

# The Environmental Audit of Lycoming College



*Eighth Edition: April 2017*

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*Seventh Edition: April 2016*

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*First Edition: December 2009*

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## Introduction

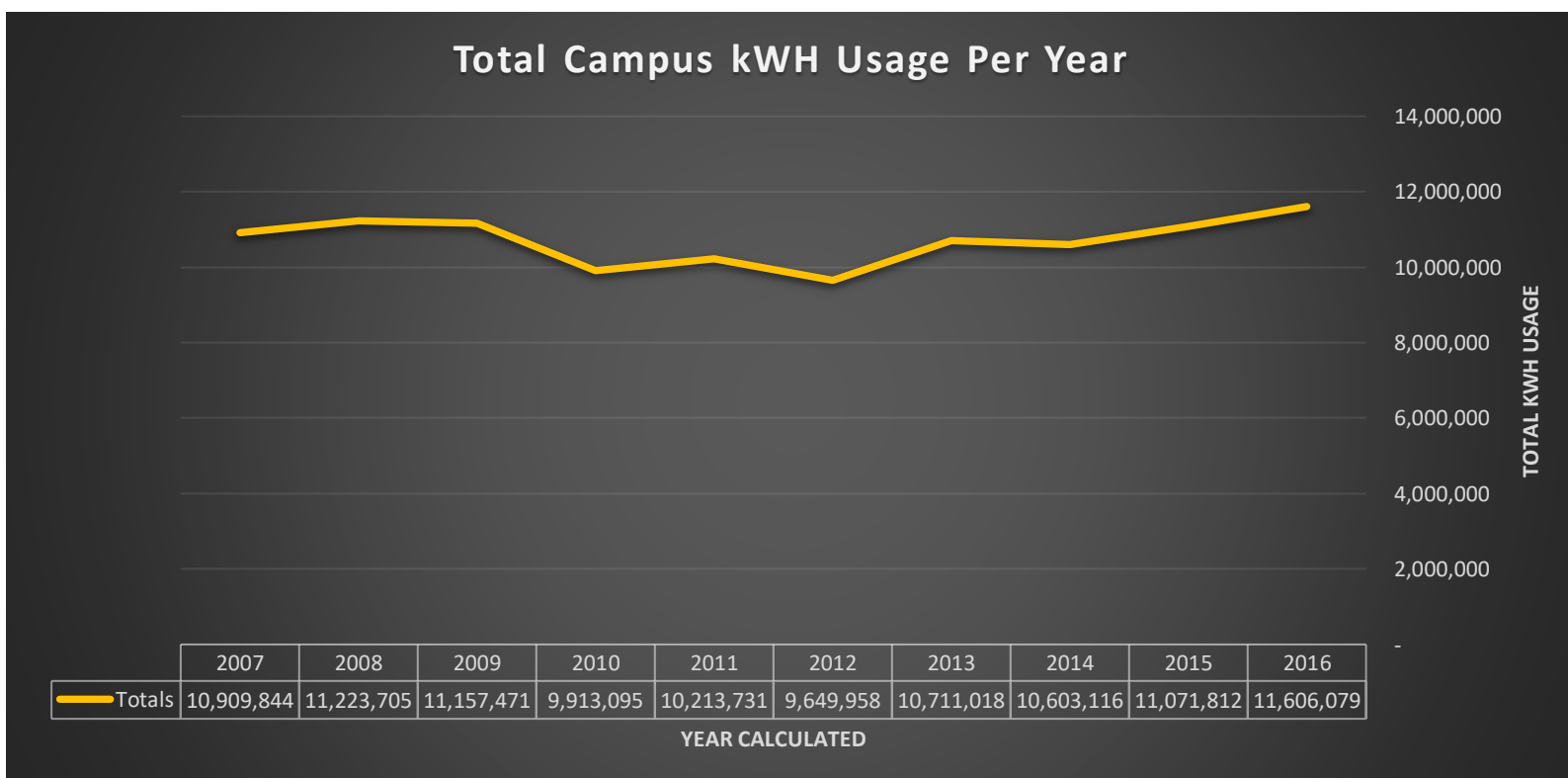
Developing more environmentally sustainable ways of living has become a global concern. Universities and colleges around the world are creating alternative, more sustainable methods to continue to meet their campus's needs, as well as decrease their own environmental footprints. As a progressive step towards these aforementioned ideas, Lycoming College conducts an annual environmental audit.

This audit incorporates data comparing utility costs, water consumption, natural gas consumption, electricity consumption, solid waste production, as well as information regarding any recycling and sustainability efforts. It also outlines a list of classes and clubs that incorporate environmental aspects into their curriculum and activities. Since students, faculty, and staff have been cataloguing data since 2009, this document also provides a comparative analysis of past forms of energy consumption among the various buildings on Lycoming College's campus. The Lycoming College Environmental Audit provides a baseline from which improvements can be documented and measured. The audit is intended to evolve through time, as future students incorporate annual updates. But above all, this document is a place that records Lycoming College's progress and growth towards enhanced sustainability.



## Electrical Energy Usage

Lycoming College currently purchases its electricity from PPL Electric Utilities Corporation. A billing analysis has been created to produce an electricity use profile for the entire college. Appendices 1 and 5 provide the individual electricity consumption of each building owned by Lycoming College. The following graph (Figure 1) shows total electrical energy consumption for all properties owned by Lycoming College from 2007 to 2016.



*\*Yearly data for future years are not complete and will be available in an updated audit.*

The year 2008 experienced a decrease in electricity consumption caused by updating a previously wasteful sprinkler system in the Heim Building used to cool compressors. Previous to this update, the compressors operated on full power at all times of the day. After the more efficient installation replaced the old one, these compressors operated at significantly lower power throughout the day, conserving a considerable amount of energy. In 2009, the college then installed more efficient compressors in Heim. In addition, the third and fourth floors of the Snowden Library experienced changes to reduce electricity consumption. A decision was made to use only every other light on the top two floors of the library, as opposed to full lighting. The alterations made to the compressors and the change in the library's lighting accounts for the steep decrease in electrical usage from 2009 to 2010.

The Snowden Library consumes the most of Lycoming College's electricity primarily because lighting on all four floors remains on for 16 total hours of the day for the majority of the week.

As stated above, the removal of every other lighting tube on the top two floors of the library saved energy tremendously. Prior to this change the library used 3, 200 tubes. After Buildings and Grounds removed 800 tubes, the library used only 2,400 tubes. This sustainable action allowed the library to run at 25 watts instead of 50 watts.

To further aid sustainable efforts in saving electricity, the Sustainability Committee initiated the “Flip It Off” campaign in 2011. As a part of their campaign, the committee encouraged students to turn off lights, appliances, electronics, and faucets when not in use. Currently, LEAF (Lycoming Environmental Awareness Foundation) assumes responsibility for continuing this campaign by hanging posters in dorms, academic buildings, and bathrooms reminding people to turn the tap completely off or shut off the lights.

2016 at Lycoming College saw a rise in overall campus kWh usage from the previous year. The data for 2016 is part of a steady incline in the graph, where the college has used more electricity from 2014 to 2016. This increase could be accounted for with a variety of factors, but three major ones were the addition of Lynn, purchasing of new apartments, and increase in usage of the recreation center and Lamade Gym. For 2016, the 6 biggest users of electricity on campus in ascending order were: Lynn, Wertz, Lamade Gym, Rec Center, Academic Center, and Heim. Heim being the largest user of electricity on campus was surprising for 2016 because the Academic Center had always been the top consumer since the audit was started in 2009.

## Renewable Energy

### *Solar*

Lycoming College’s involvement in the solar program began after Dr. Mel Zimmerman and Clean Water Institute interns, Megan Schulze ’11 and Tracie Curtis ’09, attended the Solar Scholars Conference at Dickinson College to learn more about the advantages of solar energy. Attendance at this conference, hosted by the Sustainable Energy Fund, led to a competitive grant process involving institutions that were interested in receiving a grant for a 3.1 kW Photovoltaic (PV) system. After applying for the \$15,000 opportunity amidst competition from thirty-six other colleges and universities, Lycoming was one of twelve institutions to be awarded the grant. On November 12, 2009, a 15-panel Photovoltaic (PV) system was installed on the roof of the Heim building and the electrical output began to be monitored.



