

Massachusetts Envirothon
ONE PAGE SUMMARIES
2007

“Energy Conservation and Renewable Resources in our Community”

Acton Boxborough Regional High School

Coach: Brian Dempsey

The Acton-Boxborough Envirothon Team, advised by Brian Dempsey, focused on alternative energy and energy conservation in the town of Acton. Our team divided the issue into two sectors: for the five year plan, we focused on educating the public, changing daily habits and promoting alternative energy; for the forty year plan, we focused on encouraging energy-friendly transportation schemes, architecture and legislation.

Acton's energy use is characterized by the effects of suburban sprawl. These effects are evident in consumer habits and commuting habits (most Acton residents commute outside of Acton to work). Because private residences comprise the majority of Acton's energy consumers, we were unable to access this data. Thus, in addition to qualitative advice to lower energy use around private residences, we quantitatively analyzed energy consumption (and its reduction) in public schools and municipal buildings, for which the data was readily available.

Because Acton is not an ideal place for the more radical energy alternatives, such as wind or water power, we have chosen instead to focus on energy conservation. We spoke with Tom Michelman, a longtime resident of Acton who specializes in wind renewable energy; he confirmed the current impracticalities of implementing radical alternative energies in Acton.

Additionally, we have focused on assessing and impacting public opinion towards climate change. We are attempting to broaden Acton's alternative energy horizons, and we have worked with environmentalist groups in Acton, such as the Acton Climate Action Team (ACAT), the Outdoor Lighting Education Committee (OLEC), and an administrative official (J.D. Head, the director of transportation for the Acton schools). We have worked with ACAT to secure a solar panel for Acton by campaigning for donations, and we surveyed 350 residents on their opinions with a questionnaire of nine questions pertaining to attitudes on home energy use.

This project emphasized the importance of action on a community level to affecting attitudes - and thus, policy - on a local level and more broadly, on a regional level. We discovered that most people in Acton are progressive-minded and willing to change their attitudes to better the environment, but did not have the resources or the knowledge to begin, and this indicates the importance of basic environmental education as an integral part of grassroots activism. The techniques used to effect change on communities can be applied to effect regions, states, and ultimately, on a national and even a global level.

Barnstable High School

Coach: David Gorrill

Team Members: Ariel, Rebecca, Kasey and Julian

Our Energy Conservation and Renewable Energy Issue took place in our hometown of Barnstable; our residing high school served as a great community to focus on, as it is one of the largest buildings on the Cape. Ironically, this years Current Issue happens to actually be a "Current Issue" for Cape Codders as we have been trying to rely less on foreign companies and their renewable resources and more on ourselves. To truly be a dependent, self-reliant town, we believe a community should have alternatives to the filthy burning of nonrenewable resources and the freedom to give back to the Earth. In a perfect world, we'd love to install two, maybe three, turbines for every town; eliminating the need for electric companies- and their bills.

However, we're only here in Barnstable and the \$711,000 given to our town for turbine feasibility reports has yet to erect a single turbine. Despite that, plans to install a new co-generator at BHS have finally come to full circle, and we're hoping to see it by next fall. Still burning fossil fuels, the co-generator is the second step to renewable energy behind our solar panels. After burning natural gas and supplying heat to our school and it's water, we normally release the emissions into the environment using only a third of the gas's energy. With the co-generator however, those emissions are used to also fuel the co-generator itself (250 kw/h) as well as 30%40% of our whopping \$680,000 electric bill. In addition, the 30%-40% electricity we no longer get from the grid no longer needs to travel from NSTAR to the school, which means what we get from the co-generator is exactly what we put into it. With this efficiency, the co-generator would only need to run about 85% of the day and still not have our boilers working as hard.

As if a \$700,000 electric bill weren't enough to motivate us, we quickly found that by crunching these numbers we could actually find ourselves with the money for our ultimate solution: a wind turbine. So with the 1.7 kWh being produced by 250 kW cogenerator we save \$170,000 on our electric bill, spend \$80,000 on the fuel to run the cogenerator and wind up with \$90,000-\$110,000 dollars left over in one year. This alone for two years could very well pay for Barnstable High School's own wind turbine, however awareness and conservation are not all that we can do. By making only a 10% reduction in the use of electricity in our school we could save an added \$75,000 a year. Cogenerated energy and community support alone could save us close to \$165,000 a year; giving us a brand new wind turbine in just two years!

This issue was so relevant to our town that it was almost effortless to become motivated on this topic. Cape Cod will be the first to be underwater after our ice caps melt and we are obligated as humans to do all that we can to fix what we have come to realize we have destroyed. We believe that not just one form of renewable energy will save us but a combination of them will. Through awareness, conservation and reduction we know it is possible, so lets get to work!

Bedford High School

Advisor: Michael Griffin

Energy Conservation and Renewable Energy: A Realistic Look at Change

Rather than take on a problem that we had little control of and little influence. The Bedford High School Environmental team looked at where we could have the most impact on reducing our carbon imprint and helping teachers and students look at ways of reduction. For this purpose, we chose to reduce at our school and facilitate helping reduction practices become habits of mind rather than burdens of social change.

We first looked at the new construction at our school and calculated the energy load in the newly renovated rooms. We found that, due to code, the rooms require a greater amount of lighting and thus a greater energy load. To reduce the load, we recommended that the automatic light sensors be reduced to five minutes (rather than the 15 to 20 minutes on the original setting) and teacher be encouraged to turn off the lights when leaving the room even though the automatic switches would eventually do the trick. In addition to talking with teachers and relating the energy savings (not to mention the cost savings), light levels were measured to calculate the ability of the natural light to provide a satisfactory learning environment. Once again, the club demonstrated that the light levels for reading could be met with banks of lights near the windows turned off on bright or slightly overcast days. This cut the lighting load by one third to one half per room.

In addition to analyzing light in the rooms, hallways and bathrooms were observed for methods of reducing the light load. In both areas, motion light sensors are not used. We have recommended that they be installed in both areas. After taking tabulating three separate weeks of usage, the installation of the light sensors could reduce the energy load in the hallways by 40%. The calculations are based on hallway and bathroom use. 40% of the time no one was in a bathroom or hallway during a 20-30 minute period on average per hour.

Additionally we looked at ways of reducing the carbon imprint in the office mailings. Next year, the principals newsletter will be an electronic email rather than a paper email sent to every parent and staff member. The calculated cost savings for paper, postage, ink, time, etc. was estimated at \$3000/year. This did not take into account the energy savings, only cost saving to the school.

To keep this short, other items promoted and distributed to staff and to the general student body included:

- * Turning off the monitor on the computer when not in use. (Monitors are the biggest draw of power and take the shortest time to "warm-up").
- * Use natural light whenever possible. The PE teachers turn of the gym lights after first period. Natural light is used to illuminate the gym.
- * Many other items and this needs to be one page. – Recycling is a major item.

What we learned is that if you show people simple methods of reducing their energy needs that can save money, they will implement them. We did not push an agenda, only suggested and consistently reminded people. After awhile it became a habit of mine.

The current status of the project is a continuous evolution of simple methods of reduction. We began a cloth bag campaign and are working with Whole Foods to provide free bags to all customers for reuse.

Cambridge Rindge and Latin School

Coach: Sarah Colby

Team members: Sam Lawrence, Jarvis Fisher, Najma Abdullahi, Chloe Cunha, & Joe Poirier

When it comes to the environment, Cambridge is an extraordinarily progressive city. Among other things, Cambridge recently announced that it would be creating a 100 million dollar 'Cambridge Energy Alliance,' which would devote itself to reducing the amount of energy consumed by Cambridge residents. Cambridge has also recently been awarded two 2-kilowatt solar panel arrays for a public building of their choice, and has slated their enormous high school for a renovation which would involve making the building more energy-efficient.

The biggest environmental news around Cambridge recently has been the Cambridge Energy Alliance. The Cambridge Energy Alliance is a non-profit organization that plans to reach out to Cambridge residents and businesses, helping them reduce their use of natural gas, diesel, electricity, oil and water. The Cambridge Energy Alliance also plans to promote efforts to create sources of clean energy, such as solar panels, and increase energy-efficiency in Cambridge residences and businesses through use and renovation.

In terms of creating clean energy and promoting the use of clean energy in Cambridge, City Councilor Henrietta Davis, in collaboration with many Cambridge environmental organizations, has recently been able to garner enough donations to the New England Wind Fund to be awarded two separate 2-kilowatt solar panel installations for a Cambridge Municipal building of choice. Henrietta Davis would like to see these solar arrays placed at Cambridge Rindge and Latin School (CRLS), so that science students and Rindge School of Technical Arts (RSTA) students will be able to learn how solar panels work and how to enter the solar panel service industry.

Another of Cambridge's planned environmental projects is the approximately 36 million dollar overhaul of the high school, which would renovate CRLS' HV AC, roofing, and general construction so that the school would be more energy efficient. It is also estimated that the school could reduce its electrical use from anywhere to 20-40% through this renovation. Energy bills of our school from the November 2004 reveal that oil use cost is in excess of \$49,000 for that month and electricity was \$37,000. Annually, we estimate that energy cost could be upwards to a million dollars. Over a few decades, a green renovation of our high school would virtually pay for itself. The school also plans to switch its heating from oil to gas, and to create a cogeneration plant that would serve the school.

