



PATU COLDWATER CONSERVATION CORPS



FIELD MANUAL

VERSION 2.3

May 2014





The PATU Coldwater Conservation Corps field manual was created to provide volunteers that have been trained as part of Trout Unlimited's Coldwater Conservation Corps with a reference document while engaging in water quality monitoring in the field. The field manual may not be used, reproduced or distributed without prior permission from Trout Unlimited. Please contact Jake Lemon, TU eastern shale gas monitoring coordinator at jlemon@tu.org with questions or inquiries.

TABLE OF CONTENTS

	<u>PAGE</u>
ACKNOWLEDGEMENTS	i
INTRODUCTION	1
ISSUES AND CONCERNS	3
Land Disturbances	3
Spills and Other Discharges	3
Water Withdrawal	3
Gas Migration or Leakage	4
DECIDING WHERE TO MONITOR AND CONDUCT RECONNAISSANCE	5
KEY WATER QUALITY PARAMETERS	9
Temperature	9
Total Dissolved Solids	9
Conductivity	10
Turbidity	10
pH	11
Barium and Strontium	12
STREAM WATER QUALITY MONITORING	13
Some General Rules	13
Water Quality Monitoring	13
Monitoring Kit	14
Conducting Field Monitoring	14
pH measurement	15
Measuring Conductivity and TDS	15
Measuring Turbidity	16
Measuring stream flow (surrogate)	17
Quality Assurance	19
Taking Water Samples	21
Taking Soil and Sludge Samples	22
Chain of Custody	22
CONDUCTING VISUAL RECONNAISSANCE	24
WHOM TO CONTACT. . . . AND WHEN	26
PERSONAL SAFETY CONSIDERATIONS	29
APPENDIX A – Utilizing FracMapper	
APPENDIX B – Property Access Permission	
APPENDIX C – Water Quality Monitoring Forms	
Stream Monitoring Field Data Sheet	
QA/QC Data Form	

Chain of Custody Record

APPENDIX D – Visual Observation Checklist

APPENDIX E – Agency and Organization Contact Information

ACKNOWLEDGEMENTS

The original concept of the PATU Coldwater Conservation Corps can be traced to the Pine Creek Waterdog program of the Pine Creek Headwaters Protection Group. Several members of the God's Country Chapter of Trout Unlimited attended the initial Waterdog training and shortly thereafter conceived of a similar program within Trout Unlimited. The Pennsylvania State Council of Trout Unlimited (PATU) endorsed the idea, and a work group was formed to develop what is now known as the PATU Coldwater Conservation Corps program. In 2010, the original version of this manual was developed, and the Coldwater Conservation Corps program was rolled out to TU chapters across Pennsylvania. Version 2.1 of the manual reflects the knowledge gained from nearly two years of monitoring and observations in the field.

A large number of individuals and organizations contributed to the development of this manual. Individuals who provided input to the manual, authored text, and/or reviewed the draft document and provided helpful comments are listed below:

- Ted Bear, Dr. Peter Ryan, Bob Volkmar – God's Country Chapter of TU
- Deb Nardone – Coldwater Heritage Partnership and PATU (now with the Sierra Club)
- Greg Grabowicz, Terry Morrow, Jack Williams – Pennsylvania Council of TU
- Jack Fleckenstein – Potter County Conservation District
- Ed Bellis – PATU Liaison to the Coldwater Heritage Partnership
- Steve Kepler – Pennsylvania Fish and Boat Commission
- Scott Perry – Pennsylvania Department of Environmental Protection
- Julie Vastine, Jinny Woodward, Dr. Candie Wilderman – Alliance for Aquatic Resource Monitoring (ALLARM)
- Katy Dunlap, Esq. – Trout Unlimited
- Mitchell Blake – Trout Unlimited

At the time work began on the first version of the manual, the Alliance for Aquatic Resource Monitoring (ALLARM), based at Dickinson College, was developing its protocol for Marcellus stream monitoring by citizen volunteers. There was much discussion and sharing of ideas between the two groups. That collaboration has continued to this day. In addition, input from the many TU volunteers who conducted stream monitoring and visual reconnaissance and provided feedback on the manual's utility was most valuable in developing revisions.

The authors drew on a several pre-existing documents during the development of this manual. They provided much useful information and many helpful ideas and are listed below.

Marcellus Shale Gas Extraction: A study design and protocol for volunteer monitoring. Alliance for Aquatic Resource Monitoring (ALLARM), Dickinson College. Carlisle, PA. June 2010.

Pine Creek Waterdog Log Book. Pine Creek Headwaters Protection Group. Wellsboro, PA. 2009.

Designing Your Monitoring Program: A Technical Handbook for Community-Based Monitoring in Pennsylvania. Prepared by River Network and Pennsylvania Department of Environmental Protection, Bureau of Watershed Management. Harrisburg, PA. 2007.

Volunteer Stream Monitoring: A Methods Manual. U.S. Environmental Protection Agency, Office of Water. Washington, DC. 1997.

Marcellus Well Site Inspection Protocol. Pennsylvania Fish and Boat Commission. Harrisburg, PA. 2009.

Stream Testing Protocols. Delaware Riverkeeper Network, Alliance for Aquatic Resource Monitoring, and U.S. Geologic Survey. 2010.

INTRODUCTION

There is significant potential for damage to Pennsylvania's coldwater resources as a result of land disturbances, spills, water withdrawals and wastewater discharges associated with development of the natural gas resources of the Marcellus Shale. Pennsylvania citizens who value coldwater streams and fisheries can assist Pennsylvania DEP and other agencies of the Commonwealth in protecting these resources through stream monitoring and field surveillance.

Protection of coldwater fisheries is an integral part of Trout Unlimited's mission, and members of the Pennsylvania chapters of Trout Unlimited can contribute significantly through participation in the Pennsylvania TU Coldwater Conservation Corps. The Corps is a network of stream stewards who conduct stream monitoring and routine inspections of stream conditions and report problems to the appropriate agencies. Stewards also may be asked to assist in developing watershed inventories. In this fashion, we can promote early detection and reporting of problems that develop during oil and gas drilling and production activities. More than any other segment of society, it is we who spend considerable time on these streams, and thus we are well positioned to watch over them.

This manual provides guidance and instruction for PATU Coldwater Conservation Corps volunteers. It addresses topics such as: what to look for; what types of information to record; how to monitor stream water quality; how to take samples of water and soils; and whom to contact when something is thought to be amiss. It also provides information on personal conduct and safety.

This page intentionally left blank.

ISSUES AND CONCERNS

Oil and gas activities can affect streams and riparian areas in a number of ways. Some of these are discussed below.

Land Disturbances

Land disturbance for drilling pads, access roadways, pipelines, and compressor stations can cause accelerated runoff and soil erosion. This adds to the sediment loading of nearby streams and can increase stream bank erosion. Deposition of sediments into the stream adversely affects stream biota. An erosion and sedimentation control plan incorporating best management practices must be prepared and followed for all land disturbances associated with oil and gas development. In general, these measures do a good job of holding soil erosion in check. However, sometimes improperly installed or maintained erosion and sediment control measures can lead to accelerated erosion. Often access roadways are the problem, as they frequently are built on steep slopes, and routine maintenance is not a priority once a well is installed and producing. Recent events have shown that pipeline construction too can result in significant environmental insults.

Spills and Discharges

Discharges of polluted water to streams, whether intentional or not, can have a significant impact on water quality and stream biota. In extreme cases, fish kills can occur. Every producing gas well also produces some water, which is stored in a tank at the well site and periodically trucked to a treatment facility as required by Pennsylvania law. But spills do occur; and regrettably, “midnight dumping” occasionally does take place. These events can occur and important evidence can disappear before anyone takes notice, especially on more remote streams. Early detection and prompt reporting are crucial.

Water Withdrawal

Withdrawal of water from streams for use in hydraulic fracturing at gas wells can also have an adverse impact on stream biota. There are laws and regulations that are intended to protect aquatic life and drinking water sources from excess withdrawals. In the Susquehanna River basin, the Susquehanna River Basin Commission (SRBC) closely regulates these withdrawals. The Delaware River Basin Commission (DRBC) is also creating ecological flow protocols for water withdrawals. In the Ohio River basin, Pennsylvania DEP requires well drillers to follow the SRBC requirements and protocols for water withdrawals. However, on-stream metering is not required outside of the Susquehanna and Delaware River drainage basins, and there is little oversight in the field. Given the number of streams in the Allegheny River drainage, there is ample opportunity for unauthorized water withdrawals.

Gas Migration or Leakage

Leakage of natural gas into soil, springs, and waterways results from a pipeline break, a breach in the gas well casing, or other avenue. This is not so much an environmental problem as a concern for human health and welfare. Since it is colorless and odorless, when gas is routed to a pipeline, mercaptan compounds are added to provide an odor for detection. When natural gas mixes with atmospheric oxygen in the right proportions, any spark or flame can ignite the mixture. This situation is particularly dangerous when someone's potable water supply is contaminated.

DECIDING WHERE TO CONDUCT MONITORING OR RECONNAISSANCE

Each chapter must decide where to deploy its volunteer resources to maximum benefit. This is a tiered process, beginning with the entire area encompassed by the chapter and funneling down to specific stream monitoring locations or areas earmarked for visual reconnaissance.

The first step is to prioritize subwatersheds (HUC 12's) falling within the chapter's geographic area. This is accomplished using Trout Unlimited's Conservation Success Index (CSI). The CSI is a compilation and assessment of data and information related to a species' distribution, populations, habitat features, and threats. TU's science team has assembled spatial data from national, state, and non-profit resource management agencies into a database, analyzed the data by sub-watersheds, and assigned a categorical score of 5(High) to 1(Low), allowing for the investigation and comparison of conditions and threats across subwatersheds. The categories of spatial data are organized into three groups: trout populations (e.g., Class A streams), habitats (% of subwatershed impaired by acid mine drainage), and future security (20 year forecasts for Marcellus wells).

Using local, Pennsylvania-specific data, Trout Unlimited has identified a Marcellus Strategy for monitoring the impacts of Marcellus Shale drilling on water quality and aquatic communities within subwatersheds in the Marcellus Shale formation area. The Marcellus Strategy arrays forecasts for Marcellus Shale development against existing trout population scores and produces three different monitoring strategies: immediate, long-term, and baseline. Subwatersheds containing high trout population scores and not forecasted for Marcellus development are designated with a "baseline" monitoring strategy. Subwatersheds with high trout populations, containing more than five Marcellus wells, and forecasted for continued development are assigned an "immediate" monitoring strategy. Subwatersheds with high trout population scores, but currently having no active drilling, but forecast for future development, are appointed a "long-term" monitoring strategy.

The first step in deciding where to monitor is to access TU's CSI Marcellus Strategy, prioritize the subwatersheds that are assigned a strategy within your chapter, and decide which subwatershed(s) you want to monitor. Once subwatershed(s) are chosen, the next step is to identify specific streams (main stem, tributaries) of concern, taking into account PF&BC and PADEP designations of the streams, where Marcellus well pads currently exist, where Marcellus well pads are earmarked, chapter interests, etc. It may be that a member is interested in monitoring a particular stream because he or she lives on it or fishes it frequently. Ultimately, we are interested in protecting all coldwater streams, and member interest is sufficient reason to conduct baseline monitoring of a stream in the Marcellus Shale area.

The final step in the process is the selection of specific water quality monitoring locations and areas or stream reaches at which routine visual reconnaissance will be conducted. In basins where no Marcellus development has yet occurred, you will be conducting true baseline monitoring. In other cases, you will be monitoring where Marcellus development is occurring or already has occurred. When choosing monitoring sites, key considerations are manpower

constraints, accessibility, locations of major tributary streams, current or future locations of Marcellus wells, and locations of other development within the basin.

One important consideration is the location of major tributary streams. Tributary streams that appreciably increase flow in the main-stem waterway can alter water quality as well. Thus, it is beneficial to obtain baseline water quality data in the main stem both upstream and downstream of the tributary stream. When selecting a monitoring location downstream of a tributary, be sure to go sufficiently downstream from the mouth of the tributary so that the waters of the two streams are completely mixed. If you note a significant difference between a water quality parameter up- and downstream of a tributary, you may want to monitor the tributary itself as well.

Small headwater streams (< 10 sq. miles drainage area) can be adequately monitored via a single monitoring site located near the mouth. Any change to water quality originating in the basin can be detected there. Larger streams may require multiple monitoring locations, as any change to water quality upstream may be diluted out by the time it reaches the mouth of the stream.

Another consideration is the presence of drilling activity or producing wells in the watershed. Ideally, you will be aware of where a well or group of wells will be drilled. If this is the case, it is beneficial to obtain baseline data in the vicinity of the intended drilling activity prior to the initiation of access road and well pad construction. Where a well pad already exists, monitoring should be conducted both upstream and downstream of the well(s) or access roadway. Visual reconnaissance should focus on the downstream areas.

Using Pennsylvania DEP's online portal, it is fairly easy to obtain information the location of Marcellus Shale gas wells, whether they are permitted but not drilled, drilled but not yet in operation, or producing. The following web link will take you to the Oil and Gas Reports page of Pennsylvania DEP's web site.

http://www.portal.state.pa.us/portal/server.pt/community/oil_and_gas_reports/20297

Appendix A contains a step-by-step tutorial describing how to download reports from this web site. The key piece of information regarding a well or a multiple-well pad is the coordinates (i.e., latitude and longitude). The coordinates can then be input into Google Maps, Google Earth, or a similar system to produce a map showing the precise location.

Another organization that compiles Marcellus Shale well data in a usable format is FracTracker. You can access its web site at <http://www.fractracker.org/>.

Also important is the presence of facilities or features that could affect the conductivity, total dissolved solids, or pH of the stream in question. We want to monitor in a fashion that either rules out or takes into account those features when we record changes in water quality. For example, a highway department deicing salt storage pile could affect conductivity. Thus, it

would be wise to do some reconnaissance testing up-and downstream of the pile during a rainfall event prior to establishing permanent baseline monitoring locations.

Accessibility is an important consideration. Stream reaches within posted private property or a one-mile walk from the nearest road are generally not good choices. Many of our monitoring locations on both public and private property are located at bridges. Also, you should consider winter conditions when assessing accessibility.

If you plan to monitor a stream within a state forest, please inform TU's Pennsylvania Eastern Shale Gas Monitoring Coordinator prior to monitoring. Special procedures may need to be followed on state forest lands and the district ranger will need to be contacted. If you must access private property to get to your monitoring location, please be sure to submit a landowner permission form. See Appendix B for: (1) the private landowner permission form; and (2) procedures to follow when monitoring on state forest lands.

