FREQUENTLY USED ACRONYMS

BMPs – Best Management Practices. These are the most effective and practical ways to control pollutants and meet environmental quality goals. BMPs exist for forestry, agriculture, stormwater, floodplains, and many other sectors. An example of a BMP is installing a riparian buffer between a cultivated agricultural field and stream.

BNR – Biological Nutrient Reduction. The biological nutrient removal (BNR) process uses naturally occurring microbes to remove nutrients from wastewater; BNR achieves nitrogen concentration at or below 8 mg/liter total nitrogen and 1.0 mg/liter total phosphorous.

CBTS – Chesapeake Bay Tributary Strategy. This is a strategy developed by the Pennsylvania Department of Environmental Protection that identifies specific initiatives and actions required to improve water quality in the Susquehanna River and the Chesapeake Bay.

CFA – Commonwealth Finance Authority. This is an independent agency in Pennsylvania, established to administer Pennsylvania's economic stimulus packages. The CFA holds fiduciary responsibility over the funding of programs and investments in Pennsylvania's economic growth.

CREP – Conservation Reserve Enhancement Program. This program is administered by the U.S. Department of Agriculture's Farm Service Agency. It provides funding to help farmers conserve and enhance natural resources with local, state, or federal significance.

EPA – United States Environmental Protection Agency. Established by Congress in 1970, this agency leads the nation's environmental science, research, education, and assessment efforts. The mission of the agency is to protect human health and the environment through regulatory enforcement, funding environmental programs, and technical assistance.

FASB – Financial Accounting Standards Board. This is the designated organization in the private sector for establishing standards for financial accounting and reporting.

IFAS – Integrated Fixed Film / Activated Sludge. This is an advanced technology used to remove nutrients from wastewater.

FSA – Farm Service Agency. Under the jurisdiction of the U.S. Department of Agriculture, this agency administers and manages farm commodity, credit, conservation, and disaster and loan programs laid out by Congress through a network of federal, state, and county offices.

GASB – Government Accounting Standards Board. This independent organization establishes and improves standards of accounting and financial reporting for the federal, state, and local governments.

GIS – Geographic Information Systems. GIS is a computerized system that integrates hardware, software, and data for capturing, managing, analyzing, and displaying all forms of geographically referenced information.

H_2O – Water. This refers to Pennsylvania Act 63 of 2008. This law provides for the allocation of money in the Pennsylvania Gaming Economic Development and Tourism Fund, and for funding of water and sewer projects, storm water projects, flood control projects, and high-hazard unsafe dam projects. It authorizes the Commonwealth Financing Authority to incur indebtedness up to $800 million to provide funding assistance for such projects.

I&I – Infiltration and Inflow. This refers to stormwater, surface water, groundwater, roof runoff, subsurface drainage, or other types of discharges (other than sanitary sewage) that enter the sanitary sewer system, either intentionally or unintentionally.

IPC – Industrial Properties Corporation. This is the economic development arm of the Williamsport/Lycoming Chamber of Commerce.

LCCD – Lycoming County Conservation District. This agency was formed under the Conservation District Law and is a subdivision of state government. Its mission is to encourage the use of best management practices to conserve the natural resources essential to the quality of life for the county's citizens.

LCWSA – Lycoming County Water and Sewer Authority.

MGD – Millions of Gallons per Day.

NFWF – National Fish and Wildlife Foundation. This non-profit foundation provides funding to support environmental initiatives that improve habitat. A current program that is applicable to the Chesapeake Bay Strategy is the Chesapeake Bay Stewardship Fund that provides funding for innovative nutrient and sediment reduction projects.

NPDES – National Pollution Discharge Elimination System. This is the permit program required under the federal Water Pollution Control Act (also known as the Clean Water Act), administered by the Pennsylvania Department of Environmental Protection.

NRCS – National Resource Conservation Service. This service is under the jurisdiction of the U.S. Department of Agriculture. Through state and local county offices, its mission is to help people reduce soil erosion, enhance water supplies, improve water quality, increase wildlife habitat, and reduce damages caused by floods and other natural disasters.

O&M – Operations and Maintenance.

PA DEP – Pennsylvania Department of Environmental Protection. This agency is primarily responsible for administering the state's environmental laws and regulations, including National Pollution Discharge Elimination System Permits that define specific discharge requirements for wastewater treatment plants.

PENNVEST - Pennsylvania Infrastructure Investment Authority. The Pennsylvania Infrastructure Investment Authority Act of 1988 authorized the creation of this Authority. Its mission is to provide funding support for sewer, stormwater, and drinking water projects throughout Pennsylvania.

REAP – Resource Enhancement and Protection Act of Pennsylvania. This legislation created a program that provides tax credits to landowners who implement best management practices.

TMDL – Total Maximum Daily Load – This defines the pollutant load a water body can acquire without violating water quality standards, and allocates the pollutant loading between contributing point sources and non-point sources. TMDLs are set by state and federal regulatory agencies.

USDA – United States Department of Agriculture.

WSA – Williamsport Sanitary Authority.

WWTP – Wastewater Treatment Plant.

GLOSSARY OF TERMS

Aggregator/Broker - An individual or entity that can collect and compile credits from individual sources. These credits can then either be sold on the credit marketplace, or sold directly to a point source, developer, or third-party.

Anaerobic - Not containing oxygen, or not requiring oxygen.

Atmospheric Deposition - When pollutants in the air fall onto the land or water. Pollution that falls with rain or snow is called wet deposition, and pollution that falls without precipitation is called dry deposition.

Baseline- The numeric level of pollution coming from a source during a particular time period, which is used as a standard to measure future reduction goals and allowances against. In other words, a baseline is an existing, or past existing, condition of what is or was actually coming from a source and is used for comparison purposes.

Best Management Practices (BMPs) - The most effective and practical ways to control pollutants and meet environmental quality goals. BMPs exist for forestry, agriculture, stormwater, floodplains, and many other sectors. An example of a BMP is installing a riparian buffer between a cultivated agricultural field and stream.

Bioretention Site - Also called a rain garden; an innovative method of stormwater management that retains rainwater and uses plants and layers of soil, sand and mulch to reduce the amount of nutrients and other pollutants that enter local waterways.

Biochemical Oxygen Demand (BOD) - The quantity of oxygen, expressed in parts per million, utilized in the biochemical oxidation of organic matter under standard laboratory procedure for five days at 20 degrees centigrade. This is a universal term describing the strength of wastewater.

Biological Nutrient Removal (BNR) – The biological nutrient removal (BNR) process uses naturally occurring microbes to remove nutrients from wastewater; BNR achieves nitrogen concentration at or below 8 mg/liter total nitrogen and 1.0 mg/liter total phosphorous.

Cap/Cap Load - The maximum amount of nutrients or sediments allowed to be discharged into a given water body. The cap is the baseline minus the pollutant load that needs to be reduced to meet a water quality or restoration goal. Caps are established by appropriate regulatory agencies.

Cap Load Allocations – Based on each tributary's nutrient and sediment input to the Bay, the total Chesapeake Bay pollution load is divided proportionally to each tributary and jurisdiction, and are thus set for individual wastewater treatment plants. Cap load allocations show where the nutrient and sediment loads will most effectively be reduced to achieve restoration goals.

Combined Sewer System Overflow (CSO) – A combined sewer system is one whereby the sewer system has both storm water and sanitary sewer flow in the same pipe. An overflow is when the carrying capacity is exceeded and the pipe overflows through pre-determined discharge or relief interceptors/locations.

Credit – The unit of compliance that corresponds with a pound of reduction of nutrient or sediment as recognized by PA DEP which may be used in a trade.

Credit Reserve – Credits set aside by PA DEP to address nutrient and sediment reduction failures, uncertainty, and to provide liquidity in the market.

Delivery Ratio/Delivery Factor – This compensates for the natural loss, or attenuation, of nutrients and sediments as they travel in water. The delivery ratio for every pound of nitrogen removed in Lycoming County actually has a value of 0.93 or 0.941 lbs removed from the Bay, due to our distance from the Bay. The delivery ratio for every pound of phosphorus removed in Lycoming County actually has a value of less than .5 lbs removed from the Bay.

Denitrification - The process by which nitrates in sewage are reduced to gaseous nitrogen and given off into the atmosphere.

Dischargers - The sources that emit, give off, or dispose of a gas or liquid.

Effluent - Discharge of liquid waste from a wastewater treatment facility, factory, or industry to a local water body.

Enhanced Nutrient Removal (ENR) – This is the next step beyond secondary treatment. The Chesapeake Bay 2000 Agreement requires further reduction in nitrogen and phosphorus entering the Bay by about 20 million pounds and 1 million pounds per year, respectively. Through ENR technologies, some treatment plants are modified to reduce nitrogen and phosphorus in the wastewater down to 3 mg/l total nitrogen and 0.3 mg/l total phosphorus. Currently, PA DEP does not require ENR in Pennsylvania plants.

Eutrophication - The process of excess nutrients accelerating the growth of algae that ultimately, depletes the water of dissolved oxygen.

GPD - Gallons per day.

Impaired Waters - Waterways that do not meet state water quality standards. Under the Clean Water Act Section 303(d), states, territories, and authorized tribes are required to develop prioritized lists of impaired waters.

Impervious – Describes a surface or area that is hardened and does not allow water to pass through. All of the water runs off (in the form of stormwater) instead of naturally filtering into the ground. Roads, rooftops, driveways, sidewalks, pools, patios, and parking lots are all typically impervious surfaces, although new technologies and building materials (such as pervious pavement) exist to allow many of these to infiltrate water.

Industrial User - Any industrial facility which generates, processes, pre-treats, or disposes a non-domestic (household) waste to sewer facilities.

Infiltration and Inflow (I&I) – Stormwater, surface water, groundwater, roof runoff, subsurface drainage or other types of discharges, other than sanitary sewage, that enter the sanitary sewer system, either intentionally or unintentionally.

Municipal Separate Storm Sewer System (MS4) – A publicly-owned means of collecting or conveying stormwater runoff that does not connect with a wastewater collection system or treatment plant.

National Pollutant Discharge Elimination System (NPDES) – The permit program required under the federal Water Pollution Control Act (also known as the Clean Water Act), administered by the Pennsylvania Department of Environmental Resources.

Nitrification - The process through which ammonia is oxidized into nitric acid or another type of nitrate or nitrite. Biological nitrification is a key step in nitrogen removal in wastewater treatment.

Nitrogen - A type of nutrient contributing to the Bay's poor water quality. While nitrogen is needed for plant growth, human activities—from driving cars to applying fertilizers—contribute more nitrogen than the Bay's waters can handle. Elevated nitrogen levels cause more algae to grow, blocking out sunlight, and reducing oxygen for fish, crabs, and other Bay life.

Non-Point Source (NPS) – Non-point source pollution, sometimes referred to as polluted runoff, is generally caused by stormwater runoff across the land and cannot be attributed to a clearly identifiable, specific physical location or a defined discharge channel (such as a pipe). Non-point source pollution includes nutrients that run off from farms, lawns, parking lots, streets and other land uses. It also includes nutrients that enter waterways via air pollution, groundwater, or septic systems.

Nutrient – Chemicals that plants and animals need to grow and survive. However, excess amounts of nutrients can be harmful to aquatic environments. Elevated levels of nitrogen and phosphorus, two types of nutrients, are the main cause of the Bay's poor water quality and loss of aquatic habitats.

Nutrient Credit - See "Credit."

Nutrient Reduction - The difference in nutrient discharge to surface waters achieved by implementing best management practices or performing technical upgrades to sewer facilities, compared to the applicable baseline and threshold.

Nutrient Removal Technology (NRT) - Technology that removes nitrogen and phosphorus during wastewater treatment. It is also known as biological nutrient removal (BNR).

Nutrient Trading - The transfer of nutrient reduction credits, specifically for nitrogen and phosphorus. Transactions involve the exchange of quantifiable nutrient reduction credits, approved by PA DEP. Nutrient trading is a voluntary, market driven program that helps to identify and finance cost-effective solutions to reducing nutrient loadings into a watershed. The program allows one nutrient generating source to meet reduction goals by acquiring (buying) nutrient reduction credits from another source within the same watershed. Credits are generated when a source reduces nutrient loadings to a greater extent than is required. A non-point source must first ensure it is meeting baseline compliance, and then it is meeting minimum requirements referred to as "threshold requirements." The installation of best management practices (BMPs), which are above these requirements, can generate credits for a non-point source.

PA DEP - The Pennsylvania Department of Environmental Protection.

pH - Hydrogen Ion Content; indicates the degree of acidity or alkalinity of a substance.

Phosphorus - A type of nutrient contributing to the Bay's poor water quality. While phosphorus is vital to plant life, human activities—from applying fertilizers to using household cleaners—contribute more phosphorus than the Bay's waters can handle. Elevated phosphorus levels cause more algae to grow, blocking out sun light and reducing oxygen for fish, crabs, and other Bay life.

Point Source - A source of pollution that can be attributed to a specific physical location; it is an identifiable, end-of-pipe point. The vast majority of point source discharges of nutrients are from wastewater treatment plants, although some come from industries.

Pollutant - Any input of waste, including waste heat, discharged into water. For the Chesapeake Bay, the primary pollutants include sewage sludge, wastewater, and industrial, municipal and agricultural waste.

POTWs – Publicly-owned treatment works.

PPM - Parts per million.

Pretreatment - The reduction of the amount of pollutants, the elimination of pollutants, or the alteration of the nature of pollutant properties in wastewater to a less harmful state prior to introducing such pollutants into a sewer system. The reduction or alteration can be obtained by physical, chemical or biological processes, or process changes by other means.

Primary/Physical Treatment – The earliest and most basic technology used by wastewater treatment plants, using preliminary process (screens and grit removal units) and primary settling tanks (primary clarifiers). Primary treatment achieves only 45-50 percent in reduction of pollutants by removing "settleable" and other easily removable materials.

Registry - A management system that tracks and records credits generated and traded between point sources, non-point sources, and third parties.

Reserve Ratio - The proportion of the credits generated by a nutrient reduction that is set aside in the credit reserve; the reserved credits are an "insurance policy" to cover any unforeseen problems with credit generators.

Riparian Area – This is the area of land next to a body of water. Riparian areas form the transition between aquatic and land environments.

Riparian Forest Buffers - Trees and/or other vegetation located along the edge of streams, rivers and other waterways that filter pollution, prevent erosion and provide wildlife habitat.

Sanitary Sewage, or Domestic Waste - The normal household and toilet wastes carried in water from residences, business buildings, institutions, industries, and commercial establishments.

Sanitary Sewer Overflow (SSO) – When the carrying capacity of an existing sanitary line is exceeded and unplanned overflows occur for the sewer. These overflows are a violation of the Clean Water Act (federal) and state Clean Streams law.

Secondary Treatment - The degree of treatment that is required to conform with the secondary treatment parameters established by EPA and PA DEP, and other governmental agencies with jurisdiction. Secondary treatment introduced the biological process, such as activated sludge, trickling filter, rotating biological contractor, and other biological treatment technologies. Biological treatment systems are living systems that rely on mixed biological cultures to break down waste that could not be removed by the physical treatment, and allow it to settle in the final clarifier, achieving 85 to 90 percent reduction in pollutants. Secondary treatment has been mandatory for all plants with the inception of the National Pollutant Discharge Elimination (NPDES) permit in 1972.

Sediment - Loose particles of clay, silt, and sand. Excess suspended sediment from erosion is one of the largest contributors to the Bay's impaired water quality.

Sedimentation - When sediment settles in an area, covering bottom-dwelling organisms (such as oysters) and filling shipping channels. Also referred to as siltation.

Septage - Domestic (household) waste carried in water from septic tanks, holding tanks, and recreational vehicles. Septage is differentiated from sanitary sewage, which is conveyed through a collection system to a treatment plant.

Sewer System - Facilities owned, operated, and/or maintained by the sewer authority, including collection lines, laterals, force mains, interceptors, pump stations, and/or treatment plants.

Siltation - See "Sedimentation."

Stormwater - Flow of water occurring during or following any form of natural precipitation, such as rain or snow.

Streambank Erosion - Loss of sediment along a stream bank, resulting from increased run-off from nearby development. Streambank erosion degrades stream habitats for wildlife and increases suspended sediments in the water.

Suspended Sediments - Tiny particles of clay and silt that become suspended in the water, reducing water clarity and the amount of sunlight that can reach underwater bay grasses. Excess suspended sediment is one of the largest contributors to the Bay's impaired water quality.

Sustainability - Maintaining an ecological balance by avoiding depletion of natural resources.

Technology-Based Effluent Limits - The level of treatment required for point sources based on currently available treatment technologies, or as otherwise required by the federal Clean Water Act or the Pennsylvania Clean Streams Law.

Tertiary Treatment - Treatment required at a treatment plant, in addition to that required for secondary treatment. Tertiary treatment typically consists of additional nutrient or organic loading removal rate requirements imposed by the NPDES permit.

Total Maximum Daily Load (TMDL) - Defines the pollutant load a water body can acquire without violating water quality standards, and allocates the pollutant loading between contributing point sources and non-point sources. TMDLs are set by state and federal regulatory agencies.

Total Suspended Solids (TSS) - The total amount of solids material present in wastewater in suspension, expressed in parts per million.

