Spring/Summer 2008

Stream of Consciousness

a publication of the Alliance for Aquatic Resource Monitoring

educate. engage. empower.

ALLARM in Thailand

By Jack Treichler

In January 2008, two ALLARM student staff coordinators and Director Julie Vastine traveled to Thailand for two weeks. Danielle Cioce, Vastine, and myself trained students from neighboring Burma on a variety of environmental and water quality issues, in conjunction with EarthRights International, a non-governmental organization (NGO). We translated ALLARM's technical resources for the Burmese environmental and human rights context.

EarthRights International is a nonprofit NGO that works on international environmental and human rights issues. One of their primary functions is training and education, they have environmental and human rights schools for the Amazon, the Mekong River, and Burma. The Burma EarthRights School (ERS-B) is based in Chiang Mai, Thailand. It is a twelve-month program for 14 to 16 emerging Burmese leaders from a variety of ethnic nationalities backgrounds. Recently the Burma school decided to strengthen its environmental curriculum and incorporate environmental monitoring lessons.

ALLARM was the perfect fit to do this. For more than twenty years we have worked with communities in Pennsylvania, providing education on water quality issues and trainings on visual, chemical, and biological monitoring. When the opportunity arose to export our expertise to Thailand (through Vastine's connection as a former EarthRights employee), ALLARM jumped on it.

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In order for ALLARM to develop appropriate lessons and trainings, it was important to become familiar with the situation in Burma. Burma gained its independence from Britain in 1948, but the civilian government was toppled by a military coup in 1962. The military junta has ruled steadily since then, and controls everything from education to the media. Though several environmental laws and regulations are on the books, the regime enforces them minimally, and often neglects them in natural resource extraction.

As requested, we structured much of our teaching program around the water quality and human health impacts of natural resource extraction, particularly mining. Extensive background research had to be done in preparation for the trip. As senior ALLARM staff, Cioce and I had a lot of knowledge on water quality issues, but to effectively teach we needed to understand resource extraction issues. The summer before, staff member Stevie Lewis compiled materials on copper mining, which came in handy, however the majority of the research and curriculum development was done in the fall 2007 semester.

We arrived in Chiang Mai, Thailand on Monday, January 7, 2008. During our first week there we became familiar with Chiang Mai and the EarthRights School, got to know the students, put finishing touches on our curriculum, and presented two case studies. The case studies introduced global examples of human rights and environmental issues, highlighting how communities addressed the situation and what measures were successful. The first one-hour case study was on agriculture, focusing on genetically modified organisms in India, specifically Bt cotton, Bt rice, and the role of the Monsanto Company. The second one looked at copper mining and the Celtor Chemical Corporation's operations on the Hoopa Indian Reservation in California.

The second week consisted of five lessons, split up over three eight-hour days of teaching. Over the first two days we looked at general mining, copper mining, and gold mining. The purpose of teaching general mining was to introduce the students to basic geological and mineral extraction concepts. From there we went on to explain elements, minerals, and mineral consumption worldwide, along with basic mining processes.

The next discussion focused on copper mining. We discussed extraction and refining processes for copper, and its uses in industry. In Burma the most wide-spread refining process for copper is solvent extraction-electrowinning (SX-EW), which creates huge amounts of toxic tailings. These tailings often contain small amounts of copper. Local communities, displaced by mining operations, struggle to support themselves, and often turn to mining these tailings in search of residual copper. This is a common occurrence in communities impacted by large-scale mining operations, and is called Doh-tar mining. Because of the toxic nature of the tailings this is a very dangerous enterprise, with negative human health effects.

Next, we discussed gold mining extraction and refining processes, and then moved on to a case study of Kachin State, Burma. Gold mining is widespread throughout Kachin State, at both industrial and artisanal levels. At both levels it has harmful environmental and human health impacts, largely relating to mercury. Mercury is the main chemical used to refine gold, and as a result many streams and waterways are contaminated. Five of the students had participated in gold mining at home in Burma, and were surprised to learn how dangerous mercury is. The students said it is common for children to find it by the riverbank and play with it.

On the last day, we discussed environmental monitoring and educational strategies. We chose to focus on visual monitoring, as opposed to biological or chemical monitoring, because it would be the most easily applicable for the students in Burma. As a result of security issues we were not able to take students to an actual stream, and instead we conducted the training from inside ERI's office, which fortunately was located on a waterway. The students found the environmental monitoring training among the most empowering lessons we taught. It was the first time the students had learned basic

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Dam Removal Evaluation

By Kalyn Campbell

Many dams in Pennsylvania are not currently used and have been found to be relatively destructive to the habitat and aquatic life surrounding them. Therefore dams are being removed to allow streams to go back to their natural flow (Yellow Breeches Watershed Association (YBWA), 2007). There are many changes to water quality when a dam is in place. For example, water temperature increases behind a dam because the water is stagnant, deeper, and can warm up throughout the day (Pennsylvania Organization for Watersheds and Rivers (POWR) et al.). Dams also affect the channel and habitat around a stream (POWR et al.). Removing a dam can be initially destructive to aquatic life, but if appropriate measures are taken during the removal process, stream vegetative areas (or riparian buffers) can be reestablished, which provide shade and habitat for the aquatic fauna and animals (POWR et al.).

In the fall 2007, I participated in the Henry Luce Foundation funded integrated watershed field semester (LUCE). For the independent research component of the semester, I investigated the effects of Wittlinger Dam removal in the Yellow Breeches Creek, Boiling Springs, PA.

My study focused on the macroinvertebrate populations, to determine how they were affected and to track their recovery after the dam removal. This was done by collecting macroinvertebrates, assessing the habitat, and analyzing baseline water chemistry at three sites on the stream, three times throughout the semester. One of the sites was located in the dam removal area, one was downstream of the dam, and one upstream of the dam (used as a reference site).

The stream now flows freely, but the removal affected the habitat around the dam and allowed legacy sediment to wash downstream. My results indicated that the macroinvertebrate populations at the dam site were destroyed by the dam removal. This could be due to the lower dissolved oxygen levels and/or the habitat destruction surrounding the stream. The population did not recover during the study (a thirteen week period), but continued research is required since macroinvertebrate populations can take a long time to recover. In order for the macroinvertebrates to recolonize there needs to be vegetation around the stream and rocks on the bottom of the stream for them to live on. I recommended to the Yellow Breeches Watershed Association that volunteers go out to the dam site and plant sycamores trees to build up the riparian buffer zone and provide food for the macroinvertebrates.