The number of monitoring locations within a particular basin often comes down to manpower availability. Often it is not possible to monitor all the locations or conduct reconnaissance in all the areas chosen using the criteria discussed above. It then becomes a matter of choosing the best locations, generally those that will provide the most useful information.

As a final note, bear in mind that the PATU CCC program is directed at small streams. Larger streams require a great deal more effort, equipment, and other resources. Even during normal flows, larger streams present physical challenges that we are not equipped to deal with and that the CCC program does not address. When selecting monitoring sites, try to select locations that are manageable, even at higher flows.

You can find additional information and visual tools on “Deciding Where to Monitor” under the “Resources” tab in the online data portal, located at citsci.org.

This page intentionally left blank.

KEY WATER QUALITY PARAMETERS

As a TU CCC volunteer, you will take periodic measurements of certain water quality parameters using a field meter. To provide some context for, and understanding of, what you are measuring, we provide a brief discussion of key water quality parameters below. To assure that the data you obtain are accurate, please be certain to carefully follow the instructions provided with the meter for its proper calibration and use.

Temperature

The rates of biological and chemical processes depend on temperature. Aquatic organisms—from microbes to fish—are dependent on certain temperature ranges for their optimal health. Optimal temperatures for fish depend upon the species: some survive best in colder water, whereas others prefer warmer water. Benthic macroinvertebrates are also sensitive to temperature and will move in the stream to find their optimal temperature. If temperatures are outside this optimal range for a prolonged period of time, organisms are stressed and can die. Temperature is measured in degrees Fahrenheit (F) or degrees Celsius (C).

To take water temperature, immerse the pocket meter or a good stream thermometer where there is moderate flow, allow at least one minute for it to equilibrate, then read the temperature and record it on the field data sheet or in your field notebook. Your conductivity meter also measures water temperature, and it may be used instead.

Total Dissolved Solids

Dissolved solids make up a portion of the total solids in water. The other fraction is suspended solids, made up of particulate matter, such as silt and clay particles. Total dissolved solids (TDS) are comprised of inorganic compounds and, to a lesser extent, organic compounds. It is the inorganic materials that we are most concerned with here. Most inorganic compounds form positively charged cations and negatively charged anions when they dissolve in water. For example, common table salt (sodium chloride) dissolves in water to form sodium cations (Na^+) and chloride anions (Cl^-). Because the rocks containing natural gas were deposited in ancient seas, water recovered from them is typically salty. Thus, chloride anions are characteristic of waters recovered from the Marcellus Shale and from gas and oil wells in general. Acid mine drainage, on the other hand, contains large amounts of sulfuric acid (H_2SO_4), and the sulfate anion (SO_4^-) is abundant in affected waters.

The concentration of total dissolved solids affects the water balance in the cells of aquatic organisms. At very high TDS concentrations fish, benthic macroinvertebrates, and other aquatic organisms will have difficulty maintaining proper cellular osmotic balance and may not survive.

Conductivity

Conductivity is a measure of the ability of water to pass an electrical current. Conductivity in water is affected by the presence of inorganic dissolved solids such as chloride, nitrate, sulfate, and phosphate anions (ions that carry a negative charge) or sodium, magnesium, calcium, iron, and aluminum cations (ions that carry a positive charge). Pure water has very low conductivity; the higher the levels of dissolved solids, the higher the conductivity. Conductivity is also affected by temperature: the warmer the water, the higher the conductivity. For this reason, conductivity is reported as microsiemens (μS) at 25 degrees Celsius (25 C).

Conductivity in streams and rivers is affected primarily by the geology of the area through which the water flows. Streams that run through areas with granite bedrock tend to have lower conductivity because granite is composed of more inert materials that do not ionize (dissolve into ionic components) when washed into the water. On the other hand, streams that run through areas with clay soils tend to have higher conductivity because of the presence of materials that ionize rapidly when washed into the water. Ground water inflows can have the same effects depending on the bedrock they flow through.

Mining, industrial and other discharges can dramatically increase the conductivity of streams through the addition of dissolved solids. In fact, conductivity is the key “fingerprint” parameter for discharges associated with the Marcellus Shale. Water that contacts the shale contains high levels of dissolved salts and has a very high salinity, even higher than that of seawater. Discharges of these waters to freshwater streams can have a severe impact on aquatic organisms which are not adapted to high salinity levels.

The basic unit of measurement of conductivity is the mho or siemens. Conductivity is measured in micromhos per centimeter ($\mu\text{mhos/cm}$) or microSiemens per centimeter ($\mu\text{S/cm}$). Distilled water has a conductivity in the range of 0.5 to 3 $\mu\text{mhos/cm}$. The conductivity of rivers in the United States generally ranges from 50 to 1500 $\mu\text{mhos/cm}$. Studies of inland fresh waters indicate that streams supporting good mixed fisheries have a range between 150 and 500 $\mu\text{mhos/cm}$.

Turbidity

Turbidity is a measure of water clarity – how much the material suspended or dissolved in water decreases the passage of light through it. Suspended materials include soil particles (clay, silt, and sand), algae, plankton, microbes, and other substances. These materials are typically in the size range of 0.004 mm (clay) to 1.0 mm (sand).

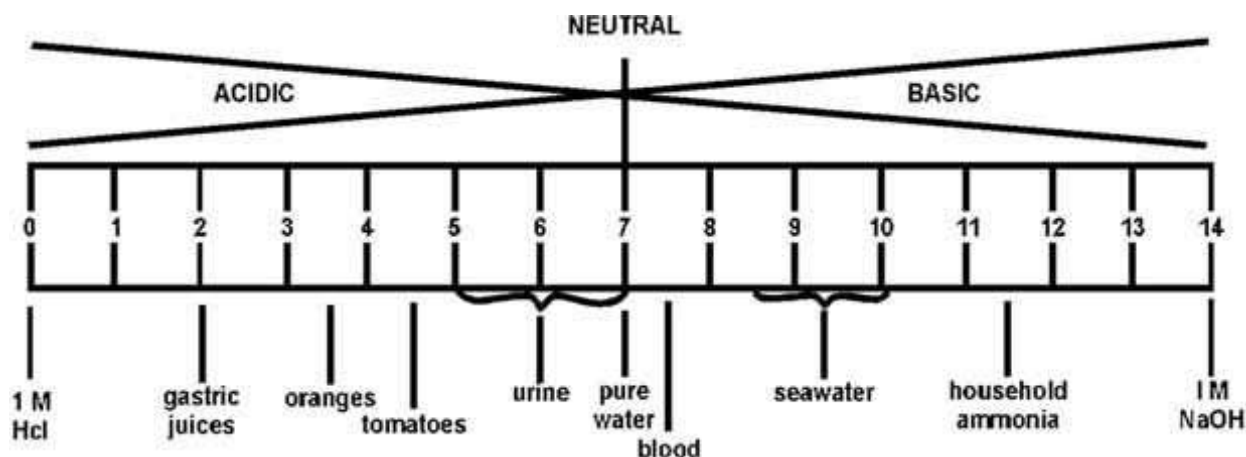
Turbidity can affect the color of the water. Higher turbidity increases water temperatures because suspended particles absorb more heat. This in turn reduces the concentration of dissolved oxygen (DO) because warm water holds less DO than cold. Higher turbidity also reduces the amount of light penetrating the water, which reduces photosynthesis and the production of dissolved oxygen. Suspended materials can clog fish gills, reducing resistance to

disease, lowering growth rates, and affecting egg and larval development. As the particles settle, they can blanket the stream bottom, especially in slower waters, and smother fish eggs and benthic macroinvertebrates. Sources of turbidity include:

- Soil erosion
- Waste discharge
- Urban runoff
- Eroding stream banks
- Large numbers of bottom feeders (such as carp), which stir up bottom sediments
- Excessive algal growth.

pH

pH is a term used to indicate the alkalinity or acidity of a substance as ranked on a scale from zero to 14.0, with 7.0 being neutral (neither acidic nor alkaline). pH decreases as acidity increases. For reference, the figure below presents the pH of some common liquids.



Source: U.S. EPA.

pH affects many chemical and biological processes. For example, different organisms flourish within different ranges of pH. The largest variety of aquatic animals prefers a range of 6.5-8.0. A pH outside this range reduces biological diversity in a stream because it stresses the physiological systems of most organisms and can reduce reproduction. Low pH can also allow toxic elements and compounds (such as aluminum in acid mine drainage) to become mobile and "available" for uptake by aquatic plants and animals. This can produce conditions toxic to aquatic life, particularly to sensitive species like rainbow trout. Changes in acidity can be caused by atmospheric deposition (acid rain), erosion and solution of surrounding rock, and certain wastewater discharges, including acid mine drainage.

Barium and Strontium

These two metals are signature elements of brines originating in the Marcellus Shale. They are alkaline earth metals, putting them in the same group as calcium and magnesium on the periodic chart of elements. In fact, strontium readily substitutes for calcium in bone formation. Both are extremely reactive and are rarely found in nature as free elements. Rather, they readily form sulfates, chlorides, carbonates and other salts and minerals. The table below provides data on barium and strontium concentrations in samples of flowback water from Marcellus Shale wells in Pennsylvania and West Virginia. For comparison, the Pennsylvania water quality criteria for barium and strontium are 10 mg/L and 0.05 mg/L, respectively.

Table 1. Barium and strontium levels based on approximately 30 samples of flowback waters from Marcellus Shale gas wells in Pennsylvania and West Virginia.

Parameter	Minimum Concentration (mg/L)	Median Concentration (mg/L)	Maximum Concentration (mg/L)
Barium	0.553	661	15,700
Strontium	0.501	821	5,841

Source: New York Department of Environmental Conservation. 2009. Draft Supplemental Generic Environmental Impact Statement on the Oil, Gas, and Solution Mining Regulatory Program, Table 5-9, p. 5-105.

STREAM WATER QUALITY MONITORING

Some General Rules

Before we get into details, let's establish some general rules of conduct when conducting monitoring and/or surveillance. Stream stewards should adhere to four general rules.

1. *Always be courteous to landowners and others you meet on the stream; avoid confrontation.*
2. *Respect private property; do not trespass on posted property. Please note that due to safety and liability reasons, you are prohibited from entering active drilling sites without permission.*
3. *Before reporting, be certain that what you are observing is unusual or illegal. To maintain credibility and assure that agencies take all calls seriously, we must avoid inappropriate reporting to Pennsylvania DEP and other agencies. When in doubt, get evidence and/or corroboration before reporting. At the very least, contact another TU member to review the situation with you at the site.*
4. *Be mindful of your personal safety at all times. We'll address this topic in detail later.*

Water Quality Monitoring

A core element of the PATU CCC program is routine monitoring of stream water quality. We discussed selection of monitoring locations in an earlier section of the manual. Here we'll discuss the monitoring activities.

The PATU CCC protocol calls for recording of the following parameters when conducting stream monitoring.

- Air temperature
- Weather conditions
- Water temperature
- Conductivity
- Total dissolved solids
- Turbidity
- pH
- Water clarity
- Stream flow and water conditions
- Stream width and depths (used to calculate stream cross-sectional area)

Typically these data and information are recorded on a field data sheet, provided in APPENDIX C.

In addition, you will take water samples on two occasions for shipment to the Alliance for Aquatic Resources Monitoring (ALLARM) laboratory based at Dickinson College for measurement of barium and strontium levels. Those same samples will be used to conduct quality assurance/quality control (QA/QC) testing to verify your field measurements.

Monitoring Kit

Each TU chapter is provided two monitoring kits. Additional kits can be purchased from Trout Unlimited. The monitoring kit contains the following materials:

- A small pocket meter for measuring water conductivity, total dissolved solids (TDS), and water temperature. The meter also can be used to measure air temperature;
- A salt solution and a small beaker for calibrating the meter;
- pH measurement strips;
- 120cm Secchi tube;
- Squirt bottle for distilled water;
- Sample collection bottles;
- Gage staff for measuring water depth;
- Tape measure for measuring stream width;
- A hand-held GPS unit;
- Field notebook and Sharpie® waterproof pen;
- Clipboard.

You will need to purchase distilled water, available in the grocery store for about \$1.00 per gallon. You may also want to purchase a pair or two of disposable latex gloves, in case you need to take a sample of contaminated material.

Conducting Field Monitoring

Weekly monitoring is optimal, and we encourage you to do so. We recommend that you monitor each selected site at least every two weeks. This varies somewhat, based on weather, personal constraints and other factors. In many areas of the state, monitoring is suspended during the heart of winter due to accessibility problems and icy stream conditions. But in general, most volunteers attempt to conduct monitoring every 10 days to two weeks. We also recommend that you team up with someone in the field (many volunteers are accompanied by their spouses). Experience has shown that having someone along to record data greatly enhances efficiency and reduces the time required to complete monitoring at a site. An experienced two-person monitoring team can complete a site in 15 minutes.

The checklist below enumerates the activities that you will conduct at each monitoring location. They are listed in the order that experience has shown to be most efficient; however, you are free to conduct them in any sequence you wish.

1. Take location coordinates (first time only).

2. Note weather conditions.
3. Note stream flow and water conditions.
4. Take sample for pH and place pH strip in sample.
5. Record air temperature.
6. Take conductivity measurement.
7. Take total dissolved solids (TDS) measurement.
8. Record water temperature.
9. Repeat conductivity and TDS measurements.
10. Take stream width and depth readings.
11. Take turbidity measurement.
12. Secure water samples for QA/QC (if scheduled for shipment to ALLARM)
13. Record pH.
14. Make visual observations.
15. Take photographs (if appropriate).

pH Measurement

It can require up to 10 minutes for the colors on the pH test strip to fully react, so we recommend that you take the pH sample after making observations about weather and stream conditions, and before completing the other stream monitoring tasks. Rinse the jar or beaker three times with stream water and fill with enough water that the color region of the strip is submersed. Set the sample aside in a safe place. When the other tasks (i.e., conductivity, TDS, temperature, stream cross-section) are completed, remove the pH test strip and hold it up to the color chart on the plastic box of test strips. Record the pH corresponding to the colors that most closely match those on the wet test strip. Most volunteers interpolate between two values when necessary. The pH of our freestone streams generally falls between 5.0 and 6.5. The pH of limestone streams is higher (above 7.0).

Measuring Conductivity and TDS

The pocket meter provided in your monitoring kit will measure temperature, conductivity, total dissolved solids, and salinity. We do not use the salinity function. You will receive detailed training on how to use the meter during the PATU CCC training. Here we will discuss general procedure and tips for field use.

We recommend that you calibrate the meter at home, before heading to the stream, using the calibration beaker and solution provided in the monitoring kit. We have found that the meter reading will drift as the calibration sample cools or warms. Conducting the calibration indoors at home eliminates this problem. It is a simple process and takes less than five minutes. After completing the calibration, make a notation of such in your field notebook; include the date, time, and conductivity of the standard solution.