Third Party - Any entity that does not discharge nutrients or sediments and participates in the trading program. This entity could include, but is not limited to environmental groups, watershed associations, aggregators/brokers, and nonprofit organizations.

Trading Ratios - Discount factors applied to nutrient and sediment reductions to account for uncertainty, water quality, delivery, or special need concerns.

Trading Threshold – Loading or level of nutrient and sediment reduction efforts to be achieved and maintained before credits can be generated for any additional reductions. Relates to "Baseline."

Treatment Plant - A treatment facility as designed, constructed, owned, and operated by the sewer authority, including any additions, improvements, enlargements, and modifications made over time.

Tributary – A stream or river that eventually flows into a larger water body. For example, Lycoming Creek is a tributary of the West Branch Susquehanna River, and ultimately of the Chesapeake Bay.

Tributary Strategies - River-specific clean-up plans that detail the actions needed to achieve nutrient and sediment cap load allocations developed in cooperation with local watershed stakeholders.

Wastewater - Water that has been used in homes, industries, and businesses that is not for reuse, unless treated by a wastewater facility.

Wastewater Treatment - The reduction of contaminants that may be accomplished by various operations or processes.

WWTPs - Wastewater treatment plants.

Water Quality Standards - Standards that define the goals for a body of water by designating its uses, setting criteria to protect those uses, and establishing provisions to protect water bodies from pollutants.

Watershed - An area of land that drains into a particular river, lake, bay, or other body of water. We all live in a watershed: some are large (like the Chesapeake), while others are small (like Pine Creek).

Note: This Glossary of Terms was compiled in December 2008 by Lycoming County Planning Department staff, with the help of CBTS project consultants (Delta Development Group, Inc., Brinjac Engineering, and LandStudies, Inc.). It is a "living" list, such that it is meant to be continually updated, as needed. It is also available on the Lycoming County Web site at www.lyco.org.

APPENDICES

DELTA DEVELOPMENT GROUP, INC.

Appendix Delta – 1: Pennsylvania's Keystone Principles

Appendix Delta – 2: Public Funding Opportunities

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LANDSTUDIES, INC.

Appendix LandStudies – 1: Summary of BMPs and the Potential Credits Generated from Implementation on a Yearly Basis

Appendix LandStudies – 2: Agricultural Land Distribution in Lycoming County

Appendix LandStudies – 3: Streams Located Within Agricultural Land Uses

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Appendix LandStudies – 11: Historic Mill Dam Locations

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Appendix LandStudies – 13: Potential Lycoming County Floodplain Restoration Sites for Generating Nutrient Credits

APPENDIX DELTA – 1: PENNSYLVANIA'S KEYSTONE PRINCIPLES

Pennsylvania's Keystone Principles

Adopted by 10 Agencies in 2005 to Guide State Investment

•**Redevelop first** -- Support revitalization of Pennsylvania's many cities and towns and give funding preference to reuse and redevelopment of "brownfield" and previously developed sites in urban, suburban, and rural communities.

•**Provide efficient infrastructure** – Fix it first use and improve existing infrastructure. Make highway and public transportation investments that use context sensitive design to improve existing developed areas and attract residents and visitors to these places. Require private and public expansions of service to be consistent with approved comprehensive plans and consistent implementing ordinances.

•**Concentrate development** - Support infill and "greenfield" development that is compact, conserves land, and is integrated with existing or planned transportation, water and sewer services, and schools. Foster creation of well-designed developments and neighborhoods that offer healthy life style opportunities for Pennsylvania residents.

•**Increase job opportunities** -- Retain and attract a diverse, educated workforce through the quality of economic opportunity and quality of life offered in Pennsylvania's varied communities. Integrate educational and job training opportunities for workers of all ages with the workforce needs of businesses. Invest in businesses that offer good paying, high quality jobs, and that are located near existing or planned water & sewer infrastructure, housing, existing workforce, and transportation access (highway or transit)

•**Foster sustainable businesses** -- Strengthen natural resource based businesses that use sustainable practices in energy production and use, agriculture, forestry, fisheries, recreation and tourism. Increase our supply of renewable energy. Reduce consumption of water, energy and materials to reduce foreign energy dependence and address climate change.

•**Restore and enhance the environment** -- Maintain and expand land, air and water protection and conservation programs. Conserve and restore environmentally sensitive lands and natural areas for ecological health, biodiversity and wildlife habitat.

•**Enhance recreational and heritage resources** -- Maintain and improve recreational and heritage assets and infrastructure throughout the commonwealth, including parks and forests, greenways and trails, heritage parks, historic sites and resources, fishing and boating areas and game lands offering recreational and cultural opportunities to Pennsylvanians and visitors.

•**Expand housing opportunities** - Support the construction and rehabilitation of housing of all types to meet the needs of people of all incomes and abilities. Support local projects that are based on a comprehensive vision or plan, have significant potential impact (e.g., increased tax base, private investment), and demonstrate local capacity, technical ability and leadership to implement the project.

•**Plan regionally, implement locally** – Support multi-municipal, county and local government planning and implementation that has broad public input and support and is consistent with these principles. Provide education, training, technical assistance, and funding for such planning and for transportation, infrastructure, economic development, housing, mixed use and conservation projects that implement such plans.

•**Be fair** – Support equitable sharing of the benefits and burdens of development. Provide technical and strategic support for inclusive community planning to ensure social, economic, and environmental goals are met.

APPENDIX DELTA – 2A: PUBLIC FUNDING OPPORTUNITIES

Lycoming County Chesapeake Bay Tributary Strategy Public Financing Opportunities for Sewage Upgrades and Best Management Practices (BMPs)							
	2008 Farm Bill (a)	**Act 63 of 2008 H_20 Act (a)**	**Act 64 of 2008 Water and Sewer Assistance (a & b)**	**NFWF (1)**	**REAP (c)**	**PENNVEST (b)**	**Act 1 Alternative Energy Act (a)**
Stormwater		X	X	X		X	
Flood Control		X					
Legacy Sediment				X			
Combined Sewer Overflows/Sanitary System Overflows		X	X				
No-Till Farming	X			X	X		
Watershed Protection	X			X	X		
Waste-to-Energy							X
Purchase or Trading Nutrient Credits			X				
Wastewater Treatment Plant Upgrades		X	X			X	
On-Lot Sewage Disposal						X	
Brownfield Redevelopment						X	

1) National Fish and Wildlife Foundation, Chesapeake Bay Stewardship Fund

a) Grant

b) Loan

c) Tax Abatement

November 21, 2008

Appendix Delta – 2B: Public Funding Opportunities

LYCOMING COUNTY CHESAPEAKE BAY STRATEGY

Financing and Economic Development

Opportunities for Public Funding

- Point Source
- Non-point Source
- Brownfield Redevelopment

Point Source
Act 63 of 2008 – H2O PA Act

Overview

- Provides up to $800 million in grant funding for water, sewer, storm water, flood protection, and dam safety projects over the next 10 years
- Administered by the Commonwealth Finance Authority (CFA) with technical assistance provided by the Department of Environmental Protection (DEP) and the Pennsylvania Infrastructure Investment Authority (PENNVEST)
- The CFA has approved program guidelines that are posted on the Department of Community and Economic Development's website at www.newpa.com

Point Source
Act 63 of 2008 – H2O PA Act

Eligible Projects and Funding Amounts

- Water, sewer, storm water projects: Up to $665 million
- Flood control projects: At least $100 million
- High-hazard unsafe dam projects: At least $35 million

Eligible Applicants

- Commonwealth, an independent agency, or one or more municipalities or municipal authorities. A Commonwealth or independent agency shall be an eligible applicant only for the purposes of high-hazard unsafe dam and flood control projects

Point Source
Act 63 of 2008 – H2O PA Act

Local Participation/Match Requirements

- Water and sewer projects: Local share shall be at least 50% of the total CFA award. Applicants must be public entities.
- Flood control projects: Applicants must provide easements and rights-of-way, relocation of buildings and utilities, alteration or rebuilding of inadequate bridges, and operation and maintenance of completed project.
- High-hazard unsafe dams: The Commonwealth or an independent agency shall not be required to match.

Point Source
Act 63 of 2008 – H2O PA Act

Limitations and Other Considerations

- Grants shall be awarded for projects of $500,000 or more, but shall not exceed a total of $20 million for any project.
- A minimum of 50% of grants for water and sewer projects ($332.5 million) must be for regional systems or for projects that will consolidate two or more systems.
- Priority shall be given to eligible applicants that are currently subject to a federal or state court or agency order, consent decree, or a new permit discharge requirements imposed after January 1, 2007

Point Source
Act 64 of 2008
Water and Sewer Systems Assistance Act

Overview

- PENNVEST is authorized and directed to borrow $400 million (in increments of not more than $150 million every year over a three-year period) for drinking water, storm water, non-point source projects, nutrient credits, and wastewater treatment projects in the form of grants and loans to municipalities, municipal authorities, and public utilities

Point Source
Act 64 of 2008
Water and Sewer Systems Assistance Act

Eligible Projects

In addition to the acquisition, construction, improvements, expansion, extension, repair, rehabilitation, or security measures of all or part of a facility or system for water, wastewater and storm water, the definition of “project” was amended to include:

- The purchase or trading of nutrient credits;
- The control of non-point sources of pollution identified in programs established under the federal Water Pollution Control Act; or
- The consolidation or regionalization of two or more water supply systems, sewage disposal systems, or storm water systems managed or operated as an integrated system, regardless of whether the system is physically interconnected.

Point Source
Act 64 of 2008
Water and Sewer Systems Assistance Act

TIMEFRAME

- No new requirements or special applications are needed to access the funding. Pennvest's application and implementation process remains the same.
- However, PENNVEST will be looking to move actual cash to communities as quickly as possible so applicants should be prepared to settle on a PENNVEST funding offer as quickly as possible.
- Communities interested in accessing this funding should be targeting February 16, 2009 to get their applications into PENNVEST.

Point Source
Act 64 of 2008
Water and Sewer Systems Assistance Act

Grant Limitations

- Limits the aggregate amount of grants to no more than $200 million.
- The PENNVEST Board shall have no power to award any grant, loan or combination thereof that exceeds the following monetary limits:

Total Grant Amount Available	Sewer Based on annual average daily flow of gallons per day	Water Based on population
$50 million	Greater than 100 million	Greater than 300,000
$35 million	Between 50 and 100 million	Between 100,000 and 300,000
$25 million	Between 20 and 50 million	Between 10,000 and 100,000
$20 million	Between 10 and 20 million	Between 3,301 and 10,000
$15 million	Between 1 and 10 million	Between 501 and 3,300
$10 million	Less than 1 million	Less than 500

Non-point Source
2008 Farm Bill

- Includes $690 million over ten years for cleaning up the Chesapeake Bay.
- It would provide an additional $2.4 billion for the Environmental Quality Incentives Program (EQIP), which offers cost-sharing assistance to help farmers make environmentally-friendly improvements on their land.
- As part of the EQIP program, it established the Agricultural Water Enhancement Program (AWEP), which funds partnerships between farmers and other stakeholders, including water and wastewater agencies, to advance watershed protection efforts.
- AWEP is funded at $73 million for FY 2009 and FY 2010; $74 million for FY 2011; and $60 million for FY 2012.

Officials from the Natural Resource Conservation Service (NRCS), a branch of the U.S. Department of Agriculture (USDA), have begun to draft regulations for implementation of AWEP.

Non-point Source
National Fish and Wildlife Foundation, Chesapeake Bay Stewardship Fund

The National Fish and Wildlife Foundation, in partnership with EPA and the Chesapeake Bay Program, will award grants on a comprehensive basis of between $200,000 and $1 million each to support the demonstration of innovative approaches to expand the collective knowledge about the most cost effective and sustainable approaches to dramatically reduce or eliminate nutrient and sediment pollution to the Chesapeake Bay and its tributaries.

A total of up to $12.9 will be awarded through this solicitation.

Non-point Source
PA Resource Enhancement and Protection Program (REAP)

The Resource Enhancement and Protection (REAP) tax credit program is administered by the State Conservation Commission and encourages farmers to use conservation best management practices to reduce erosion and sedimentation impacting Pennsylvania's streams and watershed.

Farmers can receive tax credits of up to $150,000 per agricultural operation for 50 or 75% of the total cost of a conservation project, depending on the best management practices implemented. Farmers may also qualify for a 50% tax credit to purchase no-till planting equipment.

Non-point Source
Act 1 – Alternative Energy Investment Act

Overview

Allows the CFA to incur $500 million of indebtedness and transfers a total of $150 million in General Fund tax revenue between FY 2008-09 and 2015-16 for various consumer energy programs.

Alternative Energy Production Projects

Up to $30 million per project in grants/loan to business that:

- Utilize waste coal, biofuel, biomass, solar power, wind energy, geothermal, clean coal or waste energy technologies, or other alternative energy resources recognized under the Alternative Energy Portfolio Standards Act
- Manufactures or produces products that provide renewable energy
- Research and development of technology to provide alternative energy sources or alternative fuels
- Develop or enhance rail transportation systems that deliver alternative or renewable fuel or high-efficiency locomotives.

Brownfield Redevelopment
PENNVEST

Overview

Low-interest loans for the remediation of sites that have been contaminated by past industrial or commercial activity and pose a threat to local groundwater or surface water sources

Eligibility

Applicants must be a unit of municipal or county government or an affiliated industrial or economic development or redevelopment entity, such as an Industrial Development Authority or Corporation. A public entity may apply for financing on behalf of a private party, provided that either the public entity or private party has an ownership interest in the property to be remediated.

Brownfield Redevelopment
PENNVEST

Eligible Uses

Specific assessment and remediation activities on contaminated properties across the Commonwealth. These activities must be related to a water quality benefit, which can include the prevention of contamination. The purpose of this brownfield remediation financing initiative is to encourage the cleanup and reuse of contaminated properties while improving and protecting local water resources.

Drinking water, wastewater and storm water infrastructure facilities are also eligible.

Amounts

- Up to $11 million loan per project for one municipality
- Up to $20 million for projects that serve 2 or 3 municipalities
- More than $20 million requires a special vote of the PENNVEST Board of Directors and for comprehensive projects that serve all or parts of 4 or more municipalities

Opportunities for Private Financing/Investment

- Establishment and growth of a viable nutrient credit trading system will attract private investment through the generation and sale of credits
- A robust trading system will help ensure continued economic growth, especially among developers who must reduce to “0”
- Creating a public private partnership will promote the generation of BMPs and, therefore, availability of credits within the market

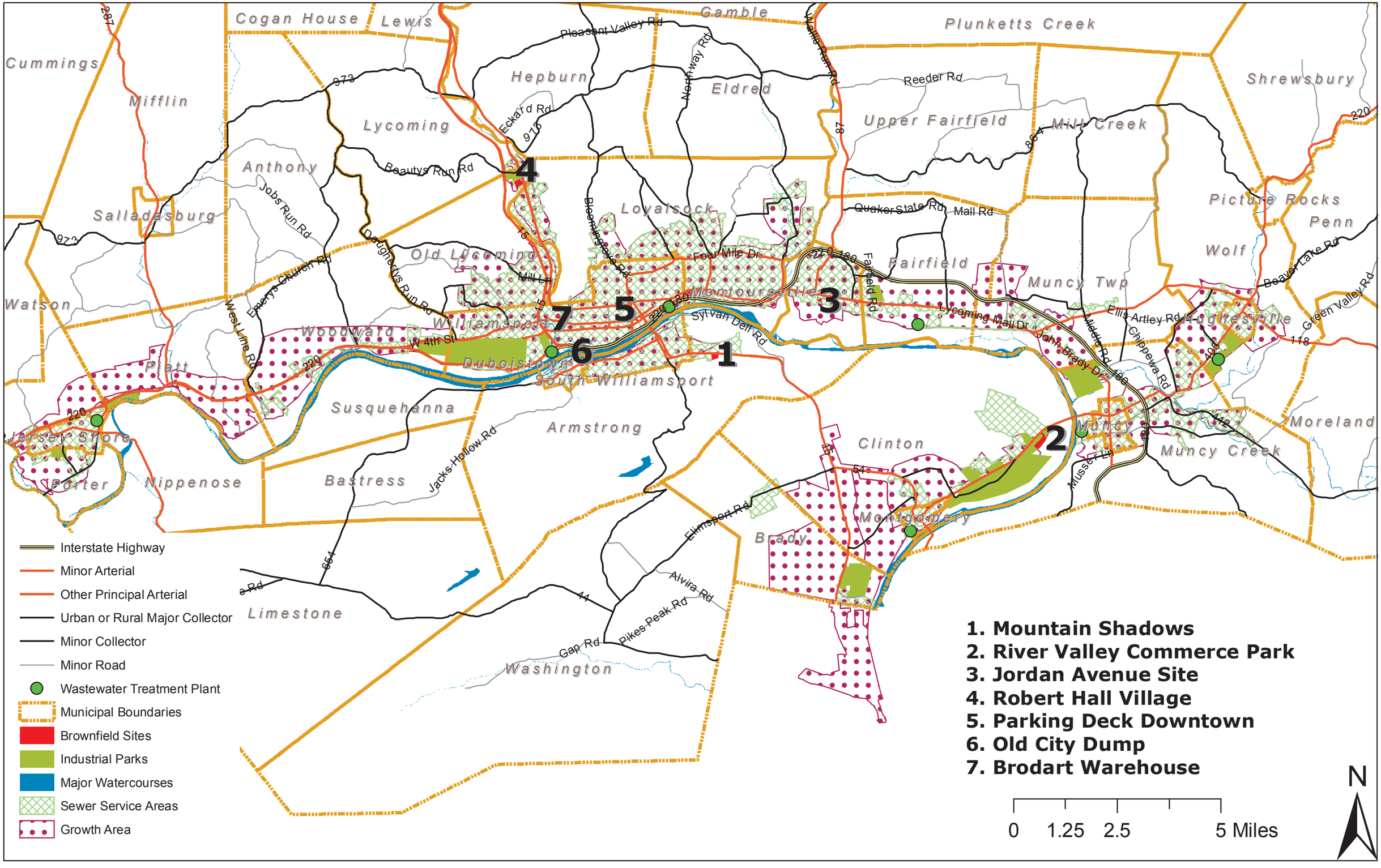
Ensure Capacity for Economic Development

- Align increased capacity of WWTP with targeted growth corridors and business parks
- Evaluate brownfield redevelopment as a priority growth strategy
  - Availability of public funding
  - Potential of reduced impacts on CBTS
- Assess business attraction strategies against CBTS impacts
  - Impacts on loading
  - Potential for BMPs

Opportunities for Private Financing/ Participation

- Inventory and assess non agriculture-related BMPs (e.g., storm water management)
- Investigate establishment of a Lycoming revolving loan fund (RLF) to finance BMP “start-ups”
- Evaluate additional incentives to reduce costs associated with entry to trading market
  - Tax credits
  - Loan guarantees

Appendix Delta - 3: Lycoming County Brownfields Map



APPENDIX DELTA – 4: NUTRIENT CREDIT TRADING PROGRAM ACCOUNTING CONCERNS

Accounting Concerns

1. Potential inconsistent accounting treatment could lead to bond rating problems.

Public wastewater treatment authorities should not suffer the same fate utilities and carbon market participants have experienced when trying to account for emissions-based cap and trade programs on the general ledger and for presentation on financial statements. The consequences of the same inaction by both government and accounting standards setters, and the resulting inconsistent accounting treatment, could lead to bond rating problems and unnecessary second-guessing by ratepayers. This can result as public authority financial reports come under greater scrutiny from the requirements of the Government Accounting Standards Board Statement Number 34[1], which requires that state and local governments (including public authorities) report on the value of their infrastructure assets, and develop procedures and methods for better asset management systems. In addition, public authorities may choose not to participate in offset programs such as nutrient credit trading, simply to avoid these potential pitfalls.

