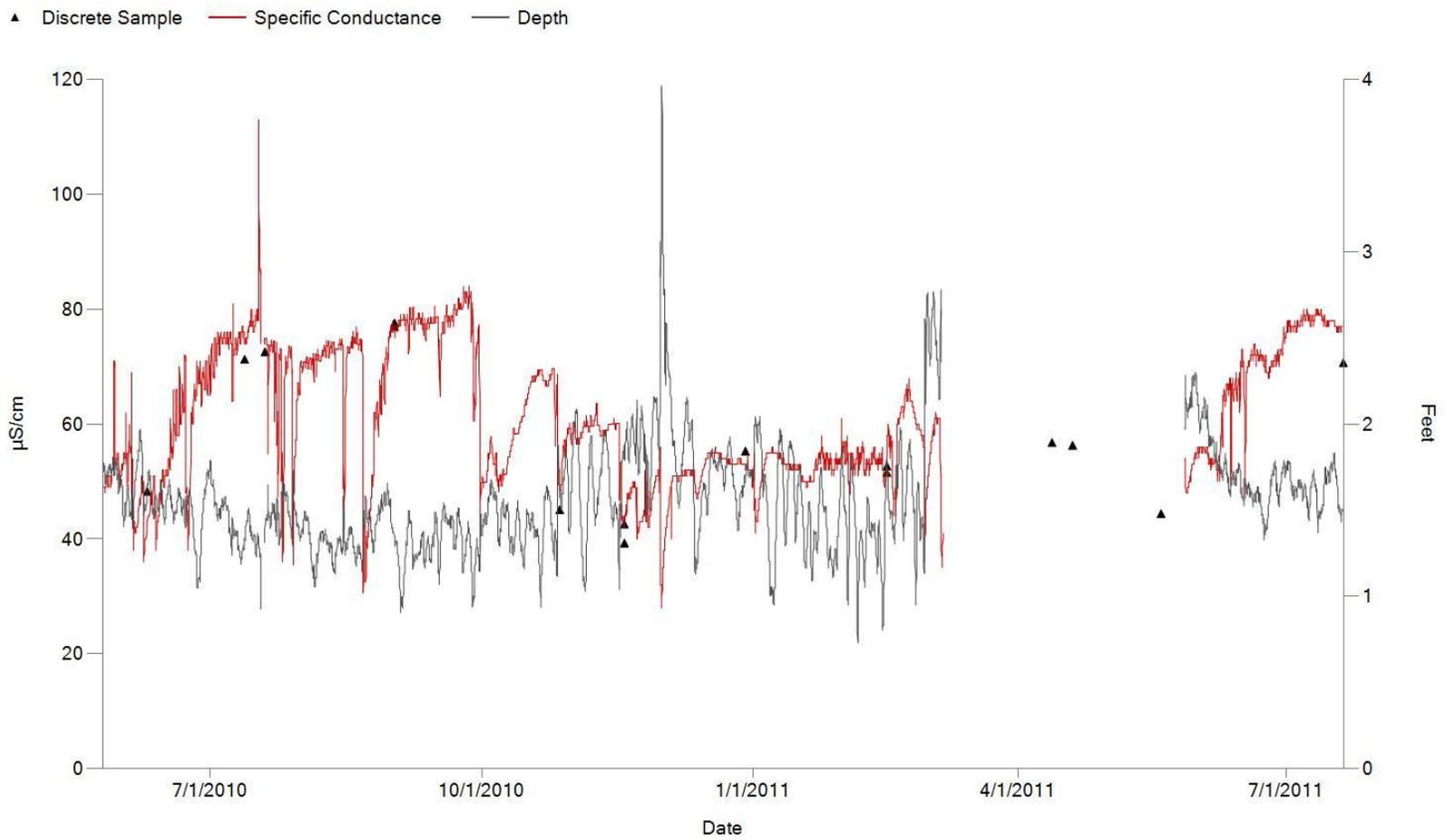


Figure 3. Continuous specific conductance, continuous depth (not corrected), and discrete samples from May 26, 2010 to July 20, 2011.

