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# **LARRYS CREEK WATERSHED COLDWATER CONSERVATION PLAN**

*Lycoming County, PA*

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and

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Trout Run, PA

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## **INTRODUCTION**

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In 2006, the Jersey Shore Joint Area Water Authority recognized the possibility of potential threats to the water supply. In an effort to address potential problems the Authority created a Source Water Protection Steering Committee and developed a Source Water Protection Plan. This plan clearly identified actual and potential sources of contamination to the water supply. The plan aids the community in educating the public on the importance of the drinking water source and provides a comprehensive action plan in case of an emergency.

After the development of the Source Water Protection Plan it was determined that a watershed organization should be created to help educate and protect the drinking water source. The Larrys Creek Watershed Association formed in 2008 with a mission to conserve the natural and cultural resources of the Larrys Creek Watershed through stewardship and education.

The Larrys Creek Watershed Association was awarded a Cold Water Heritage Grant in 2010 to complete a Cold Water Heritage Plan. The Larrys Creek Watershed Association wanted to learn more about the state of the creeks and how they could protect them in the future. This project enabled the Larrys Creek Watershed Association and the Lycoming County Conservation District to compile and summarize biological, chemical, and physical data in this Cold Water Conservation Plan. The goals of this plan were to record baseline conditions of the watershed and develop future management strategies to protect this valuable resource.

## **WATERSHED DESCRIPTION**

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Larrys Creek is a 22.9 mile long tributary to the West Branch Susquehanna River. The Watershed drains 89.1 square miles in six townships and the Salladasburg Borough. The Larrys Creek Watershed located entirely in Lycoming County, Pennsylvania. The watershed accounts for 7.17% of the county area. It lies in between Pine Creek to the west and Lycoming Creek Watershed to the east.

In the 19<sup>th</sup> century, the watershed was the center of lumber and other industries, including 53 saw mills, leather tanneries, coal and iron mines. Today, the Larrys Creek Watershed is 83% forest, 16% agriculture, and includes trout fishing, canoeing, hunting camps, lumber companies and the water filtration plant. Currently, this watershed is being explored for Marcellus natural gas extraction.

## **WATER COURSE**

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The headwaters of Larrys Creek begin in Cogan House Township just south of Stream Valley. It then flow southwest through the Village of Cogan House and then under the “Buckhorn Covered Bridge” and into State Game Lands 114 for about three miles through Mifflin Township and into Anthony Township where it meets the Jersey Shore Area Water Authorities Water Filtration Plant.

Further south Roaring Run enters on the left bank. This is the only Acid Mine Drainage in the Watershed. The mine drainage comes from an old culm bank on Bobst Mountain.

Larrys Creek then heads back into Mifflin Township, through the Borough of Salladasburg running parallel to State Route 973. At Salladasburg the Larrys Creek receives its longest tributary the Second Fork of Larrys Creek.

The Second Fork of Larrys Creek begins in Pine Township and runs through Cogan House Township through the Village of Brookside, running parallel State Route 287 through Cummings Township, Mifflin and eventually making to Larrys Creek at Salladasburg Borough.

Just south of Salladasburg, Larrys Creek receives the First Fork of Larrys Creek. Then the creek enters Piatt Township and flowing east through Larryville still running parallel of State Route 287 and under the State Route 220 Bridge at the confluence of the West Branch of the Susquehanna River.

## **TRIBUTARIES**

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Major tributaries from the headwaters (Cogan House Township): Unnamed, Birch Run, Unnamed, Dibber Hollow Run, Wolf Run, Unnamed, Crayton Hollow Run, Wendell Run, Long Run, Roaring Run, Marsh Run, Unnamed, Second Fork Larrys Creek, First Fork Larrys Creek, Canoe Run, Seeley Run, Unnamed (in Geiler Hollow).

<b>Major Tributaries to Larrys Creek</b>	<b>Drainage Area (square miles)</b>	<b>% of total Watershed</b>
Roaring Run		5.7%
Second Fork Larrys Creek	24.9	28%
Lawshee Run		<5%
First Fork	17.6	19.8%
Canoe Run		<5%

## **GEOLOGY**

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Larrys Creek flows through the Allegheny Plateau to the Ridge-and-Valley Appalachians through sandstone, limestone, and shale. The southern part of the watershed is sedimentary rocks from the Devonian period. The northern sections are mostly from the Mississippian Period with a small portion of the area from the Pennsylvanian periods. Larrys Creek and Roaring Run watersheds are mostly underlain by the Catskill Formation (48%), Burgoon Sandstone (18%) and the Mauch Chunk Formation (17%).

