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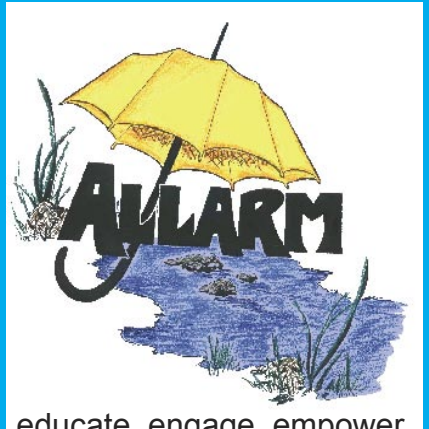

www.fs.fed.us/.../ habitat/ump_streams.html

Riparian Buffer Zones: the Next BIG Step in Protecting Pennsylvania Streams

By Danielle Cioce

The Pennsylvania Department of Environmental Protection (PA DEP) is currently considering adding requirements for stream buffers to Chapter 102 of the Pennsylvania Code which regulates best management practices necessary to control stormwater, erosion, and sediment. The undeveloped area directly adjacent to a water body is known as a riparian buffer zone. These natural or planted areas act to protect the stream and preserve its natural habitat. Riparian zones reduce excess sediments and nutrients, provide shade that decreases the temperature of the stream, supply detritus and woody debris as habitat for aquatic organisms (as well as a riparian habitat for other wildlife), increase infiltration and groundwater recharge, and decrease erosion of stream banks.

The Pennsylvania Campaign for Clean Water, a "coalition of nonprofit, conservation, environmental, sportsmen's, civic, and faith organizations" submitted a proposal to the PA DEP in July 2007 that suggests increasing buffer zones to a minimum of 100 feet for all streams in Pennsylvania. While 100 feet may sound like a long distance, it translates to 3-5 mature trees on each side of the stream. It is estimated that 80-90% of contaminants could be removed from a 100 foot buffer. The Campaign suggests additional protection for more vulnerable streams. For example, exceptional value and high quality streams should have a buffer of 300 feet, first or second order streams should have a 150 foot buffer, and streams with a sloped bank should have a wider riparian zone, based on the percent of slope. These widths were decided upon after careful

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A New Addition

By Kalyn Campbell

ALLARM welcomed Jinnie Woodward as the new assistant director this summer. She is originally from Massachusetts, but spent most of her life in Carlisle, PA. Jinnie earned both a Bachelor and Master of Science degree in Geoenvironmental Studies from Shippensburg University. After finishing her Masters program, she went to SUNY Environmental Science and Forestry in Syracuse, New York to study Forest Hydrology and Watershed Management.

Jinnie is drawn to ALLARM because of its close ties with the community and Dickinson College. She is delighted that Dickinson students are given an opportunity to work for ALLARM, getting them out into the community working with watershed groups and providing them with skills they can use for the rest of their lives.

Jinnie has many ideas to bring to ALLARM. She plans to work with the new organic farm at Dickinson College by creating an outdoor field laboratory. This site will provide the ALLARM staff with an area to test field procedures and equipment in order to supply watershed groups with the best possible information. Jinnie also hopes to update the Geographical Information System (GIS) database and the ALLARM Community Aquatic Research Laboratory (CARL).

A primary function of Jinnie's ALLARM role is to oversee projects relating to the lab, the organic farm and GIS. She also provides capacity-building technical assistance for ALLARM's community partners and organizes ALLARM's involvement with the Consortium for Scientific Assistance to Watersheds (C-SAW), a team of service providers and scientists who provide technical support for the empowerment watershed groups.

With Jinnie's knowledge and technical expertise, she is a great addition for ALLARM to continue to provide technical assistance to watershed organizations and provide ALLARM students with enriching experiences.

To Be or Not to Be Sustainable?

By Benson Ansell

The LUCE semester at Dickinson College is an integrated watershed semester where students look at cultural, political, and scientific aspects of watersheds, focusing on the Chesapeake Bay and the Louisiana Bayou regions. A major part of the semester for each student is to complete a research project that is focused on a community defined environmental problem. As part of my research project, I interviewed produce farmers in Cumberland County to gain a better sense of why farmers use certain kinds of farming practices. The overall goal of my project was to determine the impediments to "sustainable" agriculture in Cumberland County. "Sustainable" is an ambiguous word and has many meanings and interpretations. For my project, I define "sustainable agriculture" as agriculture that is able to produce an abundant amount of food, is profitable, is equitable to customers and employees, does not degrade and exploit the environment, and which food is sold locally to the community.

Dickinson College Organic Farm crops.

I interviewed six farmers and one regional horticultural educator (from Penn State's agricultural extension office) and each interview was a unique and intriguing learning experience. One of the major conclusions that was reached is that, as it is difficult to define the word "sustainable", it is even more challenging to pinpoint a farmer as farming in either a perfectly sustainable or in a precisely polluting, industrial, and "conventional" manner. All of the farmers that I interviewed use both sustainable and conventional practices to some degree. Another interesting finding was that many farmers have different perceptions on what "sustainable" agriculture entails. While most of them agree that one must incorporate many, if not all of the characteristics that were previously listed, some of them have different ideas on what should be the main focus of being sustainable. For example, some farmers see environmental stewardship as being the main factor of "sustainable" farming, while others see economic profitability as being the determining factor of whether or not a farm is sustainable. Furthermore, all of the farmers were in agreement that agriculture in Cumberland County has and will face a lot of challenges with regards to sustainability. Some of these include the pressures of development and the resulting high prices of land that gives farmers the incentive to sell. Another main factor was labor, or lack thereof. A strong labor force is integral for the high work intensity of environmental stewardship, a main component of sustainable agriculture. Others mentioned that if some chemical pesticides and herbicides were not sprayed, they would not be able to be economically profitable, and therefore not sustainable. However, there was consensus among farmers that one of the most influential impediments to sustainable agriculture is the knowledge and habits of the consumer. Until the

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consideration of the literature and studies available on buffer zones, and has been supported by forty groups in the Campaign's constituency.