According to Eduardo Lorenzo, author of “Solar Electricity: Engineering of Photovoltaic Systems,” the method employed uses semi-conductors, usually consisting of silicon, to capture



solar rays. The rays captured consist of photons, whose bonds are broken, which allows the photons to move around freely to create an electrical current that can be transmitted into an electrical system and subsequently, monitored.

The solar photovoltaic system output in 2010 was compared with the energy demands needed to run equipment, not including lights, in three of the Clean Water Institute laboratories. Room 112 houses a refrigerator and two incubators (1.021 kWh), room 105 contains a 150 gallon saltwater tank with a separate emergency circuit (0.972 kWh), and room 120 has two incubators (0.240 kWh). On average, these labs require 1.909 kW per hour, 45.816 kW per day, and 1393.57 kW per month. As of March 5, 2012, the total output of the solar photovoltaic system since its November 12, 2009 installation is 8369.9 kWh, and it is estimated that the PV system offsets the equipment energy demand by approximately 40%.

<b>Power</b>	2688 W
<b>Daily Yield</b>	7.19 kWh
<b>Total Yield</b>	8369.9 kWh

*\*Table 1 shows the power wattage, daily yield, and total yield generated by the solar panels. Due to a computer problem with the Sunny WebBox, an update for the Total Yield could not be given for this audit, but hopefully this problem is temporary and the next audit will provide current levels.*

In the future, Lycoming will be looking into finding more grants and support for other solar power projects such as water pumps for the campus swimming pool and solar recycling compactors. The solar recycling compactors and possibly even solar composting units would be a perfect addition to campus because its small size inhibits the effects of smaller scale projects. These two projects would be ideal to use as sustainability teaching tools for educating students, faculty, and the community.



*Side Photo: The 3.1 kW Photovoltaic (PV) System on the roof of the Heim building.*

## **Biodiesel**

Biodiesel is manufactured from used cooking and vegetable oils and serves as an efficient form of alternate fuel that can be used in diesel engines. Biodiesel is steadily gaining more popularity in the “Green Revolution” because it reduces carbon dioxide emissions from vehicles by providing cleaner burning power. In addition, biodiesel is a cheaper alternative to the diesel used to fuel today’s vehicles.

The first diesel engine was designed and later built by Rudolf Diesel in 1897, and his model was unique because it was meant to run entirely on peanut oil. Diesel’s innovation made his model the first successful biodiesel engine ever built. Lycoming College’s own Kyle Ruhl ’11 and Chandler Couch ’11 led the way to using “green” fuel by building a filtering and purifying system to convert the campus’ used cooking oil into effective and useable fuel. Kyle began working

with biodiesel to fulfill the needs of his senior project and also to manufacture fuel that he could use for his car. The oil that is recovered from the cafeteria is first added to a large tank, heated up, and filtered to remove any water and excess food particles. Next, the oil is heated to about 350 ° and in previous years, methanol and sodium hydroxide are added to slightly alter the chemical structure of the oil. After this process, excess methanol is recovered for later use and a glycerin byproduct is removed from the crude fuel. Water is then added to the tank to wash the fuel and dissolve the small particles of unused additives. Any excess water is then bubbled out using ordinary air leaving only the final product. The glycerin byproduct can be used as an effective compost contributor, or can be made into a truly “green” soap.

The amount of oil that is used is directly proportionate to the amount of fuel that is made, and a large part of the biodiesel operation is relatively cheap to build and maintain. The biodiesel project has received monetary support in the past including five hundred dollar donation from the college and a one thousand dollar donation from an outside source. The money was used primarily for the maintenance of items such as dry wash filters and screens that are used to remove excess food particles from the oil. Kyle and a few other Lycoming students and staff attended a conference at Dickinson College in the spring of 2010 to learn more about biodiesel and how college campuses can be made more environmentally sustainable.

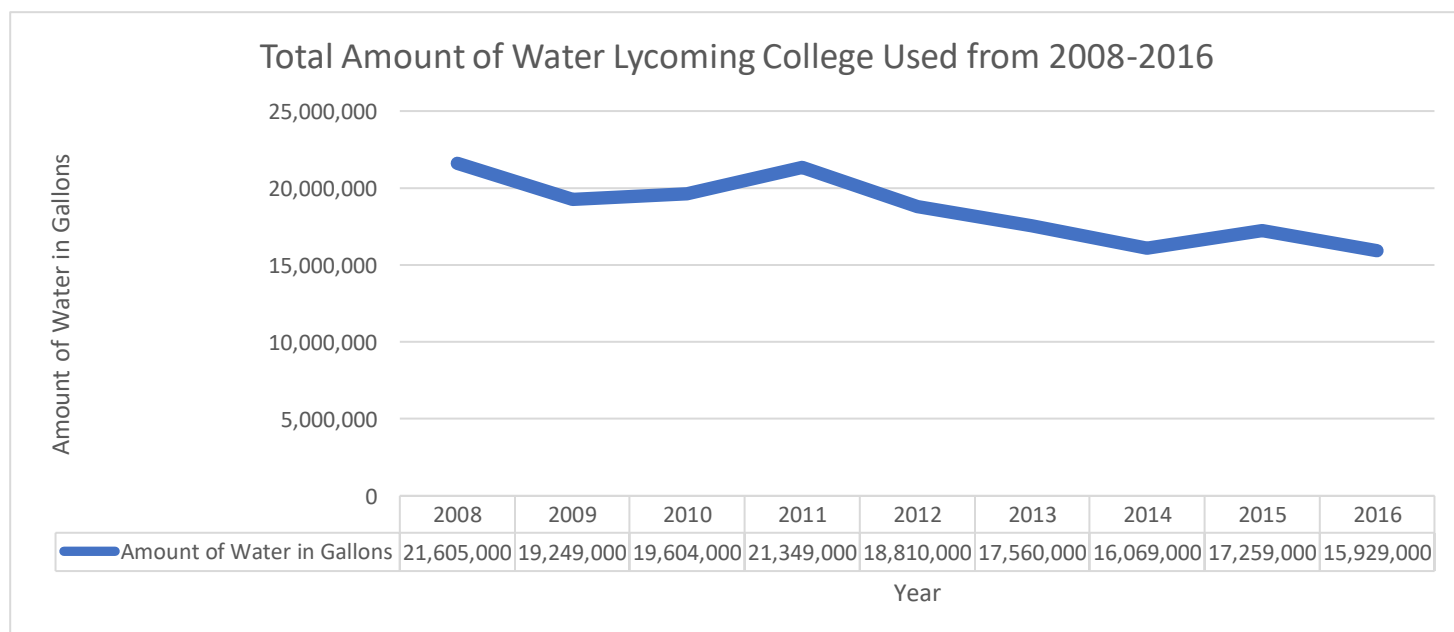
Today our biodiesel project is on hold because the machine is broken and must be repaired. The Sustainability Committee is searching for any engineering minded students that would like to attempt to fix it. If you are interested or know anyone that would be interested please email [sustainability@lycoming.edu](mailto:sustainability@lycoming.edu)!



*Side Photo: The biodiesel project located on Willow Street.*

## Water

Williamsport Municipal Water Authority (WMWA) provides Lycoming College with water. This facility extends its services to over 50,000 residents living in Williamsport, South Williamsport, Duboistown, Loyalsock Township, and Newberry. The plant filters water from two, 650 million gallon reservoirs, as well as groundwater as needed during periods of drought from a field along the Susquehanna River. The WMWA publishes a yearly update of their drinking water quality, which can be found on their website: [www.wmwa-wsa.org/waterquality.htm](http://www.wmwa-wsa.org/waterquality.htm).



-Figure 2 depicting total water usage for Lycoming College from 2008-2016

Lycoming College currently has three active wells set aside for watering and lawn maintenance. One of the wells is located at the practice field located on the southern end of campus, and the second is located by the graduation steps on the quad. The largest of these wells is located at the stadium, and it is used the most frequently to irrigate the practice fields and the softball field. The college also owns a fourth well, however this well is not in current use. This well is located between Heim and Forrest Hall.