2. Unclear guidance standards present numerous challenges

Despite the fact that marketplaces for emission credits have been around for more than 15 years, accounting for these programs remains a challenge. Market participants continue to wait for clear guidance from standards setters. Many companies remain confused about the appropriate accounting treatments under both International Financial Reporting Standards (IFRS) and generally accepted accounting principles in the United States (US GAAP). As with the emissions programs, the use of different approaches toward accounting for a nutrient credit trading program will lead to inconsistencies in accounting treatments. The consequences of various accounting treatments on the different components of financial reports (i.e. balance sheet, profit or loss statements, cash flow statements) will differ depending on which treatment is adopted. This could have significant implications, not only for financial performance reported in the profit or loss statement, but also on how a company may decide to manage its participation in the nutrient credit trading program.

3. Accounting explanations will be required.

Under current conditions, companies likely will need to explain their accounting policy to the marketplace and ratepayers to ensure the impact of their nutrient credit trading accounting on financial performance is understood. The market expects accounting for nutrient credit trading to be comparable across the sector, but in practice, and without standards to follow, a company's choice of accounting policy may affect its profit or loss quite differently.

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[1] GASB 34 is the Government Accounting Standards Board Statement Number 34 requiring state and local governments, including public authorities, to begin to report on the value of their infrastructure assets—including roads, bridges, dams, and water and sewer facilities—and to develop procedures and methods for better asset management systems. Accordingly, accountants and consultants will be determining values and accounting treatment for many infrastructure projects, some of which may have been financed through federal revolving funds flowing through the EPA to the States.

Where do we want to be?

Emissions regulators and accounting standards bodies can provide much needed guidance and consistency in the treatment of emissions transactions which should enable stakeholders to better understand the process and provide market participants a degree of comfort to allow for a robust marketplace.

Minimally, the guidance should focus on the following issues:

- ✓ How emissions are measured in order to determine the value of credits.
- ✓ What is the appropriate asset class for emission credits, if any (i.e. Inventory, Intangible asset, etc.)?
- ✓ What is the appropriate liability recognition model for emissions credits, if any?
- ✓ What is the appropriate expense model for emission credits, if any (i.e amortization or depreciation expenses, etc.)?
- ✓ What is the appropriate revenue recognition model for emissions credits, if any (i.e. trading in the open marketplace)?
- ✓ How are gains recognized or deferred?
- ✓ Related parties – how arms length must these transactions be?
- ✓ Impairment - How does a decrease in the value of the asset affect financial statements?

How Do We Get There?

With regard to cap-and-trade program design, the Nicholas Institute of Duke University has published a manuscript entitled *Designing Offsets Policy for the US*[2] that could prove very useful in establishing a comprehenisive nutrient offset trading program. The manuscript discusses the value of enlightened government intervention to establish design integrity in emissions offset programs. Government involvement in the design of an emission offset program can ensure that strict scientific standards are used for measurement, accounting and verification; that legal standards exist to establish a safe investment environment; and that appropriate tools are provided for addressing a number of concepts unique to offset markets such as establishing certainty in the measurement and monitoring of emission reductions, providing a process to deal with the risk of emission reversals over time due to fire, flood, negligence, or other cause and providing assurance that approved projects will reduce emissions far above what would have occurred naturally through the same time period.

These broad design characteristics promote system integrity and provide useful criteria for the establishment of standardized legal frameworks and accounting approaches for emissions offset cap-and-trade programs.

With regard to accounting standards, both the Financial Accounting Standards Board (FASB) and the Government Accounting Standards Board (GASB) have been made aware of efforts to establish nutrient trading markets within the Chesapeake Bay watershed, including efforts in Lycoming County. They have

[2] Olander et al . 2008. "Designing Offsets Policy for the U.S." Report NI R 08-01, Nicholas Institute for Environmental Policy Solutions, Duke University.

both been provided copies of the Pennsylvania DEP Policy on Nutrient Credit Trading and were sent the recent article on Lycoming County's efforts to think and act regionally (11-22-08). In addition, FASB has indicated that they were already aware of nutrient trading programs within the watershed, and have reinstituted a program to provide comprehensive accounting guidance for emissions programs. However, there is no timetable for completion of the FASB project. Although GASB has no project underway; staff indicated that they would advise Delta if the Board were to take any position on the nutrient trading issue going forward. GASB also indicated that the Board will soon publish a new standard on Intangible Assets that might provide helpful accounting guidance.

U.S. Accounting Standardization Efforts To-date

There have been no known efforts to-date on emissions trading accounting standardization by the Government Accounting Standards Board (GASB) because, for the most part, only private sector companies have particpated in cap and trade programs up until now. On the private side, the Emerging Issues Task Force (EITF) of the Financial Accounting Standards Board (FASB) added Issue 03-14 in 2003 pertaining to emissions credits trading to its agenda. The Task Force's objective was to provide a comprehensive accounting model for participants in a cap-and-trade emissions reduction program to ultimately address asset recognition, measurement and impairment, cost allocation, liability recognition, presentation (gross versus net), and disclosures. However, in November 2003, the Task Force dropped the emission credit project from its agenda with no plans for further discussion.

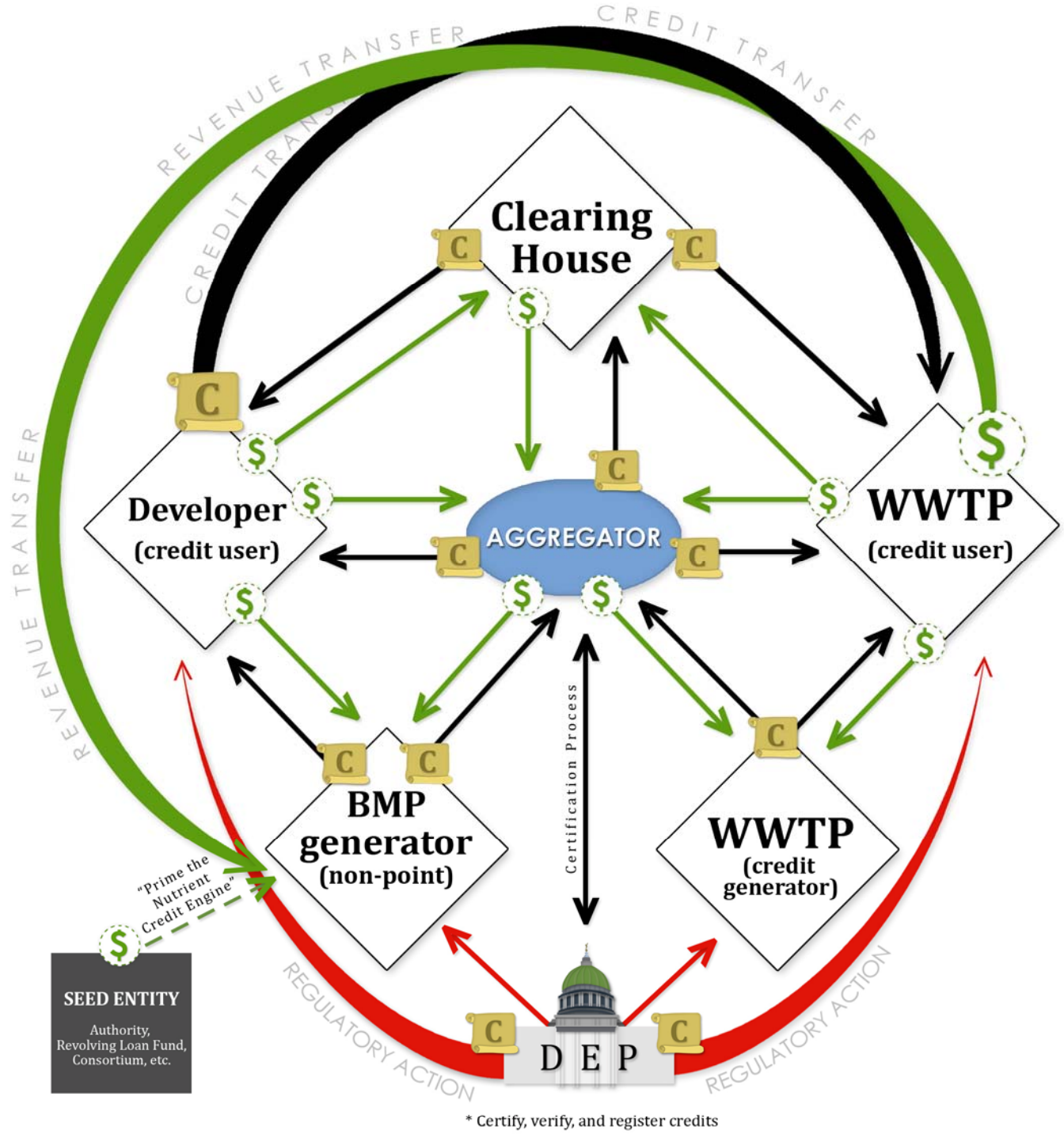
In December 2004 with the release of SFAS 153, Exchanges of Nonmonetary Assets, the issue of emissions accounting received new focus for a brief period. However, this project was withdrawn in October of 2006.

FASB announced a new project to comprehensively address emissions accounting in February of 2007. A recent request was also made to include nutrient credit trading guidance in the discussion. Unfortunately, there is no timetable for completion of this project.[3]

[3] FASB Web site, http://www.fasb.org/

APPENDIX DELTA - 5: A SUSTAINABLE NUTRIENT CREDIT MARKETPLACE

There are many ways to maintain a diverse portfolio of BMPs and nutrient credits.



LEGEND

Regulatory action | Revenue transfer | Credit transfer | Subsidy | Credit | Dollars

Appendix LandStudies - 1: Summary of BMPs and the Potential Credits Generated within Lycoming County from Implementation on a Yearly Basis

These estimates of nutrient credit potential assume landowner interest in credit trading, landowner compliance with land use trading requirements, sufficient capacity for calculating and certifying credits, and ready purchasers of nutrient credits.

BMPS for Nutrient Credits	Nitrogen Credits - 2010	Nitrogen Credits - 2011	Nitrogen Credits - 2012	Nitrogen Credits - 2013	Nitrogen Credits - 2014	Nitrogen Credits - 2015	Risk Management	Assumptions
Agricultural BMPs								
No-Till Agriculture - TOTAL	**31,750**	**105,973**	**180,191**	**186,946**	**193,696**	**200,446**		
No-Till Agriculture - Already Implemented	25,000	92,473	159,946	159,946	159,946	159,946	annual credits; need multi-year agreements to stay in no-till and sell credits	19,750 acres already in no-till. Assumes it was all in conventional tillage prior to conversion. Assumes credit certification can be accomplished over a three-year period. Assumes current conservation plans, meeting baseline and threshold, and farmer interest in nutrient credits.
No-Till Agriculture - New Projects	6,750	13,500	20,245	27,000	33,750	40,500	annual credits; need multi-year agreements to stay in no-till and sell credits	2,500 acres targeted for conversion to no-till from conventional tillage by 2012 . An additional 2,500 acres targeted for conversion to no-till from conventional tillage from 2013 to 2015. Assume these conversion targets will each take 3 years to complete. Assumes current conservation plans, meeting baseline and threshold, and farmer interest in nutrient credits.
Conservation Tillage Agriculture - TOTAL	**13,000**	**34,470**	**55,915**	**58,915**	**64,135**	**69,355**		
Conservation Tillage Agriculture - Already Implemented	10,000	26,250	42,475	42,475	42,475	42,475	annual credits; need multi-year agreements to stay in no-till and sell credits	7,900 acres already in conservation tillage. Assumes it was all in conventional tillage prior to conversion. Assumes credit certification can be accomplished over a three-year period. Assumes current conservation plans, meeting baseline and threshold, and farmer interest in nutrient credits.
Conservation Tillage Agriculture - New Projects	3,000	8,220	13,440	16,440	21,660	26,880	annual credits; need multi-year agreements to stay in no-till and sell credits	2,500 acres targeted for conversion to conservation tillage from conventional tillage by 2012. An additional 2,500 acres targeted for conversion to conservation tillage from conventional tillage from 2013 to 2015. Assume these conversion targets will each take 3 years to complete. Assumes current conservation plans, meeting baseline and threshold, and farmer interest in nutrient credits.
Cereal Cover Crops (on conservation tillage, early planting)	**24,000**	**56,940**	**89,880**	**108,880**	**127,880**	**147,080**		
Cereal Cover Crops on Conservation Tillage - Already Implemented	9,000	20,840	32,680	32,680	32,680	32,680	annual credits; need multi-year agreements to stay in cover crops and sell credits	4,000 acres already in cereal cover crops. Assumes it was on conservation tillage with early planting (not harvested). Assumes credit certification can be accomplished over a three-year period. Assumes current conservation plans, meeting baseline and threshold, and farmer interest in nutrient credits.
Cereal Cover Crops on Conservation Tillage - New Projects	15,000	36,100	57,200	76,200	95,200	114,400	annual credits; need multi-year agreements to stay in cover crops and sell credits	7,000 acres (new acreage) targeted for planting of cereal cover crops by 2012. An additional 7,000 acres (new acreage) targeted for planting of cereal cover crops from 2013 to 2015. Assumes cereal cover crops planted on conservation tillage with early planting (not harvested). Assumes this new acreage for each period will take three years to complete. Assumes current conservation plans, meeting baseline and threshold, and farmer interest in nutrient credits.

Appendix LandStudies - 1: Summary of BMPs and the Potential Credits Generated within Lycoming County from Implementation on a Yearly Basis

These estimates of nutrient credit potential assume landowner interest in credit trading, landowner compliance with land use trading requirements, sufficient capacity for calculating and certifying credits, and ready purchasers of nutrient credits.