The Catskill Formation is complex; consisting of shale, siltstone, sandstone, and conglomerate. The permeability of the formation is low to moderate. The water quality is generally good to excellent.

The Burgoon Sandstone is a medium-grained, cross bedded sandstone. It includes shale and coal and conglomerates at base. The sandstone also contains plant fossils.

Maximum thickness is about 300 feet. The permeability is high. This sandstone is an excellent aquifer. Iron and salt maybe encountered in deep wells.

The Mauch Chuck Formation are shales, claystone, sandstone and siltstone with a maximum thickness of 3,000 feet. The permeability is moderate to low. Iron content maybe high, however water quality is generally good and the water is soft.

The Larrys Creek watershed has two deposits of low volatile bituminous coal along Roaring Run. Iron oar was found south of Salladasburg along Canoe Run and was mined in the 19<sup>th</sup> Century.

The Marcellus Shale Formation is an organic-rich black shale that was deposited in an oxygen-deficient marine environment during Middle Devonian time (~390 million years ago). The formation is now been explored in Larrys Creek Watershed for Natural Gas.

## **TOPOGRAPHY**

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The Larrys Creek Watershed lies within the Appalachian Plateau and the Ridge-and-Valley physiographic Providences. The watershed is characterized by moderately steep to steep slopes with a high elevation of 2,050 feet and a low elevation of 930 feet. The drainage patterns are described as angulated and rectangular.

## **SOILS**

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The majority of the soils in the Larrys Creek Watershed are made of the Oquaga, Dekalb, Clymer and Leck Kill Series. The USDA Natural Resources Conservation Service describes the Oquaga Series as sloping to very steep, moderately deep, well drained soils found on glaciated, dissected mountaintops and mountainsides. These soils are suited for pastures and woodlots.

The Dekalb Series soils are gently sloping to very steep, moderately deep, well drained soils generally found on mountainsides and ridges. These soils are suited for pastures, woodlots and in some cases cultivated crops.

The Clymer Series are described as deep and well drained. They are usually found on mountaintops and benches. Mostly used for woodlots. However some are used for cultivated crops and pastures or are in urban areas.

The Leck Kill Series consists of deep, well drained soils, on ridge tops and convex hillsides. Mostly used for cropland, but can be used for pasture, woodlots, or urban uses.

The Oquaga, Dekalb, Clymer and Leck Kill Series all are limited by slope and depth of bedrock making these soils a poor filter for contaminants and promote run-off of these contaminates.

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## **WATER USES**

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### ***Water Supply***

The Jersey Shore Joint Area Water Authority has 7,500 customers serving a population of approximately 2,500. The two primary surface water intakes are located on Larrys Creek and Roaring Run, a tributary to Larrys Creek. The Water Filtration Plant on Larrys Creek is a 1.5mgd gravity fed filtration plant. Approximately 98% of the systems water supply is drawn from Larrys Creek.

### ***Marcellus Water Withdrawals***

According to the Susquehanna River Basin Commission there are 38 approved gas pads in the Larrys Creek Watershed. There is one approved surface water withdraw for EXCO-North Coast in Mifflin Township. They are permitted for .086mgd with a max of 60gpm with no pass by requirement. There is one pending application by Anadarko to be located on Dam Run Road. Jersey Shore Joint Area Water Supply also sells water from their Larrys Creek Filtration Plant.

## **WATER QUALITY**

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### ***Impaired Waters***

Section 303d of the Federal Clean Water Act requires Pennsylvania to identify all impaired waters. Within Larrys Creek Watershed there are only two streams (First Fork Larrys Creek and Roaring Run) listed as impaired. First Fork of Larrys Creek is impaired for 5.1 miles due to Atmospheric Deposition which causes pH problems.