In 2008, Don Cook of Don Cook's Scuba Equipment made a significant repair to the Lamade Gymnasium pool. The pool developed a pervasive leak that lead to thousands of unnecessary gallons of water consumption to keep the pool filled to proper levels. This repair potentially helps explains the 3,244,099-gallon reduction in water use from 2008 to 2009. Consumption has steadily decreased from 2011, which will hopefully continue into the future.

A number of changes aid in the steady decrease of consumption. In an effort to boost sustainability efforts the college continues to install water efficient showerheads and toilets



whenever possible. The more efficient showerheads expel 2.5 gallons per minute (gpm) and the toilets range from 1.6 to 3.5 gallons per flush (gpf). As older toilets break, which typically use 3.6 gpf or more, Buildings and Grounds replaces them with the new, more efficient toilets.

The data for water usage can be found in Appendices 2, 3, 6, and 7. In 2014, Buildings and Grounds discovered a leak in the water pipes that lead to the alarming increase of Long Hall's water consumption; the leak has since been attended to. Since the leak, water usage for Long Hall is now recorded by the same meter that records water usage for Asbury.

Renovations made to Rich Hall in the summer of 2013 led to a greatly decreased water consumption in 2014. These renovations included new showerheads and more efficient toilets. Lycoming College projected that the 2015 water data for Crever Hall would reflect a similar reduction close to that of Rich Hall in 2014. During the summer of 2014, Lycoming College remodeled Crever, installing boilers that require less water, efficient showerheads, and efficient toilets, along with installing another meter to measure the building's water consumption. However, the data compiled for 2015 does not corroborate with those projections. While Crever Hall water consumption for 2015 has decreased compared to 2014 values, it has not seen a reduction anywhere close to the Rich Hall 2014 reduction. Also, Rich Hall did have a significant decrease in 2014, but that has not carried over into 2015. The 2015 Rich Hall water consumption is nearly 3 times the amount of water consumed in 2014.

In 2016 water consumption continues to increase in Rich (now up to 1,315,000 gallons) and is now slightly over the 2014 levels. Although, since Rich is a female only dorm the total water consumption could theoretically be higher because of the number of showers girls take. Even though the overall water consumption has now increased since in remodel in 2013, the amount of water used from 2008-2012 averaged 2 million gallons. The increase then to 1,315,000 gallons can then be put into perspective and observed as a large overall decrease. Crever illustrates a similar pattern of decrease in 2016, where 907,000 gallons dropped to 840,000 gallons. The decreased continued since 2015 and the measurements in the remodel to reduce water usage and increase efficiency are working.

In 2015 Wesley was remodeled with efficient showerheads and toilets like Crever. The building also now houses about 40 less residents than before its remodel in 2015. 2016 was going to be the first year with water data after the remodel, but there was a problem with the water line. The Wesley line itself only recorded 15,000 gallons in the whole year for the building. Therefore, in the upcoming years future audits must determine if Wesley has a shared line with another building or if there was just an issue with the water line in 2016.

Figure 2 depicting the total water consumption data shows a return to a continuation of the previous trend from 2011-2014, where the Lycoming Campus used lessening amounts of water each year. In 2015, there was a slight increase from the previous year but 2016 continues the trend of using less water on campus. In 2016, the decreasing trend returned and water usage is at its lowest level since the audit began.

## Sewage

The Williamsport Sanitary Authority (WSA) treats all of Lycoming College's sewage. The WSA maintains two secondary wastewater treatment plants, the Central Plant and the West Plant. The Central Plant serves residents living in the Williamsport area lying east of Lycoming Creek, eastern Loyalsock Township, South Williamsport, and Armstrong Township. The West Plant on the other hand, serves customers residing in the Williamsport area lying west of Lycoming Creek, portions of Old Lycoming Township, Loyalsock Township, Lycoming Township, and Duboistown. It is estimated that approximately 10.5 million gallons of water per day (mgal/day) passes through the Central Plant and 5.5 mgal/day of water passes through the West Plant. Lycoming College's sewage goes directly to the Central Plant near Basin Street.

A \$125 million upgrade of both the West Plant and the Central Plant was mandated by the Environmental Protection Agency and the Department of Environmental Protection in an effort to reduce nitrogen and phosphorus discharge levels to the Chesapeake Bay and to also reduce the frequency and severity of combined sewer overflow systems (CSOs). Modifications to the West Plant began in 2000 and were recently completed sometime between 2011 and 2012. The West Plant upgrade was meant primarily to reduce the discharge severity of combined sewer overflows, but nitrogen removal capabilities were also incorporated into construction. The Central Plant however, is still in the process of being upgraded and construction is focused primarily on reducing the nutrients, namely nitrogen and phosphorus, which are discharged to the Chesapeake Bay. However, there is also hope that the upgrades being made to the Central Plant will help to reduce combined sewage overflow events that occur during heavy rains. Combined sewage overflow has detrimental effects to the health of the Chesapeake Bay because storm water that comes into contact with roadways and sidewalks can transfer raw sewage directly into the West Branch of the Susquehanna River. The upgrade of the Central Plant in particular, is a proactive move that reduces nitrogen concentrations in the West Branch as a part of the Chesapeake Bay initiative and has had success in lessening a factor that has had so much of an effect on the bay.

The upgrades to both plants have improved nitrogen and phosphorus discharges, which could help the bay to recover by reducing eutrophication that can lead to "dead zones" with low levels of dissolved oxygen that has been detrimental to many macroinvertebrates, fish, crabs, and other fauna. A brief summary of the nutrient improvements can be seen in the following:

### Nitrogen Discharge Improvements as a Result of Combined Plant Upgrades

Combined Nitrogen Discharge 2010-2011	Nitrogen Discharge in 2013 (first nine months)	Permit Level of Nitrogen Discharge
602,251 lbs	189,443 lbs	230,970 lbs

*\* Table 2 shows that as a result of the combined plant upgrades, the nitrogen discharge is now under the mandated permit level.*

### Phosphorus Discharge Improvements as a Result of Combined Plant Upgrades

Combined Phosphorus Discharge 2010-2011	Phosphorus Discharge in 2013	Permit Level of Phosphorus Discharge
54,017 lbs	28,755 lbs	30,002 lbs

*\* Table 3 shows that as a result of the combined plant upgrades, the phosphorus discharge is now under the mandated permit level, but could still use improvement.*

On March 27, 2013, the Williamsport Sanitary Authority signed a sales and service agreement to acquire and maintain the sanitary collection system that was previously owned by Loyalsock Township. The purpose of the agreement is to direct finances onto purchases and investments that are more important to sanitary treatment by reducing administrative costs and unnecessary operational costs and equipment purchases.

Ultimately, the upgrade of both the West Plant and the Central Plant may lead to a reduction in the rate customers pay for sewage treatment. Over the past five years, in particular, rates imposed to customers have been high in order to fund the construction of the two upgrades. According to John Baker, the authorities' director of finance at the Williamsport Water Authority, "On average, a household using 52,000 gallons a year pays \$808 annually" (Maroney, 2013). Until all nutrients credits are purchased and other costs involving the operation, administration, and construction of the upgrade are handled, budget costs are expected to remain high. According to Doug Kuntz from Buildings and Grounds, the campus is currently paying 1.5 cents per gallon for domestic sewage and water for the years 2013 and 2014.