BMPS for Nutrient Credits	Nitrogen Credits - 2010	Nitrogen Credits - 2011	Nitrogen Credits - 2012	Nitrogen Credits - 2013	Nitrogen Credits - 2014	Nitrogen Credits - 2015	Risk Management	Assumptions
Commodity Cover Crops (on conservation tillage, early planting)	**4,500**	**11,500**	**18,000**	**21,000**	**24,000**	**27,000**		
Commodity Cereal Cover Crops on Conservation Tillage - Already Implemented	2,500	6,000	9,000	9,000	9,000	9,000	annual credits; need multi-year agreements to stay in cover crops and sell credits	2,000 acres already in commodity cereal cover crops. Assumes it was on conservation tillage with early planting (with harvest). Assumes credit certification can be accomplished over a three-year period. Assumes current conservation plans, meeting baseline and threshold, and farmer interest in nutrient credits.
Commodity Cereal Cover Crops on Conservation Tillage - New Projects	2,000	5,500	9,000	12,000	15,000	18,000	annual credits; need multi-year agreements to stay in cover crops and sell credits	2,000 acres (new acreage) targeted for planting of commodity cereal cover crops by 2012. An additional 2,000 acres (new acreage) targeted for planting of commodity cereal cover crops from 2013 to 2015. Assumes commodity cereal cover crops planted on conservation tillage with early planting (with harvest). Assumes this new acreage for each period will take three years to complete. Assumes A26
Land Retirement (Conventional Tillage to Grassland)	**10,000**	**30,000**	**45,000**	**45,000**	**45,000**	**45,000**	annual credits; need multi-year agreements to maintain conversion and sell credits	4,996 acres originally in conventional tillage converted to grasslands through CREP. Assumes credit certification can be accomplished over a three-year period. Assumes current conservation plans, meeting baseline and threshold, and farmer interest in nutrient credits.
Streambank Fencing with Offstream Watering	**300**	**600**	**1,100**	**1,400**	**1,800**	**2,200**	one-time implementation; annual credits for maintenance assurance; low risk	12,000 feet of fencing (50 ft buffer on pasture land) with offstream watering (3 projects) to be implemented from 2010 to 2012. Three new projects (same specifications) to be implemented from 2013 to 2015. Assumes current conservation plans, meeting baseline and threshold, and farmer interest in nutrient credits.
Urban BMPs								
Stormwater Retrofits - Wet Ponds and Wetlands	**400**	**800**	**1,200**	**1,400**	**1,600**	**1,800**		
Stormwater Retrofits with Wet Ponds and Wetlands - Already Implemented Since 2005	**200**	**400**	**600**	**600**	**600**	**600**	one-time implementation; annual credits for maintenance assurance; low risk	200 acres of developed land already retrofitted with wet ponds or wetlands since 2005. Assumes 50% of drainage area is pervious surface and 50% is impervious surface. Assumes credit certification can be accomplished over a three-year period. Assumes retrofits are not required for permit compliance (not part of baseline).
Stormwater Retrofits with Wet Ponds and Wetlands - New Projects	**200**	**400**	**600**	**800**	**1,000**	**1,200**	one-time implementation; annual credits for maintenance assurance; low risk	200 acres (new acreage) of developed land to be retrofitted with wet ponds or wetlands from 2010 to 2012. An additional 200 acres (new acreage) of developed land to be retrofitted with wet ponds or wetlands from 2013 to 2015. Assumes 50% of drainage area is pervious surface and 50% is impervious surface. Assumes credit certification can be accomplished over a three-year period. Assumes retrofits are not required for permit compliance (not part of baseline).

Appendix LandStudies - 1: Summary of BMPs and the Potential Credits Generated within Lycoming County from Implementation on a Yearly Basis

These estimates of nutrient credit potential assume landowner interest in credit trading, landowner compliance with land use trading requirements, sufficient capacity for calculating and certifying credits, and ready purchasers of nutrient credits.

BMPS for Nutrient Credits	Nitrogen Credits - 2010	Nitrogen Credits - 2011	Nitrogen Credits - 2012	Nitrogen Credits - 2013	Nitrogen Credits - 2014	Nitrogen Credits - 2015	Risk Management	Assumptions
Stream and Floodplain BMPs								
Floodplain Restoration	**0**	**0**	**5,500**	**11,000**	**16,500**	**22,000**	one-time implementation; annual credits for maintenance assurance; low risk; 20-year credit time frame	4 floodplain restorations, averaging 2,800 feet long, floodplain width of 180 feet, 3.8 feet streambank height. Credits calculated assuming a 40-year erosion period.
Forested Riparian Buffers								
Forested Riparian Buffers	**18,000**	**40,000**	**66,500**	**76,500**	**86,500**	**96,500**		
Forested Riparian Buffers - Already Implemented Since 2005	10,000	22,000	36,500	36,500	36,500	36,500	one-time implementation; annual credits for maintenance assurance; low risk; 20-year credit time frame	1,223 acres of forested riparian buffers already planted since 2005. Assumes 10% of buffer and adjacent upland areas in conservation tillage, 30% in pasture, 30% in mixed open, and 30% in hay land uses. Assumes credit certification can be accomplished over a three-year period. Assumes agricultural lands on which buffers are located have current conservation plans, meet baseline and threshold requirements, and farmers are interested in nutrient credits.
Forested Riparian Buffers - New Projects	8,000	18,000	30,000	40,000	50,000	60,000	one-time implementation; annual credits for maintenance assurance; low risk; 20-year credit time frame	1,000 acres (new acreage) targeted for planting of forested riparian buffers by 2012. An additional 1,000 acres (new acreage) targeted for planting of forested riparian buffers from 2013 to 2015. Assumes 10% of buffer and adjacent upland areas in conservation tillage, 30% in pasture, 30% in mixed open, and 30% in hay land uses. Assumes credit certification can be accomplished over a three-year period. Assumes agricultural lands on which buffers are located have current conservation plans, meet baseline and threshold requirements, and farmers are interested in nutrient credits.
Nitrogen	**101,950**	**280,283**	**463,286**	**511,041**	**561,111**	**611,381**		
	2010	**2011**	**2012**	**2013**	**2014**	**2015**		

Costs per Nitrogen Credit: $4 to $8
Credit costs are averaged over a 20-year period for one-time BMP implementations
Credit calculation methods for stream and floodplain restoration have not yet been established by DEP
Credit projections assume funding availability for implementing BMPs

Appendix LandStudies - 1: Summary of BMPs and the Potential Credits Generated within Lycoming County from Implementation on a Yearly Basis

These estimates of nutrient credit potential assume landowner interest in credit trading, landowner compliance with land use trading requirements, sufficient capacity for calculating and certifying credits, and ready purchasers of nutrient credits.

BMPS for Nutrient Credits	Phosphorus Credits -2010	Phosphorus Credits -2011	Phosphorus Credits -2012	Phosphorus Credits -2013	Phosphorus Credits -2014	Phosphorus Credits - 2015	Risk Management	Assumptions
Agricultural BMPs								
No-Till Agriculture - TOTAL	**1,525**	**5,145**	**8,585**	**8,910**	**9,230**	**9,550**		
No-Till Agriculture - Already Implemented	1,200	4,500	7,620	7,620	7,620	7,620	annual credits; need multi-year agreements to stay in no-till and sell credits	19,750 acres already in no-till. Assumes it was all in conventional tillage prior to conversion. Assumes credit certification can be accomplished over a three-year period. Assumes current conservation plans, meeting baseline and threshold, and farmer interest in nutrient credits.
No-Till Agriculture - New Projects	325	645	965	1,290	1,610	1,930	annual credits; need multi-year agreements to stay in no-till and sell credits	2,500 acres targeted for conversion to no-till from conventional tillage by 2012 . An additional 2,500 acres targeted for conversion to no-till from conventional tillage from 2013 to 2015. Assume these conversion targets will each take 3 years to complete. Assumes current conservation plans, meeting baseline and threshold, and farmer interest in nutrient credits.
Conservation Tillage Agriculture - TOTAL	**650**	**1,740**	**2,805**	**2,955**	**3,220**	**3,480**		
Conservation Tillage Agriculture - Already Implemented	500	1,325	2,130	2,130	2,130	2,130	annual credits; need multi-year agreements to stay in no-till and sell credits	7,900 acres already in conservation tillage. Assumes it was all in conventional tillage prior to conversion. Assumes credit certification can be accomplished over a three-year period. Assumes current conservation plans, meeting baseline and threshold, and farmer interest in nutrient credits.
Conservation Tillage Agriculture - New Projects	150	415	675	825	1,090	1,350	annual credits; need multi-year agreements to stay in no-till and sell credits	2,500 acres targeted for conversion to conservation tillage from conventional tillage by 2012. An additional 2,500 acres targeted for conversion to conservation tillage from conventional tillage from 2013 to 2015. Assume these conversion targets will each take 3 years to complete. Assumes current conservation plans, meeting baseline and threshold, and farmer interest in nutrient credits.
Cereal Cover Crops (on conservation tillage, early planting)	**0**	**0**	**0**	**0**	**0**	**0**		
Cereal Cover Crops on Conservation Tillage - Already Implemented	0	0	0	0	0	0	annual credits; need multi-year agreements to stay in cover crops and sell credits	4,000 acres already in cereal cover crops. Assumes it was on conservation tillage with early planting (not harvested). Assumes credit certification can be accomplished over a three-year period. Assumes current conservation plans, meeting baseline and threshold, and farmer interest in nutrient credits.
Cereal Cover Crops on Conservation Tillage - New Projects	0	0	0	0	0	0	annual credits; need multi-year agreements to stay in cover crops and sell credits	7,000 acres (new acreage) targeted for planting of cereal cover crops by 2012. An additional 7,000 acres (new acreage) targeted for planting of cereal cover crops from 2013 to 2015. Assumes cereal cover crops planted on conservation tillage with early planting (not harvested). Assumes this new acreage for each period will take three years to complete. Assumes current conservation plans, meeting baseline and threshold, and farmer interest in nutrient credits.

Appendix LandStudies - 1: Summary of BMPs and the Potential Credits Generated within Lycoming County from Implementation on a Yearly Basis

These estimates of nutrient credit potential assume landowner interest in credit trading, landowner compliance with land use trading requirements, sufficient capacity for calculating and certifying credits, and ready purchasers of nutrient credits.

BMPS for Nutrient Credits	Phosphorus Credits -2010	Phosphorus Credits -2011	Phosphorus Credits -2012	Phosphorus Credits -2013	Phosphorus Credits -2014	Phosphorus Credits - 2015	Risk Management	Assumptions
Commodity Cover Crops (on conservation tillage, early planting)	**0**	**0**	**0**	**0**	**0**	**0**		
Commodity Cereal Cover Crops on Conservation Tillage - Already Implemented	0	0	0	0	0	0	annual credits; need multi-year agreements to stay in cover crops and sell credits	2,000 acres already in commodity cereal cover crops. Assumes it was on conservation tillage with early planting (with harvest). Assumes credit certification can be accomplished over a three-year period. Assumes current conservation plans, meeting baseline and threshold, and farmer interest in nutrient credits.
Commodity Cereal Cover Crops on Conservation Tillage - New Projects	0	0	0	0	0	0	annual credits; need multi-year agreements to stay in cover crops and sell credits	2,000 acres (new acreage) targeted for planting of commodity cereal cover crops by 2012. An additional 2,000 acres (new acreage) targeted for planting of commodity cereal cover crops from 2013 to 2015. Assumes commodity cereal cover crops planted on conservation tillage with early planting (with harvest). Assumes this new acreage for each period will take three years to complete. Assumes A26
Land Retirement (Conventional Tillage to Grassland)	**260**	**780**	**1,175**	**1,175**	**1,175**	**1,175**	annual credits; need multi-year agreements to maintain conversion and sell credits	4,996 acres originally in conventional tillage converted to grasslands through CREP. Assumes credit certification can be accomplished over a three-year period. Assumes current conservation plans, meeting baseline and threshold, and farmer interest in nutrient credits.
Streambank Fencing with Offstream Watering	**10**	**20**	**35**	**45**	**55**	**70**	one-time implementation; annual credits for maintenance assurance; low risk	12,000 feet of fencing (50 ft buffer on pasture land) with offstream watering (3 projects) to be implemented from 2010 to 2012. Three new projects (same specifications) to be implemented from 2013 to 2015. Assumes current conservation plans, meeting baseline and threshold, and farmer interest in nutrient credits.
Urban BMPs								
Stormwater Retrofits - Wet Ponds and Wetlands	**20**	**40**	**70**	**80**	**90**	**105**		
Stormwater Retrofits with Wet Ponds and Wetlands - Already Implemented Since 2005	**10**	**20**	**35**	**35**	**35**	**35**	one-time implementation; annual credits for maintenance assurance; low risk	200 acres of developed land already retrofitted with wet ponds or wetlands since 2005. Assumes 50% of drainage area is pervious surface and 50% is impervious surface. Assumes credit certification can be accomplished over a three-year period. Assumes retrofits are not required for permit compliance (not part of baseline).
Stormwater Retrofits with Wet Ponds and Wetlands - New Projects	**10**	**20**	**35**	**45**	**55**	**70**	one-time implementation; annual credits for maintenance assurance; low risk	200 acres (new acreage) of developed land to be retrofitted with wet ponds or wetlands from 2010 to 2012. An additional 200 acres (new acreage) of developed land to be retrofitted with wet ponds or wetlands from 2013 to 2015. Assumes 50% of drainage area is pervious surface and 50% is impervious surface. Assumes credit certification can be accomplished over a three-year period. Assumes retrofits are not required for permit compliance (not part of baseline).

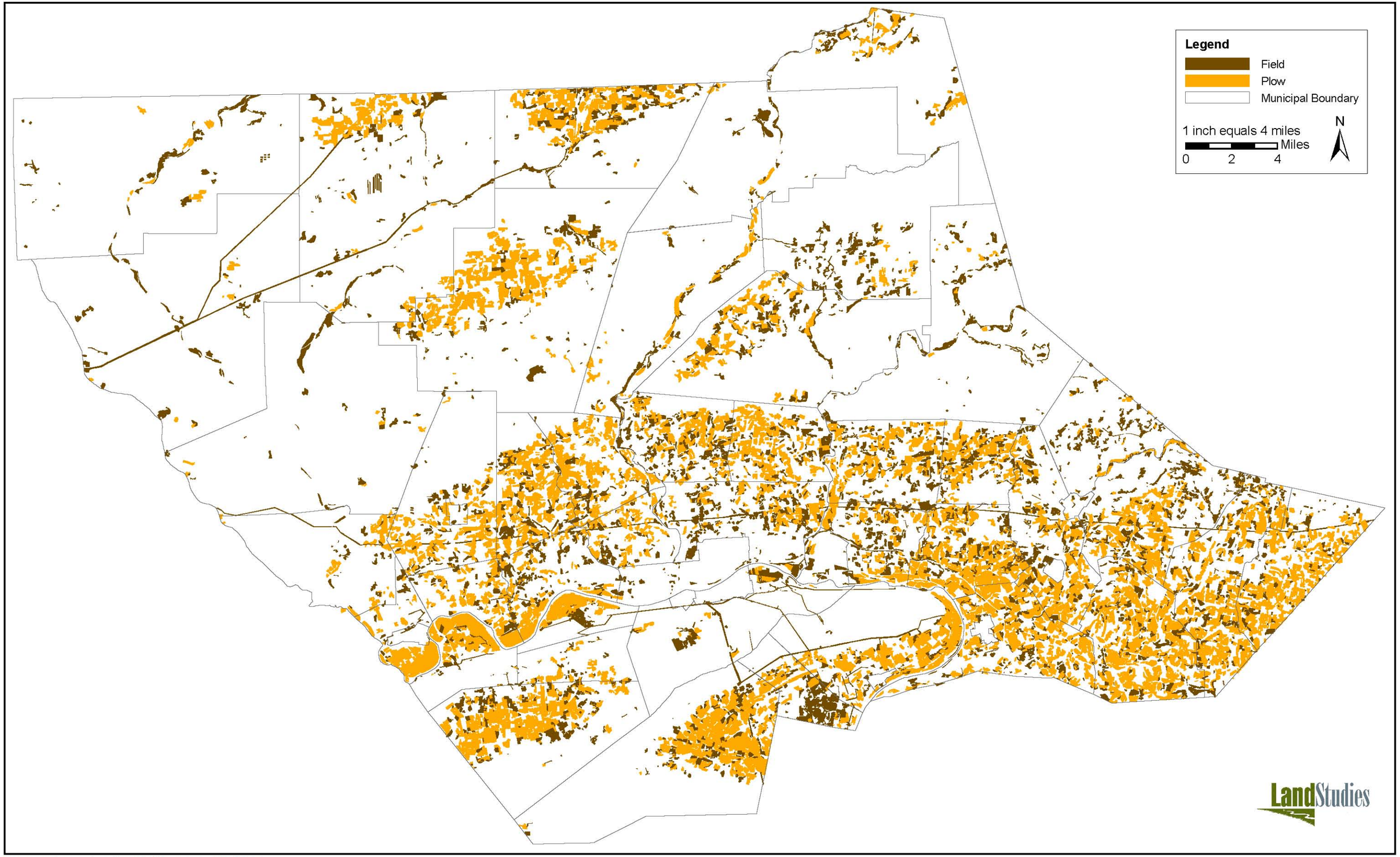
Appendix LandStudies - 1: Summary of BMPs and the Potential Credits Generated within Lycoming County from Implementation on a Yearly Basis

These estimates of nutrient credit potential assume landowner interest in credit trading, landowner compliance with land use trading requirements, sufficient capacity for calculating and certifying credits, and ready purchasers of nutrient credits.