The most common widths of riparian buffer zones according to PA DEP are from 35-100 feet. Sometimes however, building occurs right up to the edge of a stream. This has an extremely negative impact on Pennsylvania's waterways, as buffers of less than 35 feet (or no buffer area at all) are not able to provide long term protection from sediment and nutrient inputs. The lack of shade also makes a substantial impact, as removal of forest cover increases the average temperature of a stream by 7°F. It also makes the area more prone to invasion by nonnative species.

The Natural Resources Conservation Service of the US Department of Agriculture states that if riparian buffer zones are used correctly, they can remove up to 50% of nutrients and pesticides, 60% of pathogens, and 75% of sediment. Maximizing the efficiency of a buffer zone can be correlated to width, and it is important to consider the resource value of the water body, the soil and hydrogeologic conditions, the intensity of adjacent land use, and the desired buffer function. Determining the appropriate width of a riparian buffer zone depends most on the function of the buffer. The PA DEP currently recommends the following:

Use	Suggested width (feet)
Bank stability	25-50
Temperature control	20-75
Nutrient removal	20-75
Sediment removal	20-75
Flood mitigation	75-200
Wildlife habitat	30-250

While current legislation protects streams to an extent, increasing the width of riparian buffer zones would be a valuable measure to improve the quality of Pennsylvania's waterways. There are currently 7,200 miles of streams impacted by sediment and 2,500 miles of streams impacted by nutrients in Pennsylvania. Having riparian buffers with greater widths would help to mitigate negatively impacted streams. Benefits would include improved water quality and habitat, less erosion, and greater water quantity. Drinking water would also be protected, and flood damage would be reduced. Additionally, the buffers for exceptional value and high quality streams would protect not only these streams, but the receiving bodies of water as well. A 150 foot buffer for low order streams (headwater streams) would shield the entire watershed from pollutants.

Adding these requirements would be a sign of Pennsylvania's commitment to clean waterways. As Bob Wendelgass, Campaign Chair of the Pennsylvania Campaign for Clean Water has said, "We think that requiring 100 foot buffers is perhaps the best thing we can do to protect our streams and rivers." Other states already have such standards, including New Jersey with a 300 foot buffer requirement for their equivalent of exceptional value streams, and Wisconsin with a 300 foot buffer requirement for a stream or its floodplain.

Given that replanting riparian buffer zones is a priority in restoring the Chesapeake Bay, increasing the width of buffer zones is a logical next step to provide greater protection from pollutants. A part of the Chesapeake Bay Program's rigorous restoration plan was to develop 2,010 miles of riparian buffer zones in the Bay watershed by 2010. Pennsylvania was responsible for 600 of those miles. The overall goal however was achieved by 2002, and in 2003 the goal was raised to conserve or restore buffer zones along 70% of all streams and shorelines in the Bay watershed, with a focus goal of 10,000 miles of buffer by 2010. Currently, we are on track to meet this goal, as 5,337 miles of buffer zones were restored by August 2006.

PA DEP is in the process of

revising Chapter 102 and it is expected that draft revisions will be available in 2008 (probably in the spring). A public comment period will occur after that, likely in the summer or fall. It is important to note that the regulation will not include agricultural practices (such as plowing and tilling), but rather construction and other development activities (for example, building a new home in the 100 foot buffer area) as outlined in Chapter 102. While adopting this proposal would limit development practices somewhat, Wendelgass explains that "these restrictions are needed to protect the common resource, our streams, from impacts that harm all of us."

For more information regarding The Campaign for Clean Water's proposal, please visit: http://www.pacleanwatercampaign.org/.

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Until the consumer starts to demand where food comes from and how it is produced, it is not possible for there to be such a thing as true and genuine sustainable agriculture. It is the consumer that ultimately controls the landscape and health of not only Cumberland County, but the world.

Reference

Ansell, Benson. 2007. Challenges to Sustainable Agriculture in Cumberland County, Pennsylvania.

Ray Snyder, September 22, 2007 at the Old Pomfret Street Farmers' Market in Carlisle, PA, in person. Duration: 1 hour.

Patrick Barnes, September 22, 2007 at the Old Pomfret Street Farmers' Market in Carlisle, PA, in person. Duration: 50 minutes.

Patrick Belt, September 29, 2007 at Beltview Farm, Boiling Springs, PA, in person. Duration: 2 hours.

Rick Vensel, October 3, 2007 at Pumpkin Point Farm, Carlisle, PA, in person. Duration: 2 hours.

Amy Leber, October 21, 2007 at Shared Earth Farm CSA, Mechanicsburg, PA, in person. Duration: 2 hours.

Mark Toigo, October 22, 2007 at Toigo Orchards, Shippensburg, PA, in person. Duration: 1.5 hours.

Steven Bogash, November 29, 2007 over the phone. Duration: 1 hour.

Carlisle's New Stormwater Project!

by Andrea Korman

The Letort Spring Run is a spring-fed, limestone stream that runs through the town of Carlisle in south-central Pennsylvania. This stream is known by anglers far and wide for its astounding beauty and challenging fishing. The Letort is one of a few remaining streams that has a natural reproducing trout population. Because of this rare trait, many citizens of Carlisle are adamant about protecting the stream. The Letort is vulnerable, especially with regard to stormwater pollution. With widespread impervious surfaces, runoff from substances such as fertilizers, pesticides, and motor oil have the potential to cause major problems for the stream. In addition, Carlisle has a municipal separate storm sewer system (MS4) that leads polluted stormwater directly into the Letort.