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Before dam removal

After dam removal

The Aquatic Toxicology of Organochlorine Pesticides in Sediment in the Letort Spring Run

By Danielle Cioce

For the past year, I have been conducting my senior research on the aquatic toxicology and patterns of distribution of pesticides in sediment in the Letort Spring Run. The Letort Spring Run drains an area of 21.4 miles squared encompassing large parts of South Middleton, North Middleton, and Middlesex townships, a small area of Dickinson Township, and 65% of the Borough of Carlisle. In its headwaters, the Letort is internationally renowned for its trout fly-fishing and is designated a high quality cold-water fishery by the Pennsylvania Department of Environmental Protection (PA DEP). The stream flows through an upstream agricultural area, an urban area (the Borough of Carlisle), and finally a heavy trucking area (Middlesex Township) until its confluence with the Conodoguinet Creek. Students in Dr. Candie Wilderman's aquatics classes at Dickinson College collected pesticide sediment data at sites within these three regions of the Letort in the 1990s as part of a larger study focused on urban stormwater runoff. Additional samples were taken by Meghan Klasic '06, as part of her senior independent research, which focused on the efficacy of using submerged aquatic vegetation as bioindicators. Though the sediment data had been collected, it was never formally analyzed.

The goal of my study was to help clarify whether or not the Letort is improving in regards to the concentrations of pesticides in sediment.

Pesticide use has increased greatly since the beginning of the 20th century, but decreased beginning in the 1960s, as scientists learned of the harmful effects of some pesticides and worked to outlaw or restrict their use. Today, the United States uses about 1 billion pounds of pesticides each year, 80% of which is in agriculture, to control insects, weeds, and other organisms (USGS 2000). While most pesticides are used in agriculture, urban pesticides are used with a greater rate of application (Larson et al. 1999). While normally less than 2 % of pesticides applied to crops end up in waterways, many of these chemicals are still present in the environment, as the products are persistent and do not break down easily (Battaglin and Fairchild 2002).

One group of chemicals, known as the organochlorine pesticides, is known for their persistence in the environment and can biomagnify up the food chain. Most anthropogenic chemicals, including organochlorine pesticides, tend to stick to sediments and organic materials, which leads to concentrated chemicals in the sediment.

It is also thought that polluted sediments can cause biological harm even if standards for the water are not exceeded. This is problematic as there are not many established levels for pesticides in the aquatic system. The suggested sediment quality guidelines that do exist often conflict with each other and it is difficult to discern a limit that protects aquatic life. It is important to note that any toxins in sediment are not active until released from the sediment. A high concentration of a contaminant can be present in the sediment, but it will not negatively affect aquatic organisms unless it is bioavailable (Power and Chapman 1992). The only way to measure bioavailability is to conduct biological assessments to determine the response to contaminants.

In the fall, I spent a lot of time working to understand the environmental breakdown and fate of the organochlorine pesticides that my research focused on. With this knowledge, I began to examine the existing data and analyze trends over time and space. I also was concerned with exceedances of the sediment quality guidelines and if concentrations were following the expected degradation behavior of pesticides in sediment. From this analysis, I pinpointed the four most contaminated sites for resampling in Spring 2008 (samples were be ing processed at press time).This

was possible by working in conjunction with PA DEP.

While it has been difficult to draw conclusions from the data, as sites were not continuously sampled among all years, some trends can be seen (Table 1). DDT, DDE, gamma chlordane, endrin, and endrin ketone were the compounds most frequently detected in the samples. I also developed a site ranking system based on the frequency of sediment quality guideline exceedances to determine hot and cold spots. Most of the hot spots were found in the trucking reach, followed by the urban sites. The sites designated as hot spots exceeded sediment quality guidelines for three to five pesticides. The cold spots (no exceedances) were most common in the upstream area. DDT and its metabolites and endrin were found with greater frequency over time, while endosulfan, heptachlor, lindane, and methoxychlor were found less frequently over time. Pesticides found with greater frequency are still active in the aquatic system, either from previous concentrations becoming newly bioavailable or as a consequence of degradation. Pesticides found less often over time indicate that the chemicals are degrading and are being removed from the system. Aldrin/dieldrin and chlordane do not seem to follow any clear patterns in regards to frequency of detection.

There is evidence that DDT is degrading in the sediment as its breakdown products (DDD and DDE) have become more prevalent over time, which helps to explain why it was found with greater frequency. Organochlorine pesticides have been found in greater concentrations in aquatic biota than in stream sediment, which can cause problems in terrestrial and aquatic systems, as well as human health problems from ingestion of contaminated fish. Since the data were from different sites in different years, future studies would benefit from examining all of the sites in one sampling year. Extensive fish tissue studies or other biological assessments could be executed to more fully understand the extent of toxicology of the pesticides in the Letort.

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Pesticide	Detection frequency over time
Aldrin	~
Chlordane	~
DDD	+
DDE	+
DDT	+
Dieldrin	~
Endosulfan	-
Endrin	+
Heptachlor	-
gamma-HCH (Lindane)	-
Methoxychlor	-

Table 1. A visual depiction of trends seen over time: + indicates an increase in detection frequency, - indicates a decline in detection frequency, and ~ indicates no clear patterns existed in the available data.

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tools to assess the health of their environment, which they know is being degraded. We were also able to take a water sample, and run pH, temperature and copper tests. In the afternoon we taught educational strategy development. We trained the students how to take information they had learned and convey it back to their communities. We had them split into two groups—one on copper mining and one on gold mining—and they had to devise campaign strategies to educate their communities. They made posters, illustrating concepts like the danger of mercury, and wrote songs.