BMPS for Nutrient Credits	Phosphorus Credits -2010	Phosphorus Credits -2011	Phosphorus Credits -2012	Phosphorus Credits -2013	Phosphorus Credits -2014	Phosphorus Credits - 2015	Risk Management	Assumptions
Stream and Floodplain BMPs								
Floodplain Restoration	**0**	**0**	**1,720**	**3,440**	**5,160**	**6,880**	one-time implementation; annual credits for maintenance assurance; low risk; 20-year credit time frame	4 floodplain restorations, averaging 2,800 feet long, floodplain width of 180 feet, 3.8 feet streambank height. Credits calculated assuming a 40-year erosion period.
Forested Riparian Buffers								
Forested Riparian Buffers	**365**	**825**	**1,375**	**1,540**	**1,750**	**1,995**		
Forested Riparian Buffers - Already Implemented Since 2005	200	450	755	755	755	755	one-time implementation; annual credits for maintenance assurance; low risk; 20-year credit time frame	1,223 acres of forested riparian buffers already planted since 2005. Assumes 10% of buffer and adjacent upland areas in conservation tillage, 30% in pasture, 30% in mixed open, and 30% in hay land uses. Assumes credit certification can be accomplished over a three-year period. Assumes agricultural lands on which buffers are located have current conservation plans, meet baseline and threshold requirements, and farmers are interested in nutrient credits.
Forested Riparian Buffers - New Projects	165	375	620	785	995	1,240	one-time implementation; annual credits for maintenance assurance; low risk; 20-year credit time frame	1,000 acres (new acreage) targeted for planting of forested riparian buffers by 2012. An additional 1,000 acres (new acreage) targeted for planting of forested riparian buffers from 2013 to 2015. Assumes 10% of buffer and adjacent upland areas in conservation tillage, 30% in pasture, 30% in mixed open, and 30% in hay land uses. Assumes credit certification can be accomplished over a three-year period. Assumes agricultural lands on which buffers are located have current conservation plans, meet baseline and threshold requirements, and farmers are interested in nutrient credits.
Phosphorus	**2,830**	**8,550**	**15,765**	**18,145**	**20,680**	**23,255**		
	2010	**2011**	**2012**	**2013**	**2014**	**2015**		

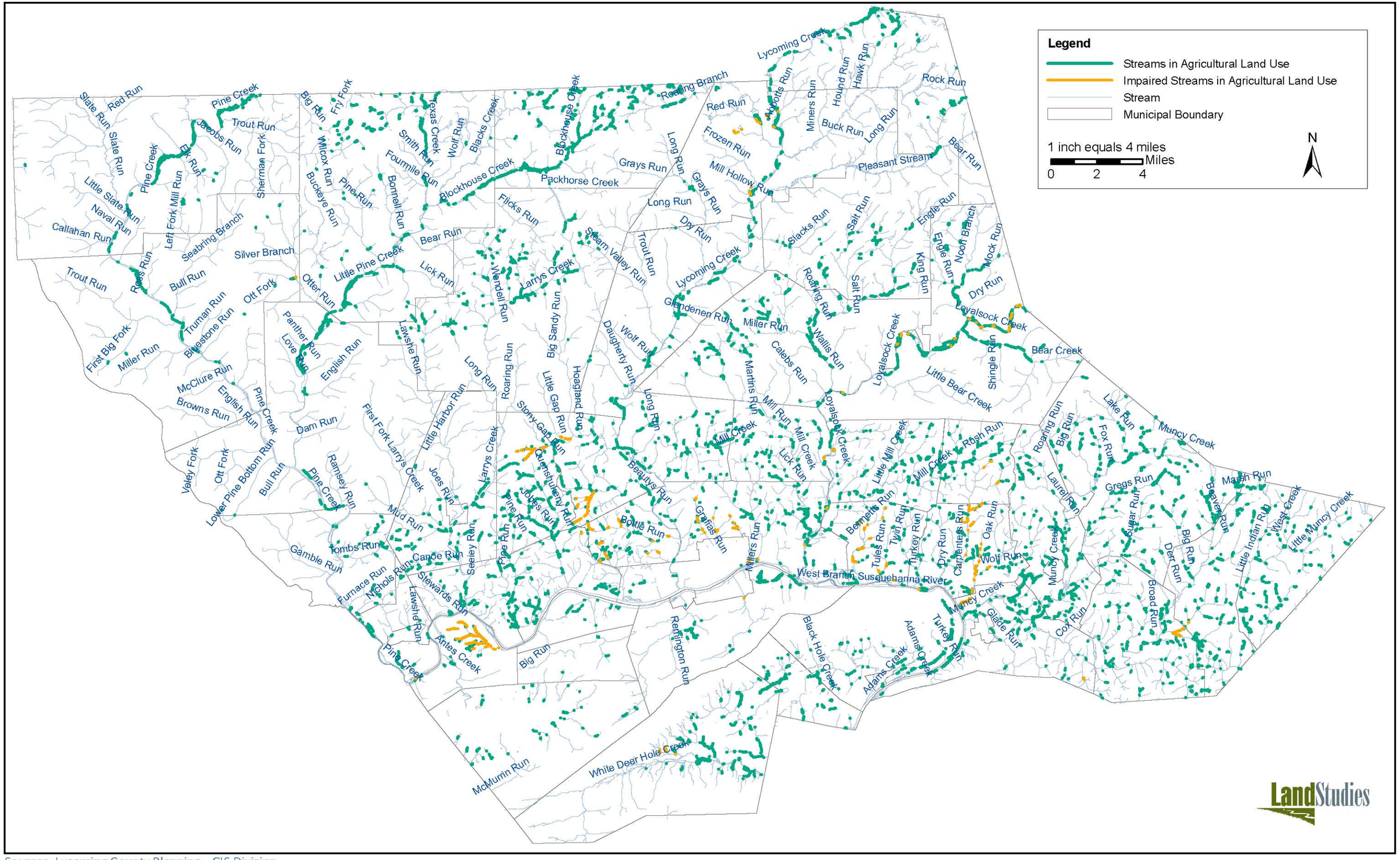
Costs per Phosphorus Credit: $1 to $3
Credit costs are averaged over a 20-year period for one-time BMP implementations
Credit calculation methods for stream and floodplain restoration have not yet been established by DEP
Credit projections assume funding availability for implementing BMPs

APPENDIX LAND STUDIES – 2: AGRICULTURAL LAND DISTRIBUTION IN LYCOMING COUNTY



Sources: Lycoming County Planning, GIS Division;
LandStudies, 2008

Appendix Land Studies – 3: Streams Located Within Agricultural Land Uses



Sources: Lycoming County Planning, GIS Division;
LandStudies, 2008

Appendix LandStudies – 4: Benefits of No-till Agriculture

- Reduces non-point source pollution: No-till provides numerous environmental benefits both to the farmer and the community. When soil disturbance is reduced leaving residue to protect the soil surface, cropland erosion is greatly diminished. Subsequently, if the soil stays in place manure, and nutrients bound to those soil particles will also stay in the field where they are utilized by crops. Sediment and nutrient losses to surface waters are reduced improving water quality locally and within the Chesapeake Bay Watershed.

- Financial Savings: Reducing tractor passes and therefore fuel is the most obvious saving. The cost of purchasing and maintaining tillage equipment is eliminated, and labor costs are reduced. Money spent on herbicide application may increase, however these added costs are usually small compared to the financial savings. See Appendix LandStudies - 5 for a summary of fuel savings in a no-till system based on the NRCS energy estimator for tillage.

- Improve Soil Health: This could be considered an indirect financial benefit. Plowing pulverizes the soil into small particles and disturbs natural layers. After a few years of no-till, soil biological, chemical, and physical health greatly improves. No-till soils have greater organic matter content, more beneficial organisms, and have better tilth. Healthy soils should result in healthy vigorous crops. Although farmers may see a slight dip in yields the first few years, most report that no-till yields reach or surpass yields from plowing.

- Reduced Runoff: No-till soils have increased infiltration rates due to residue cover reducing the crusting and sealing of the soil surface caused by the direct impact of rainfall. In addition, decomposing roots soil organisms such as earthworms create channels that absorb surface water. Residue and cover crops slow surface runoff increasing infiltration into these channels.

- Nutrient Trading can help ease the financial burden if yields are reduced during the transition from conventional tillage to no-till. For established no-tillers, selling no-till credits can enhance the financial benefits of no-till.

- General: No-till will improve soil quality, water quality, and save topsoil for future farming generations.

Appendix LandStudies – 5: Conventional vs. Conservation Tillage Energy Use, Cost Estimator

USDA United States Department of Agriculture
Natural Resources Conservation Service

Williamsport, PA 177601, DIESEL PRICE PER GALLON = 2.85

Total Diesel Fuel Cost Estimate (in dollars per year) based on 2.85/gallon					
Crop	Acres	Conventional Tillage	Mulch-Till	Ridge-Till	No-till
Corn	100	$1,847	$1,097	$1,037	$598
Soybeans	50	$923	$547	$519	$299
Total Fuel Cost		$2,770	$1,644	$1,556	$898
Potential Cost Savings over Conventional Tillage			$1,126	$1,214	$1,872

Total Farm Diesel Fuel Consumption Estimate (in gallons per year)					
Crop	Acres	Conventional Tillage	Mulch-Till	Ridge-Till	No-till
Corn	100	684	385	364	210
Soybeans	50	324	192	182	105
Total Fuel Use		972	577	546	315
Potential Fuel Savings over Conventional Tillage			395	426	657
Savings			41%	44%	68%

Visit http://ecat.sc.egov.usda.gov/ to enter other crop groups or acreages

The fuel use estimates are based on per acre fuel uses found in the literature on typical cropping and tillage systems in your area. These estimates are based on field conditions that existed in test trails cited in the literature. An example of the literature which supplied fuel consumption usage is "Estimation Farm Fuel Requirements" by H.W. Downs and R.W. Hansen.

Fuel use estimates are based on average field and equipment conditions, average fertilizer and pesticide applications, and normal crop yields. They do not include: fuel use associated with trips to your fields

and farm-to-market transport, irrigation, and grain drying. They also do not consider differences in fuel use associated with crop yields, soil texture, slope, field size and shape, implement width, tractor size, tire inflation or driving techniques. Your actual fuel use may vary significantly from the value presented.

APPENDIX LANDSTUDIES – 6:
IMPLEMENTED AND AVAILABLE AGRICULTURAL BMP ACREAGES

Best Management Practice	% of Row Crops (current)	Acres Implemented	Acres Available	Reference Year
No-till	50	19,750	39,500	2008
Conservation tillage	20	7,900		2008
Conventional tillage	30	11,850		2008
Cover Crop	12	4,000	32,300	2008
Commodity Cover Crop	28	2,000	7,200	2008
Riparian Buffer (CREP)	N/A	583.4	N/A	2005-2008

Sources: Implemented and available acreage estimations from Lycoming County agricultural agencies.

Appendix LandStudies – 7: Agricultural Outreach Guidance, Best Management Practice Implementation Strategy

This outreach program is meant to serve as guidance for Lycoming County and agencies within the County who are interested in promoting the nutrient trading program. The exact involvement and duties will need to be determined by the Non-Point Source Work Group. Agency involvement will have to correspond with the agency mission, established protocols, and funding available.

Purpose:
The purpose of the agricultural outreach program is to generate interest in the nutrient trading credit program among agricultural producers in Lycoming County.

Goals:

- Educate farmers and organizations, agencies, and consultants who work with farmers about the nutrient trading program
- Identify farmers interested in the trading program and currently implementing BMPs
- Promote implementation of new best management practices on farms
- Provide technical assistance to farmers willing to implement new BMPs
- Generate nutrient trading credits through implemented BMPs

Effective promotion of best management practice implementation and the nutrient trading program is imperative for nutrient trading program success. Before program promotion, implementation and trading procedures must be developed through Lycoming County, the Pennsylvania Department of Environmental Protection, and the Non-Point Source Work Group. The program requirements must be practical to encourage participation. The Non-Point Source subcommittee, the LCCD, and Lycoming County should collaborate on a nutrient trading pilot program to help develop these procedures. The NFWF nutrient trading grant proposal, if successful, could provide the mechanism for this pilot program. Possible producers could include:

- Previous LCCD cooperators
- Established no-tillers
- West Branch CMA members
- Preserved Farms
- Farms recommended by watershed groups

The LCCD is the most obvious primary contact for farmers and other agricultural agencies and consultants regarding the nutrient trading program. Excellent communication between Lycoming County and the LCCD is essential so both groups to be aware of policy decisions, as well as on the ground successes and challenges.

The outreach program needs to include articles in the newspaper to educate the public about the program and about nutrient credit trading within the “pilot group.” This information should target farmers and members of watershed associations, and conservation organizations. If there are any farming newspapers available in Lycoming County they should be targeted with articles and advertisements. Other focus areas should be the Lycoming County Conservation District newsletter and Web site.

Printed information, such as brochures or flyers, should be developed with farmers as the target audience. These flyers should state what nutrient trading is and how it can financially benefit farms and the environment. Information could be mass mailed to producers in Lycoming County, based on a LCCD mailing list or addresses received through the freedom of information act through the Natural Resources Conservation Service. Nutrient trading information should also be available in the LCCD office, and Penn State Extension office. Other locations to target include feed stores, equipment dealers, and auctions.

These flyers and advertisements could easily encourage participation from producers already implementing eligible BMPs. Convincing new producers to implement BMPs is the ongoing work of NRCS, Penn State Extension, FSA, and LCCD. The continuous transition of farmers to utilize better conservation practices will sustain the nutrient trading program. These agencies should continue to promote BMPs through farm visits for conservation and nutrient management planning as well as technical assistance, and complaint handling.

Opportunities should be explored to organize and promote an educational "field day," focusing on the benefits of no-till, cover crops, streambank fencing, and riparian buffers. Market the nutrient trading program as a financial incentive and an important community program. Farmers interacting and learning from each other's successes and failures can be an important aspect of BMP promotion.

Once a farmer has decided to implement a BMP, nutrient trading in conjunction with other cost incentive programs can make implementation more feasible. An important factor yet to be determined includes restrictions on the amount of public funding that can be accepted and whether the BMP implementation can generate nutrient credits for sale by the farmer if the BMPs were funded by state or federal grants. Other cost incentive opportunities may include:

- Fish and Wildlife Federation Grant Money
    - Incentive payment for first year no-tillers
    - Incentive payment for first year cover crop establishment
    - Money available for conservation district to purchase a no-till drill
- Environmental Quality Incentive Program (EQIP)
- Conservation Reserve Enhancement Program (CREP)
- Resource Enhancement and Protection Program (REAP) – No-till equipment purchase available
- Conservation District Sponsored Grants
- Watershed Association Grants
- Developing a program with the Endless Mountain RC&D council
- Growing Greener
- Trout Unlimited Funding, if available
- Pennsylvania Association of Conservation District funding, if available

Educate and distribute information to other agricultural agencies and consultants, watershed groups, and conservation organizations active within the community. Some specific groups operating within Lycoming County are listed below.

- Lycoming County Conservation District
- Penn State Extension
- Natural Resources Conservation Service
- Chesapeake Bay Foundation
- Local Agricultural Consultants and Crop Management Associations
- Local Watershed Associations
- Clean Water Institute – Lycoming College Biology Department
- Endless Mountain Resource Conservation and Development Program
- Susquehanna Chapter of PA Trout Unlimited
- The North Central Conservancy
- Susquehanna River Basin Commission
- No-till Alliance
- Alliance for Aquatic Resource Monitoring ALLAR

Appendix LandStudies – 8:
Environmental Benefits of Floodplain Restoration

Legacy sediments generally contain moderate to high concentrations of nitrogen and phosphorus. These sediments erode easily and contribute a significant pollutant load to the stream system and ultimately, to the Chesapeake Bay. Removing the legacy sediment and establishing a stable stream channel effectively eliminates this pollutant source.

The created and restored wetlands associated with the floodplain restoration further remove nitrogen through denitrification processes, and the restored floodplain also traps incoming sediments from upstream sources.