In conclusion, Cambridge is one of the more environmentally- friendly and progressive cities in Massachusetts, if not the country. It boasts many "green" homes and buildings, including the Genzyme building (LEED- platinum level) and our city annex, the oldest renovated green building in the United States. The leadership and general public have a profound and deep appreciation for the environment, and for the effect Cambridge has not only on its surrounding environment, but the world as a whole. Cambridge is ready to help.

Chelmsford High School

Advisor: Mrs. Carol Bruell

Team C.A.R.E researched the average resident of Chelmsford's energy intake and found out ways how to reduce carbon dioxide emissions by 25 and 75 percent. First we took two of our team members' homes, of differing size and layout, and obtained the electricity and heating bills from that year. On the National Grid website, we configured the units of energy and received an average of how much energy will be spent in that year and on what appliances. We also received the average energy output of residents of Chelmsford, Massachusetts. Comparing the data, the team came up with the average figures of money spent on namely electricity and the pounds of carbon dioxide emissions emitted in one year.

On another website, we found out how exactly a resident could reduce emissions such as lowering your thermostat, switching to halogen light bulbs, and switching to a "greener" form of electricity offered by National Grid. By reducing the thermostat among other small changes, a household could save up to 25 percent on their bills, also improving the emissions factor. The greener options of electricity plans included Clear Sky Power, Community Power, and MA Energy Consumers Alliance, NE Green Start. Out of the three options we research, we picked GreenStart because of its flexibility and mixed forms of energy, being 25% Wind, Solar, & Biomass and 75% Low-impact Hydro-Electric. GreetStart came with two options: one being the 50%, with fifty percent of the resident's electricity coming from GreenStart and the 100% which is all your electricity coming from GreetStart and thus the greener option. By calculating Chelmsford's average carbon emissions of 2006/7, if half of all the residents chose the 100% option, while costing approximately 8 dollars more, it would cut emissions by 50 percent. If all the residents of Chelmsford chose the 50% option, it would be more affordable while still cutting emissions by 50%.

David Prouty High School Spencer, Massachusetts

Coach: Mary McLaughlin

In continuation with the Massachusetts Envirothon program's 2006 topic, which emphasized the importance of finding alternative energy resources to avoid emitting the byproduct of fossil fuels into the atmosphere, our team has chosen to move forward with the plans to eventually construct a wind turbine on top of the hill behind David Prouty High School. This project is currently underway, and in the very beginning stages. After looking at wind maps of the area and speaking with town officials, the next step is to write grants and begin with a wind study committee.

To achieve the enormous goal of reducing fossil fuel emissions by seventy five percent before the year 2050, our team researched several necessary changes that our community needs to embrace. In discovering many causes of emissions throughout almost every average person's day, we have established that eliminating waste on a daily basis could solve the first twenty five percent of this problem. Wasting heat, water, and electricity all lead to a larger amount of oil burned, therefore more carbon dioxide emissions. Some examples are simply shutting of your computer at night or when not in use, unplugging wall chargers when not in use, taking the heat in your house down even a couple degrees in the winter, or even more at night. Simply giving up unnecessary activities like idling your car in parking lots, making one trip to town instead of two, and taking slightly shorter showers, could result in an overall twenty five percent less fossil fuel toll.

Much of our path of research has lead us to look inwards at David Prouty High School. We have begun the process towards an energy audit, to upgrade our windows, lighting, and water system. We would like to replace our single paned windows with triple paned ones to better insulate the school. We also plan to exchange all of the old t-12 fluorescent tubes to be exchanged with at least t-8's. Due to our schools highly inefficient water system, we are researching if the school is eligible for grants that would supply it with a hydrothermal water pump.

Lastly, we have begun plans to build bike and walking trails throughout many parts of Spencer to eliminate as much unnecessary driving as possible. We have met with the coordinator of this project, and the trails are still on the drawing board.

In conclusion, the David Prouty High School Envirothon team has preserved its original goals and we have set our minds on new ones as well. As we have learned, must much be done in a short amount of time for our world to thrive. When enough people share this attitude, a great impact will be made

Dexter School

Brookline, Massachusetts

Advisors: Dick and Sonya McKnight

At Dexter school we are intent on lowering our dependence on fossil fuels in the near future. As pointed out by the recent United Nations' Report on global warming, buildings are the prime wasters of energy. Therefore, any attempt at conservation and modernization of our school's facilities will contribute to world efforts to slow the effects of global warming.

Some of the possibilities for increased energy efficiency we have investigated and proposed to our school administrators are to:

- * replace all of the incandescent lights that still remain in the old buildings on our campus with compact fluorescent bulbs
 - * install light sensors in stairwells and bathrooms
- * replace light fixtures with the type that employ a reflective bulb housing to maximize illumination
 - * lessen heat loss from our swimming pool by installing a pool cover
- * investigate the installation of a cogeneration facility in the swimming pool building as well as the use of solar panels to heat the pool (currently the heat source is located in another building and piped over, resulting in great heat loss)
- * look into Nano-technology to increase the fuel efficiency of our school buses (currently they get five miles to the gallon!)
 - * expand our current use of solar panels as a source of renewable energy
- * pursue the installation of a larger wind turbine (our position on top of Mount Wally is a prime location for a major wind turbine)
- * continue to raise awareness in our community regarding the everyday actions individuals can take to reduce global warming by lowering their carbon emissions.

The Dexter School Community already has a healthy tradition of environmental consciousness and through our research for the Envirothon has indicated they will actively pursue our suggestions. It has been a valuable experience for everyone!

Doherty Memorial High School Worcester, MA

Coach: Stacey Hill

The majority of our research to prepare for our Current Issue project was done through interviews of various people who held information to answer our questions about our school's and city's fossil fuel use. These people each had a different position in Worcester, so we were able to gather different details from each, although many had the same ideas. The people interviewed were:

1. John Eager- Mr. Eager is head custodian at Doherty High. He gave us the "status" of Doherty's fossil fuel use, and how we use it/how much we use for heating , cooking, electricity, etc. Our team was happy to hear that at least half our school was changed over to use compact fluorescents.
2. Lara Bold- Lara is a planning analyst for Worcester's Planning and Regulatory Services Division. She told us all about Worcester's Climate Action Plan. She gave us some ideas on how we, as high school students, can recycle within our school.
3. Peg Middaugh- Peg is Worcester's REC Director. She taught us about the anti-idling law, and the Green UP program in which the consumer buys clean energy. It costs a little more, but it enhances electricity like National Grid to buy clean energy.
4. Martha Gach- Martha was from Broad Meadow Brook, Worcester's Mass. Audubon Sanctuary. Our main purpose of visiting Broad Meadow Brook was to ask Martha about, and see, the new solar panels on top of the Visitors Center.
5. Vivian Shortreed-Vivian is a long time resident of Worcester. She is not on any official environmental council. She is just a caring person, who wants to help. Vivian talked to us about her ways of reducing fossil fuel use, such as walking, and replacing her first floor windows.
6. Jeff Lassey- We interviewed Jeff via email, and he told us about the status of recycling in Worcester Public Schools. There is a new waste removal being discussed, in which recycling MUST be included.
7. Grandparents-Some of our teammates could trace their roots in Worcester back to their grandparents. Grandparents gave us a history of energy use. Public transportation was used more, and Worcester even had its own trolley!

We learned a lot from these interviews. Some things we propose for the anti-idling law to be taught to drivers, and enforced. Some ways to do this is for signs to be placed in front of schools and other public places, and also have the law to be taught in Drivers Ed. Another hope is for more people to get hybrid cars, and eventually even hydrogen cars. The hope is not just to reduce fossil fuel use and greenhouse gas emissions by 75%, but to create a virtually fossil fuel free community.

Essex Agricultural and Technical High School

Hathorne, Massachusetts

Coach: Charles Saulnier

Team Members: Adriane Bochenko, Emily Round, Stephanie Tanzella, Meredith Collins, Nate Jillson

We began this year with a bang. When we heard the current issue was going to be Alternate energy sources the first thing we thought of was Beverly High School. Beverly high has solar module capable of producing KWdc 114.960 and a wind mill, both of which supply power for the school. For the first couple of months we met the two people who run the Solar Now program out of the school. At the beginning of each meeting we would brain storm ideas for community outreach and education and at some point during the meeting we would discuss the specifics of their solar arrays and wind mill and more than once took a tour of the facility.

They taught us about how they do their public outreach programs to raise awareness of solar power. After January we came to the conclusion that Solar Now (the program at Beverly High) was already well established and we should try to make a difference somewhere where it was more needed. Instead we decided to concentrate more on community outreach in the town our school was located in, Danvers. We researched the town and the actions they were taking in regards to alternate energy sources. It was important that we had contacts both in the town and in places where people could learn about and purchase alternate energy sources for personal use. First we contacted several suppliers of alternate energy sources and asked them to send us brochures that we could redistribute as part of our community outreach program. Sadly enough, only one of our contacts responded to our letters and sent us brochures, the alternate energy store. Luckily enough, the alternate energy store covers all bases in supplying off grid energy for your home and contains plenty of information for beginners just learning about their alternate energy choices. To go with this booklet we designed three other information sheets to hand out with the packet. One addressing what is going on in the town to inform them of programs they could become involved in and listing ten simple ways to conserve energy in your house, included with this is a diagram showing a house and listing problem areas in homes and what can be done to fix them.