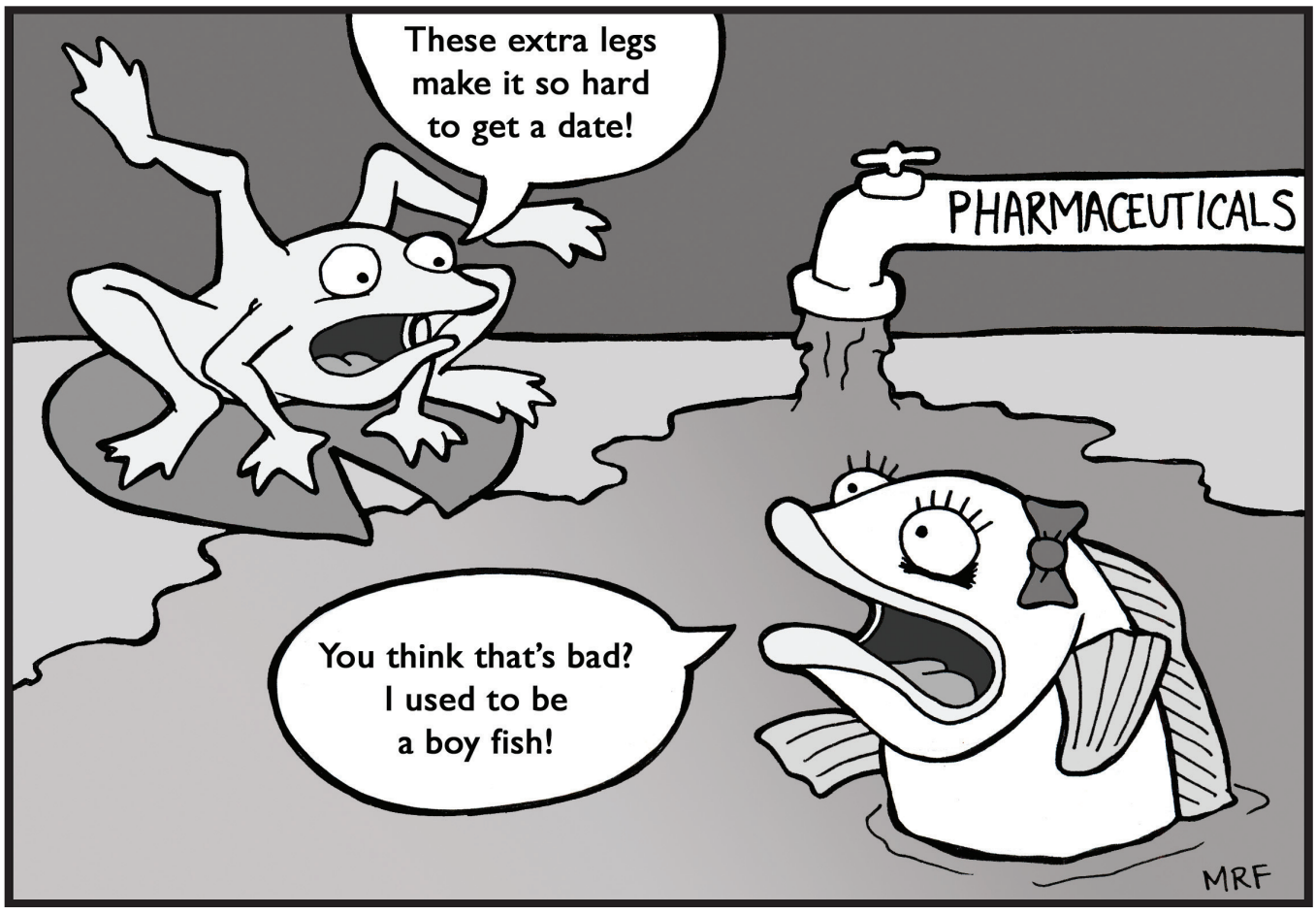
In the end, this lesson was one of the most satisfying for me. At Dickinson we talk a lot about "engaging the world," but that does not have to mean making the world a better place.

In Thailand we were not only educating students about their environment, but providing them with the tools to educate others. I left with the feeling that we were an important part of the start of something big for these students, and they would be continuing with it long after we left.

This project would not have been possible without the generous assistance of EarthRights International, the Dickinson College Research and Development Committee, and the Office of Global Education.

Pharmaceuticals in Our Streams

By Matt Freedman



Pharmaceuticals can have unforeseen effects on aquatic life when they our enter our water ways—Contact your pharmacy for proper disposal techniques.

Potential Environmental Impacts of Ethanol Production in Cumberland County

By Atandi Anyona

As a result of the push towards the use of sustainable energy, there has been a growing demand for biofuels. This push for production and use of renewable energy is a result of two major factors: the increase in greenhouse gas emissions from fossil fuels and the increased dependency on foreign oil. However, out of all the different types of biofuels, corn-based ethanol has raised the most concerns regarding its potential environmental impacts.

As a consequent of tax credits given to corn-ethanol refiners and subsidies granted to corn producers, there has been a rapid increase in corn production. It is speculated that as the market pressure to grow corn for ethanol increases, more acres of corn will be planted annually. In the 2006-2007 production years, Cumberland County reported a 4000 acre increase in the number of corn acres planted. However, the amount of corn produced per acre has simultaneously increased due to the development of genetically modified grain (Figure 1).

Increased corn production per acre and area planted results in monocultures which result in poor soil fertility and increased erosion. To sustain monocultures, intensive farming practices such as increased use of fertilizers, insecticides, pesticides and herbicides are essential.

The agricultural industry is one of the largest pollution sources in the Chesapeake Bay watershed. Fertilizers contain nitrogen and phosphorous compounds which runoff into local streams and finally the Chesapeake Bay. Excess amounts of nitrogen and phosphorous in water bodies induce processes such as eutrophication that are responsible for stream impairment. Therefore, the potential increase in corn production may result in an increase in the degree of impairment of local waterways.

People in the environmental field and farmers in Cumberland County have speculated that there will be a definite increase in corn production. The resulting impairment will depend on the implementation of best management practices (BMPs). Such practices include cover cropping, crop rotation, and proportional application of fertilizers. If