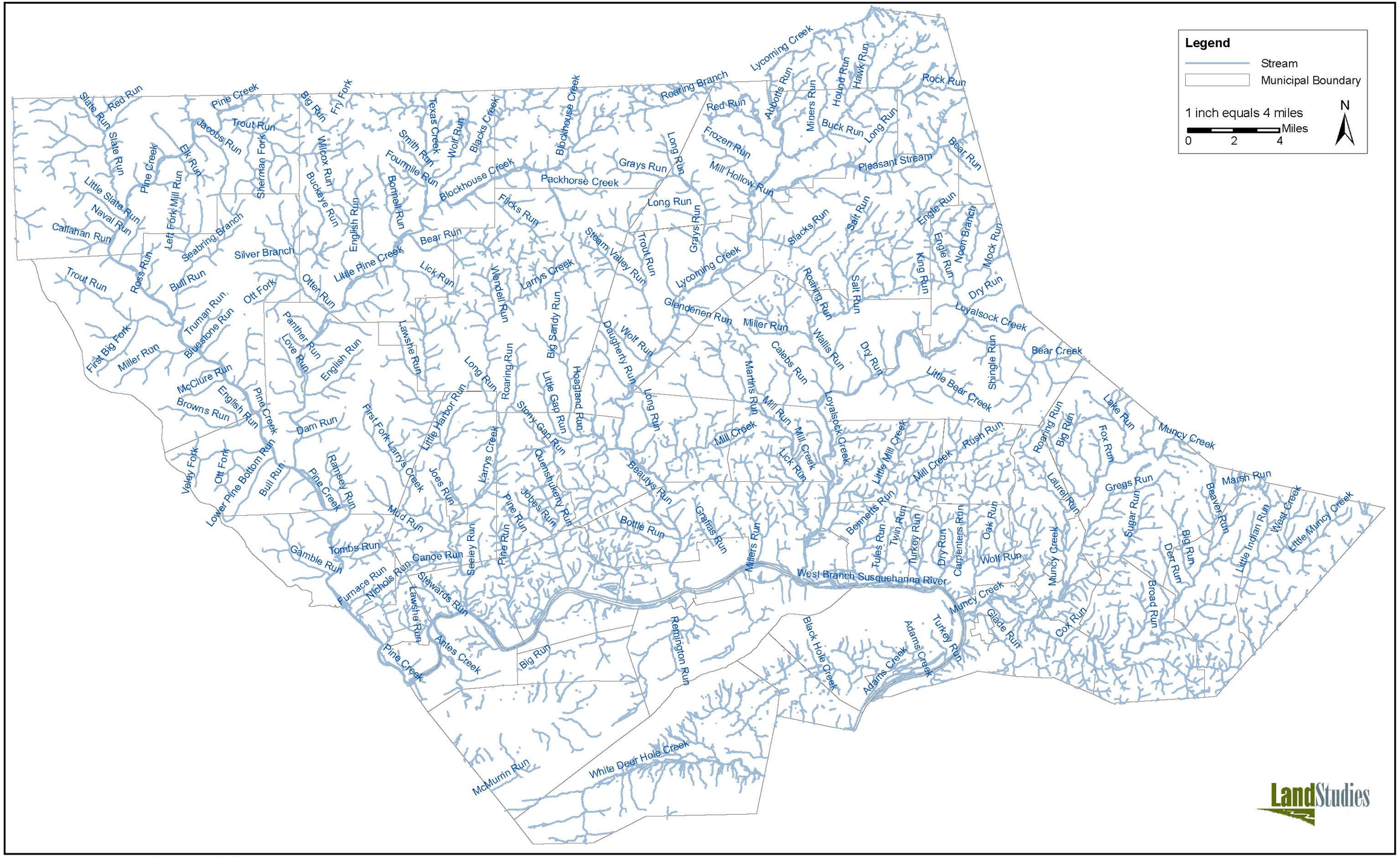
Wetland and riparian vegetation filters incoming nutrients, adding to the long term benefit of sediment and nutrient reduction.

Additional environmental benefits of floodplain restoration include:

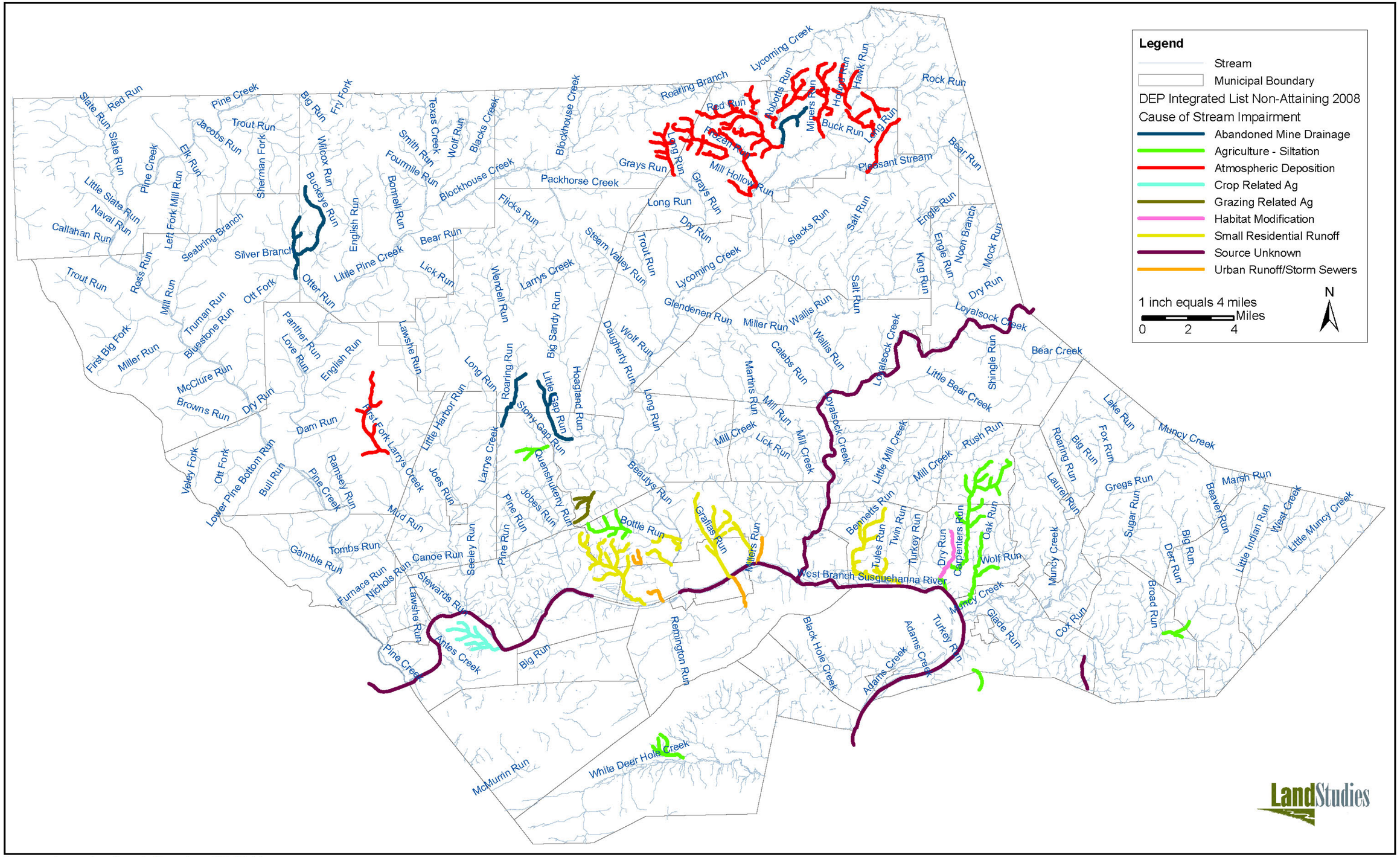
- Groundwater Recharge: The restored stream channel is designed to flood more frequently, allowing smaller storm flows to access a larger floodplain surface area on a regular basis. In addition, the restored floodplain surface has higher infiltration rates due to the removal of the clay in the legacy sediment and the establishment of deeply rooted native vegetation. This combination creates a favorable condition for significantly increased groundwater recharge.
- Stormwater Peak Flow Management and Regional Flood Control: The removal of legacy sediment can provide a tremendous increase in flood storage volume. The results of this additional volume can include the reduction of peak flood elevations and of peak flow rates.
- Wetland Creation: Wetland pockets created along the length of a restoration reach have multiple benefits, including improved water quality, flood control, groundwater recharge, and wildlife habitat. Water from high flows settles in the wetlands, where waterborne sediments can drop out, nutrients can be used by the wetland plants, and nuisance flooding can be abated. Water in the wetlands gradually filters through the ground, recharging groundwater systems. Well vegetated wetlands are prime habitat for a wide variety of aquatic and terrestrial wildlife.
- Riparian Buffers: Native plants, both herbaceous and woody, provide many benefits to the stream itself and to the water that moves into the floodplain. Trees and shrubs help shade the stream, keeping it cooler and healthier for aquatic wildlife. Leaf litter from these woody plants also provides a source of food for macroinvertebrate life in the stream. Buffers create habitat areas and corridors for birds and mammals as well. Buffers filter runoff from surrounding land uses before the pollutants reach the stream.
- Wildlife Habitat Improvement: A cleaner stream, wetland pockets, and a variety of native plants create and improve habitat for both in stream and terrestrial wildlife, starting with the macroinvertebrate life in the stream and continuing up the food web to birds and mammals. The newly naturalized site will provide food, cover, and nesting sites for a variety of species.

- Invasive Species Removal: Creating a more natural floodplain and establishing a native plant community results in the elimination of invasive species and helps discourage the return of those species.
- Aesthetic Enhancement: The naturalized landscape produces lush green vegetation, bright flowers, and seeds and nuts that look pleasant and attract a variety of butterflies, birds, and other wildlife species.

APPENDIX LAND STUDIES – 9: LYCOMING COUNTY STREAMS

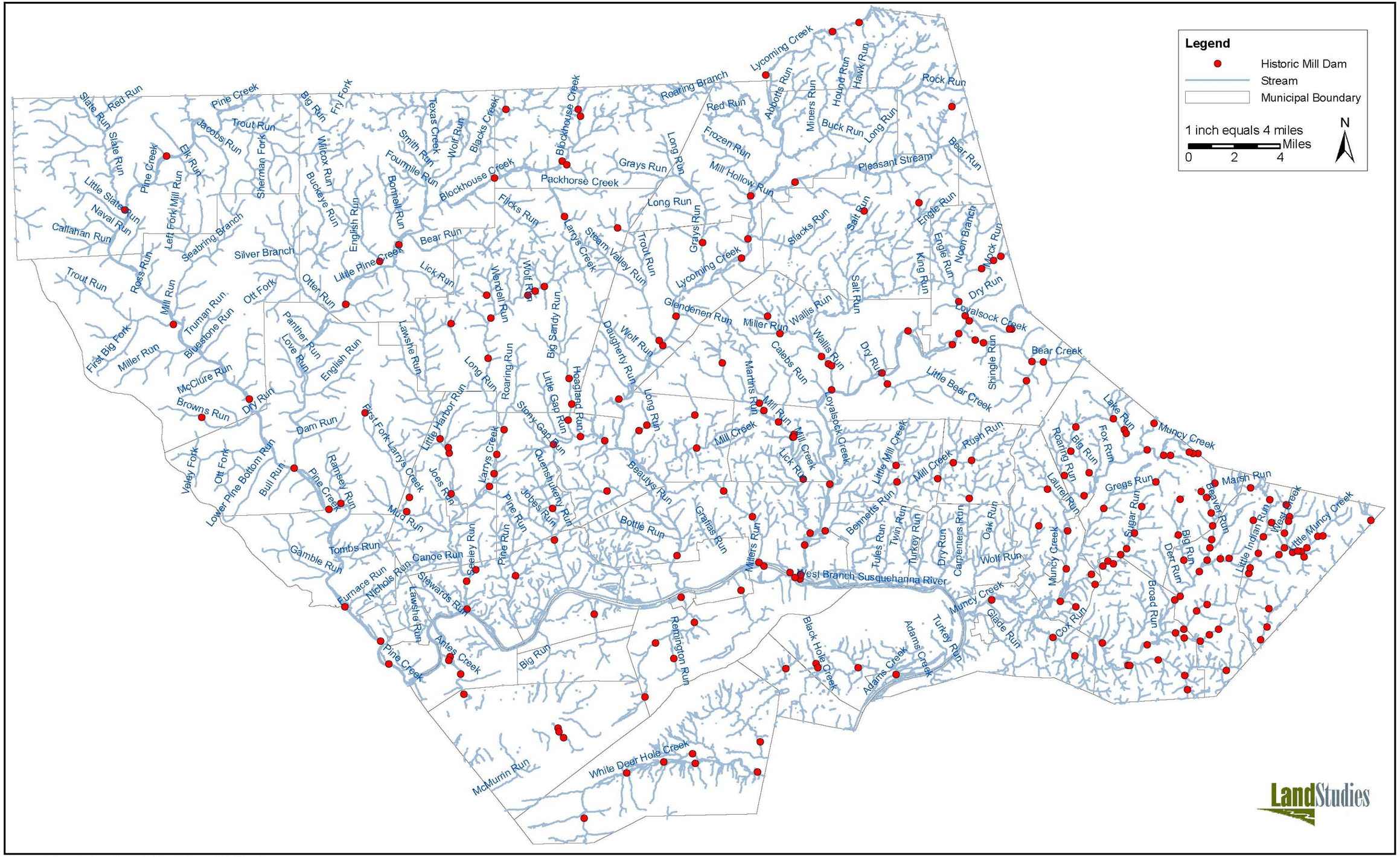


Sources: Lycoming County Planning, GIS Division;
LandStudies, 2008



Sources: Lycoming County Planning, GIS Division;
LandStudies, 2008

APPENDIX LANDSTUDIES – 11: HISTORIC MILL DAM LOCATIONS



Sources: Lycoming County Planning, GIS Division;
LandStudies, 2008

Appendix LandStudies - 12: Index of Historic Mill Dams in Lycoming County

TOWNSHIP	CREEK	NAME OF MILL
Anthony	Larry's Creek	J. Williamson Steam Saw Mill
Anthony	Larry's Creek	Minsker & Harris Saw Mill
Anthony	Larry's Creek	C.W. Williamson Saw Mill
Anthony	Quenshehague Creek	J. Metzger Steam Saw Mill
Armstrong	Unnamed Creek	Herdie & Co. Saw Mill
Armstrong	Unnamed Creek	Unnamed Saw Mill
Armstrong	Unnamed Creek	Unnamed Saw Mill
Armstrong	Unnamed Creek	Unnamed Saw Mill
Armstrong	Unnamed Creek	Unnamed Saw Mill
Armstrong	Hagirmans Run	A. Koch & Bro. Grist Mill
Armstrong	Unnamed Creek	A. Davidson Saw Mill
Brady	Unnamed Creek	W.T. Sheaffer Saw Mill
Brown	Pine Creek	Hilborn & Wilcox Saw Mill
Brown	Pine Creek	J. Gamble Saw Mill
Cascade	East Branch of Wallaces Cree	C. Cummings Saw Mill
Cascade		C. Weaver & Co Steam Mill
Cascade	Wallaces Creek	Heisley Dam
Cascade	Wallaces Creek	Mallay Saw Mill
Cascade	Wallaces Creek	Smithgall & Co. Saw Mill
Cascade	Wallaces Creek	Dubert & Co. Saw Mill
Clinton	Black Hole Creek	B. Page Saw Mill
Clinton	Black Hole Creek	Wm. Wenzel Saw Mill
Clinton	Black Hole Creek	Porter Saw Mill
Clinton		Wm. Thomas Grist Mill
Cogan House	Larry's Creek	R. & J. Wood Saw Mill
Cogan House	Larry's Creek	G.H. Thompson Saw Mill
Cogan House	Larry's Creek	A.L. Conn Saw Mill
Cogan House	Larry's Creek	Meyers & Eisenhart Saw Mill
Cogan House	Packhorse Run	F.R. Weed Saw Mill
Cogan House	Packhorse Run	F.R. Weed Saw Mill
Cogan House	Larry's Creek	J.H. English Saw Mill
Cogan House	Larry's Creek	Hayes Saw Mill
Cogan House	Larry's Creek	C.S. Larison Saw Mill
Cogan House	Hogelan's Run	C. Breining Steam Saw Mill
Cogan House	Hogelan's Run	Myers & Eisenhart Saw Mill
Cummings	Pine Creek	J.M. & M.W Grist Mill
Cummings	Pine Creek	J.M. & M.W Saw Mill
Cummings	First Fork Larry's Creek	S. Bell Steam Saw Mill
Cummings	Ramsey's Run	Ramsey Saw Mill
Eldred	Mill Creek	Kies Saw Mill
Eldred	Mill Creek	J.W. Milnor Saw Mill
Eldred	Brewer's Run	A.F. Wilson Grist Mill
Eldred	Mill Creek	J. Crawford Saw Mill
Eldred	West Mill Creek	Rentz & Streiby Grist Mill
Eldred	West Mill Creek	Rentz & Streiby Saw Mill
Eldred	West Mill Creek	T.S. Casselberry Saw Mill
Fairfield	Mill Race	Lloyd & Starr Paper Mill
Fairfield	Loyalsock Creek	Lieb & Co. Saw Mill
Fairfield	Loyalsock Creek	Lieb & Co. Grist Mill
Fairfield	Loyalsock Creek	Ransom & Parde Saw Mill
Fairfield	Loyalsock Creek	Fairfield Mills
Franklin	Beaver Run	Cooper Saw Mill
Franklin	Beaver Run	P. Snyder Saw Mill
Franklin	Beaver Run	Crouse & Bros. Saw Mill
Franklin	Big Run	G. Dugan Saw Mill
Franklin	Little Muncy Creek	Magargel Saw Mill
Franklin	Little Muncy Creek	Saw Mill