After arriving at a monitoring location, turn the meter on and set it aside; this allows it to equilibrate to the ambient temperature. Before placing the meter in the water to measure conductivity and TDS, record the temperature shown on the meter screen on the field data sheet in the space provided for air temperature.

You should measure conductivity and TDS near the center of the stream, at a location where there is some water movement but not a fast current. We have found that in a fast current the conductivity reading on the screen fluctuates erratically. In a riffle area, the slack water behind a rock provides a good location. You will take two conductivity and two TDS readings and average them. Using the mode button, set the meter to measure conductivity (μS). Place the meter tip in the water so that the electrodes are submersed. Often the conductivity reading will drift as the meter equilibrates to the water temperature. When the meter stabilizes, record the conductivity value on the field data sheet (see APPENDIX C).

Press the mode button and hold for two or three seconds to move the meter to the TDS mode (ppm). Place the meter tip back in the water. After the meter stabilizes, record the TDS value on the field data sheet. This is a good time to record the water temperature as well. Then, using the mode button, cycle the meter through the salinity mode and back to conductivity mode (μS) and record a second conductivity reading. Shift the mode to TDS (ppm) and record a second TDS value on the field data sheet. Cycle the meter through the salinity mode back to conductivity mode and turn the meter off. When you turn it back on at the next monitoring location, the meter will be in the conductivity mode.

Measuring Turbidity

Turbidity in Pennsylvania streams, particularly headwater streams, is very good indicator of stream health. Turbidity varies naturally across Pennsylvania streams and both physical and biological factors can cause turbidity to fluctuate. You will measure turbidity using a 120cm Secchi tube. To begin, remove the secchi disk from the tube and rinse the tube to ensure removal of any residual materials. Facing up-stream, fill the tube with water from the center of the stream or as close to the center as possible, making sure not to disturb or collect any

sediment from the stream bed. You will want to collect the sample from the middle of the water column and fill the tube to the zero cm mark. You may have to shake some water out of the tube to ensure the water level is correct. It is also a good idea to put your hand over the opening of the tube and shake the sample to re-suspend any sediment that may have settled at the bottom of the tube. Your reading should be taken in the open sun, but out of the direct sunlight. You may have to turn your back to the sun to shade the sample. Looking down the tube, slowly lower the secchi disk. As soon as you can no longer see the secchi disk, stop lowering the disk. While continuing to look down the tube, slowly raise the disk until it reappears. Lower and raise the disk as many times as needed until you feel confident that you have found the midpoint between where the disk disappears and reappears. At this midpoint, pinch the string to the side of the tube to hold the secchi disk at this depth. Looking through the side of the tube, sight across the top of the disk to the nearest cm on the measuring tape. Record your measurement to the nearest cm.

Once the secchi disk depth is established, find the corresponding NTU (nephelometric turbidity units) that is closest to your measurement using the chart below and record the unit on your field data sheet.

Depth to Turbidity Conversion			
Centimeters	NTU	Centimeters	NTU
6	240	39	16
7	200	41	15
9	150	43	14
12	100	46	13
18	50	48	12
19	45	51	11
20	40	53	10
23	35	57	9
26	30	62	8
29	25	67	7
33	21	76	6
35	19	85	5
36	18	97	4
38	17	118	3

Surrogate for Stream Flow

Stream Cross-Section

Conductivity will fluctuate with stream flow. As flow decreases, conductivity generally will increase. It is important to understand the relationship between flow and those water quality parameters in a given stream so that fluctuations in water quality can be placed in context. Measuring flow volume requires data on both flow velocity and stream cross-section. It also

requires specialized equipment (a flow meter) and multiple flow readings across the stream. Fortunately, the cross-sectional area of the stream is a reasonable surrogate for flow volume and much easier to measure.

It is important to determine the stream cross-sectional area at the exact same location each time the stream is monitored, so we must choose carefully. Deep pools and runs and fast flowing riffles are difficult to measure when water levels are high. On the other hand, very shallow riffles are difficult to measure when water levels are very low. So we typically choose moderate riffles and runs where flow is more or less uniform across the width of the stream as locations for measuring stream cross-sectional area. You should avoid areas where the streambed contains mud or silt, as walking in these areas stirs up a great deal of sediment. Once you have decided on a location for measuring the stream cross-sectional area, mark it with a small rock cairn, so you can return to the exact location during each monitoring visit.

The cross-sectional area is the product of the stream width and the average depth, according to the equation: $\text{Width (ft)} \times \text{Depth (ft)} = \text{Area (ft}^2\text{)}$. Your monitoring kit contains a tape measure for measuring stream width and a staff gage stick for measuring stream depth. Both should be measured in feet and tenths of a foot. Using the tape measure, measure the stream width perpendicular to the stream and record the value in the space provided on the field data sheet. You will take multiple depth readings using the gage stick. A minimum of eight depth readings is desirable. For streams more than 10 feet wide, take a depth reading every foot. For narrower streams, take depth readings on a closer spacing, so that you get eight or 10 values. Record the depth values on the field data sheet (see APPENDIX C). Later you will compute the average depth and compute the cross-sectional area.

Stage

Stage is an alternative to measuring cross-sectional area. Although not as accurate as measuring cross-sectional area, measuring the rise and fall of the water table in the stream using a gage is an important metric needed to help us understand the fluctuations between stream flow and conductivity. One advantage of measuring stage over cross-sectional area is that you do not have to enter the stream each time you monitor.

There are several ways to set-up and measure stage at your monitoring location. First, an actual stream gage can be set-up on a permanent, non-movable structure such as a bridge, pier or a large rock, or a gage can be pounded into the streambed. This type of stream gage takes some additional work and expense to set-up and you must make sure it is sturdy enough to withstand high-water events and not wash away.

A second type of stage can be measured from a bridge. Many CCC volunteers monitor by bridges since it allows easy access to the stream and is often a convenient place to park. Since the bridge is a permanent structure and is not varying in size or moving, you can measure from a point on the bridge to the top of the water and record the distance. First, choose a location on the bridge that is as close to the center of the stream as possible and is easy to come back to each time you monitor. A great example would be to choose a guard rail

post that is close to the center of the stream and either mark the post or write it down in your field notebook (e.g., 7th post from left, facing upstream) so you don't forget. Next, attach a small weight to the end of your measuring tape and lower the tape down until the end touches the water. Choose a spot on the guard rail or post as your reference point and record the distance. A good example would be to measure to the top of the guard rail. Measurements should still be taken in tenths of a foot. *It is important to remember when measuring from a bridge that your measurement will increase as stream flow decreases and the surface water table drops. As your stage measurement increases, so should your conductivity and TDS readings.

It is important that you stick with one method for measuring your flow surrogate. If you began monitoring cross-sectional area with a gage stick and tape measure, you should stick with this protocol. Switching to a stream stage measurement will not allow you to compare conductivity and TDS readily between the two methods. If you decide that you would rather measure stream stage than cross-sectional area, then use both the gage stick/tape measure to record depth and width of the stream and a gage from a bridge or other structure, until you have enough measurements to characterize high flow and low flow events, and ultimately compare conductivity and TDS readings. Finally, you should consult the USGS website (<http://waterdata.usgs.gov/usa/nwis/rt>) to determine if there is a USGS stream gage located in your watershed. If so, please make a note of the latitude/longitude coordinates in your field notebook and after each time you monitor in the field, check the real-time stream monitoring data measurements on the USGS web page and record these readings on your field sheet.

Quality Assurance

Quality assurance/quality control (QA/QC) procedures are extremely important to the success of the PATU CCC stream monitoring program. QA/QC procedures ensure that a system is operating correctly and that the system's output is correct, whether that output is manufactured goods, a service, or in our case, data. In short, those procedures lend credibility to the data we generate. That the data are credible is a key concern of scientists and environmental regulators who may use our data. We also want to be assured that our data are accurate and meaningful.

The components of our stream monitoring system of concern are the volunteer monitor and the monitoring instruments – the conductivity meter and pH test strips. Each volunteer monitor will send water samples and data to the Alliance for Aquatic Resource Monitoring (ALLARM) at Dickinson College *twice each year* – one sample during low to normal flow conditions, and a second sample during high flow conditions. You should send samples from each site you are monitoring. ALLARM then analyzes the samples in a fashion that serves as a check on both the volunteer and the monitoring instruments.

Samples should be taken following the procedure detailed in the next section. Use only the plastic bottles supplied with your monitoring kit. Using any other container will invalidate the results of the QA/QC analysis. Place your samples in a small box and ship them by U.S. Mail. Each sample must be accompanied by a QA/QC data sheet, a copy of which is provided in

Appendix C. The QA/QC data sheet contains spaces for the location at which the sample was taken, the data you obtained at the time of sampling, and your contact information. ALLARM will then contact you via email regarding the results of its QA/QC testing.

Taking Water Samples

As noted earlier, you will take water samples on two occasions and send to the ALLARM laboratory for QA/QC analyses and analysis of barium and strontium levels. In addition, there may be times that you will be called upon to take a water sample from a stream for later analysis of water quality parameters. Your TU CCC kit contains 16-ounce plastic bottles for this purpose. It is important that these water samples be taken properly, so the resulting analytical data will be valid. This is particularly critical should you take a sample during a pollution event. Proper procedure for taking a water sample follows.

1. *If you are sampling contaminated water, put on the latex gloves.*
2. Label the bottle with the sample number/location, date, and time. A useful convention for number samples is to use your initials followed by a dash and then a number (XXX-1, XXX-2, etc....). Be sure to record this information in your field notebook.
3. Remove the cap from the bottle just before sampling. Avoid touching the inside of the bottle or the cap. If you do so, discard the bottle and use another.
4. It's preferable to secure a sample from near the center of the stream, but conditions may dictate that you secure the sample from the bank. If you enter the stream, try to disturb as little bottom sediment as possible. In any case, be careful not to collect water containing stream bottom sediment. Facing upstream, collect the water sample on your upstream side, in front of you.
5. Hold the bottle near its base and plunge it (opening downward) below the water surface. Collect a water sample 8 to 12 inches beneath the surface, or mid-way between the surface and the bottom if the stream reach is shallow.
6. Turn the bottle underwater into the current and away from you. In slow-moving stream reaches, push the bottle underneath the surface and away from you in an upstream direction. Rinse the bottle twice this way before filling it.
7. Leave a one-inch air space. Do not fill the bottle completely (so that the sample can be shaken just before analysis). Recap the bottle carefully, remembering not to touch the inside.
8. Record the sample number, date, time, and location information in your field notebook.
9. QA/QC samples should be shipped to ALLARM within 24 hours (no longer than 48 hours).

In cases where there is a visible layer floating on the surface of the water (e.g., an oil slick) take a sample of that surface layer as well. Follow the sampling procedure outlined above,

except hold the mouth of the bottle at the water/air interface to capture the floating material. Be sure to record in your field notebook that it is a surface sample.

Taking Soil and Sludge Samples

Unlike materials discharged to a stream, liquid or solid material that has been dumped on the ground surface, roadway, or in a drainage ditch is not likely to migrate. These materials are best sampled by staff of Pennsylvania DEP or other appropriate agency. The best course of action when encountering sludge or contaminated soil is to record your visual observations and the GPS coordinates in your field notebook and await arrival of appropriate agency personnel. However, there may be situations when it is imperative to obtain a sample immediately (during a heavy rainstorm, for instance). You will need latex gloves, a plastic or metal trowel, and a zip-lock bag for this purpose. Follow the procedure below when taking a soil or sludge sample.

1. Put on the latex gloves.
2. Using a waterproof pen, label the bag with the sample number/location, date, and time. Number your samples as given in Water Samples section above.
3. Prior to sampling open the zip-lock bag, being careful to avoid touching the inside of the bag. If you do, use another.
4. Using the plastic trowel, scoop up a sample of the material and place it in the bag. One cupful should be adequate.
5. Push excess air out of the bag and zip it closed.
6. Record the sample number, date, time, and location information in your field notebook.
7. As soon as you return home, place the sample in the refrigerator. Keep the sample cool until you turn it over to Pennsylvania DEP or other appropriate recipient.

To avoid cross contamination, the trowel should be thoroughly cleaned between samples. If you take a second sample, clean the trowel as best you can before securing it. Upon returning home, wash the trowel in detergent, rinse thoroughly with tap water, and allow to air dry

Chain of Custody

If you take a sample during a pollution event, the custody of that sample should be carefully tracked. This process is termed *Chain of Custody*. It means that custody and care of the sample can be tracked from its initial taking through analysis at a laboratory. Each time the sample changes hands, the event is recorded on a chain of custody form. Copies of the form

are provided in Appendix C. Multiple samples can be transferred using a single form. Before turning the sample(s) over to someone else, record the information about the sample(s) on two copies of the form. For each sample, enter into the table the sample number you assigned, the date and time the sample was taken, the location, and the type of sample (i.e., water, soil, or sludge). When you relinquish the sample(s) to another party, sign and date both copies of the form and make sure the person accepting the sample does the same. You keep one copy and the person accepting the sample from you keeps the other.

CONDUCTING VISUAL RECONNAISSANCE

In addition to water quality monitoring, PATU CCC volunteers conduct periodic visual observations of streams, riparian areas, and areas of earth disturbances for Marcellus wells, access roads, and pipelines. Reconnaissance is conducted by driving or preferably walking and making visual observations, looking for anything out of the ordinary (i.e. conditions that may indicate environmental damage resulting from gas development activities). The table below provides some more specific guidance. More detailed guidance is provided in the form of a checklist, which can be found in Appendix D.

Table 2. Observations that may indicate a threat to streams or other resources

<u>Observation</u>	<u>Possible Indication</u>
Muddy, sediment-laden water in ditches or streams	Accelerated erosion from access road or other land disturbance
Erosion rills or washouts on access roads or other disturbed areas	Failure of erosion and sedimentation control measures; accelerated erosion
Any change in water color or appearance, especially an oily film on the water surface	Discharge of waste or contaminated water to the stream
Discolored water or streambed where a tributary or spring enters the stream	Possible indication of contamination in the tributary or spring
Sediment or turbidity in a water body in the absence of recent precipitation, or abnormal, persistent foam or bubbles	Accidental or illegal discharge from a pond, tank or other source
Unusual, usually organic odors	May indicate presence of waste or contaminated materials nearby
Changes in conductivity, pH, or other water quality parameter	Possible spill or other discharge reaching the stream
Dead fish or other organisms in the water or along the bank	Discharge of waste or contaminated water
Water hoses in or adjacent to stream	Possible unauthorized water withdrawal
Black or unusually colored sludge on the land surface, especially in a ditch or depression	Possible illegal dumping of liquid or solid waste material
Tanker trucks in unusual or unexpected locations	Possible unauthorized water withdrawal
Gas bubbling from a pool, puddle, or stream, or a strong sulfur odor	Escape of free natural gas from a well or pipeline (Be very cautious!)