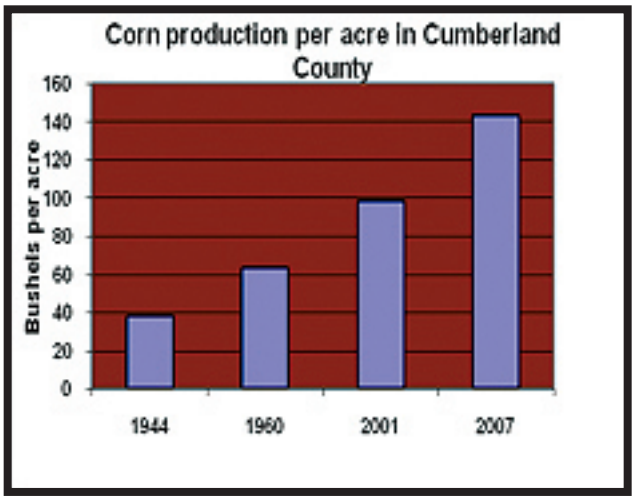
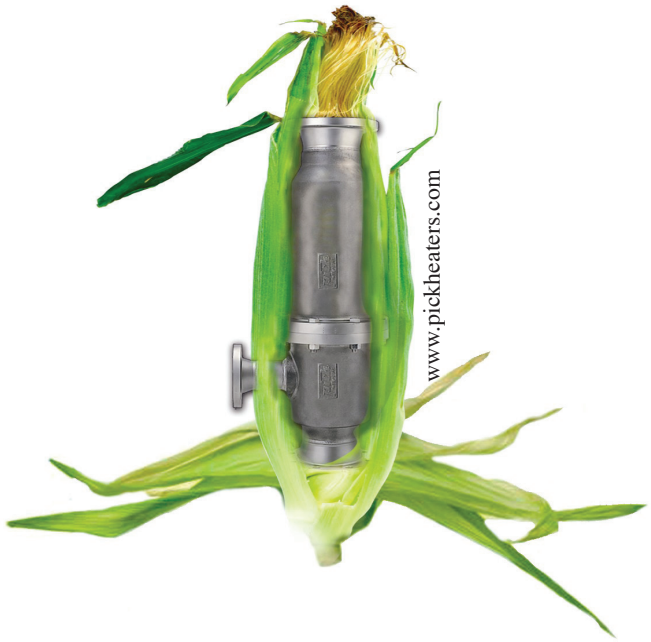


Figure 1

BMP's are implemented on new and expanded corn acreage, stream pollution and impairment is likely to be minimal. Farmers rely on incentives to implement BMPs and without them, the impairment of local streams and national waterways are speculated to increase.



Renewable Energy at Its Finest: WIREC 2008

By Lindsay Hunt

The Washington International Renewable Energy Conference (WIREC 2008) held from March 4-6, 2008 was the premiere renewable energy conference held in the United States. Prior to the U.S. government hosting WIREC, there were two international renewable energy conferences: Bonn, Germany in 2004 and Beijing, China in 2005. This international event demonstrated that the United States has a strong commitment to renewable energy development and use. The conference had several renewable energy focuses which included wind, geothermal, solar, and hydraulic energies, as well as bio fuels. Specifically, policy discussions were centered on Agriculture and Rural Development, Technology/Research and Development, and Market Adoption and Finance. The goal was to increase discussion and awareness of renewable energy while providing an outlet for organizations and governments to launch their recent renewable energy initiatives and develop a tool providing the best renewable energy solutions.

Lindsay Hunt (far left) at WIREC 2008

Last semester I interned with the U.S. Department of State in the Bureau of Oceans and International Scientific and Environmental Affairs specifically in the Environmental Policy Office. As part of my internship I had the opportunity to serve as a member of the planning team for WIREC 2008. The conference had three components including a trade show, business conference, and ministerial. My focus was the ministerial component of the conference. As part of my duties, I was a member of the interagency working team and I frequently served as the liaison between various embassies and the State Department.

As the capstone to my internship, I had the opportunity to attend WIREC as part of the State Delegation. This was a unique, exciting, and enriching opportunity. Many influential energy experts and world leaders were present at the event including Vinod Khosla, Founder and CEO of Khosla Ventures and Sun Microsystems; Tony Hayward the CEO of BP; Walter Kohn from the University of California and Nobel Laureate winner in 1998 for chemistry; President Bush; and Maud Olofsson the Deputy Prime Minister of Sweden.

Throughout the conference I worked at the pledge desk, where governments, businesses, and NGOs made pledges to increase their commitment to renewable energy use. During the conference we received over 100 pledges. This number grew to 130 pledges throughout the month of March due to the strong emphasis placed on the importance and value of making these commitments. Volvo Group made an impressive pledge to cut their energy consumption in their production processes, made a commitment to offer new hybrid vehicles by 2009, convert their plants to be carbon neutral, and produce engines adapted to 30% bio diesel blends. The United States made 31 commitments ranging from the State Department's pledge to build green embassies

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Letort Documentary

By Adrian Broderick

This year, ALLARM commenced a partnership with the Borough of Carlisle, Letort Regional Authority, and Cumberland Valley Trout Unlimited on a Stormwater Education Project, funded by a grant from the League of Women Voters through their Water Resource Education Network. The goal of the project is to educate the public on watershed stewardship (with a stormwater focus) of the Letort Spring Run – a world renown trout stream. The Stormwater Education Project includes many components, educational material development (such as Healthy Stream Habit theater advertisements and Healthy Stream Habit posters) and a community-Letort connectiveness component, including the First Annual Letort Festival, which took place May 3, 2008 at Letort Park in Carlisle, PA.

As part of this Stormwater Education Project and specifically the Letort-community component, ALLARM produced a celebratory documentary of the Letort to that was premiered at the Letort Festival. The 25 minute film illustrates how the community interacts with the stream, focusing on the experiences of anglers. We hope to foster a sense of connection to the Letort and inspire the community to protect this very important resource. The Letort is part of Carlisle's rich history, and the documentary highlights the local

Matt and Adrian editing the Letort Documentary

significance of this internationally renowned trout stream.

The Letort Spring Run played a special role in the selection of the County seat in the Cumberland Valley. Letort Spring was named after James LeTort an Indian interpreter and trader who settled on its headwaters around 1720. On January 27, 1750 the land within Pennsylvania west of the Susquehanna River (excluding the land of York County) was named Cumberland County. Upon the creation of Cumberland County, a county seat had to be designated which would house the courthouse and prison. There were five different sites being considered, one of which was at the Letort Spring. Initially, the trustees of Cumberland County decided that the location at Conococheague Creek would be the best choice, and Shippensburg was the second choice. The other three locations were thought to be too far east. However, Governor James Hamilton decided to ignore the trustees' recommendations and instead chose Letort Spring. In the spring of 1751, surveyors drafted the boundaries of what is now called Carlisle, the name that was reserved for the county seat. Carlisle was chosen as the county seat because of the abundance of clean water in the Letort Spring Run, the meadows, pastures, timber, stone, and lime.