We also contacted Danvers town hall and set up a meeting with the official who runs all of the alternate energy programs for the town, Pam Irwin. We met with her and discussed the programs in the town and suggested ideas on how we could help. She was extremely helpful and supportive of our ideas. She suggested that instead of going door to door like we originally planned we could hand our information packet out at the town hall. Every year Danvers runs a drive where the community brings old books, old clothes, and paper to be shredded to the town hall, in honor of earth day. We decided to take her up on her offer and attend this event. We also compiled a survey as a first step in our community outreach program. This survey addressed topics such as, if they already have any alternate energy or if they have ever looked in to alternate energy for their home. These surveys will be compiled and returned to the town hall in the hopes of increasing the towns understanding of their citizens and the citizens understanding of energy saving techniques and alternate energy for their home. Overall the drive was extremely successful and we feel we educated and increased awareness in the town on what the average citizen can do for alternate energy.

4-H Bristol County Envirothon Team Berkley, Massachusetts

Coaches: Nancy and Angela Possinger, Patty Doyle

The Community Supported Agriculture program at Kettle Pond Farm in Berkley is a unique opportunity for the community to be closely involved with the farm. Our team saw this as the place where we could begin to address issues of energy saving needs for Berkley. After talking with the selectman and Recycling Committee and finding that there is no coordinated effort to reduce fossil fuel use in Berkley, we felt that education was the focus that could make change happen. We learned about renewable energy in many ways including attending the Mass. Envirothon's workshops, UMass at Dartmouth's presentations, Westport Energy Series presentations, a tour of Apeiron Institute, a meeting with BCC's beginning Farm to School program, a visit from Solar Bob of Solarwright's to the farm, an interview with David Bowen of Hatch Technology about hydrogen, and many internet and news articles.

We began to put together an Energy Fair that we offered at the farm to share information that we had gathered about conservation and efficiency changes that people can make. We had a great day at the Energy Fair. Although it rained and it was cold, very cold, we still had a good number of interested visitors. The event was held in the barn and we ventured outside for the wind energy activities.

The Energy Fair convinced the team that sharing information through the farm site was an effective means to begin to reach the community.

Shawn Reeves of Energy Teachers brought a bicycle on which you can feel the difference in the energy required in lighting fluorescents vs. incandescents. Berkley's Recycling Committee brought a display and visited with people and discussed recycling. College students from Olin College shared their project about generating electricity from waste oil. The Doyle family brought projects to show how solar energy works. The projects that Elizabeth made and demonstrated included two different types of solar cookers and a working scale model of a solar hot water heating system. There was also a battery charger. They also brought Solar Sam's devices to demonstrate the use of photovoltaic panels. Margiana and Hannah ran the wind turbine experiment and anemometer stations. Racheal had an interactive house with energy tips and Megan had an active Race to Recycle game. Megan was the MC for the event encouraging people to try the activities. The Possingers handled logistics and advertisement of the day and talked about Kettle Pond Farm with guests.

We have been invited to share the energy day again at Dighton Rock State Park where we can reach another group of people. We have had a visitor to the farm ask us about his acreage becoming a CSA in a nearby community.

It shows to us that the educational programs and events planned for the farm have a way to reach the community and therein lies the opportunity for change in reducing our fossil fuel use. We appreciate the Mass. Envirothon educational program and feel that it has given us the education and incentive to be able to make a change in our community and beyond. Thank you!

Greater New Bedford Regional Vocational Technical High School

"Energy Conservation and Renewable Energy for Massachusetts Communities" Reduce-Reuse-Recycle

Coaches: Lawrence Carlesii and Christopher Pires

The issue of energy conservation has been a well-published topic of interest in today's global environment. In order for life on this planet to thrive we must act now to reduce the amounts of green house gases that contribute to climate change. The 2007 GNB Voc-Tech team has been engaged in researching this years Community Action issue: "Energy Conservation and Renewable Energy for Massachusetts Communities". The team has researched background information on energy conservation, energy efficiency and renewable energy technologies. We investigated energy issues with change components, how renewable energy will affect the community and what the community is doing to protect the climate. The Voc-Tech team has decided to put their research to work by continuing and expanding a multi faceted service project (**Reduce-Reuse-Recycle**) that raises awareness of energy conservation, renewable energy and what steps can be taken to slow down the process of climate change. Educating the citizens of New Bedford on energy conservation and renewable energy is possibly the most important part of this project for the GNB Voc-Tech team. To have change in the community the citizens must realize what they are doing wrong and how to correct it. The goal of the team is to recommend how to reduce the communities consumption of fossil fuels by 25% in the next five years and an additional 50% by 2050; giving the youth of the city a cleaner and healthier environment to live in.

Community Action Project

Reduce-Reuse-Recycle

Previous Project Components 2005-Present:

1. Drop in the Bucket :Ink cartridge recycling and Conservation
2. Adopt a Shoreline :Environmental Clean-up- Recycling-Education for Change
3. Operation Clean Sweep: Environmental Clean-up- Recycling-Education for Change
4. Solar Van: Alternative Energy Technology

NEWEST Components:

Save Our Environment Web Pledge

Students asked citizens in the community to take an online pledge. The Save Our Environment Action pledge center is a collaborative effort of the nation's most influential environmental advocacy organizations that harnesses the power of the internet to increase public awareness and activism on today's most important environmental issues. By filling out the pledge you urge Congress to pass more bills on global warming.

Light bulb Exchange program- Using money from recycled ink cartridges students have developed a project in which they will purchase new energy conscious CFL light bulbs and allow people to exchange their old light bulbs for new ones. Replacing a single incandescent bulb with a CFL will keep a half-ton of CO₂ out of the atmosphere over the life of the bulb.

Greenfield High School

Coach: Christine Perham

This is the first year that Greenfield High School, in Greenfield, Massachusetts, is sending a team to the Massachusetts Envirothon. Our advisor for this year's team, named "Go Green!", is Mrs. Christine Perham.

Our team chose to focus on the issue of energy conservation as it applies to transportation to and from school, as well as energy conservation by way of altering interior light usage. When we first started to look at energy issues in the town of Greenfield, and in Franklin County in general, we came across an important document that was being written up by The Pioneer Valley Renewable Energy Collaborative in conjunction with the Franklin Regional Council of Governments. Upon review of this extensive 64 page document draft, we were intimidated to say the least. Realizing that we needed to pick a project that was manageable and feasible, we chose to focus on our Greenfield High School community.

In line with current recommendations, a multi-pronged approach was used to improve the energy savings at GHS. We chose to first look transportation habits to and from school. A student survey revealed that only 10% of the students walk to school even though 30% live less than a mile away from the school. The town of Greenfield is rather spread out but not as much as the Hill towns. The team felt that this was an area where we could improve on conserving energy and get healthy exercise at the same time! Transportation costs are huge for the town's school budget, so we also visited the bus company that carries GHS students and found out about their energy conservation efforts. We learned that they are doing a lot to conserve fuel but could do more by including bio-diesel in their energy choices.

The second area we looked at was the feasibility of installing motion detectors in the classrooms at GHS that would automatically turn the lights off if no one was in the room. We conducted a survey to collect data on the hours lights were left on in classrooms both occupied and empty. After talking with the administration, the cost of installing these sensors didn't make sense because the high school needs to be replaced within the next 7-10 years. It was a little discouraging to know that energy improvements that have a payback time in savings of more than ten years would not be feasible. The good news is that the Town of Greenfield is very interested in building a Green School in the near future.

The "Go Green!" team learned that there are many adults, in positions of political and academic leadership, that are on the "green" bandwagon....and that is a very good thing indeed.

Hampshire Regional Envirothon Team

Coach: Tara Kiesel

We based our current issue project around the town of Westhampton, which is a small rural community located about 30 miles from Springfield. Our advisor is Ms. Tara Kiesel, a middle school science teacher at Hampshire Regional High School. For our current issue project, we decided to evaluate how well the people of Westhampton conserve energy. We measured gas use and electrical use, as well as the amount of trash and recycling generated by the town. We found that Westhampton residents use and consume more gas, electricity, and material than we thought was average. We could not evaluate Westhampton's water system, however, because almost everyone in Westhampton uses their own private well water and so therefore there are no public records of the town's annual water consumption.

Based on our data we were able to conclude that Westhampton has almost no established alternative energy projects, but does have the resources needed to heat wood stoves and/or power small solar panels. Westhampton, however, cannot fund or support hydropower, wind, geothermal, biomass, or large solar power projects. Alternative energy, based on our data and community research, did not seem to be the cheapest and most effective form of energy conservation. Instead, we focused on several short and long-term ways to conserve energy in town, which centered on our five-year plan to reduced fossil fuel use by 25%. Our goals ranged from replacing regular light bulbs with fluorescent lights to, over time, purchasing Energy – Star rated appliances.

So far our predictions have been in line with what community members think will happen in Westhampton within 30 to 50 years. We have already visited area Girl Scouts to educate them about alternative energy, and have discussed energy conservation with representatives of town government.

Lawrence Academy Groton, MA

Advisor: Michelle Ruby

This year the Lawrence Academy Envirothon team chose to focus our Energy Conservation and Renewable Energy project on home heating and electricity generation. After an energy audit of the town, we found that these two uses accounted for 97% of the energy use in town. Most of the 698 billion BTUs of energy consumed in Groton comes from fossil fuels and most of that is used to heat homes.

We have found several relatively simple steps townspeople can take to save both energy and money. If new homes are simply oriented so that the majority of windows face south, the energy needed to heat the home can be reduced by 10-20%. If passive solar design elements are incorporated, even in our cold climate, the energy needed can be reduced by up to 75%. Even in older, already existing homes, simple steps like adding insulation, sealing air leaks, and replacing old windows can conserve energy and reduce heating costs by up to 50%. Most households spend several hundred dollars on heating every year, so these renovations can pay for themselves in just a few years.