When conducting visual reconnaissance, you should adhere to the same general rules discussed above under STREAM WATER QUALITY MONITORING. In addition to the checklist (see Appendix D), it is helpful to have a pocket camera, GPS unit, binoculars, and of course, your field notebook along. The GPS unit can be used to record the coordinates of anything of interest. Should you observe any of the conditions noted in Table 1 and the checklist, photographs are invaluable.

Participants in the PATU Coldwater Conservation Corps are provided a variety of materials and equipment, including a sturdy field notebook and a waterproof Sharpie® pen for recording notes. Whether you are doing routine monitoring or observing a pollution incident, you should always record your observations and other important information in the field notebook. Place the day, date, and time at the top of the page, followed by a physical description of the location (for example, Atkins Road bridge over Fishing Creek, one mile downstream of the Methodist Church). This helps anyone conducting follow-up investigations to find the exact location. In addition, recording the latitude and longitude using a GPS unit is very helpful. The final piece of general information to record in the notebook is the current weather conditions, along with the weather conditions during the past 12 hours (if you know). Since materials are often washed into streams via runoff, tracking recent rain events is very important.

Following this general information, write a detailed physical description of what you observed. This typically involves visual observations, but also could include smells and sounds. Describe any vehicles or equipment you observe. It will be helpful to record the license number, company name, and any Public Utility Commission or other ID number on vehicles.

Photographs are very helpful when documenting a pollution event or other incident. Although participants are not provided with a camera, we hope that you will have your personal digital camera along. Make sure that the date/time stamp on your camera is accurate. This is very important should your photographs be used as evidence later. Record the number and subject of each photograph in your field notebook (for example, Photograph 4 – Fishing Creek looking downstream from Atkins Road bridge).

If you observe a pollution incident, it is extremely important to investigate further, both upstream and downstream. This information can be extremely helpful in identifying the origin of any contaminants. For example, if you record specific conductivity much higher than normal (indicative of very high total dissolved solids), it may be due to an influx of briny water from drilling or other oil/gas activity. Moving upstream to the next bridge and finding normal, low specific conductivity indicates that the source is somewhere between the two bridges. In like manner, if you observe a fish kill, attempt to trace it upstream until there is no longer evidence of fish mortality.

As a final notation, when you leave the site, record the time in the field notebook. When you move to a new location, record all of the same types of information in your field notebook.

WHOM TO CONTACT. . . AND WHEN

If you observe conditions that are of concern but do not constitute an imminent, severe threat to human health or the environment, your first call should be to the owner/operator of the well or other facility in question. Hopefully, they will then respond appropriately and repair or correct the situation. The owner/operator's name and telephone number are posted on a sign at completed wells, often on the side of a storage tank. During site construction and well drilling operations, the erosion and sedimentation control plan or permit will be present at the site, often in a mailbox at the end of the access roadway. That document sometimes contains the name and telephone number of the company that owns the well. However, in some cases the name and telephone number of the engineer that prepared the plan is listed.

It is important to immediately contact the appropriate agencies when you have observed a pollution event or firmly believe that something illegal has taken place. There are three primary agencies – Pennsylvania Fish and Boat Commission (PaF&BC), Pennsylvania Department of Environmental Protection (PaDEP), and the U.S. Environmental Protection Agency (USEPA) – and several secondary agencies. The decision diagram on the following two pages will assist you in deciding when to act and whom to contact.

If there is a discharge to a stream or evidence of stressed or dead fish or other organisms, your first contact should be the appropriate Pennsylvania Fish & Boat Commission regional office. In any instance where there is actual damage or imminent threat to a stream, the Pennsylvania Fish & Boat Commission should be contacted. The PF&BC regional office telephone numbers are listed by county in Appendix E. If you are acquainted with the local Waterways Conservation Officer or a deputy, you may want to contact him/her directly.

If you observe a discharge to a stream or the land surface, or severe erosion at a drilling site, access road, or pipeline, you will want to contact the appropriate Pennsylvania DEP regional office. Each Pennsylvania DEP regional office maintains an 800 number for reporting such incidents. A listing of the regional offices (by county) and their emergency numbers is contained in Appendix E.

The U.S. Environmental Protection Agency (EPA) has established an “Eyes on Drilling” citizen tip line for reporting suspicious activities and pollution incidents related to oil and gas drilling. If you observe such an activity or incident, please call U.S. EPA at 1-877-919-EPA.

If the event takes place in the Susquehanna River basin, it would be wise to contact the Susquehanna River Basin Commission (SRBC). Contact Mr. Eric Roof - Director, Compliance Program, at (717) 238-0425 ext. 209, or eroof@srbc.net.

If the incident occurs within a state forest or a state park, you should also contact the appropriate Pennsylvania DCNR Forestry Office (see Appendix E for a listing of locations and telephone numbers). If you observe a pollution event or illegal activity on State Game Lands, contact the Pennsylvania Game Commission regional office (see Appendix E for a listing of regional office locations and telephone numbers). Likewise, if the incident or observed

conditions occur in a state park, a call should be made to the appropriate park office. A listing of Pennsylvania State Parks and their telephone numbers is available on the Internet at the following web address. http://www.dcnr.state.pa.us/stateparks/findinfo/contacts_address.aspx.

There are additional, second-tier organizations that you may want to inform. If there is evidence that erosion and sedimentation control practices are not being implemented or maintained properly, particularly if it associated with pipeline construction, contact the local county Conservation District (see Appendix E for a listing of telephone numbers by county). If there is an imminent threat to human life or property (such as free gas bubbling from the ground or water), contact the local Emergency Management Agency (dial 911).

After contacting the appropriate government offices, please inform Trout Unlimited's Eastern Shale Gas Monitoring Coordinator and of course, the Marcellus Shale coordinator for the local chapter of Trout Unlimited.

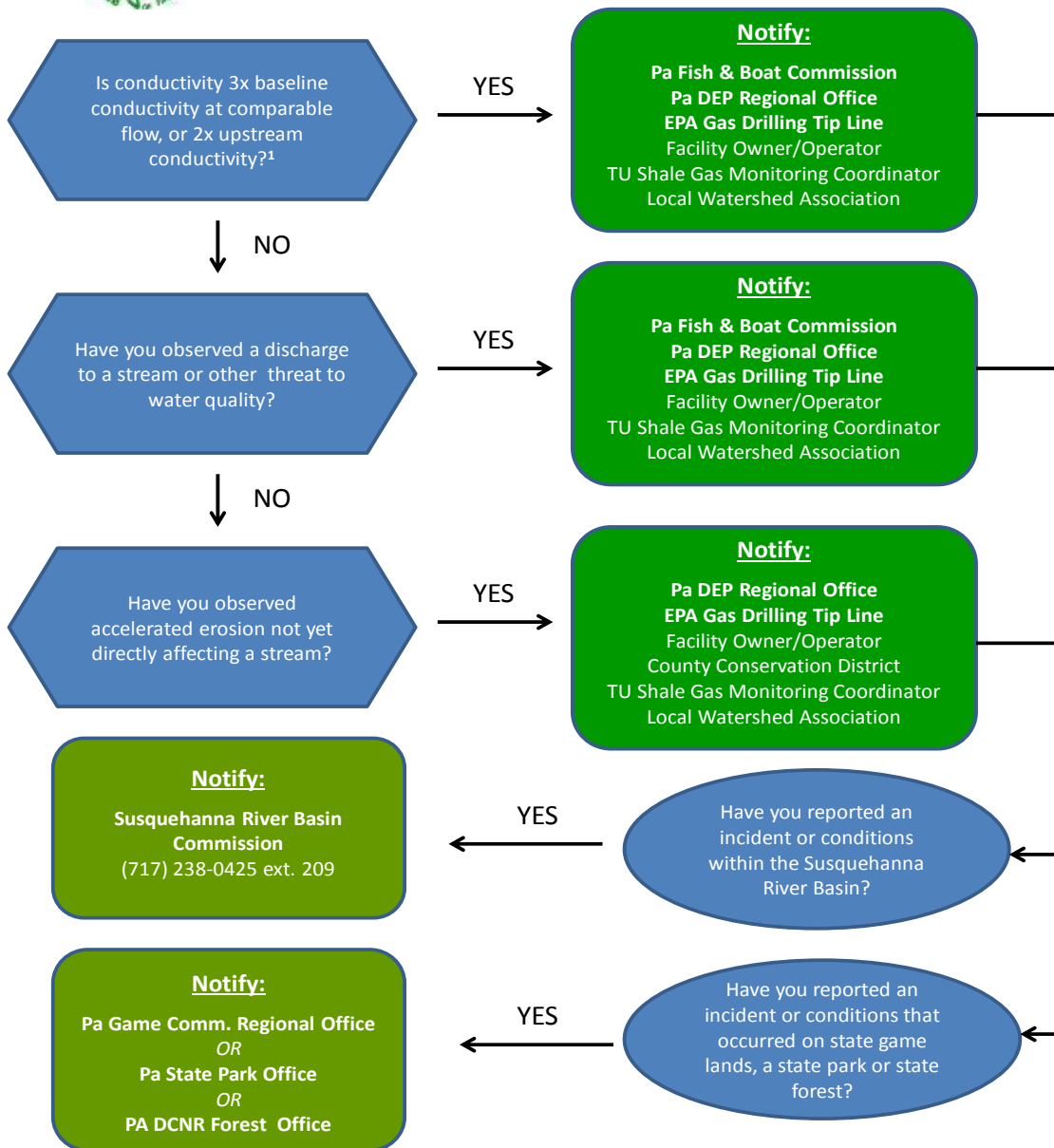
To assist you in making decisions regarding which agencies and organizations to contact, a decision flow chart is provided on the following page. Simply begin at the top left of the flow chart. As you answer the questions, you will be directed to a listing of contacts. A master listing of agencies and organizations, along with telephone numbers, is provided in Appendix E. The exact office you will call depends upon your location. For this reason, you should list the appropriate offices and their telephone numbers on the last page of your field notebook. They will then be handy when you need them. Appendix E also contains a page on which you can record the telephone numbers of agencies and organizations in areas that you frequent on a regular basis.

We stress again that you should contact these agencies only when you are certain that you have witnessed a pollution event or illegal activity. If you are not certain, further inquiry may be appropriate. Collect all the information and data you possibly can at the site, and then consult with the Trout Unlimited Eastern Shale Gas Monitoring Coordinator and your chapter's designated Marcellus Shale coordinator to decide what subsequent action is appropriate.

After contacting the appropriate agencies regarding a pollution or other incident, a courtesy call should be made to the owner/operator of the well or facility.



PATU COLDWATER CONSERVATION CORPS DECISION DIAGRAM



1/ This criterion was developed by the Alliance for Aquatic Resource Monitoring (ALLARM) in consultation with U.S. EPA, Pennsylvania DEP, and the Pennsylvania Fish & Boat Commission.

PERSONAL SAFETY CONSIDERATIONS

As important as documentation of a pollution event is, it should not be pursued at the risk of your personal safety. Some important safety suggestions are enumerated below.

1. *Do not touch, walk, or wade in water or soils that may be contaminated without wearing protective clothing.* Hip boots or waders will prevent your clothing and skin from contacting contaminated materials. If you have walked or waded in contaminated water or soil, place your hip boots or waders in a plastic garbage bag. After returning home, wash them with mild detergent and rinse thoroughly before wearing them again.
2. *To avoid contacting contaminated material, always wear gloves when taking samples of materials that you suspect are contaminated.* Latex gloves are available from Wal-Mart or any drugstore for about 50 cents per pair.
3. *Do not place yourself in a physically dangerous situation* (for example, scaling a cliff or wading in extremely high water). Remember, there are always risks when wading in streams and it is possible to drown in even an inch of water.
4. *Avoid confrontation.* If someone becomes confrontational, or if you are physically threatened, leave the scene.
5. *Be very cautious if you suspect that free gas is bubbling from the ground or water.* It could be ignited by any spark or flame. Immediately contact the local Emergency Management Agency.

The Pennsylvania Council of TU and TU are not responsible for injury to persons or property resulting from volunteer monitoring activities associated with the PATU Coldwater Conservation Corps program.

This page intentionally left blank.