For completion of the documentary, we interviewed five local anglers who are particularly fond of the Letort, one of whom is also associated with the Borough of Carlisle, two local teachers, and one college professor. The interviews highlight memorable experiences with the Letort and the problems facing its preservation. We have heard many unique stories and learned many interesting facts along the way. For example, in our interview with Dave Runkle, lab supervisor of the Carlisle Sewage Treatment Plant and fisherman, he described the response he has gotten from anglers in Alaska when they discovered he is from Carlisle. He says that these anglers told him, who live in pristine Alaska, that they dream to come fish in the Letort. In another interview, Ed Shenk reminisced about a fish that he spent three seasons trying to catch. The fish, named Old George, turned out to be a lady! Jerry Kerstetter remembered spending an entire summer trying to catch a fish in the Letort. It was not until the following summer, after assistance from a famous

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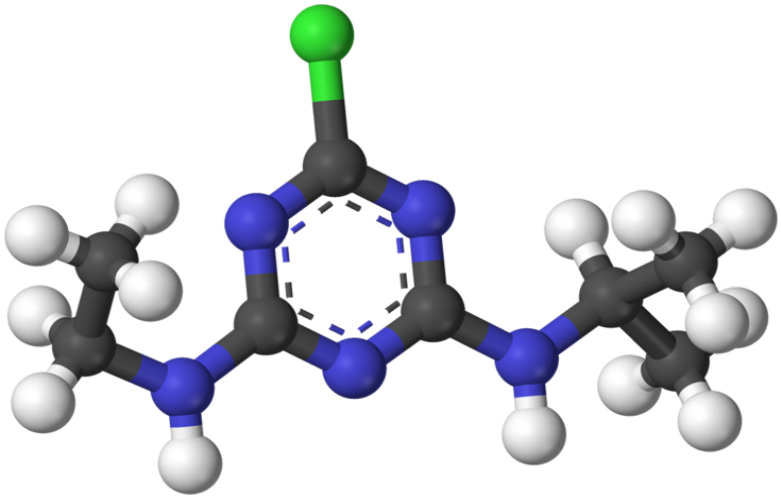
Atrazine, Is It Safe or Not?

By Sunil Baidar



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Chemical structure of Atrazine.

One of the most commonly used herbicides in the world, atrazine, is a white solid crystalline organic compound that is primarily used in corn and soybean crops to control grassy weeds and broadleaf clover. It was first introduced in the market in 1958 by the Syngenta Legacy Company. Today at least a dozen other companies produce atrazine, which is sold under different brand names. When first introduced, it was hailed as miraculous. For a relative low cost it eliminated the tedious task of manually removing the weeds which requires numerous trips to the field in a single cultivating season.

Technically speaking, atrazine has a relatively short half life of 15-100 days in soil, but it is highly persistent and has been found to persist for longer than one year. It lasts longer in water and can persist for as long as 20 years in the aquatic environment. Atrazine is still detected in aquifers in France where it has not been applied for 15 years. Chemical hydrolysis followed by the biodegradation is the most important route of disappearance of atrazine from the water system. Hydrolysis is slower when the water is nuetral compared to being acidic or basic. Under normal conditions, pH of stream water is neutral, and hence atrazine persists in aquatic environment for a long time.

Atrazine is one of the most researched herbicides. Due to the potential health and environmental effects it has come under close scrutiny of the scientific community. Dr. Tyrone Haynes, a biologist at UC Berkeley has shown that atrazine causes sexual deformities including hermaphroditism in frogs. Male frogs were found to have greatly increased occurrences of either malformed gonads or testicular gonads with non-degenerate eggs. Hayes also found that testosterone level in male frogs dipped below that of females when exposed to atrazine. Similar effects have been reported among fish, laboratory rodents and other amphibians. In plants, atrazine inhibits photosynthesis. Increase uptake of arsenic, a toxic element, has also been reported in plants treated with atrazine.

Evidences of human health effects have also been reported. Atrazine is considered to be slightly to moderately toxic to humans and other animals. It can be absorbed orally, through the skin and by inhalation. Symptoms of atrazine poisoning include abdominal pain, diarrhea, vomiting, eye irritation, irritation of mucous membrane and skin reactions. Furthermore, a study carried out by Syngenta Company showed a potential link of atrazine to prostrate cancer in humans. Syngenta employees at the St. Gabriel atrazine plant in Louisiana have been found to have a higher rate of prostrate cancer. Atrazine has also been associated with decreased sperm count and reduced fertility in humans.

Drinking water is the most common means of introduction of atrazine into the human body. The Environmental Protection Agency (EPA) has set 3 parts per billion (ppb) as the Maximum Contaminant Level (MCL) for atrazine in drinking water. According to EPA, 3 ppb is the

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The Importance of MSDS

By Ashely Whiting

Here at ALLARM we analyze many different parameters in our Community Aquatic Research Laboratory (CARL) that use a variety of reagents and chemicals. Some of the reagents that ALLARM and volunteer monitors use when testing their water contain chemicals that are toxic or harmful to humans and/or the environment. As a way of informing the public on the chemicals in the reagents, every chemical company is required to make a Material Safety Data Sheet (MSDS) for each chemical they produce. By law, the MSDS must be provided to customers and to employees working with the chemical products (the information is contained with the kit instructions for volunteer monitors). In addition, many companies post their MSDS online to provide easy access for customers.

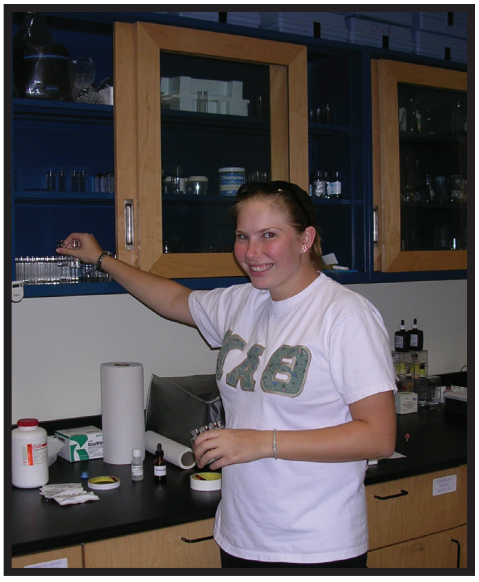
MSDS give information on the chemical such as the ingredients, safety issues and legal issues, including sections on how to clean up spilled chemicals, toxicity tests, first aid measures, handling and storage practices, physical and chemical properties of the chemical, and disposal and transportation regulations.