ALLARM has previously addressed the negative impacts of stormwater and other pollution issues of streams. After monitoring the Mully Grub, a small tributary of the Letort, ALLARM found that the stream contributed much of the pollution feeding into the Letort. As a result, ALLARM began working with the Letort Regional Authority (LRA) to initiate restoration on the Mully Grub. In 1994, there was an extensive assessment conducted on the water quality of urban runoff and the impact on the Letort Spring Run. The study showed that after stormwater runoff events, areas downstream from urban areas were impacted much more than areas upstream of urban development.

In response to continued pollution from stormwater, the Environmental Protection Agency (EPA) now requires permits for non-point source pollution (i.e. stormwater runoff). This new requirement is divided into two phases, of which Carlisle falls under Phase II. Phase II addresses regulations on stormwater runoff from MS4s and requires that municipalities, industrial discharges, certain construction sites, and large property owners (such as school districts) have a National Pollutant Discharge Elimination System (NPDES) permit. Within two years, Carlisle will be required to have this NPDES/MS4 permit for stormwater. The borough is attempting to get a head start on the program and is currently working in conjunction with ALLARM along with the LRA and the Cumberland Valley Trout Unlimited to begin their work.

Stormwater in Carlisle

Carlisle and ALLARM have recently been awarded a $4,000 League of Women Voters' Water Resource Education Network (WREN) grant to begin the Stormwater Education Project. The Borough of Carlisle, Cumberland Valley Trout Unlimited, the Letort Regional Authority and ALLARM will all be working in conjunction to accomplish the goals of this project which are to raise awareness of stormwater problems in the Carlisle community as well as promote alternative behaviors encouraging water stewardship. The plan is to address two of six best management practices (BMPs) that will eventually be required by the EPA. This will be accomplished through community outreach as well as distributing educational materials such as posters, brochures, and movie theatre ads. Aside from public outreach, the Borough and ALLARM want the community to be directly involved. This has led to the development of a Letort documentary which will include interviews from anglers and many others who feel they have a close connection with the Letort. The documentary will be shown at the Letort Festival, a community involved event, which will be held in the spring of 2008 in celebration of protecting such an important, beautiful, and rare type of stream.

How to Reduce Pollution in Stormwater Runoff

by Ashley Whiting

Have you ever wondered where storm drains lead to? Stormwater, carrying chemicals from lawns, cars, and streets, flows directly into storm drains and into our streams without ever being treated. These chemicals are harmful to aquatic life and degrade habitat. There are many ways to minimize stormwater pollution, some of which can save you time and money.

Lawns are a key source of stormwater pollution. Excess fertilizers can run off your lawn and cause algal blooms in streams. Algal blooms deplete the water of oxygen and can kill fish and other aquatic life. A simple way to avoid this is to not apply fertilizer before it rains. Another way is to use compost instead of chemical fertilizers, or just leave grass clippings, which are rich in nitrogen, on the lawn. Also, if you allow your grass to grow longer, you not only save time and money by not mowing it, but the grass will absorb more rain water and be more resistant to pests. This also allows you to use fewer pesticides, which often kill more species than intended. Further, if you point your rain spouts towards the lawn rather than the pavement, the water is more likely to soak into the ground and prevent pollutants from entering streams. An attractive way to reduce stormwater pollution from your yard is to plant native vegetation in bare spots. This will prevent erosion and .help absorb more stormwater

Vehicles are another major source of stormwater pollution. Performing regular maintenance checks on your vehicle will protect streams from harm. Any leaks should be repaired immediately, and disposing used oil appropriately is very important.

http://www.somervillema.gov/section.cfm?org=Environ&page=519

When you wash your car, go to a professional car wash where the water drains into the sewer system and it is treated at a sewage treatment plant before entering the environment. However, if you prefer washing your car at home, wash it on the lawn, so that the dirty water soaks into the grass rather than draining into a stream. Most importantly, only wash your car when it really needs it in order to reduce the amount of wastewater you produce.

Pets also contribute to stormwater pollution. Just one ounce of pet waste contains an average of 650 million fecal coliform bacteria. Pick up after your pets and properly dispose of their waste by either flushing it or putting it into a trashcan to prevent it from going into our streams.

Littering is probably the most visible form of stormwater pollution. Trash such as cigarette butts and plastic wrappers commonly end up in streams. Also, chemicals like oil, paint, and other liquids should be disposed of properly and never dumped into a storm drain.