APPENDIX A

Utilizing FracMapper



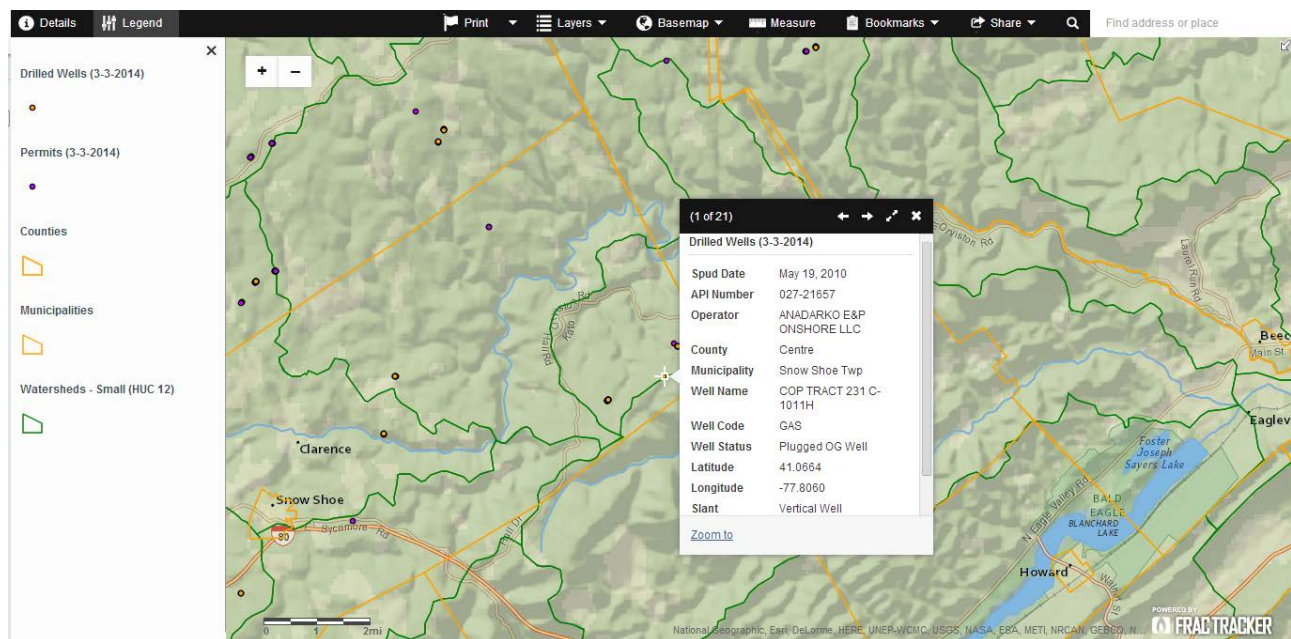
March 2014

Introduction

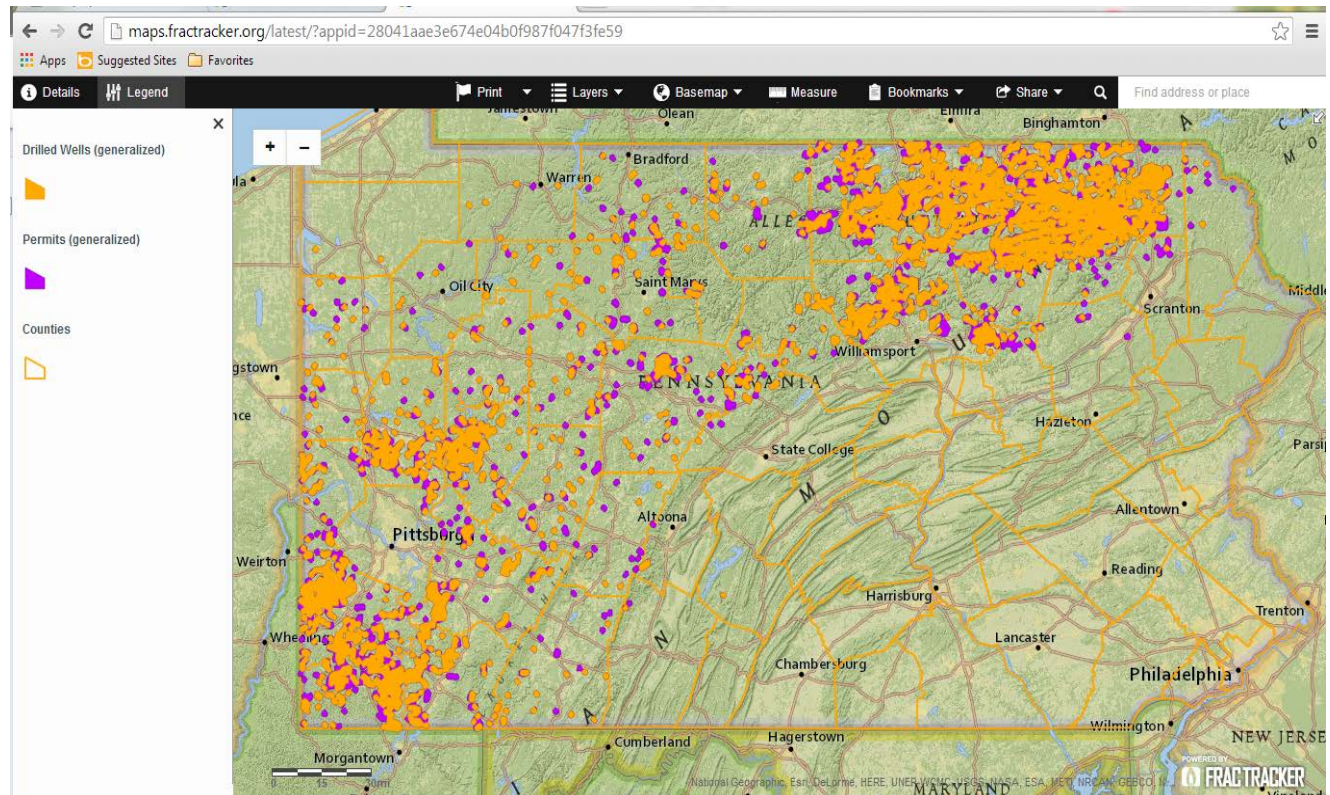
FracTracker.org launch in 2010 as a project of the University of Pittsburgh's Center for Healthy Environments and Communities. In 2012 an independent non-profit organization, The FracTracker Alliance, was established to share information to communicate impacts of global oil and gas industry and inform actions that positively shape our energy future. Their data mapping tool, FracMapper, is a user-friendly tool that can be used to pinpoint and assess gas and oil activities.

What Can You Do With FracMapper?

- Find a well or permit near your place of interest
- Learn more about the nature of an issued violation
- Measure how close a well is to a waterway
- Export maps



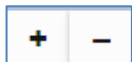
Working With FracMapper



- Navigate to [fractracker.org/maps](https://maps.fractracker.org/latest/?appid=28041aae3e674e04b0f987f047f3fe59)
- Select Pennsylvania
- Choose the Shale, Oil & Gas Viewer (Should be the top left map)

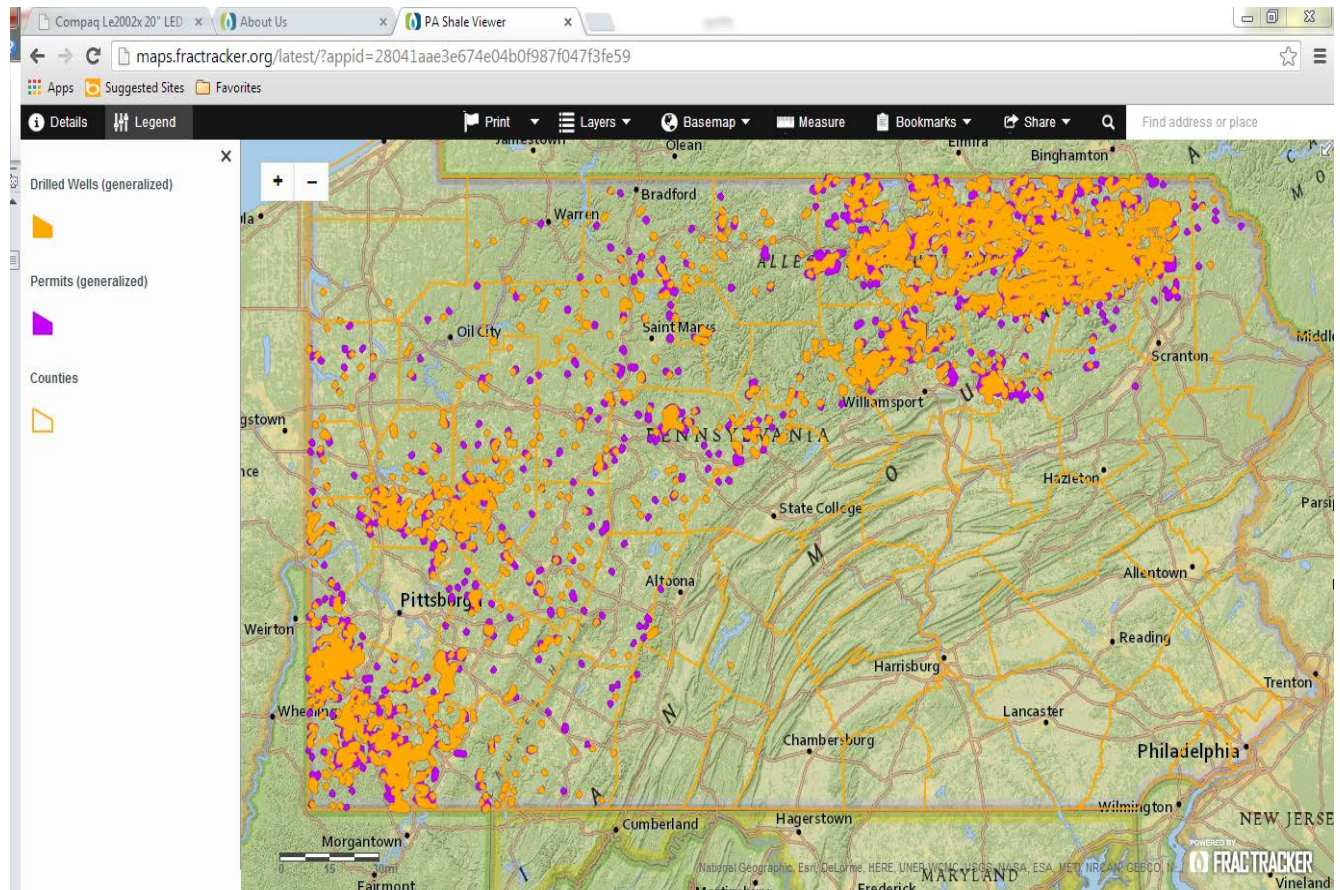
Manipulating the Map

- **Zoom:**



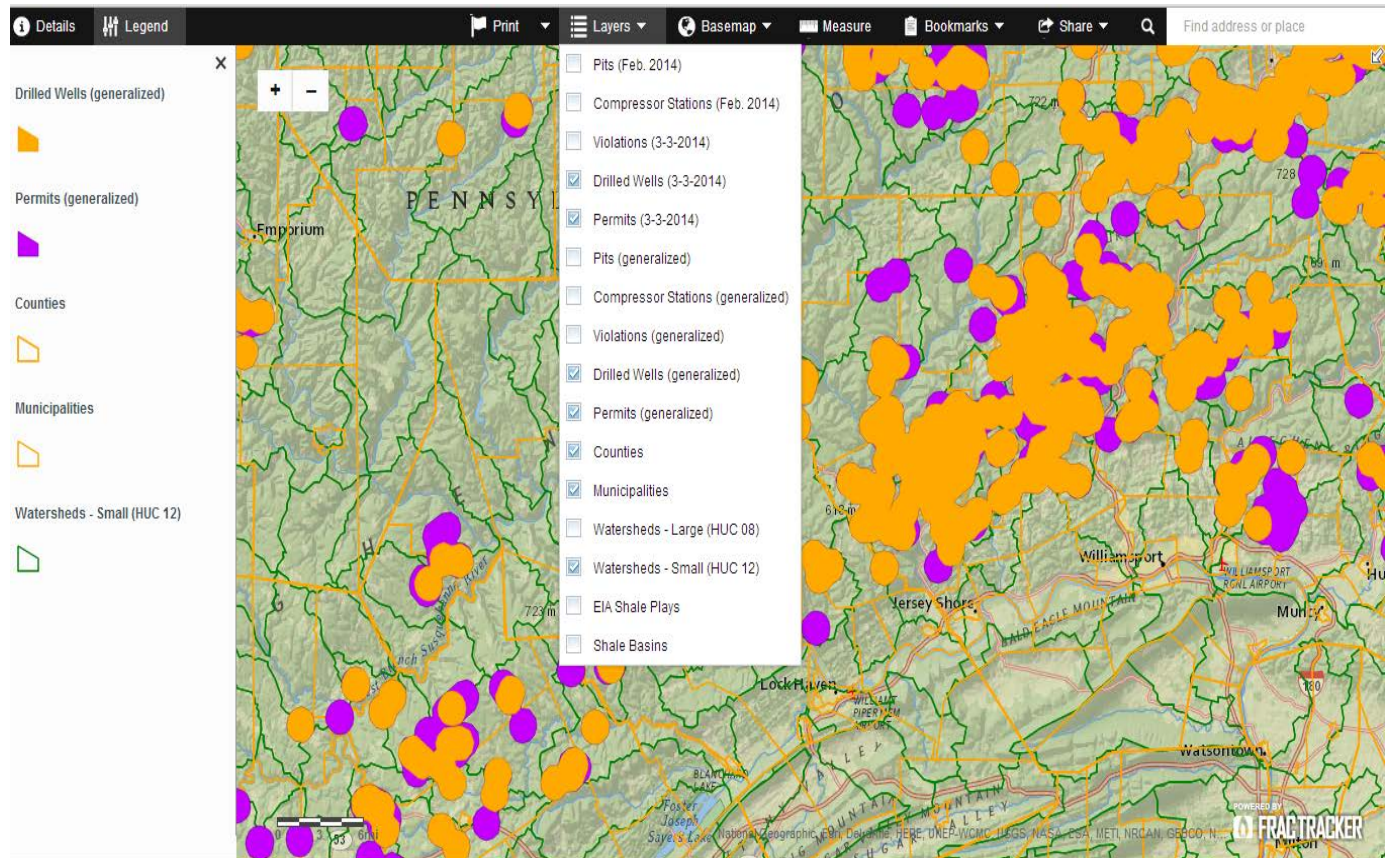
- Using the +/- button in the upper left corner of the map.
 - Or by double-clicking your mouse or rolling the mouse's scroll wheel forward (will not work for all mice)
 - Zoom in until points appear instead of generalized area.
- **Pan:** Click and hold down your mouse to pan
- **Click** on a point or area for more information:
 - Will show data layer details such as well's API number, company, county name, etc.

Toolbar Buttons



- **Details:** Gives information on the data contained in the map including date range, source and more.
- **Legend:** Shows the meaning of shapes, colors and borders.
- **Print:** Allows you to print or save your map as a pdf or image file.
- **Layers:** Shows you which data sets are being shown on the map. Layers can be turned on or off by clicking the check box.
- **Basemap:** Choose your basemap from a variety of options including satellite imagery, google map and topographic.
- **Measure:** Includes tools to measure area, distance and coordinates. Includes various units.
- **Bookmarks:** This feature is not very useful at this time. They are working on updating it.
- **Share:** This feature allows you to share your map via email, Facebook or Twitter.
- **Search:** In the top right of the map, the search box allows you to enter an address, area or landmark to zoom to a desired location. Soon they will be adding a feature to search by well API number.

Data Layers



As you can see there are several layers of data available on FracMapper. The most important for our purposes are *Drilled Wells*, *Permits*, *Drilled Wells (generalized)*, *Permits (generalized)* and *Watersheds – Small (HUC 12)*. Please note that when turning layers on/off and zooming it sometimes takes a few moments for the information to show up.

Drilled Wells (generalized): This feature shows areas where there are drilled wells while viewing the map zoomed out to a wide viewpoint. By zooming in on a particular orange dot, you will find the distinct wells in that area.

Permits (generalized): Similar to the above layer, this feature shows areas where there are permits while viewing the map zoomed out to a wide viewpoint. By zooming in on a particular purple dot you will find the distinct permits.

HUC 12 Watersheds: This is the hydrologic watershed unit used by TU in formulating monitoring strategies. This layer will only show up when zoomed to 1:500,000 (about the size of a county).

Drilled Wells: This layer shows distinct wells that have been drilled. Click on the icon to see further information such as Operator, Spud Date, Lat/Long and more.