The most notable chemical used in the kits ALLARM recommends for stream monitoring is the nitrate reagent NitraVer 6, which is found in HACH's nitrate-nitrogen kit. When this reagent is added to sample water, a small amount of cadmium is produced. Cadmium is a toxic heavy metal and is proven to cause cancer. Cadmium is also a cumulative poison, like mercury, that accumulates and stays in the body forever. Additionally, research shows that cadmium may be a teratogen, meaning it may cause birth defects. Although cadmium id potentially hazardous, these effects are caused only by ingesting or touching large amounts of cadmium, far more than the nitrate kits produce. ALLARM advises monitors to store any waste containing cadmium in a tightly sealed container that is labeled properly. When the container is full, take it to a hazardous waste facility, or to ALLARM, and it will be disposed of properly. Always wash your hands after handling this or any other reagent, especially before you eat.

Another notable chemical ALLARM and volunteer monitors use is a 10% hydrochloric acid solution to wash glassware. The diluted solution is not nearly as dangerous as concentrated acid, but safety precautions should still be taken when handling it. For example, gloves should always be worn when using acid because it can cause skin irritation.

All chemicals should be kept in a secure place out of reach of children and pets. A MSDS can be obtained for any chemical produced by a chemical company and should be stored in an accessible location. Chemical monitoring is essential to effectively monitor streams. Even though toxic chemicals can be involved in the process, it is still very important and can be done with minimal risk.

Cadmuin information was taken from HACH Material Safety Data Sheets which can be found online at http://app.hach.com/msdsweb/msds-tips.htm. Please contact ALLARM (allarm@dickinson.edu) if you want more information or help locating a MSDS.



Ashley in the ALLARM Lab

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local trout fisherman, that he finally caught is first brown trout in the Letort.

Throughout the interviews, wonderful stories intermingled with discussion of the problems facing the Letort, most notably encroaching developing and polluted stormwater runoff and their associated problems. The larger project, in which this documentary is situated, aims to inform the community how they can reduce their own stormwater pollution via simple behavior changes. Some of the changes include picking up after pets, washing cars on the lawn or at commercial car washing facilities rather than on pavement, and reducing or eliminating pesticide and fertilizer application to lawns.

At the end of each interview, we asked the interviewee to describe the Letort in a few words. The responses included: "An international treasure," and "a jewel." The Letort truly is an international treasure that deserves our protection. Hopefully after viewing our celebratory documentary, citizens of the watershed will feel compelled to do their part in protecting such a wonderful local stream.

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that earn LEED certification to the Department of the Interior's decisions to conduct an assessment determining the feasibility of producing electricity from geothermal sources and to develop alternative energy sources from wave, ocean currents, and wind on the Outer Continental Shelf (OCS). Additionally the U.S. government committed to produce 7.5%t of electrical energy from renewable resources by 2013. Pakistan made the commitment to use 10% renewable energy in the national energy mix by 2012 and Australia committed to achieve 20% of their electricity supply from renewable energy by 2020. Both nationally and internationally there is a strong, positive reception to an increased use in renewable energy.

Overall the Washington International Renewable Energy Conference was a successful event which demonstrated that the United States is a leader in renewable energy development and technology. It also reiterated the importance of our international community's work to develop alternative energy sources that will power the world through the twenty first century and into the future.

To view more pledges visit the following link: http://www.ren21.net/wiap/detail.asp?id=59.

"Atrizine" Continued from Page 10

lowest level to which water systems can detect and remove atrazine from water, based on the given present technology and resources. Large water systems test for atrazine in their water supplies and filter it from drinking water if necessary, but smaller systems do not. The good news is that a simple activated carbon-based water filter can filter atrazine from drinking water. A test carried out by Dickinson College Professor Amy Witter's Environmental Chemistry class in fall 2007 did not find any atrazine in drinking water samples from Carlisle, PA.

Because of its potential health and environmental effects, atrazine has been banned in the European Union since 1991 but it is still being used extensively in the United States. Despite its problematic nature, EPA allowed re-registration of atrazine in 2003. EPA also announced a deal in October 2003 which allowed Syngenta to be responsible for testing U.S. waterways for contamination of atrazine, a chemical manufactured by itself. This highly controversial program only requires Syngenta to monitor 40 of the 1172 highest-risk watersheds and take additional steps, like increased monitoring for a prolonged period of time when a stream exceeds a "level of concern", a range of 10-20 ppb.

From an environmental and health perspective the risks associated with atrazine far outweigh its benefits. Therefore it is recommended to reduce and if possible eliminate the use of atrazine as a herbicide in our fields and lawns.

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Schuykill Congress

By Kristen Lee

On March 1, 2008, five members of the ALLARM organization traveled to the annual Schuylkill Congress Conference in Pottstown, PA. The Congress provided the attendees with a great opportunity to network and learn more about the many water quality issues that we are faced with today. The myriad of speakers and topics available at the Congress allowed each ALLARM representative to attend sessions of personal interest.

One of the sessions I attended was entitled, "Water Quality Best Management Practices for Homeowners and Businesses" given by Susan Harris of the Montgomery County Conservation District. Ms. Harris provided us with a great deal of information regarding stormwater runoff and ways that we could personally minimize the harmful effects on the environment. She identified many ways of making your home and garden more stormwater-friendly and preventing runoff from running onto the street. Stormwater poses a threat to our water quality, first and foremost, by its sheer volume. The impervious surfaces of our roofs, streets, and parking lots are designed to direct rainwater straight to the nearest stream or river. While this may seem like a good thing, large amounts of stormwater can damage the health of the stream and its inhabitants. Another danger of stormwater runoff during storm events is contamination of waterways from pollutants picked up along the way (anything from sealers on our roofs to oil slicks on the street). When massive amounts of water laden with contaminants enter our waterways, it can negatively impact stream banks, water chemistry, and biodiversity. There are different methods for collecting and utilizing the water that runs off your roof, driveway, or lawn, including rain barrels and rain gardens.

The threat of excess water runoff can be minimized by using rain barrels. Rain barrels collect the rainwater that runs off of your roof. They are usually strategically placed to collect the water from a spout. The collected water can be used for watering your lawn or garden. You can buy a rain barrel for $90 to $299, or make your own.