TOWNSHIP	CREEK	NAME OF MILL
Franklin	Beach Bottom Run	PJV Saw Mill
Franklin	Beaver Run	W.L. Phillips Saw Mill
Franklin	Beaver Run	Raper & Co. Saw Mill
Franklin	Beaver Run	Crouse Bros Saw Mill
Franklin	Indian Camp Run	F. Cleman Saw Mill
Franklin		J.R. Saw Mill
Franklin		S. Rider & Sons Saw Mill
Franklin		J. Stackhouse Steam Saw Mill
Franklin		J.R. Swisher Saw Mill
Franklin	Laurel Run	J.T. Crist Saw Mill
Franklin		J.C. Smith Saw Mill
Franklin		Saw Mill
Franklin		Saw Mill
Franklin		Saw Mill
Hepburn	Long Run	L. Aderhold Saw Mill
Hepburn	Long Run	W. Stoln Saw Mill
Hepburn	Mill Run Trib	Saw Mill
Hepburn	Mill Run Trib	G. Halls Saw Mill, Grist Mill
Jackson	Blacks Creek	J. Smith Saw Mill
Jackson	Blockhouse Run	H. Sawyer Saw Mill, Grist Mill
Jackson	Blockhouse Run	A. Drumailer Saw Mill
Jackson	Roaring Run	J. B. Foulkrod Saw Mill
Jackson	Roaring Run	H. Fick Saw Mill
Jackson	Blockhouse Run	J. R. Smith Saw Mill
Jackson	Blockhouse Run	W. Reed Saw Mill
Jackson	Blockhouse Run	A. Drumailer Saw Mill
Jordan	Indian Camp Run	Smith & Magargel Saw Mill
Jordan	Indian Camp Run	I.J. Boudeman Saw Mill
Jordan		Gordner Bros. Saw Mill
Jordan		B. & J.R. Swisher Saw Mill
Jordan		J. Snyder Saw Mill
Jordan		G.H. Gordner Saw Mill
Jordan		J.B. Gordner Saw Mill
Jordan		E. Yocum Saw Mill
Jordan		I. Derick Saw Mill
Jordan		R.M. Bigger Saw Mill
Jordan		Reed, Fox, & Robbins Saw Mill
Jordan		Bigger & Camp Saw Mill
Jordan		J.D. Fought Saw Mill
Jordan		J. Stackhouse Saw Mill
Jordan		J.B. Warner Steam Saw Mill
Jordan		J. Boudeman Saw Mill
Jordan		C. Wilson Saw Mill
Jordan		J. R. Keller Saw Mill
Jordan		F. Schwin Saw Mill
Lewis	Lycoming Creek	S. Caldwell Steam Saw Mill
Lewis	Grays Run	BSS Saw Mill
Lewis	Lycoming Creek	S. Bodine Saw Mill
Lewis	Lycoming Creek	A. Dubois Saw Mill
Lewis	Lycoming Creek	McWilliams & C.o Grist Mill
Lewis	Lycoming Creek	Saw Mill
Lewis	Trout Run	A.S. Turner Steam Saw Mill
Lewis	Mill Creek	D. Griggs Saw Mill
Lewis	Murreys Run	Low & Major Steam Saw Mill
Lewis	Murreys Run	Southard & Lundy Saw Mill
Limestone	Nippenose Creek	J.J. Sanderson Grist Mill
Limestone		Clark Saw Mill, Shingle Mill

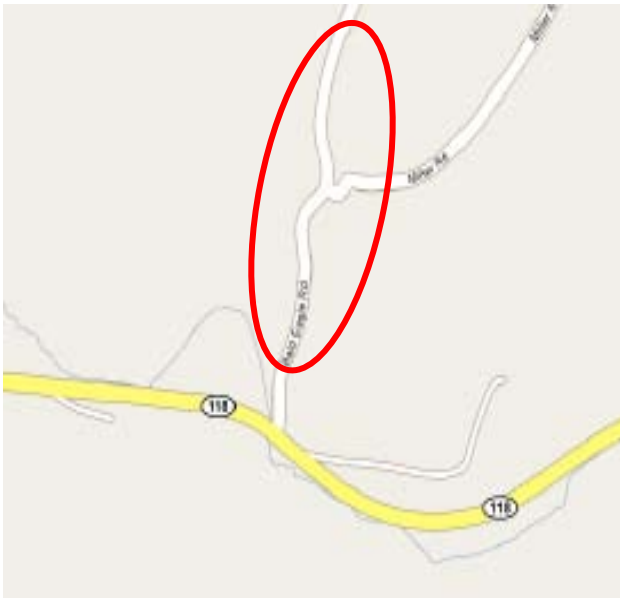
TOWNSHIP	CREEK	NAME OF MILL
Limestone		E Knauf Grist Mill
Limestone		N. Sweitzer Saw Mill
Loyalsock	Sheshoon Creek	S.P. Dunkle Steam Mill
Loyalsock	Millers Run	W. Wheeland Saw Mill
Loyalsock	Mill Creek	P. Miller Grist Mill
Loyalsock	Susquehanna River	G. Tinsman Steam Mill
Loyalsock	Susquehanna River	Canfield & Colton Saw Mill
Loyalsock	Susquehanna River	F.S. Fisher Saw Mill
Lycoming	Hoaglands Run	J. Edler Saw Mill
Lycoming	Hoaglands Run	J. Reichert Saw Mill
Lycoming	Hoaglands Run	Aderhold & Moyer Grist Mill
Lycoming	Hoaglands Run	J.W. Wendlar Saw Mill
Lycoming	Beautys Run	S. Ryle Saw Mill
McHenry	Trout Run	L.H. McHenry Saw Mill
McHenry	Harris Run	C. Lapurk Saw Mill
McHenry	Pine Creek	Ross & Bonnel Saw Mill
McIntyre	Abbotts Run	B. Abbott Saw Mill
McIntyre	Roaring Branch	C.S. Green Saw Mill
McIntyre	Roaring Branch	J. Irvin Saw Mill
McIntyre	Roaring Branch	E. Sweet Saw Mill
McIntyre	Lycoming Creek	Lycoming Iron & Coal Saw Mill
McIntyre	Pleasant Run	J. Hunter Saw Mill
McIntyre	Pleasant Run Trib	J. Wever Steam Saw Mill
Mifflin	Larry's Creek, Second Fork	E. Lyons Saw Mill
Mifflin	Larry's Creek, Second Fork	E. Lyons Steam Saw Mill
Mifflin	Larry's Creek, Second Fork	Jos. L. Cox Saw Mill
Mifflin	Larry's Creek	Minsker & Harris Saw Mill
Mifflin	Larry's Creek	C.W. Williamson Saw Mill
Mifflin	Larry's Creek, First Fork	J. Harrer Saw Mill
Mifflin	Larry's Creek, Second Fork	Williamson Saw Mill
Mifflin	Larry's Creek	Geo. Ryan Saw Mills
Moreland	Sugar Creek	I. Beaver Saw Mill
Moreland	Sugar Creek	R.F. & J. Andres Saw Mill
Moreland	Sugar Creek	P. W. Smith Saw Mill
Moreland	Little Creek	G. Derr Saw Mill
Moreland	Laurel Run	Opp Saw Mill, Grist Mill
Moreland	Laurel Run	M.W. Saw Mill
Moreland	Shipmans Run	J. Frantz Saw Mill
Moreland	Laurel Run	R. Fink Saw Mill
Moreland	Laurel Run	I. Dewald Saw Mill
Moreland	Laurel Run	C. Gardner Saw Mill
Moreland	Little Creek	Muncy Grist Mill, Saw Mill
Moreland	Little Creek	R.B. Earr Saw Mill
Moreland	Little Creek	G. & J. Smith Saw Mill
Moreland	Little Creek	W. Temple Saw Mill
Muncy	Carpenters Run	G. King Saw Mill
Muncy	Mill Creek	O. Jones Saw Mill
Muncy	Mill Creek	G.J. Saw Mill
Muncy Creek	Muncy Creek	G. Stoltz Grist Mill
Muncy Creek	Muncy Creek	Fisher Saw Mill, Grist Mill
Muncy Creek	Muncy Creek	W. Conrad Saw Mill
Nippenose	Nippenose Creek	Williamson Grist Mill
Nippenose	Nippenose Creek	J.B. McMicleen Saw Mill
Nippenose	Nippenose Creek	G.W. Youngman Saw Mill
Old Lycoming	Lycoming Creek	G. Good Grist Mill
Penn	Gregg Run	J. Frante Saw Mill
Penn	Muncy Creek	E. Lyon Saw Mill

TOWNSHIP	CREEK	NAME OF MILL
Penn	Big Run	G.H. Saw Mill
Penn	Sugar Creek	I. Beaver Saw Mill
Penn	Sugar Creek	R.F. & J. Andres Saw Mill
Penn	Sugar Creek	J. Smith Saw Mill
Penn	Sugar Creek	T. P. Smith Saw Mill
Penn	Sugar Creek	J. Poust Saw Mill
Penn	Sugar Creek	D. Reese Saw Mill
Penn	Sugar Creek	W. Danley Saw Mill
Penn	Beaver Run	G.W. Phillips Saw Mill
Penn	Beaver Run	E. Lyon Saw Mill
Penn	Beaver Run	G. Houseknecht Saw Mill
Penn	Beaver Run	G. Houseknecht Steam Saw Mill
Penn	Beaver Run	McClintock Saw Mill
Penn	Big Run	E. Lyon Saw Mill
Penn	Gregg Run	V. Kepner Saw Mill
Penn	Muncy Creek Trib	B. Fiester Saw Mill
Penn	Muncy Creek Trib	Bodine & Warm Steam Saw Mill
Penn	Muncy Creek Trib	T. Strawbridge Saw Mill
Piatt	Larry's Creek	J. D. Cowden Grist Mill, Steam Saw Mill
Piatt	Larry's Creek	Thomas Bros. Grist Mill
Piatt	Larry's Creek	Trump Grist Mill
Pine	Callahans Run	Warrel & Rogers Saw Mill
Pine	Pine Run	E. Snyder Grist Mill
Pine	Little Pine Creek	G.W. English
Plunketts Creek	West Branch of Plunketts Cre	W. Reisham Steam Saw Mill
Plunketts Creek	West Branch of Plunketts Cre	C. Haas Saw Mill
Plunketts Creek	West Branch of Plunketts Cre	A.S. Williams Saw Mill
Plunketts Creek	West Branch of Plunketts Cre	Storr's Dam
Plunketts Creek	Little Bear Creek	Rogers & Son Saw Mill
Plunketts Creek	Loyalsock Creek	Weaver & Co. Saw Mill
Plunketts Creek	Loyalsock Creek	M. Crawford Saw Mill
Plunketts Creek	Big Bear Creek	N.C. Johnson Saw Mill
Plunketts Creek	Big Bear Creek	N.C. Johnson Saw Mill
Plunketts Creek	Big Bear Creek	Rogers & Winters Saw Mill
Plunketts Creek	Big Bear Creek	Storrs & Metier Steam Saw Mill
Plunketts Creek	Big Bear Creek	M. Erec Saw Mill
Plunketts Creek	Loyalsock Creek	Day & Storr Saw Mill
Plunketts Creek	Loyalsock Creek	W. B. Harleu's Saw Mill
Plunketts Creek	Loyalsock Creek	J. Barbour Saw Mill
Plunketts Creek	Loyalsock Creek	Allen & Scott Saw Mill
Plunketts Creek	Loyalsock Creek	Pothamus & Allen Saw Mill
Plunketts Creek	West Branch of Plunketts Cre	J. Crawford & Day Saw Mill
Porter	Pine Creek	Stokes & Co. Saw Mill, Grist Mill
Porter	Pine Creek	Trump Mills, Saw Mill
Shrewsbury	Big Run	J. & J. Bowman Saw Mill
Shrewsbury	Big Run	P.D. Canon Saw Mill
Shrewsbury	Big Run	Saw Mill
Shrewsbury	Roaring Run	J. Fry Saw Mill
Shrewsbury	Big Run	W. Opp Steam Saw Mill
Shrewsbury	Lake Run	J. Reese Steam Saw Mill
Shrewsbury	Licle Run	Lyon & Springer Saw Mill
Shrewsbury	Licle Run	C. Little Saw Mill
Shrewsbury	Muncy Creek	Winegardner & Kramer Saw Mill
Shrewsbury	Rock Run	Taylor Saw Mill
Shrewsbury	Muncy Creek	E. Lyon Saw Mill
Shrewsbury	Muncy Creek	G. Pitkins Saw Mill
Shrewsbury	Muncy Creek	Taylor S. McClintock Saw Mill

TOWNSHIP	CREEK	NAME OF MILL
Susquehanna	Unnamed Creek	Susquehanna Grist Mill
Upper Fairfield	Mill Creek	Wm. Smithgall Saw Mill
Upper Fairfield	Loyalsock Creek	Wm. Hayes, Loyalsock Mills Grist Mill
Upper Fairfield	Mill Creek	J.M. Entz Saw Mill
Upper Fairfield	Mill Creek	G.W. Ebner Grist Mill
Washington	White Deer Hole Creek	Barber & Henderson Saw Mill
Washington	White Deer Hole Creek	Rissell & Co. Saw Mill
Washington	White Deer Hole Creek	S. Stevens Saw Mills
Washington	Spring Creek	I. Hain Saw Mill
Washington	White Deer Hole Creek	Smith Saw Mill
Washington	White Deer Hole Creek	E. Veyhart Saw Mill
Washington	White Deer Hole Creek	F. Veyhart Saw Mill
Watson	Pine Creek	Stohns & Co. Grist Mill
Wolf	Wolf Run	Yeakel & Bros. Steam Saw Mill
Wolf	Laurel Run	M. VanBuskirk Saw Mill
Wolf	Muncy Creek	E. Bryan Saw Mill, Grist Mill
Wolf	Muncy Creek	L.G. Huling Steam Saw Mill
Wolf	Muncy Creek	J. Ulrich Saw Mill, Grist Mill
Wolf	Muncy Creek Trib	Frantz Lyon & Co Steam Saw Mill
Wolf	Sugar Run	H.D. Fague Saw Mill
Wolf	Sugar Run	Saw Mill
Woodward	Pine Run	R.M. Clarion Saw Mill
Woodward	Quenshehague Creek	Saw Mill

APPENDIX LANDSTUDIES – 13: POTENTIAL LYCOMING COUNTY FLOODPLAIN RESTORATION SITES FOR GENERATING NUTRIENT CREDITS

Site numbers correspond to the Appendix LandStudies – 13 map
This is an unnamed tributary to Little Muncy Creek at Bald Eagle Road (Site No. 1).



Unnamed tributary to Little Muncy Creek, at Bald Eagle Road.

APPENDIX LANDSTUDIES – 13: POTENTIAL LYCOMING COUNTY FLOODPLAIN RESTORATION SITES FOR GENERATING NUTRIENT CREDITS

Site numbers correspond to the Appendix 13 map.
This is an unnamed tributary to Little Muncy Creek at Bald Eagle Road (Site No. 1).

Floodplain restoration site FPR-1. This site is located on an unnamed tributary to Little Muncy Creek at Bald Eagle Road. Streambank erosion is apparent, and may be a potential floodplain restoration site. Legacy soil nutrient concentrations need to be sampled and determined. Agricultural BMPs can also be implemented.

Appendix LandStudies – 13: Potential Lycoming County Floodplain Restoration Sites For Generating Nutrient Credits

Site numbers correspond to the Appendix LandStudies – 13 map.
This site is Laurel Run near J Houseknecht Road (Site 2)

Streambank Erosion, attempts to control bank erosion, and failing riparian zone, at Site FPR-2. (312: 11/19/2008–12:44 pm)

Streambank Erosion, and failing riparian zone, at Site FPR-2. (313: 11/19/2008 – 12:44 pm)

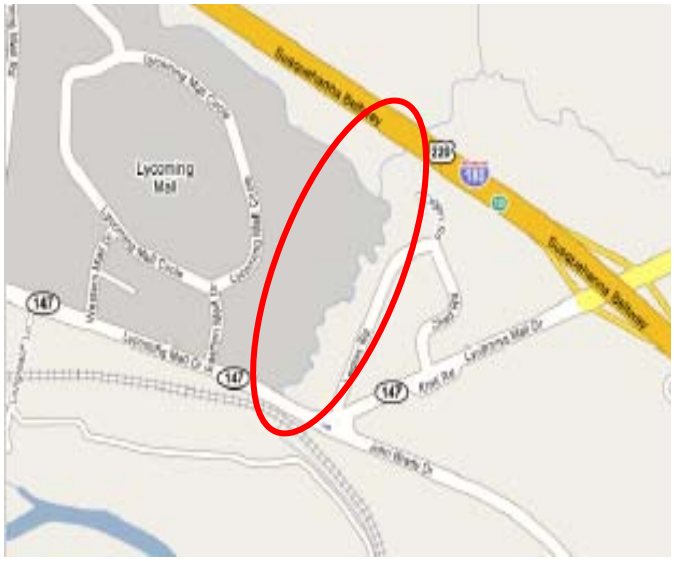
Floodplain restoration site FPR-2. This site is located on Laurel Creek near J Houseknecht Road. Streambank erosion is apparent, and the potential exists for this to be a floodplain restoration site. Legacy soil nutrient concentrations need to be sampled and determined.