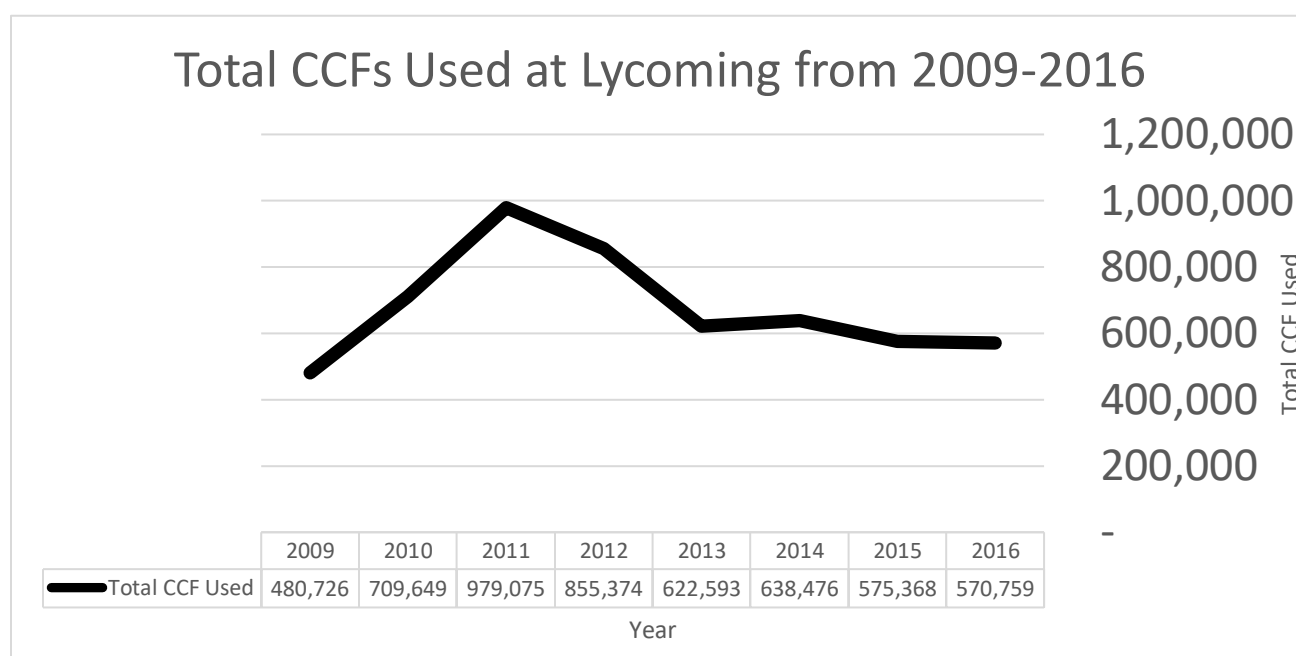
The Lycoming College Clean Water Institute (CWI) has participated in an educational effort in the city of Williamsport to encourage the public to not dump materials down storm water drains. Storm water that contains materials like trash, grease, grass, and motor oil is not treated like sanitary waste water and many residents are not aware that the harmful chemicals contained in these substances are carried to the Susquehanna River, and eventually to the Chesapeake Bay. In Williamsport, there are 13,000 storm water drains, with one hundred and ten of these located in and around the campus of Lycoming College. In the past, CWI interns were engaged in a storm water stencil project to warn the public to not dump down storm drains and to promote awareness about how harmful chemicals from wastes find their way back to the Chesapeake Bay.

### Natural Gas

In 2008 Lycoming College used a considerably higher amount of gas than in 2009. During this year, the temperatures dropped by an average of 4-6° Fahrenheit between January and March across the northeastern United States. Due to this drop-in temperature, the school required more gas to heat campus buildings. To compensate for the increased gas usage, the college reduced the temperatures in the dormitories (East, Wesley, Williams, Forrest, and Asbury)

during winter break to 58° Fahrenheit. Typically, dormitories are kept at 68° Fahrenheit, but in 2008 temperatures decreased by an additional 10°.

In 2010 Lycoming College switched its natural gas provider from UGI Utilities, Inc., a subsidiary of UGI Corporation, to Hess Corporation because the latter provided more economic benefit. Hess Corporations provided the school with the ability to consolidate its gas usage totals from all of the campus buildings. This meant that the school could now purchase MCFs (1000 cubic feet) rather than CCF's (100 cubic feet). However, this switch only lasted one year and even when Lycoming switched the College still used UGI's gas for a plethora of buildings. In 2016 Lycoming College continues to use UGI as its provider of natural gas and the CCF measurement. All of the calculations performed in this audit regarding natural gas are measured and referred to as CCF, instead of MCF.



-Figure 3 depicting total natural gas usage for Lycoming College from 2009-2016.

Figure 3 illustrates a decreasing usage of natural gas since 2011. From its peak usage in 2011, the total CCF's have been almost cut in half. This decrease could be influenced by weather and warmer winters. Then with warmer weather, less natural gas is needed to heat the buildings on campus. Yet, the decrease could also be attributed to the end of the large gas boom in the Northcentral Pennsylvania area. From 2010-2012 especially, there was a large increase in drilling for natural gas near the college. An increase in drilling meant more gas was available for use at a lower cost, therefore being a preferable energy of choice for the college. The five largest consumers of natural gas in 2016 in ascending order were: Skeath, Lamade Gym, Wertz, Academic Center, and Heim. With 2016, Heim has now been the largest consumer of natural gas three years in a row.

## Dining Services

There is a focus on the food sector of the College in this audit to determine where our food comes from and how much of it is organically and locally grown. Buying from local farmers strengthens the economy of the local community by cutting down the travel time it takes food to arrive to dinner tables.

Lycoming College outsources its food services to Parkhurst Dining, a company whose commitment to sustainability is a leader in the industry. While most of Lycoming's food comes from USFood's distribution center in Altoona PA, Parkhurst also purchases food nationwide, much of which is bought locally and in various other areas of Pennsylvania. According to Leslie Ekstrand, the General Manager of Dining Services, milk is purchased from Schneider Valley Farms distribution center, located on Third Street in Williamsport, PA. Schneider Valley Farms, in turn, purchases its milk from farmers in Pennsylvania and New York. Bread and buns are purchased from the Bimbo Bakery branch in Northumberland, PA, sub rolls are purchased from New Lycoming Bakery in South Williamsport, PA, and bagels are purchased from Georgie's Bagels in Berwick, PA. In season local vegetables are purchased from Pocono Produce in East Stroudsburg, PA and in season apples, peaches, and pears are purchased from Dries Orchard in Sunbury, PA. Canola oil is purchased from Susquehanna Mills Co. in Montoursville, PA. The oil provided by this company is converted to biodiesel in a processing shed located on Willow Street in Williamsport, PA, and later returns to the Susquehanna Mills Co. to be used as fuel on the Susquehanna Mills Co. farm. Pork products are purchased from Clemens Food Group in Hatfield, PA and ground beef is purchased from Milky Way Farms in Troy, PA. In addition, the purchase of farm shares from Walnut Run Farm located in the Nippenose Valley in Lycoming County, PA has been considered. Walnut Run Farm is a local farm specializing in the producing of vegetables like artichokes, cucumbers, onions, beans, beets, carrots, tomatoes, lettuce, squash, and more. Efforts are made to purchase from local sustainable farms whenever possible, and Lycoming College Dining Services currently purchases around 20% of their overall purchases from vendors that are considered local, or are within 125 miles of the college.

Sustainability efforts have also reached Lycoming College's other dining locations like Jack's Corner and Café 1812. Jack's Corner is making an effort to transition from using aluminum foil to waxed paper to wrap food that is taken out by students, but hasn't fully made the switch. In the future, the establishment hopes to eradicate its use of aluminum foil all together. According to Jay Breeding, the Assistant Director of Dining Services, plates that are now used are tree-free and to-go containers are made from corn and are biodegradable. Management has now replaced Styrofoam cups with cups made from more cardboard material. However, Jack's is required by the company that makes the Freshens smoothies to keep the Styrofoam cups for its smoothies. Café 1812, which is a small establishment that serves coffee and food products to students and faculty, uses cardboard for its drinks. Additionally, Café 1812 participated in the Fair Trade Agreement with coffee bean farmers who will only buy coffee beans from sustainable farms, or farms that are working towards becoming sustainable. Starting in 2017,



Café 1812 will be moving to Alabaster coffee products (still Warrior One Bean). The business is actively involved in sustainability by serving organic coffee, and recycling paper products like soup bowls, bakery bags, coffee bags, and plastic products like milk cartons. To encourage sustainability on campus, the establishment offers a discount on regular coffee if students bring their own reusable cup. Package products are also reduced to two per meal swipe. Café 1812 now charges for plastic cups for water, but if an individual brings a reusable the water is free. To improve sustainability in Café 1812 employees have suggested recycling receipts used in taking orders because they generate around three trashcans worth of waste each day.