Runoff can also be reduced by rain gardens. Rain gardens are designed specifically to capture rainwater from surrounding impervious surfaces (roof, sidewalk, and driveway) and divert it into a lawn or garden. These gardens usually consist of a ditch (anywhere from 4 inches to 2 feet deep) with native plants or grasses that have large absorptive root systems. Rain gardens prevent large amounts of rainwater from running off into the street and provide a holding place where water can be absorbed into the ground. Rain gardens also help recharge local groundwater supplies, protect local rivers and streams from flash floods, and reduce the need to water your lawn as often. The deep root systems of native plants or prairie grasses can hold and absorb enormous amounts of water - some plants have root systems that measure up to 15 feet! This boosts the absorptive capacity of your lawn and garden, since the typical grass on lawns has root systems of only 4 inches. Because of this, traditional lawns have very limited absorptive capacity and during a rain event, can let large amounts of water run off into the streets and storm drains. They are also aesthetically-pleasing to their creators and passersby alike.

The program provided me with a plethora of resources that have guided me in creating a rain garden at my own home.

The presenter provided us with several educational sites that are very helpful, including:

http://raingardennetwork.com/
http://rainkc.com/home/index.asp
http://duluthstreams.org/citizen/action.html
http://montgomeryconservation.org/barrel_program.htm

How Well Do BRITA Water Filters Work?

By Maunette Watson

Many of us know of, and have probably used, the popular household water filtering products available on the market, such as the filtering water pitchers and attachable faucet filters, by companies such as BRITA. BRITA claims that their products filter out chlorine, pesticides, organic pollutants, carbonate hardness, lead, copper and aluminum from tap water, as well as improve the taste, color, and odor of the water from filtration of the above contaminants (BRITA GmbH). However, do these filters work as well as they claim?

The BRITA cartridges filter out the contaminants listed above from tap water using an ion exchange resin and an activated carbon site (BRITA Gmbh). The ion exchange resin transforms ions such as carbonate hardness, aluminum, copper and lead through an exchange processto forrm less harmful potassium and sodium ions. The activated carbon decreases organic pollutants, some pesticides, and chlorine through the binding of the contaminants to the activated carbon surface (Huynh, Michael).

BRITA claims to decrease copper from tap water by 74%, chlorine by 94%, and lead by 97% (Huynh, Michael). However, according to a student study at the California Institute of Technology, which analyzed the effectiveness of BRTIA filters to remove chlorine and copper from tap water, the BRITA filters did not remove copper and

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chlorine from tap water as well as BRITA claimed. In the study, the BRITA filter only decreased copper by about 36% and chlorine by about 72%, although they were still decreased. Another study done in Australia, analyzing the effectiveness of BRTIA filters to remove lead and copper from tap water, found that the filters did decrease both lead and copper by 80% or more (Karras, Tresna). Although the percentage of contaminants removed by BRITA filters may vary, it seems that the filter does remove some percentage of the contaminants.

Despite these varying results, BRITA products are regularly tested for safety and quality, and are certified safe by TÜV SÜD, which is a renowned independent testing institute in Germany (BRITA GmbH 2). BRITA products are also tested by the National Sanitation Foundation (NSF) which ensures that there is no leaching from the plastic containers (Banta, Carolyn).

Overall it does seem that BRITA products are safe to use and decrease a variety of contaminants from tap water. To ensure the best use of the BRITA products (and other water filtering devices), make sure to follow instructions and replace filters periodically depending on local water quality (BRITA GmbH 3).

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Dickinson's New Sustainability Initative

By Benson Ansell

Some of the hottest news circulating on the Dickinson College campus is the initiative toward environmental sustainability. Currently, Dickinson's environmental sustainability initiative involves many programs such as the college's facilities operations sustainability program, the college organic farm, the biodiesel plant, the Environmental Studies department, and ALLARM. Through these programs environmental sustainability has developed a growing presence on campus. To help take Dickinson's sustainability initiative to a new level the college was recently awarded a grant for $1.4 million by the Mellon Foundation.

One of the main components of the Mellon grant is to help Dickinson create a sustainability center. A main goal of the center will be to help integrate aspects of sustainability throughout the college curricula. As described by Environmental Studies chair Professor Candie Wilderman, "The center will be the catalyst for the theme of sustainability that will penetrate the curriculum by training faculty so that they can bring it into their programs." One of the most intriguing aspects of the new grant proposal is how the center will connect the faculty, the co-curricular programs (i.e. ALLARM and the college farm), and the college's facilities/operations so that they will all be able to collaborate in a greater way.

The Green Devil

In addition to curricular integration, sustainability will be integrated into the living environment as well. For example the Environmental Studies department, co-curricular programs, and future sustainability center are housed in the Kaufman building – a former factory. There are renovation plans for the building to become energy efficient, to innovatively manage stormwater, and to incorporate green demonstration projects. Additionally, as part of the grant, the Environmental Studies department will be expanding with the addition of new faculty, including a position in environmental health.

Currently, the most visible facets of sustainability on campus are implemented through the facilities department, which has a number of projects including one program that is headed by sustainability specialist, Stephanie Hair. Ms. Hair is in charge of sustainability interns who collectively come up with ideas to help promote environmental awareness and sustainability at Dickinson. "We want to get the average student more involved in a fun way and maybe they will learn something along the way", says Hair. As a result of the grant, she feels that the program will gain greater exposure and Dickinson students will become more sustainably engaged.

With the implementation of the new Mellon grant and sustainability center, ALLARM will strive to integrate its community based work into the college curriculum. ALLARM's primary functions (as defined in a sustainability context) are:

- To assist local communities in building their capacity to answer questions and address their concerns about water quality; and
- To provide Dickinson College students with opportunities to convert classroom knowledge into practice through application of lessons learned to real community concerns.

ALLARM promotes environmental sustainability in a traditional sense in that we assist community groups to monitor water quality and collect data that are used to protect and restore streams. Through this process ALLARM embodies a different definition of sustainability by building community capacity. Moreover, ALLARM embodies

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Independent Research Conclusions

In the last issue of Stream of Consciousness, students wrote about independent research they were doing in LUCE, an intergrated watershed field semester focusing on estuaries in the Chesapeake Bay and Louisiana. Each student did independent research on a variety of issues. Two of our ALLARM staff wrote articles last semester about their research and have contributed final conclusion information for this issue.