Some other simple steps can reduce the amount of electricity a home uses. Replacing an older refrigerator with a newer, more efficient model can reduce the electricity demand by 1594 kwh per year. At Groton's current electricity cost of \$0.15/kwh, the new fridge would pay for itself in about eight years. Switching to compact fluorescent light bulbs can save up to 438 kwh and \$60 per bulb over the life span of the CFL.

The last step we focused on was alternative sources of electricity for our local electric company, Groton Electric Light Department (GELD). GELD currently buys electricity from HydroQuebec, Seabrook Nuclear Plant, and the "system," which is made up mostly of natural gas powered plants. Because Groton is away from the coast and has rolling hills rather than mountains, wind power is not a practical option. However, Groton has a trash problem. The town landfill closed several years ago and residents pay to either deposit their trash at the transfer station or to have a large company pick it up at the curb. One of those large companies, Waste Management, Inc., has a waste-to-energy plant not far away in North Andover, MA. That plant generates enough electricity to power more than ten times the number of homes in Groton. We would like to see GELD begin to purchase electricity from this plant in addition to its current sources.

Our next step is to begin to implement our plan, by working with GELD and local businesses, like the hardware store downtown, to educate the public about ways they can save money on their heating and electric bills. We hope that through education, Groton can be a more energy efficient community.

Respectfully submitted,
The 2007 Lawrence Academy Envirothon Team
Akul Patel, Chris Watson, Steve Zaloudek, Matt Moschitto, and Stephen Hart

Leicester High School

Energy Conservation and Renewable Energy for Massachusetts Communities

Advisor/Coach- Joanne Bernier

This year, our Envirothon team chose to focus our efforts on researching both conservation methods and potential sources of renewable energy.

After extensive research into our energy consumption through an energy audit, MTC advisory, and review of our electric bills, our team decided that our best resource would be conservation while reviewing possible alternative energy systems available to us that would be both energy saving, doable and cost effective.

This year our team looked over our "carpooling" pledge prepared for our presentation last year. We also reviewed our "bus idling pledge". Our team again obtained signatures of students who drive cars to school agreeing to carpool whenever possible. The team also approached all the school bus drivers and asked them to agree to turn the busses off whenever idling. All agreed and signed a "bus idling pledge". We obtained 57% more signature this year and have a significant decrease in the number of cars in the parking lot.

We researched alternative renewable energy systems that would work with our surroundings. We contacted MTC (Massachusetts Technology Collaborative) and applied for a grant. An engineer is scheduled to come out and begin an initial assessment this week.

We found wind would not work because we need to erect a 260' wind turbine and due to our close proximity to the Worcester Airport we are not allowed to go above 200'. Therefore, right now...that's out. We looked towards solar power and with the large expanse of flat roof located at the high school, it is possible. Our concern is the initial expense. If we were able to secure enough funding initially, we could make this work.

We also obtained more data concerning the "Rentar Fuel Catalyst" that could be installed in all LHS buildings to reduce noxious air emission and burn fuel more efficiently, thus burning less fuel. Our Facilities Director has visited several neighboring schools that have installed this devise and found at one school there was a 40% reduction in fuel use.

We created a brochure that was passed out to all high school students in an effort to promote conservation and to educate the student citizens of Leicester about renewable energy.

Respectfully submitted by the 2007 Leicester Envirothon Team

Dylan Baker, Marcela Jimenez, Kelly Johnson, Julie Johnson, Thomas Killoran, Alyssa Hammond and Jessica Robinson

Lexington High School

Coach: Steve Wilkins

Hi, we're the Lexington High School Envirothon Team. Our advisor is Steve Wilkins who is an Earth Science teacher at our school. Over the past year, much of our work was based on a survey we conducted of 84 Lexington families. We asked them to look at their energy bills and record their energy usage over the past year. From this data we estimated the total amount of energy that our town uses and calculated how many pounds of carbon dioxide that translated to.

Much of our project focused on ways to reduce this amount of carbon dioxide emission. Three topics that we researched included alternative energy, energy efficiency and energy conservation. Using data from local companies such as Evergreen Solar, we calculated the benefits of installing various forms of alternative energy such as solar panels or solar hot water heating in our town. For energy efficiency, we sold fluorescent light bulbs at local gatherings to increase awareness and contacted energy companies to obtain methods of insulating houses. For energy conservation, we interviewed school employees and surveyed our classmates to find out ways that we could reduce energy usage through conservation. These methods included shutting off computers and traveling to school via a different means of transportation than cars and buses.

We also built a shed on which we plan to test various forms of alternative energy such as solar shingles and hot water heating in the future. In the wetland area behind our school, we also continued a multi year landscaping project to remove invasive species and replace them with native plants.

**Millbury Memorial Junior Senior High School
Environmental Council**

RENEWABLE ENERGY FOR THE TOWN OF MILLBURY

Advisor: Terry Hamilton

Issue Description: As soon as our team started researching what renewable energy would be appropriate for Millbury, we found out that there were many options. However, we felt that solar power and wind turbines would be the best option for the town. After we determined this, our problem became how to find out how much energy the town used and how many people use electric heat, oil or natural gas. This was difficult because the town has many oil and gas companies. Finding out how we could reduce the town's consumption is an important issue because each year as the cost on the energy bills continue to rise, it becomes harder for families and the town in general to continue to afford their bills.

What we learned: Our team learned how to read a zoning map, because in our town there are height restrictions in certain areas, one of which was where we decided to place one of the wind turbines. So through the zoning map we learned how tall the turbine could be. Also, we learned how to read a topographical map because we had to determine what the highest point in Millbury was to know where the turbine would go. Along with this, we learned how to conduct organized research through interviews in person and over the phone and how to work together as a team to accomplish out one common goal.

Current Status of Project: Our team interviewed many townspeople, including high school staff, town hall employees- the Town Manager and other town officers, and utility companies. Our recommendations are:

- * To have a wind turbine on top of Butler Farm Hill to generate energy for the town to use to heat and cool buildings as well as community members to use to heat and cool their houses as well.
- * Place Solar panels on top of the three schools in town to generate enough energy to reduce the amount of energy each school uses by half.

The team also plans on attending a selectmen's meeting at the town hall one night to present the ideas and to further see if more can be done for the town.

Monson High School

Monson Environmental Action Team

Advisors: Leslie A. Duthie, Jennifer Ohop

Our team chose to address the current issue topic by researching how our town used energy. We were surprised to find out how much the town spent on electricity and fuel for our schools. We were also surprised to find out that the town had thought ahead and installed furnaces in each school that can use either natural gas OR fuel oil – at least the town can take advantage of better supply and prices. Our approach to the energy issue in town is to take advantage of our windy ridge lines and begin to promote wind energy as an alternative. We think our town is prepared for this direction because it just adopted a by-law allowing individuals to take advantage of this form of energy and install wind turbines (they still call them wind mills) for personal power production. Our town buildings are predominantly flat-roofed, also providing a good opportunity to install photo voltaic systems in several locations. Our team also found that we have a long-range planning committee in town and that they are looking at energy-savings measures and would be a good place to present out infomercial on how to cut our reliance on fossil fuels.

The team learned how difficult it is to project costs, production and energy savings from various alternative forms of energy. We spent a lot of time trying to understand how to figure out how much energy a wind turbine could produce, and what that meant in terms of savings on our High School electric bill. Exploring the idea of using photo voltaic systems was even more difficult. How do you figure this stuff out? Each supplier and each web site we looked at provided different information. This was confusing and hard to understand.

Where does our project stand? Our team is putting the finishing touches on our info mercial. We produced it in the form of a power point presentation. Our team could present it to the long range planning committee and then we would like to take it to the cable – access channel and record it for play on our local station. We think that most people could take advantage of easy conservation tips and reduce their use of fossil fuels by 25% without too much problem. We just think we need to get that information out to the public and our presentation would do that. We hope that the community will think beyond the first 25% and begin to look into other energy savings measures such as wind turbines and photo voltaic use.

Nauset Regional High School North Eastham, Massachusetts

Coach: Valerie Bell

The community that we looked at for the current issue is our school Nauset Regional High School. We chose the school for several reasons. Nauset participates in the school choice program and has attracted students from 11 of the 15 towns on Cape Cod. An out reach program about renewable energy on Campus has the potential to reach people living across Cape Cod. Nauset is located in the town of Eastham. The year round population is 5,646 people. The population of the high school is about 1,222 people. When school is in session the high school makes up almost 18% of the total population of Eastham. Any reduction in fossil fuel use on campus would have a tremendous effect on the total fossil fuel use in the town of Eastham.

The major use of fossil fuel at NRHS is for electricity, natural gas, school buses and cars. We chose to focus on these because we were able quantify how much was being used. We converted the fossil fuel use into pounds of CO₂ given off so that we could compare one to the other. For example electricity use emits 772,328 lbs. Of CO₂ per year, natural gas use emits 965,337 lbs. per year, bus fuel emits 222,295 lbs. per year and car use on campus emits 1,195,085 lbs. per year. We identified other uses of fossil fuel on campus but chose not to address them because either we could not accurately quantify the amount used or we could not determine a way to reduce the amount used. For example Nauset participates in several foreign exchange programs where students fly to various places. Jet travel is a large user of fossil fuel and a large emitter of CO₂. But we felt the educational advantages of travel out weighed the cost of the fossil fuel use.