Dining Services has been striving to become environmentally sustainable through its catering practices and efforts are being made to replace plastic ware with chinaware and to suspend the use of plastic utensils. There have even been considerations to buy recyclable utensils and/or “spudware,” utensils made from potatoes! For instance, the sustainability sector at the University of Wisconsin-Green Bay has utilized biodegradable dishware that is made of corn, potatoes, and limestone (Patrick et al. 2008). However, plastic utensils are still used occasionally and these goals have not yet been reached.

At the beginning of the spring 2014 semester, dining services introduced the Reusable To-Go Container Program as a way to reduce waste and promote campus sustainability. The program replaced unsustainable plastic containers with containers that are washable. Prior to the implementation of this program, it is estimated that Lycoming disposed of approximately 1,500 to 1,700 plastic containers weekly and 24,000 containers throughout the semester. Currently, there are six hundred “green” boxes that are being distributed in the cafeteria, all of which that are washable, reusable, and responsible for reducing the waste existing prior to the spring semester. The program, despite being received with mixed feelings, is a convenient and easy system for students, especially if they are on a meal plan. Students using a meal plan can simply ask for a to-go box, use it, bring it back to Wertz to be washed, and receive a “green box ticket” that enables them to obtain another box. Commuter students or visitors who are not using a meal plan must pay \$4.50 for their first box and must return the box to the cafeteria to be washed. According to Leslie Ekstrand, the General Manager of Dining Services, approximately 100 to 125 students ordered take-out prior to the implementation of the Reusable To-Go Container Program and currently, around 110 to 140 students ask for take-out with the “green” boxes. Based on these statistics, Ms. Ekstrand does not believe that the boxes are having any effect on student to-go practices yet, perhaps due to students’ difficulties with handling change.

In February of 2014, dining services entered a partnership with Northern Tier Sustainable Meats, a consortium of local beef organizers brought together by Kim Seeley of Milky Way Farms in Troy, PA. Kim Seeley established Northern Tier Sustainable Meats in 2005, and since its establishment, it has offered customers a local, sustainable, and convenient way to purchase a variety of meats including pork, ham, and beef. Founded in 1962 by Lewis Seeley, Milky Way Farms is currently operated by the 4th generation of the Seeley family to produce beef from grass-fed cattle. In addition to producing beef from livestock that are grass-fed rather than corn-fed, the Seeley family also practices pesticide-free farming, pasteurizes and bottles milk at

the farm rather than at a plant, and sustainably produces other dairy products like butter, heavy cream, ice cream, and cheese. By being local, Milky Way Farms reduces packaging and travel costs normally associated with factory processing by selling its products directly through its Milky Way Store, as well as through Penn College of Technology, Bullfrog Brewery, and the Peter Herdic House in Williamsport. The partnership between Dining Services and Northern Tier Sustainable Meats is an environmentally friendly decision that reduces travel costs, saves oil, and gives students meat that is more likely to be higher in nutrients.

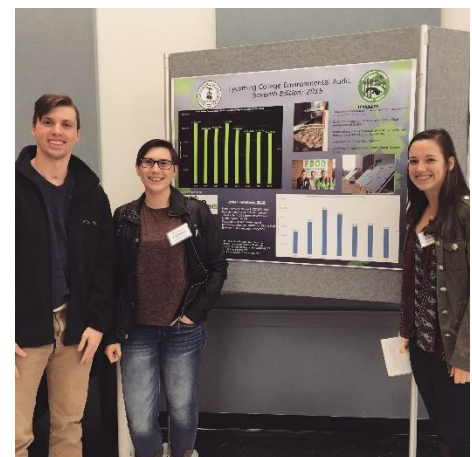
2016 saw the introduction of the renewable cup program in Wertz. The to-go cups were removed and each student was given a Lycoming cup valued at 7 dollars. Cups can be used to take drinks from Wertz, but must be cleaned by the student. The cup will be given at the beginning of a student's freshman year and if lost students can purchase a new one from the book store at \$7. Reusable cups are also available at Café 1812 for thirteen dollars. Removing the to-go cups has an estimated savings of \$40,000 for dining services each year. This money could then go into serving higher quality food during the school year or supplement the purchase of new equipment. The waste that was generated by the to-go cups was approximately 6,000 to 8,000 cups weekly, which added up to around 96,000 cups throughout the semester; a staggering amount of waste surmounting the waste produced by the plastic to-go containers. Mount Holyoke College's "sustainable mug" program has saved them approximately 31,000 gallons of water and 5 tons of paper, a staggering amount of material that was used in the manufacture of the 322,700 paper cups used by the college annually.

### **Warrior Coffee (<http://www.lycoming.edu/coffee/> )**

In October 2014, Lycoming College joined the Cultivation to Cup (C2C) network, partnering with Golden Valley Farm Coffee Roasters (GVF) and Parkhurst Dining, to offer Warrior Run. Warrior Run is Lycoming College's own brand of organic, shade-grown coffee from the Las Lajas farm in Costa Rica.

### **Food Waste**

Dining Services has been changing its own policies in the last few years in an effort to become more sustainable. The tray-less initiative, which dining services introduced in the 2008-2009 school year, was one a notable change that helped to reduce food waste and water usage. First, trays were not used on Tuesdays and then, an additional tray-less day was added each week until trays were no longer available. The purpose of the tray-less dining hall is to:



- *Photograph of Sustainability Committee members at the 2015 PERC conference at Penn State*

- 1) Reduce the amount of food waste produced
- 2) Decrease the amount of water going into and out of the Wertz Student Center

- 3) Reduce the amount of electricity used in running the dishwashers
- 4) Decrease the amount of dish washing chemicals that are purchased and wasted

As a result of this initiative, dining services was able to reduce the amount of food waste that is comparable to that which is produced by eight, fifty gallon trash cans, and water usage by about 360,000 gallons per semester.

All campus wastes are disposed of at the Lycoming County Landfill. Prior to 2014, all food waste was mixed in with other solid wastes from around campus and was measured in tonnage. Because of limited space, there were no dumpsters outside of the Wertz building and each day, food waste was refrigerated in order to reduce odor and insect problems. The waste was then transported to the county landfill for disposal.

However, in January of 2014, the Sustainability Committee launched the Food Recovery Network, an organization that assists colleges in collecting food from dining halls and other campus dining facilities to donate to local food banks and soup kitchens. This new initiative was made possible by the Bill Emerson Good Samaritan Act, which helped to cover any liabilities, and a grant that covered the cost of the containers that were used to transfer food. Collections are made by volunteers and members of the Sustainability Committee Monday through Friday and are delivered each week to the American Rescue Workers. The Food Recovery Network is a new organization that seems to have much promise for lowering food waste from campus and for helping the local community.

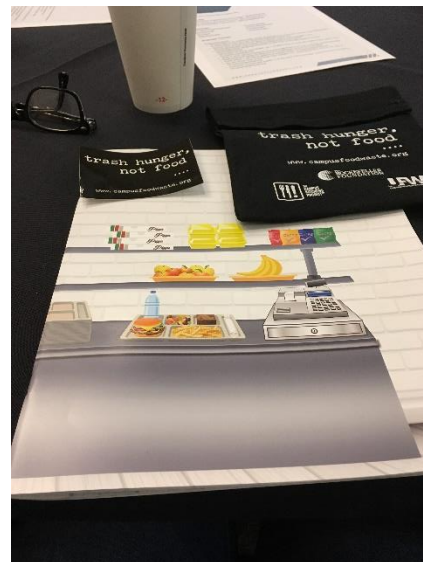
### ***Food Waste & Hunger Summit***

The weekend of April 5 and 6 at Northwestern University in Evanston, IL marked the first annual Food Waste & Hunger Summit, which was co-hosted by the Campus Kitchens Project and the Food Recovery Network. The conference served to gather student leaders who have worked to reduce food waste in their own communities in an effort to educate and introduce them to new ideas relating to the reduction of food waste and problems concerning food insecurity. Students attending the conference listed to a variety of experts from fields relating to social justice, social enterprise, public health, and non-profit management in order to learn more about how they could work more efficiently with their local communities.