Roaring Run is impaired for 3.7 miles due to Acid Mine Drainage caused by a groundwater seep from historic coal mining site which lowers the stream pH to 5.5. Although that it is listed as impaired, it serves as a secondary water intake for the Jersey Shore Water Authority. The Roaring Run Watershed is highly forested and the water intake is located at the bottom of the watershed. Roaring Run is much clearer raw water and reduces the chemical treatment cost during higher flows when Larrys Creek has a much higher turbidity.

### ***DEP Special Protection Waters***

The Department of Environmental Protection reevaluated Larrys Creek Watershed as part of their review of the Chapter 93. Water Quality Standards (WQS) which determines the protected uses for all Pennsylvania surface waters, including fish and aquatic life, water supply, water contact recreation and special protection; and establishes the water quality criteria for physical, bacteriological, chemical and radiological contaminants to protect the surface water uses.

In the evaluation of Larrys Creek Watershed 14 of the 16 stations the benthos reflected Exceptional Value (EV) conditions. Exceptional Value waters are the highest protect use regulated under Chapter 93 and state the water quality of Exceptional Value Waters shall be maintained and protected. These candidate stations scored 93-100% compared to the reference reaches located in Kettle Creek, Slate Run and Marsh Creek. Two of the 16 did not meet special protection criteria and were not recommended for an upgrade to Exceptional Value.

As a result, in 2010, the Existing Use regulatory changes were made. Larrys Creek Basin to Wolf Run remained High Quality Cold Water Fishery (HQ-CWF). Wolf Run Basin was upgraded from HQ-CWF to EV. Larrys Creek Basin, Wolf Run to Wendell Run was upgraded from HQ-CWF to EV. Wendell Run Basin remained a High Quality Cold Water Fishery (HQ-CWF). Larrys Creek Basin from Wendell run to Second Fork was upgraded from HQ-CWF to EV. Both Second Fork and First Fork Basins were upgraded from HQ-CWF to EV. Larrys Creek Basin from Second Fork to the mouth was upgraded from a Warm Water Fishery (WWF) to EV.

### ***PAFB Stream Classifications***

The PA Fish and Boat Commission designates Larrys Creek from the water company filtration plant downstream to 1.0 mile downstream of confluence with First Fork Larrys Creek as an approved Trout Waters. These waters have significant portions that are open to public fishing and are stocked with trout by the Commission.

Wild Trout Waters (Natural Reproducing) are the streams sections supporting naturally reproducing populations of trout. A wild trout stream section is a biological designation that does not determine how it is managed; therefore, these streams may also be stocked with hatchery trout by the Commission. In the Larrys Creek Watershed there are thirty-one streams listed;

Larrys Creek (from Wendell run to mouth), Long Run, Mash Run, Match Pine Hollow, Pond Hollow, Pot Lick Hollow, Roaring Run, Spook Hollow, Watt Hollow

Second Fork Larrys Creek, Cold Spring Hollow, De France Hollow, Funston Run, Left Fork Funston Run (trib. to Funston Run), Harbor Run, Joes Run, Kline Hollow, Little Sandy Hollow, Little Harbor Run (trib. to Little Sandy Hollow), Lawshe Run Bear Hollow (trib. to Lawshe Run), Thompson Hollow

First Fork Larrys Creek, Buckhorn Run, Dog Run, Little Dog Run (trib to Dog Run), Hickory Swale, Jacobs Hollow, Marsh Run, Pot Lick Cove Run, Tarklin Hollow

## **CURRENT MONITORING EFFORTS**

### ***SRBC Realtime Data***

The Susquehanna River Basin Commission (SRBC) initiated the establishment of the Remote Water Quality Monitoring Network.. This monitoring network continuously measures and reports water quality conditions of smaller rivers and streams located in northern tier Pennsylvania and southern tier New York. The data helps agency officials track existing water quality conditions and any changes in them on an ongoing, real-time basis. The stations are operating in areas where drilling for natural gas is most active, as well as other locations where no drilling activities are planned so SRBC can collect control-data.

The monitoring network provides constant data collection with instruments sensitive enough to detect subtle changes in water quality on a frequency that will allow background conditions and any changes to them to be documented throughout the year. The following five water quality parameters are being measured at each station: temperature, pH, conductance, dissolved oxygen, and turbidity.