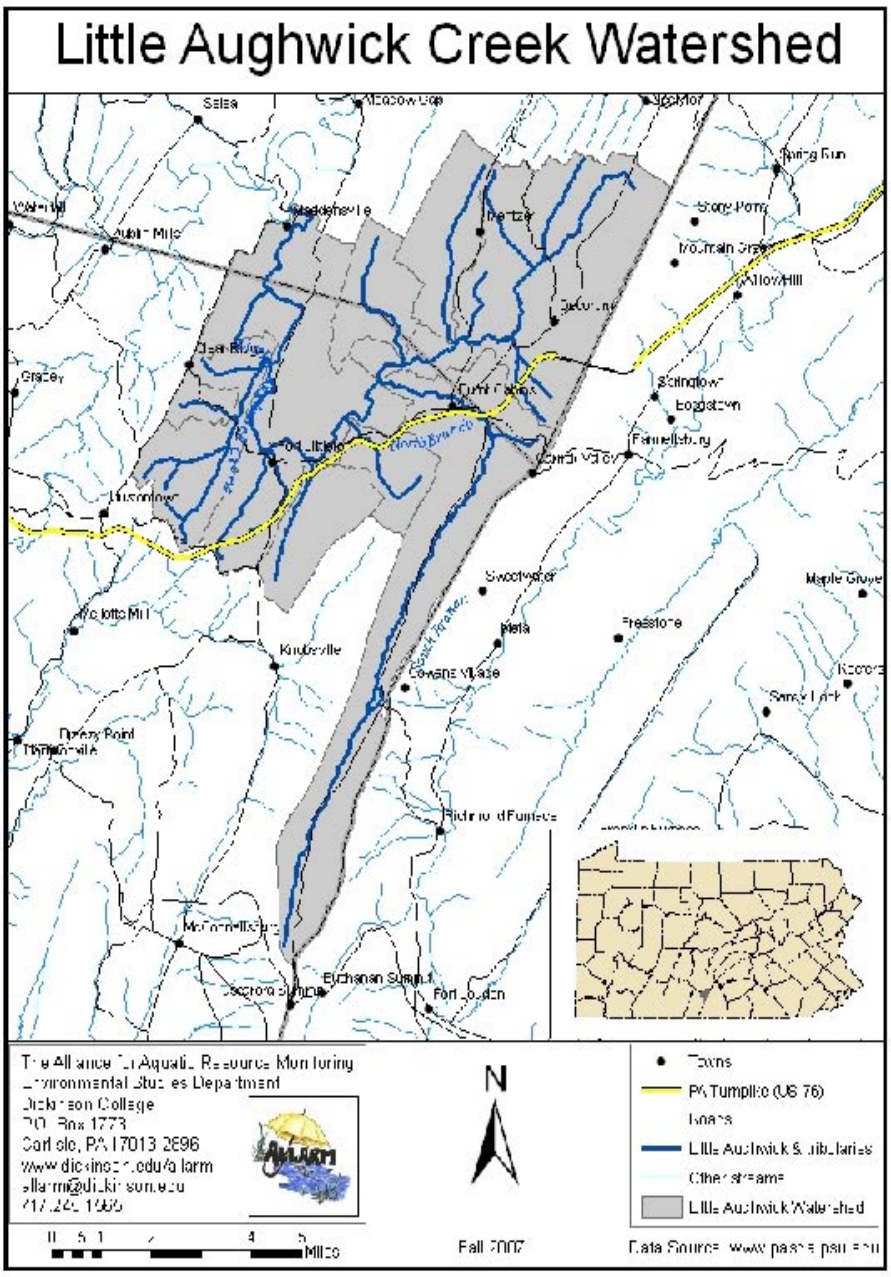
Road salt is a major source of stormwater pollution in the winter. When it snows, shovel your driveway instead of applying salt. Sodium chloride (salt) reacts with stormwater and produces chlorine, which is toxic to many aquatic organisms.

Stormwater pollution is a major problem facing our streams today. There are many sources of stormwater pollution, including lawns, cars, streets, pets, and litter. There are many ways to reduce stormwater pollution that are very simple practices, which may even save us time and money. We all must do our part to reduce stormwater pollution if we want to have

Meet FLAC!

By Jack Treichler

The volunteer monitoring community has a new member in south-central Pennsylvania: the Friends of the Little Aughwick Creek, or FLAC for short. They started meeting about a year ago, in Fall of 2006. Its founding members were concerned with the health of the Little Aughwick Creek, a tributary of the Aughwick Creek and part of the Chesapeake Bay watershed (see map and watershed address). The Little Aughwick watershed encompasses approximately 61 square miles, spread over Fulton and Huntingdon Counties.



Flac Baseline Map

The upper portion of the south branch of the Little Aughwick is classified as exceptional value, and runs through Cowen's Gap State Park. The north branch originates in Huntingdon County and is largely forested. Portions of both branches are classified as high quality, cold water fisheries. The two branches converge between Burnt Cabins and Fort Littleton. The Little Aughwick joins the Sideling Hill Creek near Maddensville to form the Aughwick Creek.

"When sewer management and citizens' concerns for water became a local issue, I knew it was time to get a group started," says Derrick Winegardner, one of the founding members. The group is concerned with a wastewater treatment plant that has recently been built in the Fort Littleton area. Other concerns are erosion, commercial agriculture, acid rain, and runoff from the Pennsylvania Turnpike, which runs through a significant portion of the watershed.

FLAC's mission is "to protect and promote the environment and water quality of the Little Aughwick Creek watershed," and their main programs will be water quality

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Who is Middle Spring Watershed Association?

by Courtney Haynes

Members of MSWA participating in a Visual Assessment workshop, lead by Julie Vastine, Director of ALLARM.

This October, Middle Spring Watershed Association (MSWA) celebrated its two year anniversary. MSWA is a watershed organization dedicated to restoring and protecting parts of the Branch and Middle Spring Creeks, located near Shippensburg, PA. Every month, members of MSWA meet in the basement of the Middle Spring Presbyterian Church to discuss the most important threats to the health of Middle Spring Creek.

The group originally formed in response to the possible construction of a second sewer treatment facility along Middle Spring Creek. MSWA secretary, Robin Dolbin, mentioned that a concern about the stream's heath encouraged MSWA members to work to "preserve, protect and monitor" the health of the stream. The development of the treatment facility is still in the beginning stages, however, this is the primary, and most imminent concern for MSWA. They fear that because Middle Spring Creek is a low-gradient, limestone, cold-water fishery stream, it does not have a capacity to support further sewage discharge (Heberlig, 2007). In addition, the group is also concerned about the health of the stream due to other factors, such as stormwater drainage and farming, which both degrade the quality of a healthy stream.