(1 of 10)	
Drilled Wells (3-3-2014)	
Spud Date	September 11, 2008
API Number	105-21500
Operator	PA GEN ENERGY CO LLC
County	Potter
Municipality	Keating Twp
Well Name	REED RUN 2145
Well Code	GAS
Well Status	Active
Latitude	41.7282
Longitude	-78.1681
Slant	Horizontal Well
Zoom to	

Permits: This layer shows distinct permits that have been issued. Click on the icon to see further information such as Operator, Permit Data, Lat/Long and more.

(1 of 11)	
Municipality	Sweden Twp
Permit Date	April 4, 2012
Operator	TRIANA ENERGY LLC
Application Type	NEW
Authorization Type	Drill & Operate Well Permit
API Number	105-21755
Unconventional	Yes
Slant	Horizontal Well
Well Type	GAS
Well Name	SWEDEN VALLEY PAD A 4H
Latitude	41° 44' 26.41"
Latitude	41.7407
Zoom to	

Contacts for help with FracMapper

FracTracker Pittsburgh Office
Sam Malone: malone@fractracker.org
Matt Kelso: kelso@fractracker.org
(412) 802-0273

Or contact Jake Lemon at jlemon@tu.org or 814-779-3965

Appendix B

ACCESS PERMISSION FORM & MONITORING ON STATE LANDS

[This page intentionally left blank.]



LANDOWNER ACCESS AUTHORIZATION



The Pennsylvania Council of Trout Unlimited has developed a stream surveillance program, called the *Coldwater Conservation Corps (CCC)*. The CCC program is designed to help TU volunteers collect baseline water quality data on Pennsylvania's coldwater streams and to monitor the impacts of Marcellus Shale gas development. While TU volunteers make every effort possible to monitor streams from publicly accessible locations, on occasion, the most effective monitoring locations can only be accessed from private lands. In those cases, TU members should seek written permission from the private landowner, using this form.

I, _____, owner of _____, do hereby
(name of property owner) (address of property)

authorize and agree to permit _____ of the _____
(Volunteer name) (TU Chapter)

to enter my property for the purpose of conducting stream surveillance, including visual assessments

and water quality monitoring, on _____, accessible from my property,
(stream name)

beginning _____.
(specific date)

This permission allows the above-named individual to carry out weekly, bi-weekly, or monthly water quality tests and visual assessments, while exercising due diligence in protecting the above-referenced property and personal safety and health.

Property Owner signature

Date

Volunteer Monitor signature

Date

To find out where to submit this form, please contact:

Jake Lemon
Eastern Shale Gas Monitoring
Coordinator Trout Unlimited
jlemon@tu.org; 814-779-3965

[This page intentionally left blank.]

MONITORING ON STATE FOREST LANDS

Many of Pennsylvania's prized coldwater streams are located in large, contiguous tracts of forest lands. These are the very lands that comprise the state's forest system, and the same areas where shale gas development is occurring. Monitoring streams that fall within state forest system is an important step in protecting Pennsylvania's public resources. If you choose to monitor a stream that is located on state forest lands, then there are additional steps that need to be taken before you begin monitoring.

Trout Unlimited has entered into an agreement with the Pennsylvania Department of Conservation and Natural Resources for monitoring activities taking place on state forest lands. In order for TU to meet its reporting obligations under the agreement, volunteers who monitor streams on state forest lands must supply TU with the following information:

☐ **Volunteer monitor's name and contact information**

Name: _____

Phone number: _____

Address: _____

- ☐ **Name of stream:** _____
- ☐ **County where stream is located:** _____
- ☐ **State forest name:** _____
- ☐ **Latitude/longitude coordinates:** _____
- ☐ **Anticipated frequency of monitoring (weekly, bi-weekly, monthly, etc.):** _____

Trout Unlimited will submit all necessary information to appropriate DCNR staff. If you need to contact your local state forest office, please see *Appendix E* for contact information. Additionally, please read the attached DCNR State Forest Regulations thoroughly, prior to monitoring on state forest lands, so that you understand the rules and regulations governing activities and use of state forest lands.

PLEASE NOTE: DCNR must be provided with notice in writing of any and all accidents, casualties or loss of life within thirty-six (36) hours of said accident, casualty or loss of life. Thus, it is critical that you communicate with TU's Pennsylvania Marcellus Shale Field Organizer, as soon an incident occurs.

To find out where to submit this form, please contact:

Jake Lemon
Eastern Shale Gas Monitoring Coordinator
Trout Unlimited
jlemon@tu.org; 814-779-3965

[This page intentionally left blank.]

RULES AND REGULATIONS
TITLE 17. PENNSYLVANIA CODE, PART I. DEPARTMENT OF CONSERVATION AND NATURAL RESOURCES
Subpart C. STATE FORESTS

CHAPTER 21. GENERAL PROVISIONS

Authority

The provisions of this Chapter 21 issued under Section 313 of the Conservation and Natural Resources Act (71 P.S. § 1340.313); and the Crimes Code, 18 Pa.C.S. §§ 7505 and 7506, unless otherwise noted.

PRELIMINARY PROVISIONS

§ 21.1. Definitions. The following words and terms, when used in this chapter, have the following meanings, unless the context clearly indicates otherwise:

Camping--Overnight lodging using standard camping equipment.

Commercial activity--An activity in which a person, organization or association directly or indirectly accepts consideration of value as compensation for the provision of goods or services, including transportation.

District Forester--The Department's Bureau of Forestry employee so designated.

Group activity--An organized activity occurring as a scheduled event and requiring a large land area or unique land formation and which may conflict with normal or traditional uses or pose a potential environmental problem.

State Forest land--Land which is owned or leased by the Commonwealth and which is administered by the Bureau of Forestry.

§ 21.2. Scope. This chapter applies to State Forest land.

§ 21.3. Violations.

(a) A person is guilty of a summary offense under 18 Pa.C.S. § 7505 (relating to violation of governmental rules regarding traffic) if that person commits an act which is prohibited by § 21.21 (relating to motor vehicles).

(b) A person is guilty of a summary offense under 18 Pa.C.S. § 7506 (relating to violation of rules regarding conduct on Commonwealth property) if that person commits an act which is prohibited by this chapter other than those in subsection (a).

§ 21.4. Closure.

(a) Areas or portions of a State Forest or State Forest facilities may be closed or restricted to certain uses by the District Forester or a designee.

(b) The public will be informed of the closed or restricted areas or facilities by any form of communication, which may include posted signs, or by fencing or other enclosure manifestly designed to exclude intruders.

(c) Violation of the closure or restriction notices under subsection (b) is prohibited.

BOATING

§ 21.11. Use. All waters on State Forest land are open for the operation of watercraft unless posted as closed.

§ 21.12. Mooring and launching.

(a) Overnight mooring or storage of watercraft from November 15 through March 31 is prohibited except on lands leased from the Commonwealth. This prohibition does not apply to canoes, kayaks, rafts and other paddle-powered small boats stored overnight at the operator's campsite.

(b) The launching or mooring of watercraft on waters in State Forests requires the appropriate valid State Recreation Area Watercraft Permit affixed aft of amidship on the starboard-right-side.

(c) A current Fish and Boat Commission number and certificate of watercraft registration permits daily launching only.

(d) The Department will establish a schedule of fees for mooring and launching permits. This schedule and any subsequent revisions will be effective upon publication in the *Pennsylvania Bulletin*.

(e) Small, hand-carried boats, rafts and canoes may be launched from any point on the shoreline. Boats on trailers may be launched only at designated launch areas.

(f) Boat mooring is restricted to designated mooring areas.

§ 21.13. Motorized boats. Only electric motors may be used for propulsion of motorized watercraft.

MOTORIZED VEHICLES

§ 21.21. Motor vehicles.

(a) This section pertains to motor vehicles other than those addressed in §§ 21.22, 21.23 and 21.23a (relating to snowmobiles; trail bikes and other motorized off-road vehicles; and all-terrain vehicles).

(b) Operation of motor vehicles on State Forest land in the following manners is prohibited:

(1) Operation of a motor vehicle in careless disregard for the safety of persons or property, or in excess of posted speed limits or, where no speed limit is posted, in excess of 25 miles per hour.

(2) Driving on roads, trails or other areas not specifically designated and posted for motor vehicle traffic unless authorized in writing by the District Forester or a designee.

(3) The use of State Forest roads for commercial purposes without a road use agreement from the Department. An individual or corporation whose property adjoins State Forest land is not required to obtain a road use agreement to use State Forest roads for incidental commercial purposes to make deliveries to the property.

(4) Operating unlicensed, unregistered or uninspected motor vehicles on State Forest land.

§ 21.22. Snowmobiles.

(a) Snowmobiling is permitted in accordance with 75 Pa.C.S. Chapter 77 (relating to snowmobiles) and this section.

(b) Snowmobiles may be operated only on designated snowmobile roads, designated trails and designated and posted areas on State Forest land.

(c) Snowmobiles may be operated on State Forest land from the day following the last day of regular or extended antlerless deer season as established by the Game Commission through the following April 1, or earlier, as determined by the District Forester.

(d) Operation of snowmobiles on a road, trail or area not specifically designated and posted for snowmobile use or at any time of year other than that in subsection (c) is prohibited.

§ 21.23. Trail bikes and other motorized off-road vehicles. This section pertains to motorized off-road vehicles other than those addressed in §§ 21.22 and 21.23a (relating to snowmobiles; and all-terrain vehicles).

(1) Trail bikes and other motorized off-road vehicles may be operated only on roads, trails or other areas that have been specifically designated and posted for their use.

(2) Trail bikes and other motorized off-road vehicles may be operated only during the times of year authorized by the Department's Bureau of Forestry by posted signs.

§ 21.23a. All-terrain vehicles.

(a) The operation of all-terrain vehicles is permitted in accordance with 75 Pa.C.S. Chapter 77 (relating to all-terrain vehicles) and this section.

(b) All-terrain vehicles may be operated only on designated and posted roads, trails and other areas.

(c) All-terrain vehicles may be operated on State Forest land from the Friday before Memorial Day through the last full weekend in September, and from the day following the last day of the regular or extended antlerless deer season as established by the Game Commission through the following April 1.

§ 21.24. Spark arrestors. Operation of any motorized vehicle, all-terrain vehicle, trail bike or other motorized off-road vehicle in, on or through State Forest land without a fully functional spark arrestor is prohibited.

§ 21.25. Parking.

(a) Parking a motor vehicle, all-terrain vehicle, snowmobile, trail bike, other motorized off-road vehicle, boat trailer, camp trailer or other equipment which obstructs a gate, road, trail, footpath, bicycle path, access way, drinking fountain, entrance, exit or road turnaround on State Forest land is prohibited.

(b) A person may not park a vehicle in a parking area on State Forest land designated for handicapped persons, unless the vehicle bears a handicapped or severely disabled veteran registration plate or displays a handicapped or severely disabled veteran parking placard, in

accordance with 75 Pa.C.S. §1338 (relating to handicapped plate and placard), and the vehicle is operated by or for the transportation of a handicapped person or a severely disabled veteran.

(c) Violations of this section will be handled as follows:

(1) Prior to the filing of a citation charging a summary offense under this section, the Department may issue a parking ticket, which will be handed to the violator or placed on the windshield of the violator's vehicle. The violator may avoid criminal proceedings by paying a fine to the Department, equivalent to the maximum fine as provided in 18 Pa.C.S. § 7505 (relating to violation of governmental rules regarding traffic), within 5 days of the violation in the manner specified on the ticket.

(2) When a parking ticket has been issued, the Department may institute criminal proceedings only upon failure of the violator to pay the fine in accordance with the time limit specified in paragraph (1) and in the manner specified on the ticket.

(3) When a parking ticket has not been issued, the Department may institute criminal proceedings by issuing a citation.

FOREST PRODUCTS

§ 21.31. Prohibitions. The following activities are prohibited:

(1) Cutting, picking, digging, damaging or removing, in whole or in part, a living or dead plant, vine, shrub, tree or flower on State Forest land without written authorization of the District Forester or a designee, except that edible wild plants or plant parts may be gathered without authorization if they are gathered for one's own personal or family consumption. Dead and down wood for small campfires may be gathered without prior authorization.

(2) Removing rocks, shale, sand, clay, soil or other mineral products from State Forest land without written authorization of the District Forester or a designee.

(3) Removing peat, sawdust, bark, mulch or other products from State Forest land without written authorization of the District Forester or a designee.

(4) Removing or disturbing historical or archeological resources from State Forest land without written authorization of the District Forester or a designee.

(5) Planting a tree, shrub or plant of any kind without the written authorization of the District Forester or a designee.

§ 21.32. Designated trees. Only designated trees may be cut or removed.

§ 21.33. Cutting practices.

(a) The stump height of cut trees may not exceed the diameter of the stump or 12 inches whichever is smaller.

(b) All tops and slash shall be removed 25 feet from streams, roads, trails and State Forest boundaries.

(c) The blocking of drainage ditches, pipes and other structures with tops and slash is prohibited.

§ 21.34. Removal. The removal of fuel wood and other forest products from the forest by the use of tractors, skidders or any method other than hand carrying is prohibited without written authorization of the District Forester or a designee.

MISCELLANEOUS PROVISIONS

§ 21.61. Camping permit. Camping without a current camping permit issued by the District Forester or a designee is prohibited. Primitive backpack campers not using developed facilities do not need a permit if they stay no more than 1 night at any campsite.

§ 21.62. Open fires.

(a) Subject to the prohibition in subsection (b), small campfires are permitted only where adequate precautions are taken to prevent the spread of fire into the forest. All other fires are prohibited. Campfires shall be attended at all times.

(b) Open fires are prohibited when the forest-fire danger is determined by the District Forester to be High, Very High or Extreme and from March 1 through May 25 and from October 1 through December 1 without authorization from the District Forester or a designee. This prohibition does not apply to small self-contained camp stoves when used in a safe manner.

(c) A person causing a wildfire, in addition to possible criminal penalty, is liable for all damages, costs of extinction and fines.

§ 21.63. Hunting and trapping. Hunting and trapping on State Forest land are permitted in accordance with 34 Pa. C.S. (relating to Game and Wildlife Code) and rules and regulations, unless otherwise posted.

§ 21.64. Fishing. Fishing in waters on State Forest land is permitted in accordance with 30 Pa. C.S. (relating to Fish and Boat Code) and rules and regulations, unless otherwise posted.

§ 21.65. Target shooting. Target shooting with firearms, bows and arrows or devices capable of launching projectiles and causing injury to persons or property is prohibited except where authorized by the District Forester or a designee.

§ 21.66. Destruction of property. Damaging, defacing or removing any sign, structure, equipment or other material is prohibited.

§ 21.67. Posting and soliciting. Posting of signs or soliciting without written authorization of the District Forester or a designee is prohibited.

§ 21.68. Littering and disposal. Littering or disposal of garbage, paper, household refuse, waste or other material of any kind is prohibited.