The Larrys Creek Monitoring location is at The Larryville Water Filtration Plant on Larrys Creek. Data can be viewed in real-time and can download quarterly data. [http://mdw.srbc.net/remotewaterquality/data\\_viewer.aspx](http://mdw.srbc.net/remotewaterquality/data_viewer.aspx)

### ***Lycoming County Floodready***



Larrys Creek County Stream Gauge at Salladasburg data is available on the Lycoming County website. Stream height is recorded on a daily basis and can be viewed with historical crest and Caution Stage. Caution Stage is listed as 4 feet and record crest of 8 feet during Hurricane Ivan 9/18/2004. Note: There is no USGS Gauging Station within the Larrys Creek Watershed.

<http://www.lyco.org/Home/FloodReady/CountyWatershedsStreamGaugeSites/LarrysCreek.aspx>

The County Flood Ready Program also monitors rainfall data every 10 minutes. There are two locations in the Larrys Creek watershed one is at Salladasburg and the other in White Pine.

<http://www.lyco.org/Home/FloodReady/CountyWatershedRainfall.aspx#Larrys>

### ***Larrys Creek Watershed Association Stream Monitoring Program***

The Larrys Creek Watershed Association was able to purchase two water monitoring kits with the funding provided by the Cold Water Heritage Grant. The watershed volunteers monitor six stations monthly before their monthly board meeting. For list of sampling locations (See Appendix: LCWA Monitoring Data)

The LCWA monitors the temperature, pH, alkalinity, total dissolved solids, salinity, conductivity, dissolved oxygen, nitrate nitrogen and phosphates.

Temperature can be up to 18.8C for cold water streams. In August, all sampling location exceeds 18.8 degrees Celsius for cold water fish habitats with temperature ranging from 20.3-27.3C.

pH is the concentration of hydrogen ions and is the measure of acid and basic compound in the water. The pH range 6.5-8.2 is optimal, with a pH of 7 as neutral. All sampling locations were within the optimal range with pH ranging from 7.01-8.30. Low pH can affect the biological productivity of a stream as well allow dissolved metals precipitate out, as in the case of Acid Mine Drainage.

Alkalinity is the carbonate compounds found in nature that provide a natural buffering. The Pa standard for alkalinity is 20mg/l, 100-200 mg/l is considered optimal. All sampling location except LC-1, Larrys Creek Covered Bridge, had low alkalinity of



<20ppm. Low alkalinity can not mediate or buffer low pH events for example acid rain events.

Total dissolved solids (TDS) are the amount of suspended matter in the water (anions and cations) such as calcium, sodium, sulfates, orthophosphates, and other dissolved chemicals. The max level for TDS is 1500 mg/l. New drinking water standards have lowered the level to 500 mg/l. All sampling locations were within the optimal range with TDS ranging from 24.6- 102 mg/l.

Salinity is the measure of concentration of salt in the water. The EPA standard for salinity is <250 mg/l anything less than 500 mg/l is considered freshwater. High salinity could be the result of Marcellus brine flow back or from winter application of salt to the roadways as a deicing agent. All sampling locations were within the optimal range with salinity ranging from 19.2-66.5 mg/l.

Conductivity is an indicator of the amount of total dissolved solids and is affected by temperature. The conductivity is usually 50-1500micromhos; all sampling locations were within the optimal range with conductivity ranging from 19.5-144 micromhos.

Dissolved oxygen (DO) is the amount of oxygen in water. DO levels are controlled by respiration and photosynthetic activities. Higher levels are late in the day and are lower in the morning. DO less than 3-4 mg/l is stressful to aquatic life and 6 mg/l is best for cold water fish. All sampling locations were within the optimal range with DO ranging from 6-9 mg/l. All samples were taken in the late afternoon.

Nitrogen compounds act as nutrients in streams and rivers. Nitrate reactions in fresh water can cause oxygen depletion which can effect aquatic organisms depending on the supply of oxygen in the stream. Nitrogen can get to a steam by municipal and industrial wastewater, septic tanks, feed lot discharges, animal wastes and discharges from car exhausts. Nitrate nitrogen is the most abundant form on nitrogen is usually <1 mg/l and rarely exceeds 10 mg/l. The drinking water standard is 10 mg/l. Algae can use nitrogen for grown high levels of nitrogen can lead to large algal blooms. All sampling locations were within the optimal range with nitrates ranging from <.25-.5 mg/l.