Earlier this year, ALLARM began working with MSWA to provide assistance in developing a stream monitoring plan. MSWA is one of the three new watershed groups who will be assisted by Consortium for Scientific Assistance to Watersheds (C-SAW), an assembly of scientists and service providers in Pennsylvania. ALLARM's service provider role within C-SAW enables ALLARM to provide free technical assistance to watershed groups. This fall, ALLARM helped MSWA complete a ten step monitoring study design that outlined physical, chemical and biological monitoring procedures. The group has already begun to monitor the stream visually after receiving a visual training workshop provided by ALLARM. In addition, MSWA has established a water monitoring committee in hopes to start chemically monitoring the stream in January of 2008. ALLARM is working with MSWA to assist them in designing and implementing this chemical monitoring program.

Annually, MSWA holds events to create awareness about the stream and to ask for support in their mission. The group celebrates the first day of trout fishing in the spring, creating awareness about trout, sunnies, bass and other species the group is hoping to protect. MSWA also organizes a clean up day, coinciding on Earth Day or Governor Rendell Day, to help rid the stream of trash. During the summer, MSWA displays a booth at the Shippensburg Fair to educate community members about

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Improve Stream Quality With Best Management Practices

By Jenny Bowman

Beginning in the 1990's, acts such as the Pollution Prevention Act and the Nutrient Management Act stressed the importance of reducing non point source pollution (pollution that can not be attributed to a single source) to Pennsylvania streams. Agriculture in Pennsylvania is one of the largest causes of non point source pollution. Nutrients such as nitrogen and phosphorus from fertilizers, sediments from erosion, and various chemical pesticides and herbicides leave agricultural fields as runoff during storm events, entering streams and degrading their quality. Pennsylvania is part of the larger Chesapeake Bay watershed and contaminated water from PA will eventually end up polluting the Chesapeake Bay. As a way to help alleviate non point source pollution from agriculture, the Environmental Protection Agency (EPA), the United States Department of Agriculture (USDA), and the National Resource Conservation Service (NRCS) along with other organizations have created a series of practices that can be applied to farms called Best Management Practices (BMP's).

BMP's encompass a wide range of activities such as methods for planting and cultivating crops, changes in land use, and more advanced planning of of certain practices to minimize

Dickinson College Organic Farm

pollution. Many BMP's can overlap uses so that one practice can simultaneously control runoff of sediments, chemicals and nutrients. Conservation tillage, vegetated filter strips, vegetated field borders, and strategic planning are four significant categories which encompass a wide range of practices.

Conservation tillage involves not tilling all or a portion of the cover crop back into the ground when it is time for planting the next crop. Instead the "crop residue" is left on the surface of the soil and seeds are planted underneath leaving the crop residue in place for the growing season. Some advantages of conservation tillage are erosion prevention, conservation of soil moisture, improvements in soil quality, and a decrease in chemical leaching. Disadvantages. Disadvantages include increased use of pesticides for weed control and a possible decrease in soil temperature which decelerates seed germination.

There are many different types of filter strips including, grassed waterways, vegetated filter strips, contour buffer strips, and riparian buffer zones. Filter strips use areas of dense vegetation to trap chemical runoff, sediment runoff and nutrient runoff, preventing it from entering streams. The vegetation acts as a sponge absorbing nutrients and some chemicals and acts as a physical barrier for sediments. Some advantages of filter strips are nutrient, sediment, and chemical load reductions, habitat for wildlife. Like filter strips, borders have disadvantages of occupying an area of land that could have been cultivated and could provide habitat to harmful pests.

Strategic planning is an important tool because it allows farms to customize plans to suit their own needs. By developing a nutrient management plan farmers can keep track of their total nutrient inputs to their fields and through monitoring for nitrogen and phosphorus in their streams can get an estimate of how much they are losing through runoff. Nutrient management plans also include parameters for soil testing so that farmers are not using more fertilizer than necessary on their field thus saving them money on materials and labor. Integrated pest management (IPM) is a complicated process which aims to reduce the use of pesticides in pest control. Instead, IPM uses biological and physical controls as the main efforts to remove pests. The disadvantages to strategic planning are that it requires an extensive amount of knowledge, can be very time consuming, and hiring consultants can be very costly.

This article only highlights a few BMP's that are available to farmers, there is a very large variety out there and many government organizations (see listed above) that can help with BMP guidance. There are also new incentives for farmers to incorporate BMP's onto their farms such as the Conservation Reserve Enhancement Program pays farmers to remove a certain portion of land from cultivation, usually turning it into a riparian buffer zone. The PA nutrient trading program allows farmers to implement BMP's reducing their nutrient load to obtain a certain amount of "credits" (nutrient reductions) which they can then sell to other sources who might not be able to meet necessary reductions so easily. Information on both of these programs can be found through the EPA, the USDA, and the Department of Environmental Protection.

"MSWA" Continued from Page 9

the importance of the Middle Spring Creek. In the fall, the group holds Middle Spring Stream Awareness Day, a day centered around celebrating Middle Spring Creek with fellow community members through fun, stream based activites.

Although twenty members actively participate in MSWA, the dynamic group has members who range in ages from ten year olds to members in their nineties. The majority of the members are active anglers or conservationists who live along Middle Spring Creek, although they welcome anyone who is interested in joining the group. Julie Vastine, Director of ALLARM, comments, "MSWA is a very energized organization with a committed group of volunteers and concerned citizens". MSWA's volunteer motivation has gotten them off to a great start, and the group's efforts contribute to protecting the health of Pennsylvania waterways.