The Campus Kitchens Project (CKP), a co-host of the event, provides community service for students that focuses on hunger relief through the development of models that are used to combat hunger in the students' local communities. In other words, the project aims to build strong leaders out of high school and college students alike, by encouraging them to develop solutions to problems they encounter in their schools and their towns and cities. The Campus Kitchens Project works to help communities help themselves by building leaders who are capable of developing solutions to poverty and food waste. The overall mission of the Campus Kitchens Project is to strengthen bodies by using existing resources to satisfy the hunger and nutritional needs of the community, empower minds by providing leadership opportunities for students and educational benefits for adults, and to build communities by building a network of

partnerships among students, schools, and businesses. Currently, fifty-two schools, including Lycoming College, are involved in the Campus Kitchens Project and are actively involved in a food reduction program like the Food Recovery Network at their institution.

In the spring of 2014, three Lycoming students, Emily Vebrosky '14, Lynette Dooley '15, and Julian Jones '16, attended the Food Waste & Hunger Summit conference in Evanston, IL. Throughout the entire semester, the Sustainability Committee has been working alongside LEAF and student volunteers to recover leftover food from the cafeteria every Monday through Friday after lunch and dinner. The food that is recovered is then donated to the American Rescue Workers in Williamsport, PA. As of May 1<sup>st</sup>, 2017, the Sustainability Committee at Lycoming College has recovered 33,440 lbs of food from the cafeteria to be donated!! The impact this has on the community is unquestionable, especially with American Rescue Workers as the college is their primary food provider. The college will undoubtedly continue participating in the Food Recovery Network in the future and help the community as the years go on.



## ***Appliances***

In an effort to make the campus more sustainable, employees have been urged to turn off their appliances after they are finished using them. This request to Lycoming's workers to "Flip it Off" has been of particular importance because the majority of the appliances on campus are at least thirty years old. However, outdated appliances are gradually being replaced with newer, more energy efficient appliances as they wear out. In 2009, Dining Services made the switch to a more sustainable, electric gas oven. Electric gas ovens contain no pilot light, spark and light on demand, and are better insulated; qualities that all work to reduce cooking time. Many light fixtures have begun using Compact Fluorescent Light (CFL) bulbs with special care being taken to not use CFL bulbs on lights that are used to warm food. Dining services management also tracks the costs of equipment repairs in comparison to the original cost of the equipment to determine whether or not it would be more cost effective to replace that piece of equipment with a more sustainable model. The most energy consuming appliances in the kitchen are the dish washer, bakery oven, and the coolers and freezers. The dish washer generates a high amount of energy because it runs constantly is fueled by steam-generated water pumps. The bakery oven generates a large amount of energy because it is continuously rotating, and the coolers and freezers owe their high energy to the fact that they are continuously running for twenty-four hours throughout the entire week.

## ***Other Initiatives***

Parkhurst Dining Services, in addition to purchasing its food from local farmers, working to reduce food waste by participating in the Food Recovery Network, and helping to reduce

energy by turning off appliances when not in use, is helping with environmental sustainability in other ways. Parkhurst is working with the school to convert used fryer oil into biodiesel fuel for use by the Susquehanna Mills Co. farm. Cardboard products are currently being recycled, and efforts are being made to find available space to recycle more plastics. During the 2008-2009 school year, dining services replaced individual ketchup bottles on each table with a condiment station containing fast food-style pump dispensers. In addition to this, bleached napkins were replaced with napkins made from post-consumer recyclable materials.

Parkhurst and Lycoming College's Building and Grounds staff are looking into more ways to recycle the large volume of cans and plastic bottles that are generated every week by the college. Currently, the cans and plastic bottles are picked up each day and sent to recycling by the building and grounds crew.

## **Solid Waste**

All solid waste that is generated at Lycoming College, except that which is recycled, is collected by Fred Hamm Inc., which serves Lock Haven, Jersey Shore, Williamsport, and surrounding areas in Pennsylvania. The collected waste is then disposed of at the Lycoming County Landfill in Montgomery, PA.

The Lycoming Landfill is located just off of Route 15 on property leased from the Federal Bureau of Prisons and is the only municipal landfill in Pennsylvania, serving mostly Lycoming and Union counties; no out-of-state waste is accepted. The landfill receives about 1,100 tons of municipal solid waste per day and is the home to an extensive county-wide recycling program that offers biweekly curbside pick-up and generated approximately \$1,618,544 in revenue from the sale of recycled materials in 2008. The Lycoming County landfill is a Cogeneration plant, which means that they generate electricity and useful heat while simultaneously using power to generate their facility. In fact, they generate enough electricity to power about 1,400 homes and provide hot water to all on-site buildings without having to use fossil fuels. Lycoming College is proud to call the Lycoming County landfill their definitive waste receivers because they are one of the most environmentally-minded landfills in Pennsylvania. Recycling is then collected by the landfill every Monday and Wednesday, where it is processed.

## ***Recycling***

Climate change, groundwater contamination, and greenhouse gas emissions are becoming of greater concern to environmentalists and individuals with an average or below average interest in the environment, alike. The EPA estimates that increasing the rate of recycling from 30% to 35% is enough to reduce greenhouse gas emissions by ten million metric tons of carbon equivalent (Patrick et al. 2008), suggesting that steps taken by small campuses like Lycoming are enough to make a difference. Every building on campus is equipped with recycling bins on



each floor that are able to collect recyclables such as glass, plastic, aluminum, and paper. In addition, bins have been installed in each computer lab specifically for the collection of paper and other recycling bins have been placed in the professors' offices. However, recycling is more extensive in the dormitory buildings because the trash rooms house glass, plastic, aluminum, newspaper, white paper, magazine, and cardboard recycling, as well as general trash cans. It is our hope in the future to install permanent glass, aluminum, and plastic recycling units beside each trash can in every building.

In March of 2012, Lycoming College received nearly 1,600, six gallon blue recycling bins that appeared in every residence hall upon students' return from Spring Break. The receptacles were provided by the ALCOA Foundation's grant to encourage students to enhance their recycling efforts. Any excess bins were placed by the Building and Grounds staff in classrooms, faculty offices, and other common areas.

The ALCOA Foundation grant was discovered as a result of Lycoming College's participation in RecycleMania, an eight week competition between colleges and universities that is meant to reduce waste, increase campus recycling efforts, generate attention towards recycling programs, and encourage students and faculty to pay attention to how much of their waste is actually being recycled and how much is being wasted so their campus can become more sustainable. With the help of Dr. Sue Gaylor, who drafted the proposal to help enable the school to acquire the bins, Lycoming College was one of thirty-two schools that were awarded the grant. Part of the stipulations of receiving the containers however, includes monitoring the impact that the bins have on student recycling efforts, which is a task that is assisted by the weight measurements and data collection that is required by RecycleMania.

As of 2015, Lycoming College is now a single-stream recycling university. Being single-stream means that any recycle material can go into the bins, making it easier than ever to recycle. Recyclables are then weighed by the recycling trucks once they arrive at the landfill. Once at the landfill, recyclables are separated into their own designated sections at the plant. In the future, having more outdoor recycling bins could increase the rate of recycling on campus. Currently, there is only one outdoor recycling bin located at the Snowden Library and Academic Center entrance.

## ***RecycleMania***

Lycoming College is an annual participant in RecycleMania, a recycling competition active in the United States, Canada, and a few other countries that challenges colleges and universities to promote waste reduction over a 10-week period. This year, RecycleMania ran from January 24 to April 2; the first of the two weeks act as a preliminary trial period.

Increased awareness for recycling through the efforts of the LEAF organization and the Sustainability Committee has helped to promote student interest in recycling and waste reduction. Currently, efforts are being made to re-label the trash rooms to help make sorting recyclable materials easier to understand for both students and members of the Sustainability committee and volunteers who assist in recycling collections. Grants, like the ALCOA Foundation grant received in 2012, has helped to improve sustainability on campus by helping to ensure that recycling can be monitored through the use of small bins issued to each and every student.