Appendix LandStudies – 13: Potential Lycoming County Floodplain Restoration Sites For Generating Nutrient Credits

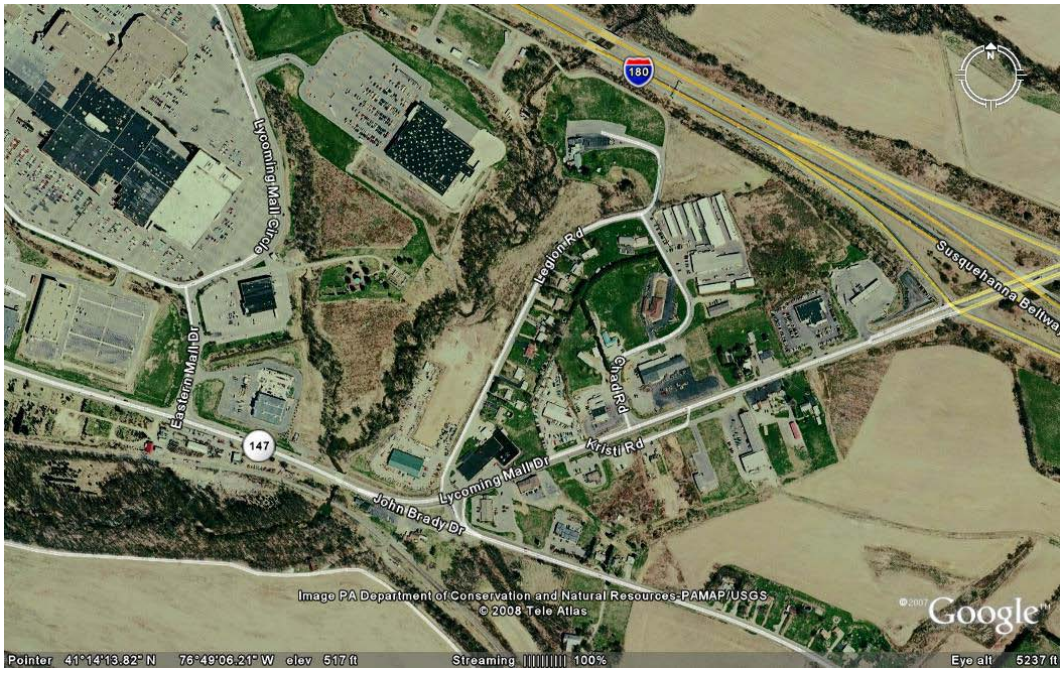
Site numbers correspond to the Appendix LandStudies – 13 map.
This site is Laurel Run near J Houseknecht Road (Site 2)

Appendix LandStudies – 13: Potential Lycoming County Floodplain Restoration Sites For Generating Nutrient Credits

Site numbers correspond to the Appendix LandStudies – 13 map.
This is Margaret Run (also called Carpenter Run in this segment) along the eastern border of the Lycoming County Mall (Site No. 3).



Margaret Run, east of Lycoming County Mall.



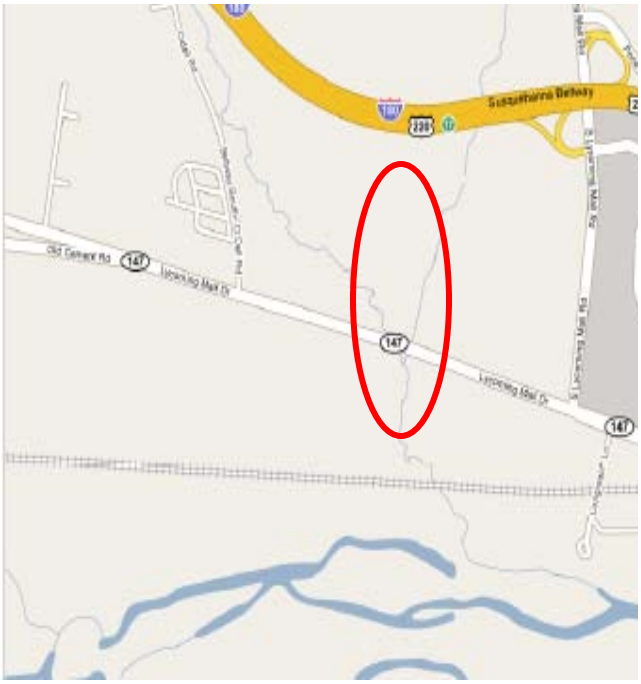
Appendix LandStudies – 13: Potential Lycoming County Floodplain Restoration Sites For Generating Nutrient Credits

Site numbers correspond to the Appendix LandStudies – 13 map.
This is Margaret Run (also called Carpenter Run in this segment) along the eastern border of the Lycoming County Mall (Site No. 3).

Floodplain restoration site FPR-3. This site is located on Margaret Run (also called Carpenter Run). Streambank erosion is apparent, and may be a potential floodplain restoration site. This stream segment is listed as impaired because of habitat modification. Carpenter Run further upstream is listed as impaired because of agricultural siltation. Legacy soil nutrient concentrations need to be sampled and determined.

APPENDIX LANDSTUDIES – 13: POTENTIAL LYCOMING COUNTY FLOODPLAIN RESTORATION SITES FOR GENERATING NUTRIENT CREDITS

Site numbers correspond to the Appendix LandStudies – 13 map.
This is Turkey Run west of Lycoming County Mall (Site No. 4).



Turkey Run and Twin Run, west of Lycoming County Mall.

Floodplain restoration site FPR-4. This site is located on Turkey Run, with Twin Run a possibility as well. Streambank erosion is apparent, with some banks up to 6 feet high. The potential exists for this to be a floodplain restoration site. Legacy soil nutrient concentrations need to be sampled and determined.

Appendix LandStudies – 13: Potential Lycoming County Floodplain Restoration Sites For Generating Nutrient Credits

Site numbers correspond to the Appendix LandStudies – 13 map.
This is Bennetts Run along Fairfield Road (Site No. 5).

Streambank erosion along Bennetts Run, parallel to Fairfield Road - Site FPR-5. (349: 11/20/2008 – 1:30 pm)

Streambank erosion along Bennetts Run, parallel to Fairfield Road - Site FPR-5. (350: 11/20/2008 – 1:30 pm)

Streambank erosion along Bennetts Run, parallel to Fairfield Road - Site FPR-5. (351: 11/20/2008 – 1:30 pm)

Area for floodplain restoration along Bennetts Run, with accumulated legacy sediment – Site FPR-5. (352: 11/20/2008 – 1:33 pm)

Appendix LandStudies – 13: Potential Lycoming County Floodplain Restoration Sites For Generating Nutrient Credits

Site numbers correspond to the Appendix LandStudies – 13 map.
This is Bennetts Run along Fairfield Road (Site No. 5).

Streambank erosion along Bennetts Run, parallel to Fairfield Road - Site FPR-5. (353: 11/20/2008 – 1:33 pm)

Streambank erosion along Bennetts Run, parallel to Fairfield Road - Site FPR-5. (354: 11/20/2008 – 1:34 pm)

Streambank erosion along Bennetts Run, parallel to Fairfield Road - Site FPR-5. (355: 11/20/2008 – 1:34 pm)

Floodplain restoration site FPR-5. This site is located on Bennetts Run, east of Montoursville along Fairfield Road. Streambank erosion is significant, and the potential exists for this to be a floodplain restoration site. Bennetts Run is listed as impaired because of residential runoff. Legacy sediment analyses for nutrients need to be run at this site.

APPENDIX LANDSTUDIES – 13: POTENTIAL LYCOMING COUNTY FLOODPLAIN RESTORATION SITES FOR GENERATING NUTRIENT CREDITS

Site numbers correspond to the Appendix LandStudies – 13 map.
This is Bennetts Run along Fairfield Road (Site No. 5).

Bennetts Run along Fairfield Road, east of Montoursville. Significant legacy sediment accumulations along the stream. Feasibility assessments need to be made to determine the extent of stream that could be restored, land ownership, landowner interest, nutrient concentrations in the legacy sediment, and floodplain restoration widths.

APPENDIX LANDSTUDIES – 13: POTENTIAL LYCOMING COUNTY FLOODPLAIN RESTORATION SITES FOR GENERATING NUTRIENT CREDITS

Site numbers correspond to the Appendix LandStudies - 13 map.
This is Wolf Run west of Muncy (Site No. 6).

Channelized stream drainage across agricultural field, at Site FPR-6. (325: 11/19/2008 – 1:32 pm)

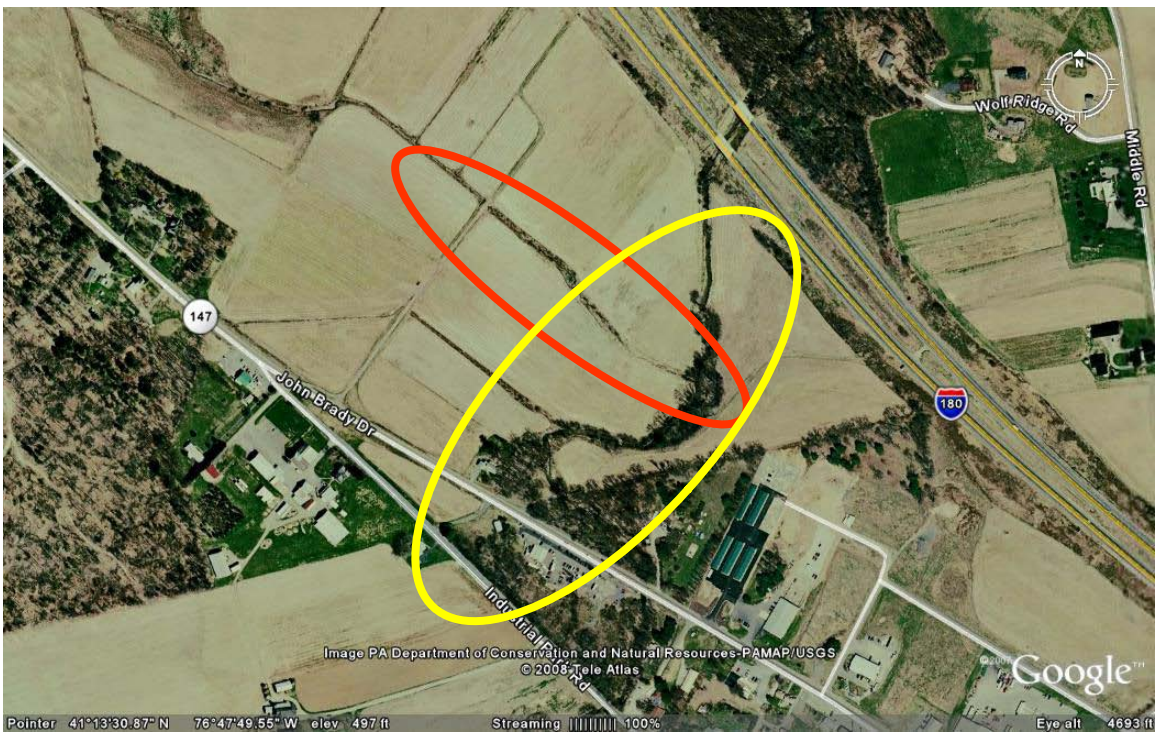
Channelized stream drainage across agricultural field, at Site FPR-6. Bank erosion is apparent. (326: 11/19/2008 – 1:33 pm)

Streambank erosion along Wolf Run, at Site FPR-6. (327: 11/19/2008 – 1:36 pm)

Streambank erosion along Wolf Run, at Site FPR-6. (328: 11/19/2008 – 1:37 pm)

Appendix LandStudies – 13: Potential Lycoming County Floodplain Restoration Sites For Generating Nutrient Credits

Site numbers correspond to the Appendix LandStudies – 13 map.
This is Wolf Run west of Muncy. (Site No. 6)



APPENDIX LANDSTUDIES – 13: POTENTIAL LYCOMING COUNTY FLOODPLAIN RESTORATION SITES FOR GENERATING NUTRIENT CREDITS

Site numbers correspond to the Appendix LandStudies – 13 map.
This is Wolf Run west of Muncy. (Site No. 6)

Floodplain restoration site FPR-6. This site is located on Wolf Run, west of Muncy. Streambank erosion is significant, and the potential exists for this to be a floodplain restoration site. The channelized stream drainage crossing the agricultural field joins Wolf Run, and also offers restoration and BMP opportunities. Wolf Run is listed as impaired because of agricultural siltation. Legacy soil nutrient concentrations need to be sampled and determined.

Appendix LandStudies – 13: Potential Lycoming County Floodplain Restoration Sites For Generating Nutrient Credits

Site numbers correspond to the Appendix LandStudies – 13 map.
This is a site on Little Muncy Creek near Tome Road (Site 7).

Streambank Erosion, and failing riparian zone, at Site FPR-7. (309: 11/19/2008 – 12:15 pm)

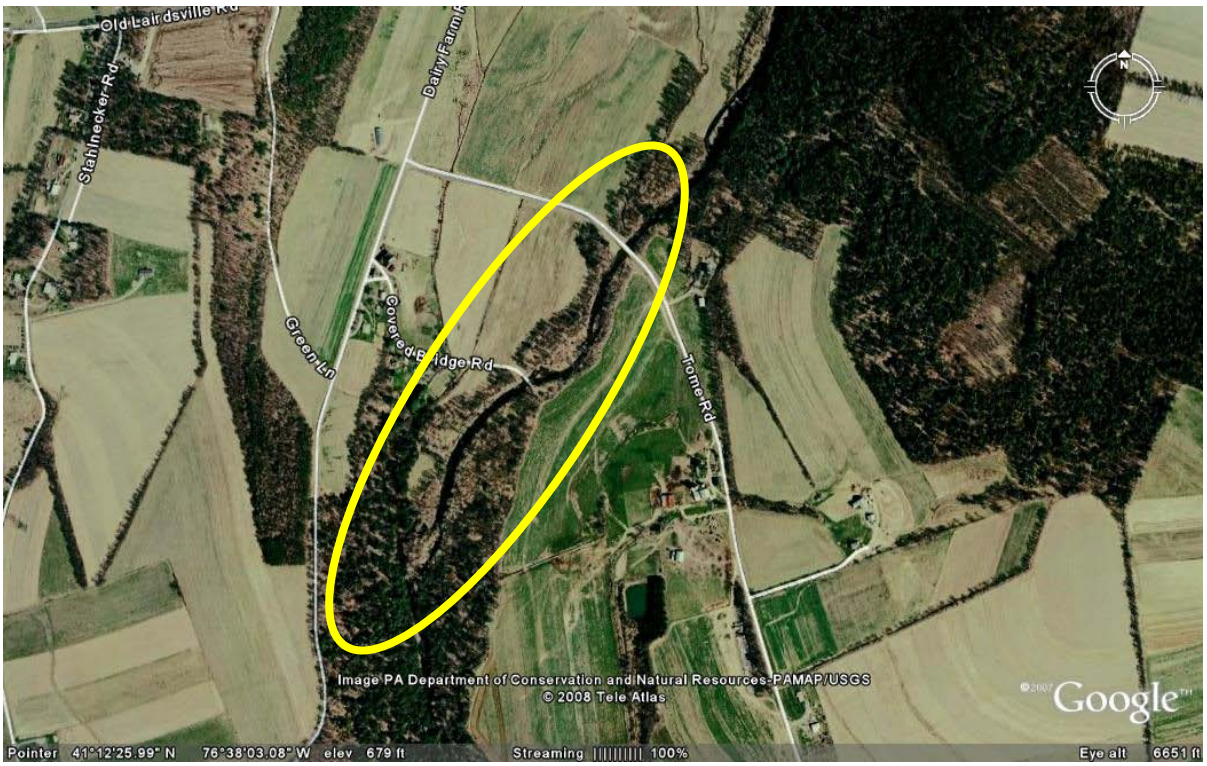
Streambank Erosion, and failing riparian zone, at Site FPR-7. (310: 11/19/2008 – 12:15 pm)

Streambank Erosion, and failing riparian zone, at Site FPR-7. (311: 11/19/2008 – 12:16 pm)

Floodplain restoration site FPR-7. This site is located on Little Muncy Creek near Tome Road. Streambank erosion is apparent, as is the failing trees along the riparian zone. This site may have potential, although the presence of the forested riparian buffer makes this a lower candidate site for floodplain restoration. Legacy soil nutrient concentrations need to be sampled and determined.

Appendix LandStudies – 13: Potential Lycoming County Floodplain Restoration Sites For Generating Nutrient Credits

Site numbers correspond to the Appendix LandStudies – 13 map.
This is a site on Little Muncy Creek near Tome Road (Site 7).



Appendix LandStudies – 13: Potential Lycoming County Floodplain Restoration Sites For Generating Nutrient Credits

Site numbers correspond to the Appendix LandStudies - 13 map.
This is Little Muncy Creek at Rock Road (Site No. 8).

Streambank Erosion threatening Rock Road, on Little Muncy Creek, at Site FPR-8. (314: 11/19/2008 – 1:01 pm)

Streambank Erosion, and failing riparian zone, at Site FPR-8. (315: 11/19/2008 – 1:05 pm)

Streambank Erosion, and failing riparian zone, at Site FPR-8. (317: 11/19/2008 – 1:06 pm)

Floodplain restoration potential at Site FPR-8. (320: 11/19/2008 – 1:06 pm)

APPENDIX LANDSTUDIES – 13: POTENTIAL LYCOMING COUNTY FLOODPLAIN RESTORATION SITES FOR GENERATING NUTRIENT CREDITS

Site numbers correspond to the Appendix LandStudies - 13 map.
This is Little Muncy Creek at Rock Road (Site No. 8).

Streambank Erosion, and failing riparian zone, at Site FPR-8. (321: 11/19/2008 – 1:07 pm)

Streambank Erosion, and failing riparian zone, at Site FPR-8. (322: 11/19/2008 – 1:07 pm)

Floodplain restoration site FPR-8. This site is located on Little Muncy Creek at Rock Road. Streambank erosion is apparent, with a historic mill dam at the downstream end of this site. Substantial potential exists for this to be a floodplain restoration site. Legacy soil nutrient concentrations need to be sampled and determined.

Appendix LandStudies – 13: Potential Lycoming County Floodplain Restoration Sites For Generating Nutrient Credits

Site numbers correspond to the Appendix LandStudies - 13 map.
This is Little Muncy Creek at Rock Road (Site No. 8).