For more information on MSWA, check out their website at http://www.middlespringwatershed.org

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Pharmaceuticals in Our Streams

By Sunil Baidar

Pharmaceuticals (medicinal drugs) in surface water is a recently emerging issue. Preliminary studies were carried out in the 1970s but systematic research did not begin until the mid 1990s. As the results of these studies started to surface, concerns of the presence of pharmaceuticals in water have been growing and the issue has become a matter of global concern.

http://www.globalregulatory.com/www/images/objects/pharmaceuticals.jpg

The main source of pharmaceutical contamination is from human and animal patients. Manufacturing facilities, aquaculture industries and farm runoffs are other significant contributors. When a patient takes medicine, the drugs do not get completely broken down by metabolic reactions inside the body and hence are excreted as parent compounds and/or metabolites in urine and feces. Unwanted or expired medications are often improperly disposed of, directly in waste water. Several pharmaceuticals can therefore reach sewage treatment plants in substantial amounts and if they escape degradation, which in fact is the case with most compounds, is released into surface water.

Contaminations due to pharmaceuticals vary from place to place according to prevalence of diseases, treatment habits and options or even the availability of drugs in the market. Among the different groups of pharmaceutical compounds namely antibiotics, nonprescription drugs, prescription drugs and reproductive hormones; non prescription drugs have been found most frequently. Sulfamethoxazole, ibuprofen, and diltiazem are just the few of the drugs frequently detected in surface water.

Potential health and environmental health hazards due to these compounds are virtually unknown at this time. The effect of these compounds on human and aquatic life has scarcely been investigated. These compounds are present in very low concentrations, below any of the health or drinking water guidelines. In most of the cases such guidelines are not even present. Acute toxicity tests do not reveal any biological effects because of their low concentrations. Some of the potential health hazards include development of antibiotic resistant bacteria, increased incidences of cancer, abnormal physiological processes and reproductive impairment among aquatic species. Endocrine disruption has been reported among biomagnifications remains very high. Trace level and life -long exposure impacts of these pharmaceuticals need to be studied in order gain further insights into the potential harmful effects of these compounds.

Knowledge on these pharmaceutical compounds in water is rapidly growing but at the moment the problem as well as the risks and mitigating measures associated with the problem are not fully clear. Keeping in mind the potential hazards associated with it, it is definitely a matter of serious concern and further studies need to be carried out in order to come up with solutions.

The Mully Grub Revisited

by Kate Consroe

Starting in 2000, ALLARM was involved with restoration efforts of the Mully Grub in Carlisle, Pennsylvania. The Mully Grub is a stream that flows underneath the town of Carlisle and receives the town's stormwater runoff. The Mully Grub eventually flows into Letort Spring Run, a renowned trout stream and part of Pennsylvania's Scenic River System. Concern about the impact of the Mully Grub on the Letort prompted Professor Candie Wilderman and her aquatics classes to complete research projects in the spring of 1998 and the spring of 1999. Their results showed that the Mully Grub, full of sediment and heavy metal pollution from Carlisle's stormwater runoff, was indeed having a negative impact on the Letort. A multi-faceted restoration project was implemented by the Letort Regional Authority and ALLARM starting in 2000. One part of the project involved regrading the Mully Grub's channel as it flows from Bedford Street to the Letort, located between Letort Elementary and the baseball field. In addition, vegetation was planted along the sides to improve bank stability. Another aspect of the restoration project was the construction of a stormwater detention pond, also known as the Mully Grub wetland. The wetland was designed as a place for pollutants, specifically sediments, to settle out in order to minimize the Mully Grub's effects on the Letort.

As a LUCE student this semester, I am completing an independent research project focusing on the effectiveness of the Mully Grub mitigation efforts, specifically the wetland and the restored riparian area. The evaluation of restoration projects is an important step that is often overlooked. This fall marks five years since the completion of the Mully Grub wetland. Waiting five years before evaluation is important as it gives plant communities time to establish. To determine the efficacy of the wetland and restored riparian area in filtering the waters of the Mully Grub before they join the Letort, I am examining plant communities and water chemistry. Terrestrial plant communities in the wetland and riparian zone were surveyed and are being used as an indicator of the general health of the wetland and riparian zone area. In addition, aquatic plants will be analyzed for traces of zinc, lead, and copper, as aquatic plants have the ability to uptake some heavy metals. Water chemistry data was collected a total of four times, two times between storm events and two times during storm events. Dissolved oxygen, pH, alkalinity, total hardness, chloride, nitrates, and phosphates were measured for each water sample. Water was collected at six sites: three in the Mully Grub (one upstream of the wetland intake pipe, one downstream of the wetland outflow pipe, and one in the restored riparian area), one in the Mully Grub wetland, and two in Letort Spring Run (one upstream of its confluence with the Mully Grub, and one downstream of the confluence). My research project will be completed at the end of November, and will provide important feedback on the mitigation efforts. Look for a summary of my results in the next issue of Stream of Consciousness!

The Mully Grub Wetland

For more information:
http://alpha.dickinson.edu/storg/allarm/allarm%20projects/mully%20grub2.htm

The New College Organic Farm

by Atandi Anyona

The Dickinson College organic farm, located in Boiling Springs, PA, is project aimed towards increasing Dickinson's sustainability initiatives. The farm is an extension of the Student Garden which is located at Dickinson Park. When the major focus shifts to the college farm, the Student Garden will be turned into a community garden. The principle farm operations, which include tillage, planting, harvesting, and selling, began in the summer (2007). At present, the farm is under the management of Jennifer Halpin (manager) and Matthew Steiman (assistant manager). Jenn Halpin is also part of the Dickinson College teaching staff, and Matt Steiman runs the biodiesel plant at the college.

2007 summer interns: (from left to right) Prana Miller, Atandi Anyona, Danielle Hoffman, Stephanie Roberts, Kaitlin Harrigan, Jenn Halpin (manager) and Kathleen Airola (not in picture)

The 80 acre piece of farmland was donated to Dickinson College in the 1960s by a Dickinson alumnus, under the condition that it should not be used for development purposes. Jenn Halpin, in collaboration with the Environmental Studies department, formulated a proposal to the College requesting for part that land to be converted into an organic farm for both production and educational purposes. Since the 1960s, the land had been rented to conventional large scale farmers. At present, a large portion of it is still under the management of a conventional farmer, and approximately 1.5 acres is under organic farming production. Beside crop production, the farm has sheep, cows and poultry.