**pH:** Average: 6.43; Maximum: 7.12; Minimum: 4.8

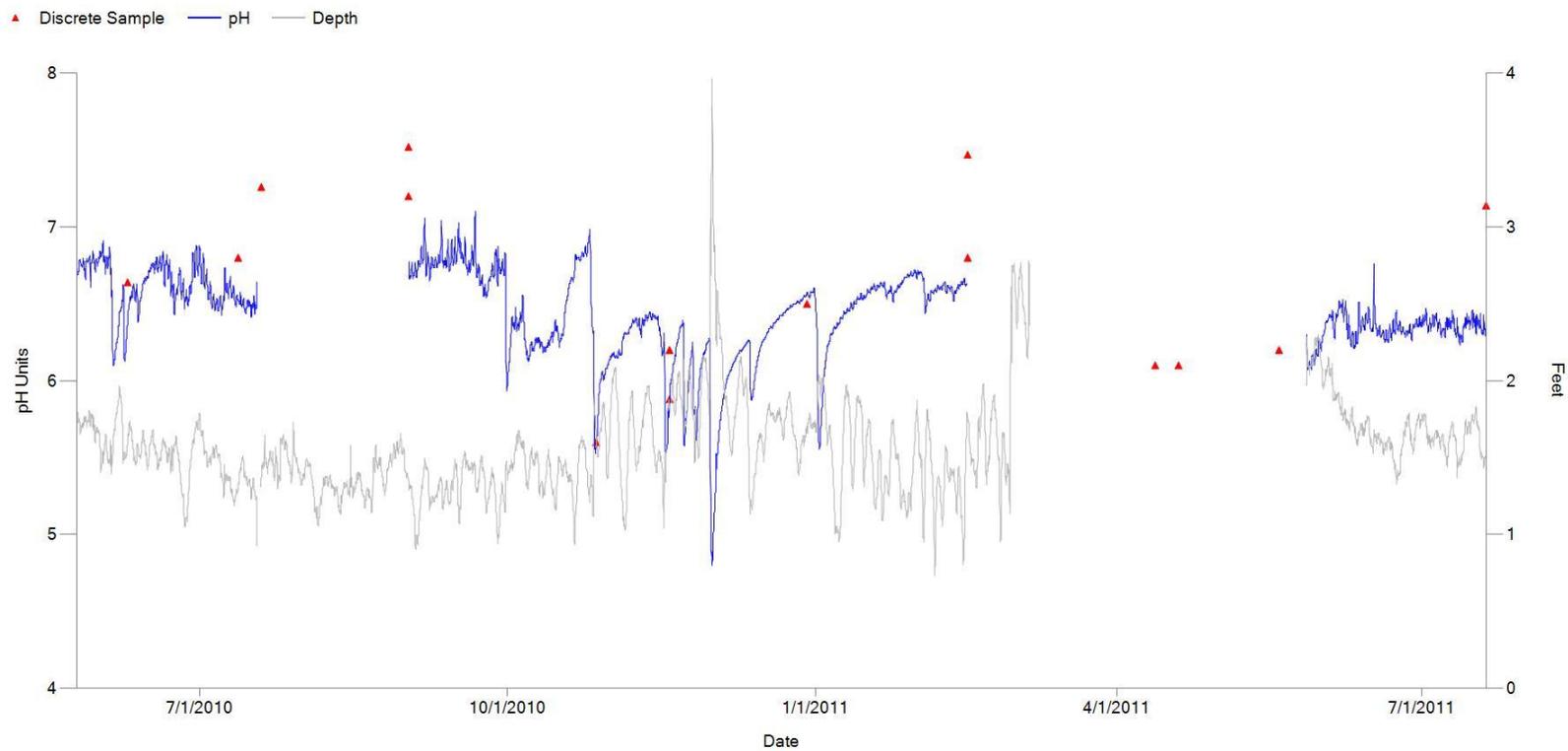


Figure 3. Continuous pH, continuous depth (not corrected), and discrete samples from May 26, 2010 to July 20, 2011

**In-situ Water Chemistry:** Samples were collected ten times using standard analysis code 046. Measurements with "<" indicate concentrations below the reporting limit.