Nauset does not currently use any renewable energy. The school participated in an energy audit in 2003 by The Cape Light Compact. The audit recommended installation of energy efficient lighting throughout the school. Implementation was completed in April 2007. Nauset saved 76,779 KWH from 2003 use or about 6%. A group of volunteer students runs our recycling program. Nauset recycles some of the white office paper we use and some of the plastic bottles.

The history of energy use at NRHS reflects the history of energy use Cape wide. The Cape has very little large-scale industrial users of fossil fuel. The largest single users are municipal buildings like town halls and schools. Individuals in their homes and cars consume most of our energy. The increase in fossil fuel use on Cape Cod follows the increase in population on the Cape. In 1945 the population of the Cape was about 50,000. In 1995 it was 200,000. According to the 2000 census data Eastham's population grew by 22% in the last decade. In 1996 NRHS added a new building to accommodate the increase in the school population. Our electricity consumption went from 937,872 KWH in 1996 to 1,137,184 KWH in 1997, an 18% increase.

Cape & Islands Self Reliance, a non-profit organization on Cape Cod, is at the forefront of promoting and implementing renewable energy projects. The executive director Megan Amsler spoke to our group about local wind energy projects. Richard Lawrence who is the education coordinator at Self Reliance spoke to our group about the use of biofuels on Cape Cod. At NRHS our principal Tom Conrad is our biggest promoter of renewable energy. He has begun an investigation to see if NRHS can build a wind turbine on campus. One student organization called Take A Stand recently hosted a talk about a local offshore wind project. Several classes attended this talk. Our recycling committee is planning to increase participation in recycling on campus. Many students are concerned about global climate change.

NRHS has an excellent wind resource. We have already begun the process of putting up a wind turbine. The UMASS Renewable Energy Research Lab. studied our site and produced a report that

indicated our campus would be a good site for a large scale wind turbine. The school has a grant proposal in to M.T.C. for funds for a feasibility study. We should know if that is approved by summer 2007. The project would be completed in about 5 years or less. A large-scale turbine like a Vestas V47 (660kW) would provide almost all of our electricity and would cut our CO2 emissions by 25% in the next 5 years.

Biodiesel fuel is now available on Cape Cod through Loud Fuel Company of Falmouth. The shuttle buses for the Steamship Authority use Biodiesel in their shuttle buses. The Cape Cod Regional Transit Authority uses Biodiesel in the Flex bus. We feel that our school buses should be running on Biodiesel. The business manager for the school system indicated she would be willing to ask the buses to run Biodiesel for our next bus contract. This would reduce our CO2 emissions from the school buses by about 20%. This would make the buses much more efficient.

The school has already done an energy audit and has upgraded the lighting in the school. Any more gains in energy conservation will have to come from changes in behavior of the staff and students. We plan to initiate a program to remind students and staff to turn off lights when a classroom is not in use. We also will recommend all computers be turned off when not in use. In the future when bids go out for new equipment we will suggest that energy efficiency be one of the criteria for purchasing the items.

Our use of fossil fuel in cars is a difficult area to reduce. We do not have good public transportation. Stores, schools, businesses and homes are spread out and are not easy to walk to. Our school buses are only half full. Many students drive their own cars to school. Our plan to reduce driving to school is based on having designated days as Ride The Bus To School day. We will offer incentives for students to leave the car at home. One idea is to offer coupons on the bus good at local stores. The other idea is to promote the use of the Flex bus, which is a new bus that serves the lower Cape. The cost for students is only \$1.00 and it uses Biodiesel fuel. With gas prices climbing these options may become more appealing.

A wind turbine, the use of Biodiesel and reduced dependence on cars will reduce our fuel consumption and our CO2 emissions by at least 25% in five years. A further reduction of 50% by 2050 is harder to quantify. NRHS may be a very different place by 2050. Currently our school population is predicted to decrease. 23% of people who live on Cape Cod now are over 65 years of age. 27% of the population is between 45 and 64 years of age. The average age in the U.S. is 36 years but the average age on the Cape is 44 years. The number of young adults with school age children is declining. As the school shrinks so will our use of energy. Our large-scale wind turbine will be providing a larger percent of our total energy needs. We may even have 2 turbines by then. We believe that by 2050 the Cape will have a well-developed wind industry with both land based turbines and turbines offshore. Much of the electricity on Cape Cod will come from wind and not fossil fuel. A shrinking school population also means fewer cars on campus. The cars of 2050 will also be very different from the cars today. We envision electric cars charged by clean electricity produced by wind. By 2050 students may not even have to come to school. The development of online courses may allow many students to take classes on the computer.

The general interest in renewable energy on the Cape, in Massachusetts and in the country as a whole seems to be increasing. Policies and actions beyond our community that would be helpful would include government support for emerging renewable energy industries and increased tax incentives for individuals to purchase renewable energy or energy efficient products. Businesses should be limited in the amount of CO2 they can emit. After a certain phase in time fines should be levied on those businesses that fail to meet CO2 standards.

Our plan for ensuring broad public involvement begins at NRHS by sponsoring class presentations about energy use at the high school. We also plan to present our plan to the school committee. We have begun to investigate the possibility of having a green energy fair to help raise awareness of renewable energy and biofuels. We also will be soliciting support from the local Eastham community for our wind turbine project. Some people have raised objections to turbines because of a perception that they harm birds, are loud or that they are visually unattractive and therefore reduce property values. Working with our neighbors will be an important part of moving forward with this project.

Newton North High School Science Team

Teacher Advisors: Dr. Barbara Gibson and Ms. Ann Dannenberg

We decided to look into methods of fossil fuel reduction that are not being put into use in Newton currently but that we believe should be used by our city government.

Our first idea is to minimize fossil fuel use in municipal vehicles, such as police cars, fire engines, garbage and recycling trucks and school buses, by switching to pure biodiesel. Biodiesel is nontoxic, biodegradable and renewable and releases few emissions. Biodiesel would be very easy to switch to from fossil fuels because it can be used in a regular diesel engine with few or no modifications. Furthermore, it is projected that biodiesel will be cost-competitive with gasoline and diesel by 2015. The city, from now on, would purchase only diesel vehicles instead of gasoline automobiles in order to run them on biodiesel.

Other ways the city could decrease fossil fuel consumption in municipal vehicles would be to encourage biking, walking and the use of public transportation by city employees on their way to and from work. This could be done by offering incentives, such as paying the employees for the extra time they spend during their commute. Furthermore, the city should purchase the most fuel-efficient vehicles and should promote the Massachusetts anti-idling law by making city employees attend seminars about the negative effects of idling.

Our second idea is to construct a plasma converter in Newton. A plasma converter disintegrates trash into its constituent elements by tearing apart molecular bonds in a process called plasma gasification. The byproducts of this process are melted metal, a clean, gaseous fuel, known as syngas and a lot of energy. All this sounds quite futuristic, but it is being put to use right now. New York City, which has run out of room for landfills, is in the process of buying six converters so that it does not have to truck all of its trash out of the city.

The energy produced by the plasma converter would be used in Newton's public buildings and homes. The plasma converter produces about 50 times the amount of energy used by Newton, so the excess energy would be sold to other cities. Also, to operate to its full capacity, the converter requires much more trash than Newton residents produce, so many nearby cities would have to give their trash to Newton. The selling of the energy and the syngas plus the money made when other cities pay Newton to take their trash would allow Newton to pay for the construction of the plasma converter in less than 3 years and then bring in \$100 million annually.

Our last idea involves passing legislation requiring all new residences built in Newton to meet the LEED certification rating of platinum, thus causing new homes in Newton to conserve energy and be more energy efficient. Besides conserving energy in new houses, it would be good to retrofit most, if not all, current Newton residences or replace them with LEED certified houses. One way the city government might encourage the retrofitting (and replacement) of current homes could be with campaigns pointing out the economic and environmental benefits of such changes and by possibly offering incentives like tax breaks to homeowners with LEED houses.

Nipmuc Regional High School
Upton, Massachusetts

Coach: Michael Maloney

Team Members: Alex Kara, Adam Parlin, Lauren Fragoza, Matt Flodstrum, and Samantha Nelson. Our alternates are Casey Mazel and Amelia Gould.

We are the Environmental Club from Nipmuc Regional High School. Our names are Our current issue project is taking place in Upton, Massachusetts, where our school is located. The name of our advisor is Mr. Michael Maloney, an earth science and chemistry teacher at our school.

The energy conservation issue that we have chosen is the wasted energy from conventional light bulbs when there are more efficient light bulbs in existence. This energy conservation problem was chosen because it is a major concern of Upton which is a primarily residential town. It is also a very easy plan to put into motion and it will save people money as well as the environment.

Our team never got around to actually executing the project. Therefore, the primary thing we have learned is to never procrastinate and to put your plans into action early. We have also learned about the timely process of raising money to support your project. I final thing we have learned is that our community, although very small, is capable of making differences.

Currently, the project is in its embryonic stages. Only research around the project has been completed. By installing compact flouescent light bulbs we could cut our lighting energy by up to 80%. We will distribute these energy saving light bulbs at our school. In addition, we will try to install these light bulbs throughout the school as well.

North Attleboro High School Envirothon Team

Coach: Donna Cochrane

Team Members: Regina Correa, Elise D'Adamo, Ashley Haselton, Sarah Kahn, Kevin O'Brien

The energy conservation and renewable energy issue in our town is one of great concern. The town of North Attleboro has no plans for the use of alternative energy. This is partly due to the fact that North Attleboro Electric, the main source of the town's energy, is an independently owned company. Our team has spoken with the company about the possibility of alternative energy, but yielded little results. Our town's lack of awareness and unwillingness to aid us has severely hindered our results.