The major purpose of the farm is to supply Dickinson College with local fresh produce which includes cabbage, tomatoes, cucumbers and lettuce. Additionally, it will be the source of produce for the already existing CSA (Community Supported Agriculture) members and the farm will sell produce at the local farmers market during the summer. The College provides most of the capital required to purchase machinery (tractor implements) and run farm operations. Other major sources of capital include grants, CSA and farmers market sales.

Besides production, education is the other component of the Dickinson College farm. Presently, two seniors (Art & Biology majors) are conducting research projects on the farm. The farm also organizes volunteer opportunities which are open to all Dickinson faculty, staff and students. It is also a service site of Alpha Phi Omega, a national service fraternity. Moreover, it provides an opportunity for students to get first hand

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Investigating the Huntsdale State Fish Hatchery

By Maunette Watson

State fish hatcheries, through their fish cultivation and stocking, are a known source of economic wealth and recreational activity throughout Pennsylvania. However, all fish hatcheries discharge pollution into waterways, sometimes significantly impacting the water quality. Studies have documented both waterways impaired by hatchery effluents, as well as waterways not seriously affected. The range of results is due to differences in the receiving body of water or hatchery discharges.

Merging of the Huntsdale Fish Hatchery effluent and the Yellow Breeches Creek.

In Cumberland County there is one state fish hatchery, the Huntsdale State Fish Hatchery, which is located about 12 miles southwest of Carlisle, PA. The Hunstdale Hatchery discharges water into the Yellow Breeches Creek, which flows through south-central Pennsylvania and into the Susquehanna River. The Yellow Breeches is part of the Pennsylvania Scenic Rivers System and is known for its trout fishing.

As part of a LUCE independent research project this semester, I investigated the impact the Huntsdale Hatchery effluent has upon the Yellow Breeches Creek. To determine the impact, I collected and identified macroinvertebrates to the family-level, and analyzed them using a Pennsylvania protocol to determine stream health both upstream and downstream from the discharge point. To accompany the macroinvertebrate analysis, I conducted habitat assessments to determine how much habitat influences macroinvertebrate populations. I also analyzed water chemistry parameters, such as pH, temperature, dissolved oxygen, conductivity, alkalinity, nitrate, and phosphate, which I will use to determine the water quality upstream and downstream.

Another part of my research included interviewing an employee from the Huntsdale Hatchery to help learn more about the processes at fish hatcheries and about the hatchery itself. From that interview, I learned that the Hunstdale Fish Hatchery was built in 1932 by an old Youth Conservation Core group, and was situated in the village of Hunstdale because of the abundant source of limestone springs, which are good for fish rearing. Currently, the hatchery raises approximately 500,000 fish per year, of brook, brown, rainbow, and golden rainbow trout; striped bass; tiger muskellunge; and fathead minnows (used mostly for tiger musekellunge forage). The fish are raised until stocking size, and then they are stocked in rivers and lakes throughout south-central and south-eastern Pennsylvania.

Water for the fish is brought in from springs via electrical pumping (which also degases and aerates the water) and aqueducts. Water then travels into concrete raceways (where the fish live) and into retention ponds. The first retention pond filters fish waste coming directly from the raceways, and the second pond allows remaining waste to settle out before releasing the water into the Yellow Breeches Creek.

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monitoring, educational outreach and awareness, and stream stewardship.

They hope to perform physical, biological, and chemical monitoring along the Little Aughwick. This will include stream walking, stream bank assessment, flow, specific conductivity, and macroinvertebrates. For chemical monitoring they hope to test nitrates, orthophosphates, temperature, dissolved oxygen, and pH.

They plan to promote the stream through brochures, placemats in restaurants, and other public outreach events. In these and other ways they hope to encourage stewardship for the watershed and increase their organizational membership.

FLAC has just completed their study design process with ALLARM. This is an important process where groups focus on what they are trying to accomplish, and then establish the most appropriate monitoring strategyto meet those goals. It also provides a written document that clearly defines the group's methodology, which will give credence to their results. A study design process can unify a group and provide an important sense of continuity as membership shifts through the years.

The current members of FLAC have high hopes for the organization over the next couple of years. Dawn Harnish, a business owner use ... reproducing trout and other fish in the stream ... [and] one of the greenest communities in the state."

Winegardner hopes in five or ten years to have "lots of good factual data to encourage sound land in the watershed, hopes that FLAC will continue "to grow as an organization, educating our children and the general public on the quality of our watershed and ways to maintain it."

Here at ALLARM, we hope to help FLAC on their mission to a healthier, happier Little Aughwick Creek!