In 2007, the first year Lycoming participated in the RecycleMania competition, Lycoming was ranked number one out of the ten Pennsylvania colleges and universities in the category of pounds and cans per person weekly. Lycoming won by recycling more recyclables both per person and overall than Dickinson College, Bucknell University, Millersville University, and Shippensburg University, among others competing that year. Overall, Lycoming ranked 12th out of 15 Pennsylvania schools in regards to collections of paper, corrugated cardboard, and food service organics. It is a hope that through awareness, both by the Sustainability Committee and the LEAF organization, that Lycoming students can be encouraged to recycle to this magnitude again in the future.

Now that Lycoming is single-stream we can no longer do individual categories of recycled items. The two available categories we can participate in are, total recycled goods and per capita recycling. The 2016 Recyclemania competition showed that Lycoming College has plenty of work to do to improve recycling amounts. Overall in total amount recycled, Lycoming College placed 198 out of 217 with 13,828 lbs recycled. In the per capita competition, Lycoming College placed 137 out of 245 with 8.096 lbs recycled per person. Increasing initiatives in recycling across campus will then improve these numbers and demonstrate that Lycoming is a leader in 21<sup>st</sup> century recycling and sustainability.

## ***TerraCycle***

Natural resources like water, timber, air, and even raw materials used for processing seem inexhaustible at times, but in reality, are diminishing in quality and amount as unsustainable waste practices persist. Waste, if not recycled, is typically disposed of in a landfill where it poses a risk of leaching chemicals into the soil and contaminating groundwater. If the waste is incinerated however, a more serious danger could arise in the form of dioxin, a persistent chemical that has been seen to cause cancer and other health effects. Recycling is practiced on campus regularly, and requires that material be extracted from an item in order to transform it into a new product. Recycling is an effective way to reduce waste and is undoubtedly a better option than disposal in a landfill or incinerator. However, upcycling is a revolutionary technique that reduces even more waste by using every aspect of the item in order to make a new product. Two factors that are central to TerraCycle processing are the material the item is made from and the shape of the item. The program will then use the material and shape of the item in processing to create a product that can be used for a longer time without melting or changing the structure of the item in any way. The TerraCycle Program, by using every part of a

recyclable in processing, reduces waste, eliminates the need for raw materials and processing, saves money that would be needed for manufacture, minimizes environmental impact, alleviates the effects of resource depletion and water withdrawal, and reduces the carbon footprint by lowering carbon emissions.

TerraCycle was established by the Sustainability Committee at Lycoming College during the spring semester of 2014 and is slowly growing into an organization that could become a popular way of reducing solid waste on campus. All bins that are used are located in the trash rooms and are made from 100% recycled plastic. The Sustainability Committee and any volunteers who are doing collections record the number and weight of the items present. An accurate record of the weight of the items is critical because the TerraCycle program is based on a point system of \$0.01 per item. The money earned from the TerraCycle point system accumulates quickly and Lycoming College currently donates all of its earnings to Charity: Water, an organization that works to bring clean drinking water to people in as much as twenty-two developing countries, specifically in areas like Sub-Saharan Africa, Central and South America, and South Asia. Charity: Water uses donations to find sustainable solutions for people in rural, impoverished areas through partnerships with local organizations in project areas.

The Sustainability Committee at Lycoming College is participating in 13 different TerraCycle Brigade Programs: Tom's of Maine Natural Care brigade, Personal Care and Beauty brigade, Brita® brigade, Solo® Cup brigade, Scotch® Tape brigade, Cleaner Packaging brigade, Drink Pouch brigade, Energy Bar Wrapper brigade, MOM Brands® Cereal Bag brigade, GoGo squeeZ® brigade, Bear Naked® brigade, Entenmann's Little Bites brigade, and Writing Instruments brigade.



*Above: New Terracycling bins introduced in 2015*

The Solo Cup Brigade collects plastic #6 Solo® cups and upcycles them into items like recycled dog bowls. The college is awarded two TerraCycle points for each unit of waste, which is any shipment over six pounds. The Personal Care and Beauty Brigade collects a variety of personal care items including shampoo, conditioner, hair gel, and hair spray bottles, caps, and triggers, lip balm and chap stick tubes, lipstick containers, powder and eyeliner cases, eyeliner and lip liner pencils, and much more. The Personal Care and Beauty Brigade will upcycle these items into products like tote bags, spiral notebooks, and pencil cases and the college receives two points per unit of waste as long as the shipment is over ten pounds. The Energy Bar Wrapper Brigade by Clif Bar is a focused collection of Clif Bar and Co. product packaging and any foil-lined energy bar, granola bar, and protein bar wrapper. The wrapper that is collected is

upcycled into items like duffel bags, notepads, and clipboards, and the college gains a point per unit of waste as long as the shipment is over a pound. The Tom's of Maine Natural Care Brigade focuses its collection on mouthwash bottles and caps, deodorant containers and caps, toothpaste tubes and toothbrushes, soap packaging, and floss containers. TerraCycle upcycles these personal care items into home décor products like paving stones and patio chairs, and the college receives a point per unit of waste as long as the shipment is at least two pounds. 2016 saw the Sustainability Committee ship out 15,070 Terracycle items and raised about \$150 for charity.

## ***E-Waste***

E-waste is any form of consumer and business electronic equipment that is near to, or at the end of its useful life, and makes up about 5% of all municipal solid waste worldwide. Despite its small proportion in comparison to other forms of waste, it is much more hazardous, in that it contains compounds like cadmium, lead, mercury, and polychlorinated biphenyls (PCBs) that can damage human health and the environment.

An interview with Dave Heffner, head of the Information Technology Services (ITS) department, has helped to explain how Lycoming College handles its e-waste. Heffner said that the college is on a five-year cycle of computers with many of the newer ones entering the general computer labs and power users about every two or three years. The older computers are removed, and experience "tumble down," or reuse, in the professors' offices or labs. Computers that are out of commission are either sold to campus employees or traded into the manufacturer. An interview with Heffner revealed that IT Services does not strip large devices like hard drives and spam servers for parts and also does not strongly rely on eBay to sell unused electronics. The computers that are not purchased are sent to Computer Parts and Electronics in South Williamsport, and are stripped of parts, sold, and recycled if they are unable to be sold. Upon removing all hazardous materials and scrap metal from the electronics, Computer Parts and Electronics ships all devices to Staiman's Recycling Corporation in Williamsport, PA. Computer Parts and Electronics will come to the campus to do a pick-up when outdated e-waste fills the ITS hallway to a level of about 224 cubic feet.

Lycoming College is fairly conservative in its five-year e-waste cycle considering that most other institutions operate on a two to three-year cycle, which generates more waste annually. Additionally, the servers or network equipment that are ready to be replaced are either traded into the manufacturer or sold on eBay and their destination is undetermined.

IT services has been actively pursuing other sustainable measures that many people may not have been aware of. In 2012, they started a five to six-year project where they began phasing out bulky, less-efficient equipment for newer, less energy consuming devices. In addition, they started implementing SANs (Storage Area Network devices) that house the faculty F-drive, student H-drive, and e-mail accounts. SANs are large specialized storage equipment that can be logically divided into smaller storage spaces instead of having separate storage in many

individual servers. The switch has reduced the cost of electricity to run, heat, and cool the SANs because one large server is more energy efficient than many small servers.

VMware is another innovative idea that has been utilized by IT Services. VMware, which refers to virtual machines, is an efficient idea that made it possible for IT Services to go from forty-seven servers to only ten. VMware makes it possible for IT Services to have fewer computers and instead, use a larger computer to increase utilization, consolidation, and efficiency while simultaneously decreasing heat, cooling, and electricity costs.

Other sustainable measures that IT services encourage include having student lab monitors shut down all computers every night and having faculty members do the same. This energy saving step is similar to the initiative that has been undertaken by the University of Ohio, in which Computer Management Software is used to shut down computers every night when not in use. This initiative saved the university approximately 15,150,000 kWh in energy and 15,000 tons of CO<sub>2</sub>, and its similarity to the step taken by IT services may give insight to how much energy is really being saved on campus (Patrick et al. 2008). In another initiative to control waste, a printing curve was calculated in 2000 to project the adequate print balance that should be allotted to all students. This allotment was determined to be six hundred pages and minimal charges were added onto the accounts of those who went over the printing limit during the semester. The limit on printing was implemented because it was noticed that the paper waste in every computer lab was astronomical without a penalty for over-printing set in place. In addition, IT services recycles their toner cartridges after every use, and also recycles their cardboard boxes for shipping purposes when selling old servers on eBay.