As a result we began to examine the different types of alternative energy and what would work best for North Attleboro. Through several research we came to the conclusion that Solar and Wind energy would work best. Solar energy is the most conventional, in that it can be used in all different landscapes from the inner city to the rural country. Also, Solar energy would not ruin the towns landscape and would cease all concerns with disrupting views. Solar energy would also be useful for towns like North Attleboro, which are far from the ocean. Lastly and most importantly, through investment of solar panels the savings would outnumber the cost of installation by at least a third.

Our second choice of Alternative energy was wind power. Wind power is convenient on the simple fact that wind is free. Like solar energy, wind energy is less expensive than oil in regard to long-term investment. In concern with the environment, the National Audubon Society has improved the installation of windmills because they don't substantially affect wildlife.

Although the lack of alternative energy in our town was disappointing and discouraging, we tried to look at it positively and as an opportunity. Since then, we thought of ways to help our community become more aware environmentally and ways to help teach them about alternative energy. To make the most impact, we need to start at the community level.

Although we have learned a lot from this project, the most important thing is how much you can make a difference. Since our work in the Envirothon, the town's newspaper and local cable show mentioned what we are trying to do. Although we were not successful in finding alternative energy in North Attleboro, we are working on a plan to change it.

Northbridge High School

Reducing Energy Use in Northbridge

Coach: Melissa Martin

Our Envirothon team from Northbridge High School is conducting our current issue project throughout the entire town. We are attempting to help reduce emissions from fossil fuels and use less energy over a period of five and fifty years.

The team has researched and developed a plan to lower the dependence of our town on foreign and domestic oil products so that the energy used is at minimal level and can be produced without the use of fossil fuels or a reduced level of such fuels. Our plans consist of the use of alternative energy sources to create new sources of energy while making other types more efficient and eliminating others.

To determine what plan of action would be best for the team to implement, we talked with various people who are involved with alternative energies. In our town an old mill is being rebuilt and renovated to become a green building for apartments and artisan spaces. This place is called Alternatives Unlimited and the mill it is being built within has a water wheel that was once used for hydroelectric power. The original turbine is being refurbished to generate power once again. The construction manager and an architect from the site came to visit our team and discussed the LEED standards they would comply with to be certified as green building.

To also help formulate our plan we held an Envirothon workshop at our very own high school where we learned many things that we would need for the competition. We also had a presentation about the effective use of wind turbines. Although we discovered that our town was not suitable for this type of alternative energy, it aided us in our quest to formulate an effective plan to reduce energy use. Our best energy plan consists of using photo voltaic panels wherever possible to help create energy to be used in our own homes. This is part of a greater plan to make all buildings in the town green. With enough solar energy, our reliance on oil and other petrochemicals will decrease quickly.

Northbridge is a bedroom community facing the ever-present problem of car emissions in the town. People do not work here so they must get into their cars and drive to work an average of 15 miles one way. A plan could be put into place to get busing service from Northbridge to Worcester where one could get the commuter rail train or bus into Boston, Hartford or Providence. Also, an effort to promote carpooling would greatly reduce the amount of air pollution as we found by talking to citizens that few people carpool because few work at the same place and they see it as an inconvenience. Adding commuter lots at key locations where drivers from several towns who work in the same office could meet and park for free may increase carpooling and reduce emissions.

Raising awareness about the problems we face and gaining support for the proposed changes is also a daunting task as our town faces financial instability and is unwilling to invest in the future and does not have energy use figures about anything! So our team went to the people instead. In an attempt to raise awareness about alternative energy and energy conservation, team members Cailah DeRoo and Michael Szkutak visited the Whitinsville Women's Club in March and discovered that they were very interested in having home energy audits done so we provided them with the information to do so. Hopefully a grassroots approach to alternative energy use and reduction of emissions will help our town meet both its five and fifty year goals.

Old Rochester Regional Environmental Club Mattapoisett, MA

Coach: Lynn Connor

The Old Rochester Environmental Organization (OREO) is a small group of high school students that attend the ORR High School in Mattapoisett. Along with our team captain Ms. Lynn Conner we have experienced an unforgettable year in dealing with the environmental issues of our community, as well as the world. The team has narrowed our Energy Conservation and Renewable Energy Issue to wind power. Wind power is a major controversy in the town of Mattapoisett at the moment. In 2002, an oil spill in Buzzards Bay polluted beach areas and estuaries for many years. Some of the oil is still present in the Bay today.

Thousands of lives were lost as the oil spread, suffocating many of the Bay's inhabitants. Hundreds of birds were sent to emergency care units, as their feathers were coated in oil, and many died from the inability to stay afloat in the water, as well as ingesting much of the oil on their bodies.

Today, the Wind Coalition has brought a proposal forth, to place about 130 wind turbines in the Buzzards Bay region. This proposal would cause the area to be less dependent on oil over a very short period of time, as the turbines would help to create a great majority of the energy needed in the towns.

The team has learned a great deal from this project, including most of the effects that this project will have on the nearby ecosystems. We have conducted fundraisers and environmental festivals (Earthfest) over the course of a few years to help donate to this cause and others.

The ORRHS is also conducting an experiment to observe how well a certain area of the school's property is subjected to winds. A wind tower has been erected to measure the amount of wind that passes through everyday. If enough is available, a wind turbine will be built and will probably supply most, if not all, of the energy needed for the school each day. This will help the school not only cut back on other forms of energy that may be unhealthy to the environment, but will also help the budget from these expensive endeavors. Thus far, the results of this project have been more than acceptable and it is currently in its last stages of experimentation.

Oliver Ames Environmental Club
North Easton, MA

Coach: Debbie Margarite

Our Envirothon project for 2007 was to help our town reduce its use of energy by changing the way in which people within it lived. Within the past decade the challenge of solving global warming has been considered to have one solution by most people. Some thought the definitive answer was wind power, others supported solar panels, or even running our cars on vegetable oil. When in reality, it is no longer a matter of changing single elements in our environment, but more of a matter of changing ourselves and the way we live. After having done research for the past year, our team had come to the conclusion that it was not feasible to put up wind turbines due to the geography of our town and lack of wind. Dams were also not a likely solution for any of the small local ponds due to their seasonal currents and putting up solar panels on town public offices was largely rejected because of their historical value. Once we had looked into all of these solutions we decided that the next best thing to do would be for us to educate the younger school children of Easton. Since after looking into all of the modern solutions we realized how little we knew as consumers on the amount of energy we waste. This was our rationalization for designing our education portion for the school children and beginning to organize a Green Team in Easton. As there are no existing recycling programs in the public schools and people are widely unaware of the difference they can make in conservation.

The program that we are designing for the younger grades is focused mainly on the differences they can make in their own homes. Such as simple changes like trading in incandescent light bulbs for CFL bulbs. Since generally children are more responsive than adults and will bring home whatever is taught to them and will spread around their knowledge. So that a handout on how to save energy while driving or doing laundry has more of an impact than people first assume. Bill Beattie once said that "the aim of education should be to teach us rather how to think, than what to think-rather to improve our minds, so as to enable us to think for ourselves " We hope to have our presentation put into the schools assembly times by next year and have already received a great deal of encouragement. Hopefully our recycling program will also be put into action next year. That way our research can help to shape the way the next generation thinks about how they live and the impact they have on this pressing dilemma.

Provincetown High School

Coach: John Hanlon

Renewable energy is being considered in a variety of ways in our community. There are several proposals for wind turbines in the various towns on Cape Cod. Solar energy is currently being used in a lighthouse in Provincetown and even in our high school. Biodiesel holds promise too for future public transportation proposals. There are even "green" buildings being constructed in town and "green" building materials being sold. Everyone can at least do things to conserve energy in their daily lives and in their homes.

Quabbin Regional High School

Barre, MA

Coach: Rebecca Bottomley

Team Members: Heather Boudreau, Maria Cerce Nathan Nesbitt, Dillon O'Neil Kristina Smith, Elizabeth Stefanik

Our team chose to focus on community of Barre Massachusetts, where the Quabbin Regional High School is located. The Quabbin Regional High School is for students from five towns in central Massachusetts, including Barre, Hardwick, Oakham, Hubbardston and New Braintree. Barre is a small rural community with a population of 5,386.

The Quabbin Envirothon team did a number of site visits and interviews to learn more about energy conservation and alternative energies. The team visited a passive solar home with grid-tied photovoltaics and solar hot water. The team also investigated hydropower with a visit to a dam of Ware River Power in Barre, which supplies energy to surrounding towns. The team also visited the Doyle Conservation Center of the Trustees of Reservations in Leominster. The center is a "green" building made with green recycled materials and energy efficient design with photovoltaic panels and geothermal energy.

To learn about alternative energy, the team visited National Grid in Westboro and met with John Bzura, principal engineer of alternative energy in research and development.

The team chose to put on an Energy Expo in the Barre Town Hall to educate the public on energy conservation and what they can personally do to reduce their energy consumption. The Energy Expo was held on April 14 Step it Up Day, a national day of climate action to send a message to Congress to reduce carbon emissions 80% by 2050. Step it Up is a nationwide campaign which had over 1400 events in all of the 50 states.