§ 21.70a. Snow plowing. The plowing or removal of snow from State Forest land without authorization of the District Forester or a designee is prohibited.

§ 21.72. Closure because of fire danger.

(a) If the forest-fire danger rating is Very High or Extreme, all or portions of the State Forest may be closed to certain specified uses.

(b) Violation of a closure notice under subsection (a) is prohibited.

§ 21.73. Pets. Pets are permitted on State Forest land if they are kept under control and attended at all times.

§ 21.74. Disorderly conduct. The following are prohibited:

(1) Fighting or other behavior that is threatening, violent or tumultuous.

(2) The possession or consumption of alcoholic beverages by persons under 21 years of age.

(3) Creating an unreasonable noise that may disturb other visitors to State Forest land.

§ 21.75. Sanitation.

(a) Washing in water outlets, springs, lakes or waterways is prohibited.

(b) Discharging of trailer, camper or motor home sewage, sink water or bath water on or into ground or surface waters is prohibited.

§ 21.76. Feeding of wildlife.

(a) Feeding of wildlife, except for elevated songbird feeders of less than one-half bushel capacity, is prohibited on State Forest land from 30 days prior to the beginning of spring gobbler season through the end of flintlock muzzleloader deer season.

(b) Placing of wildlife feeders of more than one-half bushel combined capacity on State Forest land without the authorization of the District Forester or a designee, is prohibited.

§ 21.77. Commercial activity. Selling, distributing, delivering, servicing, guiding or renting any equipment, material or commodity or otherwise engaging in commercial activity on State Forest land without written authorization of the District Forester or a designee is prohibited.

§ 21.78. Group activities. Group activities are prohibited without written authorization of the District Forester or a designee.

§ 21.79. Structures. Building or erecting a structure or memorial, or engaging in construction or excavation activity, without written authorization of the Department is prohibited.

§ 21.80. Trespass.

(a) A person who violates this chapter or disregards instructions or warnings given by a State Forest officer or interferes with a State Forest officer in the performance of the duties of the officer may be ordered to leave State Forest land.

(b) A person who refuses to leave State Forest land, after receiving an order to leave from a State Forest officer, commits an act of criminal trespass under 18 Pa.C.S. § 3503(b) (relating to criminal trespass).

Appendix C

WATER QUALITY DATA SHEETS

Stream Monitoring Field Data Sheet
QA/QC Instructions and Form
Chain of Custody Record



[This page intentionally left blank.]

STREAM MONITORING FIELD DATA SHEET

SAMPLE SITE: _____ DATE: _____ TIME: _____

STREAM NAME: _____

LOCATION DESCRIPTION: _____

MONITOR'S NAME: _____

WEATHER & PRECIPITATION: Clear Rain Cloudy Drizzle Partly Cloudy Intermittent Rain Fog/Haze Snow

PRECIPITATION LAST 48 HOURS: None Trace Light Moderate Heavy

AIR TEMPERATURE: _____ °F WATER TEMPERATURE: _____ °F

STEAM FLOW: Low Normal High

WATER CONDITION: Clear Cloudy/Off Color Muddy

Parameter	Units	Replicate 1	Replicate 2	Average
Conductivity	μS/cm			
Total Dissolved Solids	ppm			
pH	units			

STREAM WIDTH: _____ Feet

STREAM DEPTHS:									

AVERAGE DEPTH: _____ Feet

CROSS-SECTIONAL AREA = _____ X _____ = _____ FT²
(Width) (Avg. Depth)

[This page intentionally left blank.]



PATU Coldwater Conservation Corps QA/QC Instructions and Data Form



Directions for collecting and sending water samples for QA/QC:

1. You should collect one sample from each site you are monitoring. **Each sample should be accompanied by a copy of this form.**
2. Label the sample collection bottle with your name, sampling site name, and date of collection.
3. Enter the stream and stand downstream of your sampling site and face upstream. Rinse the bottle a total of 3 times, emptying the bottle behind you (downstream).
4. Lower the bottle into the water with the opening facing upstream. Fill the bottle completely with stream water and screw the cap on tightly.
5. Record the information and data in the tables below.
6. Pack a small box with your water samples and copies of this sheet. Be sure that the sample bottle is secure within the box and cannot move around.
7. Mail the box containing your water samples and copies of this sheet to ALLARM for processing. Samples should be mailed within 24 hours.

ALLARM
Dickinson College
5 North Orange Street
Carlisle, PA 17013

Your Name		Stream Name	
Email Address		Coordinates	N W
Mailing Address		County	
Organization		Sample Date	

Parameter	Units	Result
Conductivity	µS/cm	
TDS	mg/l	
pH	pH units	
X-Sectional Area	sq. feet	

[This page intentionally left blank.]



CHAIN OF CUSTODY RECORD

Sample No.	Date/Time	Location	Sample Type	Remarks

Relinquished by: _____ Date/Time: _____ / _____

Received by: _____ Date/Time: _____ / _____

cut here



CHAIN OF CUSTODY RECORD

Sample No.	Date/Time	Location	Sample Type	Remarks

Relinquished by: _____ Date/Time: _____ / _____

Received by: _____ Date/Time: _____ / _____

[This page intentionally left blank.]

Appendix D

VISUAL OBSERVATION CHECKLIST



[This page intentionally left blank]

PATU Coldwater Conservation Corps Checklist for Visual Observations

Location: _____

Latitude: _____° _____min. _____sec.

Longitude: _____° _____min. _____sec.

Earth Disturbance

Access Road:

- ☐ Mud/sediment on Township / State Road that access road enters
- ☐ Mud/sediment entering public road ditch from site
- ☐ Access road to site not stabilized with clean gravel
- ☐ Access road crosses stream with access road drainage directly emptying into stream
- ☐ Access road carrying drainage from site directly to road ditch or stream
- ☐ Road banks not stabilized with mulch, seeding, vegetation, etc.

Pad/Storage Pond/Staging Areas:

- ☐ Earth disturbance to edge of water body with no controls to stop or filter
- ☐ Clean water entering site from uphill (no diversion ditch)
- ☐ Outlets of sediment control structures go directly to water body without filtering/cleaning
- ☐ Diversion ditch
- ☐ Sediment pond
- ☐ Road drainage
- ☐ Silt barrier (fence, hay bales, tubes, etc.)
- ☐ Soil stockpile areas not stabilized if open longer than 20 days
- ☐ Outlets of ditches, sediment control structures, etc. are not stabilized and are causing erosion

Receiving Streams:

- ☐ Visual evidence of sediment entering stream, pond, wetland or other body of water
- ☐ Sediment plume
- ☐ Discolored water
- ☐ Increased sediment deposition on the stream bottom

Spills and Discharges

- ☐ Unusual odor in water
- ☐ Persistent foam or bubbles in absence of high level of agitation
- ☐ Dead fish or other organisms in the water or along the bank
- ☐ Discolored water, especially an oily film on the water surface
- ☐ Increased bank erosion (may indicate a high water event)

Water Withdrawal

- ☐ Water hoses in or adjacent to stream
- ☐ Unusually low flow in the stream not related to drought conditions
- ☐ Trucks parked beside streams where there are no signs posted that it is a withdrawal area.

Gas Migration or Leakage

- ☐ Gas bubbling from a pool, puddle, or stream
- ☐ Odor due to mercaptan compounds

APPENDIX E

AGENCY/ORGANIZATION CONTACT INFORMATION

Pennsylvania DEP Regional Offices
Pennsylvania Fish and Boat Commission Regional Offices
County Conservation District Offices
Pennsylvania Game Commission Regional Offices
Pennsylvania DCNR Forest Offices



[This page intentionally left blank.]

**PATU Coldwater Conservation Corps
Agency/Organization Contact Information**

Stream Name: _____

County: _____ State Forest: _____

TELEPHONE NUMBERS

Pennsylvania DEP: _____ Pa Fish & Boat Comm: _____

Conservation District Office: _____

State Forest Office: _____ Pa Game Commission: _____

Susquehanna River Basin Commission: (717) 238-0423

Trout Unlimited Chapter: _____

.....

**PATU Coldwater Conservation Corps
Agency/Organization Contact Information**

Stream Name: _____

County: _____ State Forest: _____

TELEPHONE NUMBERS

Pennsylvania DEP: _____ Pa Fish & Boat Comm: _____

Conservation District Office: _____

State Forest Office: _____ Pa Game Commission: _____

Susquehanna River Basin Commission: (717) 238-0423

Trout Unlimited Chapter: _____

AGENCY CONTACT INFORMATION BY COUNTY

COUNTY	PaDEP REGIONAL OFFICE	Pa FISH & BOAT COMM. REGIONAL OFFICE	COUNTY CONSERVATION DISTRICT	Pa GAME COMMISSION REGIONAL OFFICE
Adams	Southcentral Regional Office Harrisburg, PA (484) 250-5900	Southcentral Regional Office Newville, PA (717) 486-8227	Gettysburg, PA 17325 (717) 334-0636	Southcentral Regional Office Huntingdon, PA (814) 643-1831
Allegheny	Southwest Regional Office Pittsburgh, PA (412) 442-4000	Southwest Regional Office Somerset, PA (814) 445-8974	Pittsburgh, PA 15208 (412) 241-7645	Southwest Regional Office Bolivar, PA (724) 238-9523
Armstrong	Southwest Regional Office Pittsburgh, PA (412) 442-4000	Southwest Regional Office Somerset, PA (814) 445-8974	Kittanning, PA 16201 (724) 548-3425	Southwest Regional Office Bolivar, PA (724) 238-9523
Beaver	Southwest Regional Office Pittsburgh, PA (412) 442-4000	Southwest Regional Office Somerset, PA (814) 445-8974	Aliquippa, PA 15001 (724) 378-1701	Southwest Regional Office Bolivar, PA (724) 238-9523
Bedford	Southcentral Regional Office Harrisburg, PA (484) 250-5900	Southcentral Regional Office Newville, PA (717) 486-8227	Bedford, PA 15522 (814) 623-7900 ext. 4	Southcentral Regional Office Huntingdon, PA (814) 643-1831
Berks	Southcentral Regional Office Harrisburg, PA (484) 250-5900	Southeast Regional Office Elm, PA (717) 626-0486	Leesport, PA 19533-0520 (610) 372-4657	Southeast Regional Office Reading, PA (610) 926-3136
Blair	Southcentral Regional Office Harrisburg, PA (484) 250-5900	Southcentral Regional Office Newville, PA (717) 486-8227	Hollidaysburg, PA 16648 (814) 696-0877 ext. 5	Southcentral Regional Office Huntingdon, PA (814) 643-1831
Bradford	Northcentral Regional Office Williamsport, PA (570) 327-3636	Northeast Regional Office Sweet Valley, PA (570) 477-3221	Towanda, PA 18848 (570) 265-5539	Northeast Regional Office Dallas, PA (570) 675-1143
Bucks	Southeast Regional Office Norristown, PA (484) 250-5900	Southeast Regional Office Elm, PA (717) 626-0486	Doylestown, PA 18901 (215) 345-7577	Southeast Regional Office Reading, PA (610) 926-3136
Butler	Northwest Regional Office Meadville, PA (814) 332-6945 – bus. hours 1- 800-373-3398 – after hours	Northwest Regional Office Meadville, PA (814) 337-0444	Butler, PA 16001-6501 (724) 284-5270	Northwest Regional Office Franklin, PA (814) 432-3187
Cambria	Southwest Regional Office Pittsburgh, PA (412) 442-4000	Southwest Regional Office Somerset, PA (814) 445-8974	Ebensburg, PA 15931 (814) 472-2120	Southwest Regional Office Bolivar, PA (724) 238-9523
Cameron	Northcentral Regional Office Williamsport, PA (570) 327-3636	Northcentral Regional Office Pleasant Gap, PA (814) 359-5254	Emporium, PA 15834 (814) 486-2244 ext. 5	Northcentral Regional Office Jersey Shore, PA (570) 398-4744

COUNTY	PaDEP REGIONAL OFFICE	Pa FISH & BOAT COMM. REGIONAL OFFICE	COUNTY CONSERVATION DISTRICT	Pa GAME COMMISSION REGIONAL OFFICE
Carbon	Northeast Regional Office Wilkes-Barre, PA (570) 826-2511	Northeast Regional Office Sweet Valley, PA (570) 477-3221	Lehigh, PA 18235 (610) 377-4894 ext. 4	Northeast Regional Office Dallas, PA (570) 675-1143
Centre	Northcentral Regional Office Williamsport, PA (570) 327-3636	Northcentral Regional Office Pleasant Gap, PA (814) 359-5254	Bellefonte, PA 16823 (814) 355-6817	Northcentral Regional Office Jersey Shore, PA (570) 398-4744
Chester	Southeast Regional Office Norristown, PA (484) 250-5900	Southeast Regional Office Elm, PA (717) 626-0486	Kennett Square, PA 19348 (610) 925-4920	Southeast Regional Office Reading, PA (610) 926-3136
Clarion	Northwest Regional Office Meadville, PA (814) 332-6945 – bus. hours 1-800-373-3398 – after hours	Northwest Regional Office Meadville, PA (814) 337-0444	Clarion, PA 16214 (814) 226-4070	Northwest Regional Office Franklin, PA (814) 432-3187
Clearfield	Northcentral Regional Office Williamsport, PA (570) 327-3636	Northcentral Regional Office Pleasant Gap, PA (814) 359-5254	Clearfield, PA 16830 (814) 765-2629	Northcentral Regional Office Jersey Shore, PA (570) 398-4744
Clinton	Northcentral Regional Office Williamsport, PA (570) 327-3636	Northcentral Regional Office Pleasant Gap, PA (814) 359-5254	Mill Hall, PA 17751 (570) 726-3798	Northcentral Regional Office Jersey Shore, PA (570) 398-4744
Columbia	Northcentral Regional Office Williamsport, PA (570) 327-3636	Northcentral Regional Office Pleasant Gap, PA (814) 359-5254	Bloomsburg, PA 17815 (570) 784-1310	Northeast Regional Office Dallas, PA (570) 675-1143
Crawford	Northwest Regional Office Meadville, PA (814) 332-6945 – bus. hours 1-800-373-3398 – after hours	Northwest Regional Office Meadville, PA (814) 337-0444	Meadville, PA 16335 (814) 763-5269	Northwest Regional Office Franklin, PA (814) 432-3187
Cumberland	Southcentral Regional Office Harrisburg, PA (484) 250-5900	Southcentral Regional Office Newville, PA (717) 486-8227	Carlisle, PA 17013 (717) 240-7812	Southcentral Regional Office Huntingdon, PA (814) 643-1831
Dauphin	Southcentral Regional Office Harrisburg, PA (484) 250-5900	Southcentral Regional Office Newville, PA (717) 486-8227	Dauphin, PA 17018 (717) 921-8100	Southeast Regional Office Reading, PA (610) 926-3136
Delaware	Southeast Regional Office Norristown, PA (484) 250-5900	Southeast Regional Office Elm, PA (717) 626-0486	Media, PA 19063 (610) 892-9484	Southeast Regional Office Reading, PA (610) 926-3136
Elk	Northwest Regional Office Meadville, PA (814) 332-6945 – bus. hours 1-800-373-3398 – after hours	Northcentral Regional Office Pleasant Gap, PA (814) 359-5254	Ridgeway, PA 15853 (814) 776-5373	Northcentral Regional Office Jersey Shore, PA (570) 398-4744