Phosphorus levels are usually <1mg/l. High levels of phosphorus can stimulate plant production. High phosphorus levels in stream can result from fertilizers use, animal waste and the use of phosphate detergents. All sampling locations were within the optimal range with phosphorus ranging from <1 mg/l. (See Appendix: LCWA Monitoring Data)

## **IDENTIFIED POTENTIAL IMPACTS**

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### ***Acid Rain***

Acid rain effects on forests and soils, streams and lakes, fish and other organisms, materials, and human health. First Fork of Larrys Creek is impaired for 5.1 miles due to Atmospheric Deposition which causes pH problems. Since the passing of the Clean Air Act the pH has been improved in this area. In the 2004 Mercury in Rain Report form DEP Bureau of Air Quality the average pH ranged from 4.14- 4.18 in 1983-1994. 1995-2006 the average pH has increased 4.34-4.38. (See Appendix: Average pH Map)

### ***Acid Mine Drainage***

Acid Mine Drainage (AMD) is formed when water and oxygen interact with iron pyrite (Fools Gold) which is found with the coal in the mine. The chemical reaction produces sulfuric acid which lowers the pH and leaches metals out of the mine. Roaring

Run is impaired for 3.7 miles due to Acid Mine Drainage caused by a groundwater seep from historic coal mining site which lowers the stream pH to 5.5 fortunately for Roaring Run metals such as aluminum and iron are very low concentrations compared to other AMD Site in the West Branch Basin.

### ***Active Farming Practices***

Cogan House Township is a rural agricultural township in the headwaters of Larrys Creek. Currently, there are 11 active farms within the headwaters ranging from crops, dairy, cattle and one proposed hog operation. Many of the farmers have installed best management practices (BMPs) on their farms to control runoff. The Conservation District and the Natural Resource Conservation Service continue to work with these farms to keep there plans updated and encourage more BMPs.

### ***Aging Onlot Septic Systems***

On lot septic systems are utilized in the Larrys Creek Watershed Association because there are no municipal sewage systems. The townships could have an ordinance to routinely inspect and pump the systems. To date none of the townships in the watershed have done this so failing septic systems are a concern to the surface water as well as private drinking water supplies.

### ***Marcellus Gas Development***

Currently, there are 38 approved gas pads in the Larrys Creek Watershed. The Cogan House and Mifflin townships have seen an increase in activity. With increase in activity there have been concerns over the traffic, road conditions, lack of erosion and sedimentation controls, private water supply quantity and quality. The most recent incidents are from the pipeline boring under the stream and the bentonite mud made it up into the streambed and impacted a cattle barn water supply. (See Appendix: Gas Well Map)

### ***Illegal Dumping***

In 2011, PA Cleanways surveyed illegal dumpsites in Lycoming County. There were 6 dumpsites identified in Cogan House Township with an estimated 9 tons, all of which were with 100 feet of a waterway. Two dumpsites were identified in Mifflin Township with 2.25 tons within 100 feet from a waterway. In Anthony Township, 5 sites were located with 13.75 tons. The largest dumpsite is located on Clark Hill Road with estimated 6 tons all located within 100 feet of the waterway. Piatt Township had 4 sites identified and 6.25 tons most are within 50 of the waterway. (See Appendix: Illegal Dumpsites Map)

### ***Stream Bank Erosion***

The Larrys Creek Watershed has few stream bank erosion sites. The overall the stream channel is stable. The biggest erosion concern is the Larryville Site just north of Larryville on Route 287. Since the Flood of 1996, the channel has been unstable and gradually working itself into the farm field. In 2010, the erosion accelerated and has now cut a relief channel through the field. Anadarko Petroleum Corporation is working with McTish and Kunkle Consulting on a mitigation project for their pipeline. They are looking at doing a natural channel design project there in the summer of 2012. (See Appendix: Larryville Site Photos)

## **RECOMMENDATIONS**

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**1. Establish a long-term stream monitoring program.**

Continue the Larrys Creek Watershed Association's monitoring program. To record any changes, potential impacts and build upon the baseline water quality data collect with this grant.