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Don't Let A Good Fish Go Bad

By Matt Freedman

Urban stormwater runoff contains heavy metals such as lead, copper, zinc, cadmium, arsenic, and chromium. These heavy metals are listed as priority pollutants under the Clean Water Act. They can be directly toxic to aquatic life, accumulate in stream sediments, and bioaccumulate through the food chain—ending up in the fish on our dinner plates. Heavy metals in urban runoff comes from our automobiles, motor oil, paints, pesticides, and many other sources:

Lead: Mainly car exhausts and engines
Copper: Vehicle brake pads, pesticides
Zinc: Vehicle tires, motor oils, corrosion from galvanized iron
Cadmium: Burning of fossil fuels (gasoline and diesel), paint, batteries
Arsenic: Brake linings, fluid leaks, vehicle emissions
Chromium: Air-conditioning coolants

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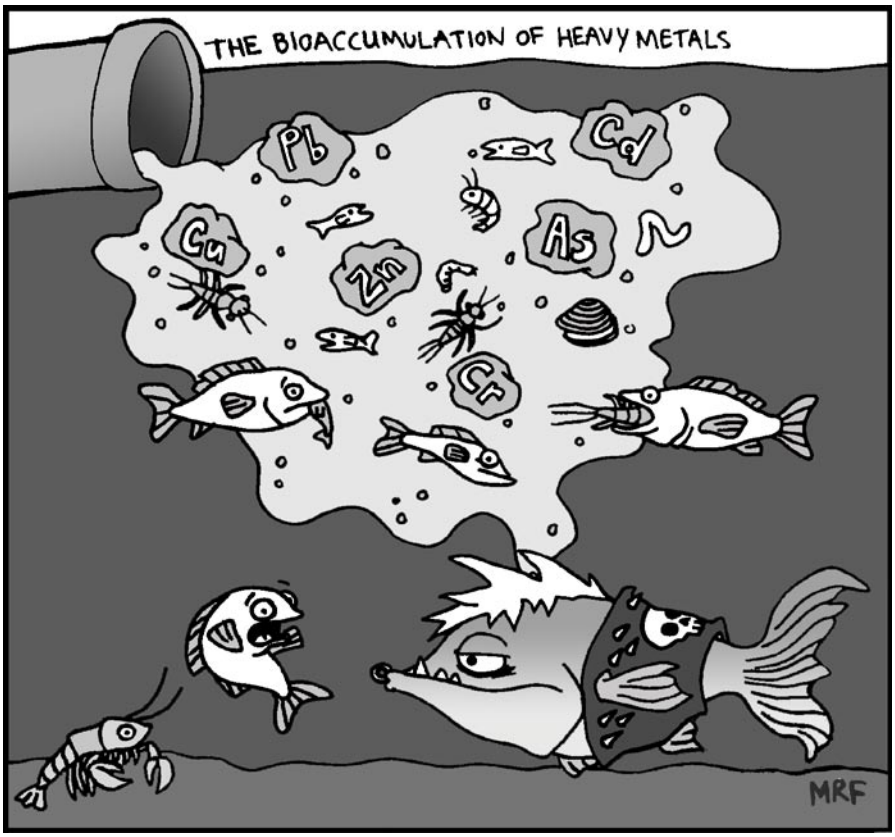

Drawn by Matt Freedman

"Farm" Continued from Page 14

farming experience through summer internships. The interns benefit from educational field trips that broaden their knowledge on farming practices in Pennsylvania and all over the country. When interviewing two of the summer interns, I received the following responses:

"It was an excellent learning experience as a result of the close connection with the land and working alongside amazing people." – Prana Miller

"You get to meet people who live off the land. You gain knowledge and experience on farming practices not done on the farm through the field trips."- Danielle Hoffman

In the course of the next five years, the farm plans to undertake key modifications, namely the construction of a greenhouse and pond, renovation of the farm barns, installation of solar panels, increasing farming acreage from 1.5 acres to 11 acres, using biodiesel fuel for all farm equipment, provide half-year internships to graduating seniors, expand the CSA membership, and host international interns.

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The effluent is tested at the outfall by the hatchery, and currently includes monitoring for flow, pH, dissolved oxygen, total suspended solids, total phosphorus, total nitrogen, formaldehyde, biological oxygen demand, and particulate organic carbon, among others, under NPDES (The National Pollutant Discharge Elimination System: a point source discharge permit system under the Clean Water Act aimed towards reducing water pollution and regulated by the Department of Environmental Protection (DEP) in PA). The hatchery recently had its NPDES permit renewed, and the stricter regulations from the new permit were enacted on April 1, 2006. According to the hatchery, it has been meeting all of the NPDES requirements.

Aside from the discharge, the hatchery has been having some problems with polychlorinated biphenyl (PCB) contamination. Through routine testing, high levels of PCBs were found at the hatchery a number of years ago. This led to further testing of water, fish tissue, and the encompassing area to determine the source. One section of the hatchery was found to contain higher levels of PCBs in the fish and was shut down to fish production in 2002. Since the closing of that section, all fish at the hatchery are tested for PCBs and are determined safe for consumption prior to stocking. The Pennsylvania Fish and Boat Commission is also currently using semi-permeable membrane devices (devices that measure PCBs) to investigate the source of contamination. In the near future, the hatchery has plans for a large renovation project that focuses on improving the quality of the effluent from the hatchery. These renovations include state-of-the-art technologies such as microscreen filtration, and installations of a new settling pond and a newly lined retention pond.

The results from my research on the impact of the Huntsdale State Fish Hatchery effluent upon the Yellow Breeches Creek will be summarized in the next issue of Stream of Consciousness.

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Fall Staff 2007

Back Row: (Left to Right) Assistant Director Jinnie Woodward, Kalyn Campbell, Andrea Korman, Ashley Whiting, Danielle Cioce, Matt Freedman, Courtney Haynes, Maunette Watson
Middle Row: Sunil Baidar, Kate Consroe, Adrian Broderick, Jack Treichler, Director Julie Vastine
Front Row: Atandi Anyona, Science Director Candie Wilderman, Benson Ansell

Welcome to the ALLARM family: Jinnie Woodward, Atandi Anyona, Benson Ansell, Kalyn Campbell, and Maunette Watson

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ALLARM, founded in 1986, is a project of the Dickinson College Environmental Studies Department. Our team of students, professional staff and faculty provides community groups with comprehensive technical support for locally-driven watershed assessments, protection and restoration. For more information visit our website: www.dickinson.edu/allarm.

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