Table 1. Chemical grab sample results.

PARAMETER	UNITS	6/9/2010	7/12/2010	9/1/2010	10/27/2010	11/18/2010	12/29/2010	2/15/2011	4/12/2011	4/19/2011	5/19/2011
		12:55	13:30	10:00	10:30	9:00	10:30	10:55	10:35	10:00	10:45
ALKALINITY	MG/L	5.6	10	13.4	0.8	1.6	4.2	5.6	1.4	1.4	1.4
ALUMINUM T	UG/L	<200	<200	<200	541	267	<200	<200	<200	<200	264
AMMONIA T	MG/L	0.03		<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
ARSENIC T	UG/L	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3
BARIUM T	UG/L	39	43	40	48	39	41	40	44	40	36
BOD	MG/L	0.8	<0.2	0.5	0.4	0.3	0.4	0.7	0.6	2	0.8
BORON T	UG/L	<200	<200	<200	<200	<200	<200	<200	<200	<200	<200
BROMIDE T	UG/L	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50
CALCIUM T	MG/L	3.358	5.016	5.649	2.437	2.348	3.546	3.684	2.765	2.55	2.257
HARDNESS T	MG/L	13	20	21	9	9	14	14	11	10	9
IRON T	UG/L	204	94	70	493	148	35	34	137	112	146
MAGNESIUM T	MG/L	1.109	1.719	1.773	0.756	0.798	1.239	1.255	1.004	0.88	0.759
MANGANESE T	UG/L	57	25	25	183	90	41	40	44	42	51
OSMOTIC PRESSURE	MOSM	<1	<1	<1	<1	2	2	3	4	2	<1
SELENIUM T	UG/L	<7	<7	<7	<7	<7	<7	<7	<7	<7	<7
SODIUM T	MG/L	2.49	4.538	4.222	2.74	2.528	3.471	2.863	4.397	4.021	3.147
STRONTIUM T	UG/L	16	19	25	12	12	18	18	15	13	12
CHLORIDE T	MG/L	5.01	8.99	9.91	5.08	4.94	5.98	5.51	7.58	7.32	5.04
TDS @ 180C	MG/L	36			36	46	44	52	40	62	30
NITRATE & NITRITE T	MG/L	0.23	0.35	0.27	0.12	0.21	0.44	0.36	0.42	0.47	0.24
PHOSPHORUS T	MG/L	0.013		<0.01	0.014	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
SULFATE T	MG/L	6.08	5.99	5.62	6.74	6.99	6.6	7.02	7.06	7.14	7.16
TSS	MG/L	16	<5	<5	<5	<5	<5	8	<5	<5	<5
ZINC T	UG/L	<10	<10	<10	18	16	<10	<10	14	12	12

**Biology:** The indigenous aquatic community is an excellent indicator of long-term conditions and is used as a measure of water quality. Benthic macroinvertebrates were collected on 11/18/2010 (20101118-0900-jessimille) and again on 05/19/2011 (20110519-1100-jessimille) (Table 2).

Table 2. Taxa lists for benthic macroinvertebrate surveys.