**2. Assist private landowners to do conservation practices (wetland restorations, riparian plantings, etc.)**

Continue advocating to the public about conservation practices for the farm and home. Assisting landowners on good best management practices and permitting requirements.

**3. Assist with future mitigation projects for the impacts from Natural Gas Development.**

Continue to work with industry partners in need of mitigation projects for their stream and wetland impacts by providing potential site locations and landowner contacts.

**4. Continue public education and outreach efforts.**

Continue to hold public education and outreach meetings and workshops on topics pertinent to the Larrys Creek Watershed such as LCWA activities, project updates, Marcellus gas development, best management practices, farming, and the Jersey Shore Joint Water Authority.

## **ACKNOWLEDGMENTS**

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Funding for this project was provided by the Cold Water Heritage Partnership, a collaborative effort between Pennsylvania Fish and Boat Commission, Pennsylvania Department of Conservation and Natural Resources, Foundation for Pennsylvania Watersheds and the Pennsylvania Chapter of Trout Unlimited.

## **RESOURCES**

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*Pennsylvania Department of Environmental Protection- Reassessment of Larrys Creek Watershed Report. 2010*

*Jersey Shore Joint Area Water Supply and Pa Rural Water- Source Water protection Plan. 2008*

*Jersey Shore Joint Area Water Supply and Spotts Steven and McCoy Inc.- Source Water protection Plan. 2003*

***Lycoming County Flood Ready Data***

<http://www.lyco.org/Home/FloodReady>

***Susquehanna River Basin Commission- Remote Water Quality Data***

[http://mdw.srbc.net/remotewaterquality/data\\_viewer.aspx](http://mdw.srbc.net/remotewaterquality/data_viewer.aspx)

***PALMS: Pa Lake Management Society- Water Quality Parameters***

<http://palakes.org/resources/publications>

***Pennsylvania Department of Environmental Protection- Water Quality Standards***

[http://pa.gov/portal/server.pt/community/water\\_quality\\_standards/10556](http://pa.gov/portal/server.pt/community/water_quality_standards/10556)

***Pennsylvania Department of Environmental Protection- Air Quality***

<http://www.dep.state.pa.us/dep/deputate/airwaste/aq/acidrain/isomaps.htm>

***Pennsylvania Fish and Boat Commission: Trout Water Classifications***

[http://fishandboat.com/waters\\_trout.htm](http://fishandboat.com/waters_trout.htm)

***Pennsylvania DCNR- Bureau of Forestry: Tiadaghton Forest District***

<http://www.dcnr.state.pa.us/forestry/stateforests/tiadaghton/index.htm>

***Pennsylvania Game Commission- State Game Lands 114 Maps***

[http://www.portal.state.pa.us/portal/server.pt/gateway/PTARGS\\_0\\_2\\_126465\\_11363\\_0\\_43/http%3B/www.sgl.state.pa.us/zoom\\_maps.aspx?rgn=Northcentral&sgl=114](http://www.portal.state.pa.us/portal/server.pt/gateway/PTARGS_0_2_126465_11363_0_43/http%3B/www.sgl.state.pa.us/zoom_maps.aspx?rgn=Northcentral&sgl=114)

***Penn State Cooperative Extension- Natural Gas Information***

<http://extension.psu.edu/naturalgas>

***Penn State University- Marcellus Center for Outreach and Research***

<http://www.marcellus.psu.edu/resources/maps.php>

***Lycoming County Gas Taskforce- Lycoming County Drilling Sites***

<http://www.lyco.org/Home/GasExplorationTaskForce/DrillingSites.aspx>

***US Geologic Survey Historical Chemical Data***

USGS 01549782 – Larrys Creek at Salladasburg 1979-1981

USGS 01549790- Larrys Creek at Larrys Creek 1970-1975

<http://nwis.waterdata.usgs.gov/>

**APPENDIX**

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Larrys Creek Watershed Map

Redesignation Changes in the Larrys Creek Watershed

Lycoming Creek Watershed Association: Monitoring Data

Average pH Map from the 2004 DEP Mercury in Rain Report

Lycoming County Gas Well Location Map

Illegal Dump Survey Map

Larryville Project Site Photographs

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