The Envirothon team made educational displays to reduce our carbon footprint with energy conservation tips from changing to energy efficient lights and appliances to reducing hot water use. The team handed out informational brochures, as well as free CFL (Compact Fluorescent lights), low flow shower heads, cloth bags, tire gauges and tree seedlings to plant. Energy efficiency experts Rick Arnold, Energy Star builder of the year and Paul Wolff were guest speakers and there were showings of the Academy Award winning film "An Inconvenient Truth". The event also had music on the common from the Quabbin Faculty rock band and a grease car was on display. The Step it Up event was a great success with over 250 people attending throughout the day.

The Envirothon team learned a great deal about energy conservation and a had fantastic time sharing this knowledge with so many people on Step it Up Day. We need to convince people to change their behaviors to live a more sustainable lifestyle.

Ralph C. Mahar Regional School Orange, Massachusetts

Advisors: Kurt Enko and Mike Magee

Like every community, the towns of Orange, New Salem, Petersham and Wendell must all work together to conserve energy, explore renewable and alternative sources of energy, and maintain current lifestyles. It appears, from reviewing various programs designed to conserve energy, that in order to truly sustain an energy conservation program, the negative impact on the consumer must be minimal and the benefits substantial. It appears that "saving money" as a motivator for conserving energy is not all that effective. This is demonstrated by today's present prices at the pump. With gasoline prices approaching an all time high, the current research indicates that drivers are **not** significantly reducing fuel consumption. It seems that even with these exorbitant prices, the driving habits are not changing.

Being a rural community, many of the households in our region use wood as the primary fuel to heat their homes. Although this obviously reduces the amount of fossil fuels being used, there are some associated problems with this practice. We are also fortunate in that many of the residents in our area are very aware of the energy problems and are willing to make changes to improve this situation.

Our team has contacted local oil companies to look at actual numbers concerning consumption rates and discussed ways to reduce the usage. We informed that there are a number of efficient burners that are now on the market that may reduce the individual oil consumption by 10 – 20%. We were also told of a program that would include a \$500 rebate with the purchase of efficient heating system. This program included a mandatory energy audit of the home. There were many light bulbs and other electrical devices designed to save energy that were available free of charge with this program.

We feel that our primary mission is to make people aware of methods that they can utilize to reduce energy use, save money and not require a great deal of effort on their part. Simple actions like shutting off lights when not in use, lowering the setting on the thermostat by a couple of degrees, and using air conditioners more wisely can greatly reduce electrical usage if everyone participates.

There are also alternative energy sources that are available in our area. There are several people that use biofuels in their homes and/or vehicles. Although availability of these oils may be an issue if the popularity increases, at this time, there appears to be an ample supply.

Our final step is to create a specific "Set Of Instructions" that will reduce energy use. These will be fairly simple and easy to follow. It is our opinion that if we can approach the problem in this manner, we will have a much greater chance at success.

Somerset High School Environthon Team

Coach: Matt Talbott

Team Members: Mike, Brad, Katie, Lindsey, and Kevin

Short-term goals

In order to reduce emissions in the town of Somerset quickly and effectively, our Somerset Environthon Team has taken a few actions. First, we planned and put into effect a "Lights Out" day at our high school, and with the cooperation of most teachers, were able to save 744 kilowatt hours of energy in 1 day, as 12076 kwh were used as opposed to an average of 12820 kwh. Seeing the benefit of this action, we are in the process of making this a monthly activity, as well as promoting a "Lights Out" day for the entire town of Somerset. Not only will this save energy, but this will also raise awareness of the global warming problem both locally and globally. In addition to this activity, we have also planned to institute a "Car-Pool to School" day for our high school, a day in which any group who uses the car pool system to get to school will receive a raffle ticket, and in turn prizes will be drawn at the end of the day. Again, this will help to lower emissions in our town while also raising awareness. A final action we have taken, as a team, to ensure that emissions will be cut quickly, is to put an advertisement on our local town T.V. channel, educating about the effects of global warming and what actions can be taken.

Long-term goals

As you may know, Somerset is a town which contains two highly inefficient (at least in terms of cleanliness) power plants. Although removing them would greatly reduce emissions for our town, this action would also cripple our town economically, so a happy medium must be found. When asked about the actions which Dominion Power Plant has taken and is taking to become more economically friendly, 25 year employee Robert DeMoranville has informed us of the plant's actions, working together with a local weather committee, in researching the feasibility of using wind turbines to reduce emissions from this plant. Also, the Somerset Environthon Team has put forward the idea of using hydro-power as well, as the power plant is right on the Taunton River, and using water would again reduce emissions as well as help preserve the fossil fuel supply. Another action we have taken as a team is to write a letter to Congress, expressing our concern about the global warming problem, and stating what we would like to see happen in the future in response to the global warming problem. We feel that reaching out to the government will help to secure progress in the future. Hopefully, global warming will soon be a thing of the past, and we will be able to once again look with pride on human actions with regard to nature.



South Hadley High School Envirothon Team

Composting Program at South Hadley High School

Advisor: Sylvia Cooley

This year, our Envirothon team chose to participate in the new composting program in our school's cafeterias. We chose this as our project for the Current Issue because it is an energy conservation measure we really believe in. By composting food, our school reduced the amount of trash hauled, slowed the use of landfills, and helped to improve a farmer's soil in the process.

The program was student-driven and initiated by Abbe Hamilton, a sophomore at our school, as a part of her Girl Scout Gold Award badge. We attended planning meetings, training sessions, and monitored the bins at lunchtime to explain the process to students. We made over 40 posters to hang in the school's hallways to announce, promote, and teach students about the composting program. We created a huge banner that hangs near the cafeterias.

Instead of just dumping all trash in one container, students now sort their food, paper napkins, and plates, and place them in a biodegradable compost bag. We expected that students would resist and complain about this new program. Instead, we have practically 100% compliance, with most students easily sorting their lunch trays with no complaints.

We also helped to collect data from the composting program. We weighed the trash at the beginning of the process and then two months later to see how the composting reduces the amount of trash that is hauled. In one week our school produces about 840 pounds of waste from the lunchrooms. We cut the amount of trash by more than half with composting and recycling. Compost now accounts for about 40% of the waste (-340 pounds), recycling makes up 32% of waste (-270 pounds)- for a total of 72% either composted or otherwise recycled. Only 230 pounds of trash gets hauled to the landfill now per week (28% of total waste produced at lunches). This process has seemed to produce a domino effect- increasing recycling in classrooms as well. Recycling of paper and containers in classrooms has more than doubled this year.

In addition, our Envirothon team worked on designing T shirts to promote environmental awareness. We have produced over 125 T shirts so far and they can be seen almost every day on someone at our school. Our plan is to use the profits to help fund the composting program. We are wearing one of our designs today.

Springfield Central High School

Advisor: Naomi Volain

Our Energy Conservation and Renewable Energy Issue involves the expansion of our city's green initiatives. Our plan for the city of Springfield is to do what we can to use renewable energy resources, along with conserving the energy we must use, to as little as possible. These initiatives were chosen for expansion because according to Country Home Magazine, Springfield is ranked in the top 10 for the best green large cities nation wide.

We have many Energy Conservation ideas for Springfield. All new buildings will be required to adopt the practices of green buildings including social, environmental and economical aspects. All streetlights will be replaced with energy saving fluorescent bulbs that will conserve energy. This will be much needed especially during the Christmas season. Springfield has a huge light show called "Bright Nights" in our local Forest Park. The bulbs could be replaced with energy saving ones and it would be a tremendous conservation of the light sources.

For Renewable Energy, solar panels for water heating will be installed on all public buildings in Springfield. This will include our 53 schools, 4 colleges, private industries, municipal buildings, post offices, libraries, churches and synagogues, Baystate Medical Center, Mass Mutual Center, and the famous Basketball Hall of Fame downtown. The vehicles of the city will be slowly swapped for hybrid/electric cars and high mileage cars. The first to do this will be the city cars and trucks such as police vehicles, fire trucks, ambulances, etc. The school buses and public buses will also be transformed to energy saving hybrids, which would have a great impact on the city considering the large amount of buses being used.

The major new Renewable Energy initiative is the use of methane in landfills to generate electricity. We are planning to use Bondi's Island, our local landfill to create electricity for the homes in Springfield. What we've learned from doing our Current Issue's project is that our city is already starting to take action. Springfield is a city with a public transportation system in place, a progressive recycling program. We currently have one hybrid bus and hope there will be more to come. There are also plans in place to build a new Putnam Vocational High School. Many energy-conserving measures will make the new Putnam a green building.

The current status of the plans in our city are the use of hybrid buses, planning to build more green buildings, and replacing the older city vehicles with newer, more efficient cars. Springfield is also one of the many cities involved in Tree City U.S.A. This is an organization sponsored by the National Arbor Day Foundation. Springfield has been a part of this program for 20 years. They are planning to plant 1400 more trees. This reduces energy requirements of building and takes in CO₂ and will up the trees planted in the city itself.

Taconic High School Pittsfield, Massachusetts

Coaches: Laura Schneider and Deirdre Lock

In our hometown, Pittsfield, MA, there are sixteen municipally managed buildings. They comprised our research community. We began our carbon footprint research by conducting a survey of the municipal buildings to identify the least energy efficient in our sample. Our initial survey focused on the energy efficiency of the lighting, windows, insulation, heating and air conditioning systems. Of the sixteen municipal buildings we audited, those determined as needing the most improvements were the two high schools, the Court House, City Hall, and the Central School Administrative Building. After further examination, we found that the buildings all had the same basic heating and cooling systems, as well as similar lighting, windows and insulation. Therefore, Taconic's energy consumption was determined indicative of all the municipal buildings in Pittsfield and Taconic was chosen as our primary research site. We utilized the current and previously collected data on the efficiency of Taconic's heating system and Pittsfield's waste management systems to determine the magnitude of carbon emission reductions the prescribed changes would effect.