ORDER	FAMILY	GENUS	20101118-0900- jessimille	20110519-1100- jessimille
Ephemeroptera	Siphonuridae	Siphonurus	1	
Ephemeroptera	Heptageniidae	Epeorus	4	2
Ephemeroptera	Heptageniidae	Maccaffertium	7	3
Ephemeroptera	Ephemerellidae	Eurylophella	7	
Ephemeroptera	Leptophlebiidae	Paraleptophlebia	2	
Ephemeroptera	Ephemeridae	Litobrancha	3	
Odonata	Gomphidae	Lanthus	1	
Odonata	Cordulegastridae	Cordulegaster	1	1
Plecoptera	Peltoperlidae	Tallaperla	4	
Plecoptera	Nemouridae	Amphinemura		5
Plecoptera	Leuctridae	Leuctra	29	49
Plecoptera	Capniidae	Paracapnia	21	
Plecoptera	Perlidae	Acroneuria		1
Plecoptera	Perlodidae	Isoperla		1
Plecoptera	Chloroperlidae	Alloperla		3
Plecoptera	Chloroperlidae	Sweltsa	5	1
Trichoptera	Philopotamidae	Dolophilodes	1	1
Trichoptera	Polycentropodidae	Polycentropus	1	
Trichoptera	Hydropsychidae	Ceratopsyche	3	
Trichoptera	Hydropsychidae	Hydropsyche	3	
Trichoptera	Rhyacophilidae	Rhyacophila	11	2
Trichoptera	Lepidostomatidae	Lepidostoma	3	5
Trichoptera	Limnephilidae	Pycnopsyche	15	
Trichoptera	Uenoidae	Neophylax	1	3
Coleoptera	Elmidae	Optioservus	7	2
Coleoptera	Elmidae	Oulimnius	17	38
Diptera	Ceratopogonidae	Probezzia	1	
Diptera	Tipulidae	Tipula	1	
Diptera	Tipulidae	Antocha		2
Diptera	Tipulidae	Dicranota		2
Diptera	Tipulidae	Hexatoma	3	1
Diptera	Tipulidae	Limnophila	3	
Diptera	Simuliidae	Simulium		6
Diptera	Chironomidae		67	76
Oligochaeta (Class)			3	2
Decapoda	Cambaridae			1

## ASSESSMENT:

**Continuous:** Overall, parameters collected by the instream monitor indicate good, but not excellent water quality conditions. Specific conductance data shows multiple erratic spikes in values throughout the period, which could be attributed to periodic fouling or influence from Forest Highway 186, a dirt and gravel road, located just upstream. Overall specific conductance typically decreases with increased stage or depth. pH measurements ranged 6.0 to just above 7.0 June through September. From about October 2010 through at least January 2011 pH values significantly decrease with increased stage. The two most significant pH depressions occurred late October (10/25/2010 through 10/27/2010) and late November/early December (11/30/2010 through 12/1/2010). In late October pH decreased 1.44 standard units over a 42-hour period with a low of 5.54. In late November/early December pH decreased 1.49 standard units over a 20-hour period with a low of 4.79 (Figure 3). This is not atypical of streams with limited buffering capacity like Glad Run where alkalinity ranges 1.4 to 13.4 mg/l throughout the year (Table 1).

**Biological:** The benthic macroinvertebrate community is influenced by seasonal acid deposition. Both the November 18, 2010 and May 19, 2011 collections were affected by acidic events. The November sample has elevated taxa richness and diversity but a depressed contribution of intolerant taxa including mayflies. The May sample has depressed taxa richness, depressed diversity, and a lower contribution of intolerant taxa. Chironomidae was the dominant taxon from both collections.

Table 3. Macroinvertebrate metric calculations.

Date	IBI	Richness	Mod EPT	HBI	% Dom	% Mod May	Beck3	Shannon Div
20101118-0900-jessimille	75.5	29	14	3.49	29.6	8.8	27	2.58
20110519-1100-jessimille	64.7	23	12	3.73	36.5	2.4	24	1.96

## SUMMARY:

Overall water quality is good with seasonal acid deposition impacts. Specific conductance over the period was low with multiple erratic spikes that could have been the result of influence from a dirt and gravel road located just upstream. Maximum specific conductance values were highest throughout the low-flow summer months. The seasonality characterized by the samples collected from Glad Run is not unusual and is described as an acute or seasonal affect. It is very important to appreciate this seasonality when sampling to characterize either baseline or cause/effect.

## **LITERATURE CITED**

PA DEP. 2009. Instream Comprehensive Evaluations (ICE).  
[http://files.dep.state.pa.us/Water/Drinking%20Water%20and%20Facility%20Regulation/WaterQualityPortalFiles/Methodology/ice\\_2009am.pdf](http://files.dep.state.pa.us/Water/Drinking%20Water%20and%20Facility%20Regulation/WaterQualityPortalFiles/Methodology/ice_2009am.pdf)