Mully Grub Independent Research Update by Kate Consroe

My independent research project on the effectiveness of the Mully Grub wetland and restored riparian areas yielded some interesting results. Alkalinity, hardness, and nitrate levels decreased in the downstream portion of the Letort Spring Run during storm events. This is consistent with large volumes of storm water entering the Letort from the Mully Grub. In addition, the levels of phosphates increased in the downstream section of the Letort during storm events, which could correlate with increased amounts of suspended solids. This shows that the storm water from the Mully Grub is still impacting the Letort. There is potential for the wetland, acting as a sediment basin, to reduce this impact, though in this study it was not shown to do this consistently. The restored riparian areas appear healthy although they could be wider. A visual assessment revealed that the south bank (along the baseball field) has a greater diversity while the north bank (by the elementary school) has a greater number of total trees. Heavy metals (lead, copper, and zinc) are present in aquatic plants, although it is unclear whether the metal uptake by plants has a significant impact on the water quality. The efforts to reduce the effects of the Mully Grub on Letort Spring Run are making some difference, but there is the potential for further mitigation.

Results of Investigating the Hunstdale State Fish Hatchery Update by Maunette Watson

The results from the analysis of the impact on the Yellow Breeches Creek from the Huntsdale State Fish Hatchery this past fall showed a minimal impact on the overall health of the creek. The majority of the impact was at the confluence of the hatchery effluent and the creek, but the Yellow Breeches was able to recover further downstream. This is good news for both the hatchery and the surrounding communities who use the Yellow Breeches Creek, and who have seen impacts on the creek from the hatchery in the past.

Although there was minimal impact shown during this study, it is possible that the Yellow Breeches Creek is impacted during other times of the year, such as when the fish are at highest production, when it is time for the cleaning of the settlement pond, or when there is a decreased flow in the creek due to low rainfall. Thus, to gather a complete view of the current health of the Yellow Breeches Creek, future studies should also be done to assess the impacts during other times of the year.

"Sustainability" Continued from Page 15

a definition of sustainable education by empowering students to use their knowledge learned in the classroom and apply it to community watershed issues. The new grant is very exciting for ALLARM because of the potential opportunities to become further integrated on campus.

Dickinson College can already claim to be a leader in sustainability due to its great Environmental Studies department, the general focus on sustainability by its facilities department, and its innovative co-curricular programs such as ALLARM, the biodiesel plant, and the organic farm. However, stay tuned, with the help of the Mellon grant, Dickinson hopes to become one of the nation's top models when it comes to environmental sustainability.

Class of 2008 Reflections

Danielle Cioce

Without a doubt, the best thing I did in my four years at Dickinson was work for ALLARM. Not only have I gained hands on job experience that will benefit me in my career, but I also have had the chance to participate in the volunteer monitoring movement. I've loved spending my days in CARL, interacting with monitors at workshops, chatting with anglers about their experiences on the Letort, and wheeling cadmium waste across campus. Bringing ALLARM's expertise with environmental monitoring to Burmese refugees in Thailand was an honor. I have also enjoyed spending time with my coworkers (especially listening to country)! It is rare that students will be able to have such a wonderful on campus job, and I am very grateful to ALLARM for the opportunity.

Adrian Broderick

Working for ALLARM has shaped my experience at Dickinson in a very unique way. I have learned and witnessed firsthand the power of grassroots and community activism, an experience that has influenced not only my career goals, but my personal goals as well. When I look back on the past 3½ years here at ALLARM, I do not think of the details of individual projects that I was able to work on; rather, I think of the hope and inspiration the experience has left me with. It is hope and inspiration that there are people out there who recognize things that are worth caring about, and they are willing to dedicate their time over and over again to the cause. The volunteers I have met through ALLARM have helped to keep alive that part of me that wants to, and still thinks it's possible, to change the world … or at least make it a little bit better.

Matt Freedman

My three years with ALLARM provided me with a variety of experiences that fostered my connection to our streams and environment more than any of my courses. My work with SMART continually reinforced my plans to pursue environmental education after graduation. Every time a student would get excited about macroinvertebrates or explain non-point source pollution after a SMART presentation, I knew that I was doing something I truly loved--getting to wear waders half the time was just the icing on the cake! The Stormwater Education Campaign allowed me to apply my artistic skills and explore media-based community education through print, film, and radio. I hope to find more opportunities like this in the future, as I really enjoyed being able to combine science, art, and education. I'm going to miss ALLARM, but hopefully our paths will cross again.

Lindsay Hunt

Looking back on my college experience, ALLARM has played an influential role in my life at Dickinson. When I walked into the student employment fair at the end of my freshman year I never dreamed that I would find an organization where I could learn about the environment while educating the community. The time I have spent working at ALLARM has provided me with much insight into the non profit setting. I have met a phenomenal group of motivated environmentalists who have provided me with a greater awareness of the importance and value of grassroots organizations. Our staff is more like a family that passionately rallies around a common cause, making definite impacts in the Carlisle community. I am very proud of my work at ALLARM and will be interested to see where this organization will be and the type of changes it will implement in the next couple of years!

Jack Treichler

The three years I have spent working at ALLARM have been a defining aspect of my time at Dickinson. As an ALLARM employee I have learned that a college or university does not have to just sit next to a community, or study a community, but instead can actively participate in their community and help them help themselves. It is not just an academic institution's option to do this; it is their duty to empower the community. If the academy fails to do this it becomes a purely self-serving, self-perpetuating institution, with no purpose beyond the academy. ALLARM plays a key role in fulfilling Dickinson's responsibility to the community and the environment, and it has been my pleasure to be a part of it. My time at Dickinson would not have been complete without it.

Ashely Whiting

I started working for ALLARM at the beginning of my junior year at Dickinson. In my time at ALLARM, I have been involved in most of our programs, even though my title has always been Lab Coordinator. I've had the pleasure of getting to know CARL, our Community Aquatics Research Laboratory, very well. I'm thankful to ALLARM for giving me the opportunity to use the skills I've learned at Dickinson in real world situations. I have gained a lot of perspective on environmental issues from giving basic presentations to people who don't have my scientific background. ALLARM has been a vital part of my education at Dickinson. I feel much more prepared for the professional world having worked for ALLARM. Where ever my career takes me in the future, I will always remember the lessons and skills I learned at ALLARM.

Spring Staff 2008

Back Row: Director Julie Vastine, Assistant Director Jinnie Woodward, Matt Freedman, Danielle Cioce, Ashley Whiting, Adrian Broderick, Atandi Anyona
Middle Row: Maunette Watson, Kristen Lee, Kalyn Campbell, Sunil Baidar, Jack Treichler
Front Row: Lindsay Hunt, Benson Ansell, Science Director Candie Wilderman

Welcome to the ALLARM family Kristen Lee and welcome back Lindsay Hunt.

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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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