Initially the study focused on the impact of upgrading the lighting and windows. Calculations were performed to determine the amount of energy saved by using energy efficient fluorescent bulbs, timers and motion sensors, which reduce unnecessary hours of lighting. The effect of replacing the poorly insulated single paned windows with double paned windows were also examined for energy conservation.

The second are of focus was the effects updating the inefficient heat distribution systems would have. The principal source of heat throughout the city is oil, the secondary is electric. As our electricity is produced by a coal burning plant, both are significant sources of carbon emissions. Due to the high cost of fossil fuels the city has maintained and upgraded furnaces to maximize fuel efficiency. However, the distribution systems need to be upgraded as they were determined to be a major source of wasted energy.

As all trash collected for municipal building is incinerated. further reductions of carbon emissions could be gained by expanding the city's recycling programs for paper and aluminum. Also expanding the city's use of public transportation and increasing carbon uptake by vegetation was examined.

The steps of the five-year plan to reduce carbon emissions by a minimum of 25% include: upgrading the heat distribution systems, lighting, recycling, amount of vegetation insulation of windows and increasing the uses of public transportation. Over the next few decades the city could expand its focus to include: purchasing hybrid vehicles for city uses, encouraging purchases by private citizens with tax incentives, requiring energy efficient construction technique for all new construction and investing in renewable energy sources such as solar panels that can reduce our use of getting electricity from the coal burning plant.

Over the next 50 years to further decrease fossil fuel use, it is very important that the community as a whole is aware and hopefully participating. The initial finding of this energy study are encouraging. If our community begins to take these simple corrective actions to increase energy efficiency we can easily reach our goal of reducing fossil fuel use and dependency up to 75%. Not only will carbon emissions be reduced, but uptake of carbon dioxide will increase and city will be saving money that can be reinvested in our crusade to stop global warming.

Tahanto Envirothon Team 2007

Berlin-Boylston School District - Boylston, Massachusetts

Coach: Sue Moore

Team Members: Nick Wiedeman, Ian Kampersol, Dearma Filsinger, Heather Viola, Josh Bergevin

The Tahanto Envirothon Team interviewed Gary Harrington of the Boylston Electric Department to find out about the history and the source of energy for Boylston. Most of the town's energy comes from New York hydro-power and New Hampshire and Connecticut nuclear sources. Boylston is part of the MMWEC or the Mass Municipal Wholesale Electric Company, a state agency that includes 21 towns with municipal electric departments. Boylston participates in the HELPS or Home Energy Loss Prevention Services Programs. These provide rebates and information on energy conservation through their website.

Although only 11% of the Boylston's energy source is renewable, the Electric Department is researching the possibility of solar and wind energy. The hill at Hillside near the power line meets the elevation requirements but a year of wind studies need to be done to confirm its eligibility as a potential site for a wind turbine. Tower Hill may also be a potential site but its elevation is not as high as that of Hillside. Tahanto High School may even be a possibility but its proximity to the Reservoir may pose a problem. We encourage the town of Boylston to pursue the idea of a wind turbine at Hillside to offset energy costs in the town.

Because Tahanto is in the municipality of Boylston and not part of the National Grid or N Star" it is not eligible for grants from the MTC (Mass Technology Collaborative). The MTC, however, has a new program for municipalities not using National Grid. The CEO, or Communities Energy Opportunities Program, will give communities 2 to 4 days of free consultation if they are looking in to the possibility of wind energy. We urge Boylston to take advantage of this opportunity.

Our T earn took a field trip to the Doyle Conservation Center in Leominster to learn about energy conservation. The Center had a geothermal heat source, or GeoExchange, compost toilets, and recyclable and reusable building materials. Native and xerophytic (requires no water) plants were also used. We also visited the Blackstone Valley Regional Technical High School which is a "green school" with photovoltaic cells (solar energy) for electricity and heating water, natural lighting, and other energy saving methods. We encourage the Tahanto Building Committee to consider building a green school when applying for a grant from the state's School Building Authority.

We also interviewed Nikki McKoon of Mass Audubon Society who helped us calculate our carbon footprint. The Team plans to make a website for Tahanto with energy saving ideas for the community.

**Urban Science Academy
West Roxbury, Massachusetts**

Coach: Brooke Spencer

During our current issue experiment, we have encountered many obstacles and setbacks in collecting the necessary data, such as annual energy costs and the amount of light bulbs and windows.

At every attempt at gathering data from facilities we were sent on a wild goose chase being directed to a different number. We called many people and they would call back. Some were really helpful but most never called back even gave us the information we wanted. We tried asking our Principal for help with gathering information, but he just tried to refer us to other people who also didn't help.

We also had trouble collecting the data. It was hard to walk around the whole school to count things such as lights and windows. This is mainly because our school is split into different schools and sometimes we would have to worry about trespassing. At time we were feeling like there was no hope. So we had to get creative.

There was also good things during this project. It wasn't always hard. We have good people who work hard and get the job done. Our team did a good job especially with the teamwork. We agreed on lots of things, helping each other with different tasks, and met everyday to discuss the project. We had great teachers to help us with our math and science problems.

To briefly conclude, we had many obstacles, but we overcame them. We had great resources, great teachers, and great teammates. And we were rewarded for our time, patience, and efforts.

The Waltham High School Envirothon

Coach: Marc Smith

With "Renewable Sources of Energy" as the current issue the Waltham Envirothon team believed it was very important to get the word out that alternative sources of energy exist. One of the major events was Earth Day where the emphasis was on educating. The Waltham team used posters and games to educate the general public on alternate sources of energy. We emphasized the little things that can be done by individuals, however, also stressed the fact that alternative sources of energy must be taken into consideration. Our primary desire in conducting the Earth Day festivities as we did was to enlist the youth of Waltham into conceiving through visuals the impact they personally have on the environment. We sought this as our route of outreach because we have found that giving knowledge to embracing young minds has a two fold of prosperity; first in their families and friends and second in themselves: our posterity. While they are still young, they are at the most advantageous age where learning can be apprehended better than any other time in their life, at this point they are the most impressionable and rather than polluting their minds we seek to cleanse their minds against pollution.

We also met with the Mayor who gave us some invaluable information; such that Waltham has planted \$75,000 in trees and that we are trying with extreme prejudice to make our community a role model rather than a follower or a contributor to the problem. Waltham is full of dedicated individuals as the Mayor told us, who want to make our former industrial capital of America the best it can be. Because Waltham was the capital of industrialization, we did have hurdles to climb in terms of pollution, however, the overwhelming dedication of our citizens have helped us to rebound from our "dirty" ways. Today, Waltham is moving forward and with the best strides of intentions.

Willow Hill School
Team Name: W.H.E.A.T. (Willow Hill Environmental Action Team)
Town/Community: Willow Hill School

Advisors: Robert Smith and Carol Holly

W.H.E.A.T. has chosen to work on making Willow Hill School more energy efficient in a variety of ways. This project was chosen because it is important not only to be energy efficient but also to educate the rest of our school about conservation. Environmental education in schools is important because we are the next generation of decision makers. We have chosen our school for our community because Willow Hill School students come from a variety of areas and we cannot improve them all at once. Our main projects are getting solar panels and laminate for the Porter and Mason buildings. W.H.E.A.T. is also pursuing other initiatives because we have learned that we should do everything we can for our environment.

Before the end of this year, W.H.E.A.T. will present its ideas to the Willow Hill School Administrative Team. After receiving approval, Willow Hill School will start a quarterly backpack cleanout day. This will give students the opportunity to recycle their old papers. Effective in the fall, all possible technology purchases will be energy star rated. Also starting in the fall of 2007, Willow Hill School will enforce a No Idling in Good Weather policy for vehicles dropping off or picking up students. We will follow the Massachusetts law against unnecessary idling for more than five minutes. Also in the fall, Envirothon elective members will hold an all-school recycling education meeting. Immediately following this, Willow Hill's expanded recycling program will begin. In the next few years, when Porter building's roof is replaced, solar panels will be added. These solar panels will save 7,884-kilowatt hours per year. Also in the area of electricity, all incandescent light bulbs will be replaced with compact fluorescents as they burn out.

Any future construction will be built with efficiency and conservation in mind. In the next five to ten years, solar laminate will be added to the roof of Mason building. This solar laminate will save 8,935-kilowatt hours per year. About seven years from now, the windows in Porter building will be replaced so as to reduce the energy used for heating. Willow Hill School will look into acquiring fuel-efficient school buses in about ten years. Bio diesel is a possibility. Finally, fifteen years from now, the Weeton, Mason, and Porter buildings will be connected. This will reduce the amount of energy lost when doors are opened in cold weather.

Overall, members of W.H.E.A.T. have learned about various ways to conserve energy. This includes using more efficient appliances such as compact fluorescent light bulbs and installing better windows to prevent energy waste. We have also learned about better ways of generating energy. W.H.E.A.T. researched both wind and solar power, though wind turbines turned out to not be feasible. Our current status is that we are seeking administrative approval so that W.H.E.A.T. can implement its ideas starting in the fall of 2007. It is W.H.E.A.T.'s hope that Willow Hill School will keep improving so that someday down the road, our school will be a good role model of an environmentally friendly institution.