COUNTY	PaDEP REGIONAL OFFICE	Pa FISH & BOAT COMM. REGIONAL OFFICE	COUNTY CONSERVATION DISTRICT	Pa GAME COMMISSION REGIONAL OFFICE
Erie	Northwest Regional Office Meadville, PA (814) 332-6945 – bus. hours 1- 800-373-3398 – after hours	Northwest Regional Office Meadville, PA (814) 337-0444	Erie, PA 16509 (814) 825-6403	Northwest Regional Office Franklin, PA (814) 432-3187
Fayette	Southwest Regional Office Pittsburgh, PA (412) 442-4000	Southwest Regional Office Somerset, PA (814) 445-8974	Lemont Furnace, PA 15456 (724) 438-4497	Southwest Regional Office Bolivar, PA (724) 238-9523
Forest	Northwest Regional Office Meadville, PA (814) 332-6945 – bus. hours 1- 800-373-3398 – after hours	Northwest Regional Office Meadville, PA (814) 337-0444	Tionesta, PA 16353 (814) 755-3450	Northwest Regional Office Franklin, PA (814) 432-3187
Franklin	Southcentral Regional Office Harrisburg, PA (484) 250-5900	Southcentral Regional Office Newville, PA (717) 486-8227	Chambersburg, PA 17202 (717) 264-5499	Southcentral Regional Office Huntingdon, PA (814) 643-1831
Fulton	Southcentral Regional Office Harrisburg, PA (484) 250-5900	Southcentral Regional Office Newville, PA (717) 486-8227	McConnellsburg, PA 17233 (717) 485-3547	Southcentral Regional Office Huntingdon, PA (814) 643-1831
Greene	Southwest Regional Office Pittsburgh, PA (412) 442-4000	Southwest Regional Office Somerset, PA (814) 445-8974	Waynesburg, PA 15370 (724) 852-5278	Southwest Regional Office Bolivar, PA (724) 238-9523
Huntingdon	Southcentral Regional Office Harrisburg, PA (484) 250-5900	Southcentral Regional Office Newville, PA (717) 486-8227	Huntingdon PA 16652 (814) 627-1627	Southcentral Regional Office Huntingdon, PA (814) 643-1831
Indiana	Southwest Regional Office Pittsburgh, PA (412) 442-4000	Southwest Regional Office Somerset, PA (814) 445-8974	Indiana, PA 15701-3571 (724) 471-4751	Southwest Regional Office Bolivar, PA (724) 238-9523
Jefferson	Northwest Regional Office Meadville, PA (814) 332-6945 – bus. hours 1- 800-373-3398 – after hours	Northcentral Regional Office Pleasant Gap, PA (814) 359-5254	Brookville, PA 15825 (814) 849-7463	Northwest Regional Office Franklin, PA (814) 432-3187
Juniata	Southcentral Regional Office Harrisburg, PA (484) 250-5900	Southcentral Regional Office Newville, PA (717) 486-8227	Mifflintown, PA 17059 (717) 436-8953 ext. 5	Southcentral Regional Office Huntingdon, PA (814) 643-1831
Lackawanna	Northeast Regional Office Wilkes- Barre, PA (570) 826-2511	Northeast Regional Office Sweet Valley, PA (570) 477-3221	Mayfield, PA 18433 (570) 281-9495	Northeast Regional Office Dallas, PA (570) 675-1143
Lancaster	Southcentral Regional Office Harrisburg, PA (484) 250-5900	Southeast Regional Office Elm, PA (717) 626-0486	Lancaster, PA 17601 (717) 299-5361	Southeast Regional Office Reading, PA (610) 926-3136

COUNTY	PaDEP REGIONAL OFFICE	Pa FISH & BOAT COMM. REGIONAL OFFICE	COUNTY CONSERVATION DISTRICT	Pa GAME COMMISSION REGIONAL OFFICE
Lawrence	Northwest Regional Office Meadville, PA (814) 332-6945 – bus. hours 1- 800-373-3398 – after hours	Northwest Regional Office Meadville, PA (814) 337-0444	New Castle, PA 16101 (724) 652-4512	Northwest Regional Office Franklin, PA (814) 432-3187
Lebanon	Southcentral Regional Office Harrisburg, PA (484) 250-5900	Southcentral Regional Office Newville, PA (717) 486-8227	Lebanon, PA 17042 (717) 272-3908 ext. 4	Southeast Regional Office Reading, PA (610) 926-3136
Lehigh	Northeast Regional Office Wilkes- Barre, PA (570) 826-2511	Southeast Regional Office Elm, PA (717) 626-0486	Allentown, PA 18104 (610) 391-9583	Southeast Regional Office Reading, PA (610) 926-3136
Luzerne	Northeast Regional Office Wilkes- Barre, PA (570) 826-2511	Northeast Regional Office Sweet Valley, PA (570) 477-3221	Shavertown, PA 18708 (570) 674-7991	Northeast Regional Office Dallas, PA (570) 675-1143
Lycoming	Northcentral Regional Office Williamsport, PA (570) 327-3636	Northcentral Regional Office Pleasant Gap, PA (814) 359-5254	Montoursville, PA 17754 (570) 433-3003	Northcentral Regional Office Jersey Shore, PA (570) 398-4744
McKean	Northwest Regional Office Meadville, PA (814) 332-6945 – bus. hours 1- 800-373-3398 – after hours	Northcentral Regional Office Pleasant Gap, PA (814) 359-5254	Smethport, PA 16749 (814) 887-4001	Northcentral Regional Office Jersey Shore, PA (570) 398-4744
Mercer	Northwest Regional Office Meadville, PA (814) 332-6945 – bus. hours 1- 800-373-3398 – after hours	Northwest Regional Office Meadville, PA (814) 337-0444	Mercer, PA 16137 (724) 662-2242	Northwest Regional Office Franklin, PA (814) 432-3187
Mifflin	Southcentral Regional Office Harrisburg, PA (484) 250-5900	Southcentral Regional Office Newville, PA (717) 486-8227	Burnham, PA 17009-1837 (717) 248-4695	Southcentral Regional Office Huntingdon, PA (814) 643-1831
Monroe	Northeast Regional Office Wilkes- Barre, PA (570) 826-2511	Northeast Regional Office Sweet Valley, PA (570) 477-3221	Stroudsburg, PA 18360 (570) 629-3060	Northeast Regional Office Dallas, PA (570) 675-1143
Montgomery	Southeast Regional Office Norristown, PA (484) 250-5900	Southeast Regional Office Elm, PA (717) 626-0486	Collegeville, PA 19426 (610) 489-4506	Southeast Regional Office Reading, PA (610) 926-3136
Montour	Northcentral Regional Office Williamsport, PA (570) 327-3636	Northcentral Regional Office Pleasant Gap, PA (814) 359-5254	Danville, PA 17821 (570) 271-1140	Northeast Regional Office Dallas, PA (570) 675-1143
Northampton	Northeast Regional Office Wilkes- Barre, PA (570) 826-2511	Southeast Regional Office Elm, PA (717) 626-0486	Nazareth, PA 18064-9211 (610) 746-1971	Southeast Regional Office Reading, PA (610) 926-3136

COUNTY	PaDEP REGIONAL OFFICE	Pa FISH & BOAT COMM. REGIONAL OFFICE	COUNTY CONSERVATION DISTRICT	Pa GAME COMMISSION REGIONAL OFFICE
Northumberland	Northcentral Regional Office Williamsport, PA (570) 327-3636	Northcentral Regional Office Pleasant Gap, PA (814) 359-5254	Sunbury, PA 17801 (570) 286-7114 ext. 4	Northeast Regional Office Dallas, PA (570) 675-1143
Perry	Southcentral Regional Office Harrisburg, PA (484) 250-5900	Southcentral Regional Office Newville, PA (717) 486-8227	New Bloomfield, PA 17068 (717) 582-8988 ext. 4	Southcentral Regional Office Huntingdon, PA (814) 643-1831
Philadelphia	Southeast Regional Office Norristown, PA (484) 250-5900	Southeast Regional Office Elm, PA (717) 626-0486	Philadelphia does not have a Conservation District.	Southeast Regional Office Reading, PA (610) 926-3136
Pike	Northeast Regional Office Wilkes- Barre, PA (570) 826-2511	Northeast Regional Office Sweet Valley, PA (570) 477-3221	Hawley, PA 18428 (570) 226-8220	Northeast Regional Office Dallas, PA (570) 675-1143
Potter	Northcentral Regional Office Williamsport, PA (570) 327-3636	Northcentral Regional Office Pleasant Gap, PA (814) 359-5254	Coudersport, PA 16915 (814) 274-8411 ext. 4	Northcentral Regional Office Jersey Shore, PA (570) 398-4744
Schuylkill	Northeast Regional Office Wilkes- Barre, PA (570) 826-2511	Southeast Regional Office Elm, PA (717) 626-0486	Pottsville, PA 17901 (570) 622-3742 ext. 5	Southeast Regional Office Reading, PA (610) 926-3136
Snyder	Northcentral Regional Office Williamsport, PA (570) 327-3636	Northcentral Regional Office Pleasant Gap, PA (814) 359-5254	Middleburg, PA 17842 (570) 837-3000	Southcentral Regional Office Huntingdon, PA (814) 643-1831
Somerset	Southwest Regional Office Pittsburgh, PA (412) 442-4000	Southwest Regional Office Somerset, PA (814) 445-8974	Somerset, PA 15501 (814) 445-4652 ext. 5	Southwest Regional Office Bolivar, PA (724) 238-9523
Sullivan	Northcentral Regional Office Williamsport, PA (570) 327-3636	Northeast Regional Office Sweet Valley, PA (570) 477-3221	Dushore, PA 18614 (570) 928-7057	Northeast Regional Office Dallas, PA (570) 675-1143
Susquehanna	Northeast Regional Office Wilkes- Barre, PA (570) 826-2511	Northeast Regional Office Sweet Valley, PA (570) 477-3221	Montrose, PA 18801 (570) 278-4600 ext. 280	Northeast Regional Office Dallas, PA (570) 675-1143
Tioga	Northcentral Regional Office Williamsport, PA (570) 327-3636	Northcentral Regional Office Pleasant Gap, PA (814) 359-5254	Wellsboro, PA 16901 (570) 724-1801 ext. 5	Northcentral Regional Office Jersey Shore, PA (570) 398-4744
Union	Northcentral Regional Office Williamsport, PA (570) 327-3636	Northcentral Regional Office Pleasant Gap, PA (814) 359-5254	Lewisburg, PA 17837 (570) 524-3860	Northcentral Regional Office Jersey Shore, PA (570) 398-4744

COUNTY	PaDEP REGIONAL OFFICE	Pa FISH & BOAT COMM. REGIONAL OFFICE	COUNTY CONSERVATION DISTRICT	Pa GAME COMMISSION REGIONAL OFFICE
Venango	Northwest Regional Office Meadville, PA (814) 332-6945 – bus. hours 1- 800-373-3398 – after hours	Northwest Regional Office Meadville, PA (814) 337-0444	Franklin, PA 16323 (814) 676-2832	Northwest Regional Office Franklin, PA (814) 432-3187
Warren	Northwest Regional Office Meadville, PA (814) 332-6945 – bus. hours 1- 800-373-3398 – after hours	Northwest Regional Office Meadville, PA (814) 337-0444	Warren, PA 16365 (814) 726-1441	Northwest Regional Office Franklin, PA (814) 432-3187
Washington	Southwest Regional Office Pittsburgh, PA (412) 442-4000	Southwest Regional Office Somerset, PA (814) 445-8974	Washington, PA 15301 (724) 228-6774	Southwest Regional Office Bolivar, PA (724) 238-9523
Wayne	Northeast Regional Office Wilkes- Barre, PA (570) 826-2511	Northeast Regional Office Sweet Valley, PA (570) 477-3221	Honesdale, PA 18431 (570) 253-0930	Northeast Regional Office Dallas, PA (570) 675-1143
Westmoreland	Southwest Regional Office Pittsburgh, PA (412) 442-4000	Southwest Regional Office Somerset, PA (814) 445-8974	Greensburg, PA 15601 (724) 837-5271	Southwest Regional Office Bolivar, PA (724) 238-9523
Wyoming	Northeast Regional Office Wilkes- Barre, PA (570) 826-2511	Northeast Regional Office Sweet Valley, PA (570) 477-3221	Tunkhannock, PA 18657 (570) 836-2589	Northeast Regional Office Dallas, PA (570) 675-1143
York	Southcentral Regional Office Harrisburg, PA (484) 250-5900	Southcentral Regional Office Newville, PA (717) 486-8227	York, PA 17402 (717) 840-7430	Southeast Regional Office Reading, PA (610) 926-3136

Pennsylvania DCNR Forestry Offices

<u>STATE FOREST</u>	<u>OFFICE LOCATION and TELEPHONE NUMBER</u>
Bald Eagle	Milmont, PA (570) 922-3344
Buchanan	McConnellsburg, PA (717) 485-3248
Clear Creek	Clarion, PA (814) 226-1901
Cornplanter	North Warren, PA (814) 723-0262
Delaware	Swiftwater, PA (570) 895-4000 or -4001
Elk	Emporium, PA (814) 486-3353
Forbes	Laughlintown, PA (724) 238-1200
Gallitzin	Ebensburg, PA (814) 472-1862
Lackawanna	Scranton, PA (570) 963-4561
Loyalsock	Dushore, PA (570) 946-4049
Michaux	Fayetteville, PA (717) 352-2211
Moshannon	Penfield, PA (814) 765-0821
Rothrock	Huntingdon, PA (814) 643-2340
Sproul	Renovo, PA (570) 923-6011
Susquehannock	Coudersport, PA (814) 272-3600
Tiadaghton	South Williamsport, PA (570) 327-3450
Tioga	Wellsboro, PA (570) 724-2868
Tuscarora	Blain, PA (717) 536-3191
Weiser	Cressona, PA (570) 385-7800
William Penn	Elverson, PA (610) 582-9660