Recently, the campus has converted the phone system to voice over IP (VOIP), which is a much more efficient way to offer phone services than the older large PBX equipment. In the future, more equipment will be consolidated into fewer, more efficient units.

Routine e-waste collections are made by Computer Parts and Electronics of South Williamsport, and IT collects E-waste once a month in their office. In the future, the college hopes to partner with the Funding Factory, a program that is a branch of Clover Technologies Group. The program is unique in that it provides fundraising to non-profit organizations like K-12 schools, colleges and universities, churches, local charity organizations, sports teams, and clubs and has no charge for participation and shipping for recyclables. The Funding Factory was established in 1997, and it is estimated from the Sustainability Report that is available on their website that approximately 14,118,678.81 lbs. of e-waste has been recycled through the program and that 58% of this waste consists primarily of inkjet cartridges. Since the Funding Factory's founding, it has helped raise over \$35 million dollars for non-profit organizations, making it one of the most popular fundraising-thru-recycling programs in the country. The program accepts a variety of products including laptops, laser printer cartridges, cell phones, and small electronics like digital cameras, mP3 players and iPods, GPS systems, and headsets. The Funding Factory works like TerraCycle because participants can redeem recycling points they accumulate for cash that they can either convert into a check that they can receive through the mail, or can use the cash they earn to buy a variety of classroom supplies and technology like tablets, laptops, printers,



projectors, and more in the Rewards Catalog. In addition to fundraising, the program can also help businesses recycle their ink cartridges, which can serve as an indirect form of fundraising for the business' non-profit organization of choice. The Funding Factory would be a great addition to Lycoming's sustainability program because the program is easy, free, and is compatible with a variety of brands. The program even offers a ten cent minimum for all broken items, and the cash refunded for recyclables like some cell phones may reach up to \$108.00, which can be converted into cash that can be used by a non-profit organization. It is a hope that this program can be permanently implemented at Lycoming College in order to reduce e-waste that is landfilled, earn money for the college, and further spread awareness for sustainability on campus.

## **Campus Involvement**

### ***Sustainability Committee***

The Sustainability Committee is a body of students and faculty members dedicated to the development, implementation, and promotion of environmental sustainability at Lycoming College. The committee works closely with Sustainability Coordinator, Dr. Mel Zimmerman, to develop initiatives that will promote campus environmental sustainability. The Sustainability Committee often reaches out to members of LEAF and other volunteers for assistance with sustainability projects like RecycleMania and Earth Week.

### ***Clean Water Institute (CWI)***

The Clean Water Institute (CWI) provides services to local watershed and environmental groups by developing and coordinating internships and independent study projects and making them available to Lycoming College students. Watershed projects that are offered to interns through the CWI require that they assist in data collection and analyses of water chemistry. In order to fulfill these requirements, the CWI team carries out any analysis in their water testing laboratory, which provides the groups with technical assistance in the design, collection, and interpretation of water chemistry. In addition, the college's CWI lab assist's interns in their analyses and interpretation of any data they find relating to macroinvertebrates, plankton, and fish. All data that is analyzed in the CWI lab is archived and continuously updated as ongoing projects develop, and results are made available to the public in order to promote awareness relating not only to the environment, but also to the health of watersheds and the Susquehanna River. The CWI, in addition to research, also provides educational and training programs. These programs may include an array of seminars and workshops focusing on a multitude of environmental issues, such as stream restoration, habitat improvement for native wildlife species, and water quality, and these awareness programs are offered to groups such as watershed awareness clubs and local schools.

The CWI is also responsible for the 3.1 kW 15 panel photovoltaic (PV) system that was installed on the Heim Science building on November 12, 2009. The solar power that these panels generate is sent to a power grid in Heim as a source of green energy that can be used throughout the facility. In addition, CWI interns also have an opportunity to study the Eastern Hellbender (*Cryptobranchus alleganiensis*), which is an entirely aquatic salamander that is an important indicator of water pollution that is now only found in drainage areas of the Allegheny, Ohio, and Susquehanna Rivers. Interns working with Dr. Petokas not only have a wonderful opportunity to do unique research with a species that is unknown to many people, but also have a chance to promote awareness as to how human activities can have a profound impact on surrounding ecosystems and the wildlife inhabiting its streams, forests, and other habitats.

### ***Lycoming Environmental Awareness Foundation (L.E.A.F.)***

In order for change to occur on campus, it is crucial that students, faculty, and administration are all actively involved with sustainability efforts. Lycoming College is an institution that encourages opportunities meant to better its community through campus organizations. The green initiative began on Lycoming College's campus in 1992 with the founding of the Lycoming Environmental Awareness Foundation (LEAF), which is made up of a group of students who strive to create an environmentally friendly campus. The group's purpose is to raise awareness about sustainability issues and ultimately, act on that awareness to promote change.

The majority of LEAF's activities are outdoors, but community service activities are also a priority, with events focusing on stream, park, and highway cleanups. In addition to this, the club donates and participates in the American Cancer Society's annual Relay for Life. LEAF's other trips and activities include, camping, hiking, kayaking, and rafting. The organization also works closely with the Sustainability Office to coordinate RecycleMania, an eight week recycling competition, and Earth Week, a weeklong celebration of Earth Day, both of which occur in the spring. During Earth Week, students can participate in an array of sustainable activities like potting plants and park clean-ups, awareness programs, and can listen to lectures by interesting guest speakers.

During the spring 2014 semester, LEAF collaborated with the Sustainability Committee to assist with the Food Recovery Network, an organization that is showing potential as a way of reducing campus food waste while helping those in the community.

For 2016, LEAF will again be active in a variety of recreational environmental activities. Trips to Reptileland, Penn's Cave, and the Baltimore Aquarium will occur in the fall semester. These trips will allow students to appreciate a variety of different animals and natural structures (especially in Penn's Cave). LEAF will sponsor their main event of Earth Week in the spring semester, where students can participate in a variety of free activities that grow an appreciation of the outdoors.

## ***Outdoor Leadership Education (OLE)***

### **Take your education outdoors!**

Lycoming College provides students with many opportunities to grow professionally and build leadership skills outside of the classroom through enhanced educational experiences. Toward that end, the college launched its Outdoor Leadership and Education program in 2016.

Learning while doing is one of the most effective ways to gain and apply new knowledge and skills. Lycoming Outdoor Leadership and Education is committed to providing students with opportunities to learn and grow through intentionally-designed outdoor experiences in an adventure-filled, fun environment.

### **Spring 2017 Schedule**

Feb. 3

2 p.m. - 5 p.m.

Winter Festival

OLE and CAB are teaming up to celebrate winter activities! Join us on the quad for a bon-fire, s'mores, a snowman building competition, snowyskiing and more!

Event is complimentary.

No Registration Needed

Feb. 4

9 a.m. - 4 p.m.

Cross-Country Skiing at Crystal Lake

Join OLE on a winter fun day as we go cross-country skiing at Crystal Lake Camp. Never cross-country skied? No worries! We will be glad to show you the ropes and help you explore the winter forest. OLE will provide all necessary equipment and lunch.

\$10.00 Deposit Required\*

Register Online

Feb. 9 - 11

### Ski & Snowboard at Jay Peak Resort in Vermont

Join OLE and Ski & Snowboard Club to ski or ride the slopes at Jay Peak Resorts. Jay Peak is one of the largest resorts on the East coast and famous for their amazing snow. This is truly going to be an amazing trip!

Contact Ben Thompson for more information.

Feb. 17 - 19

Leave Campus at 5 p.m. on the 17th and return by 6 p.m. on the 19th

### Winter Camping & Cross Country Skiing Clinic at White Grass, WV

Wintertime in the forest is beautiful! Join OLE to learn how to take full advantage of outdoor winter activities. You will learn how to camp in the winter and cross-country ski at one of the most unique ski areas in the country. OLE will provide all necessary equipment and food.

\$20.00 Deposit Required\*

Register Online

Mar. 4

9 a.m. - 5 p.m.

### Rock Climbing Clinic

Take on a new challenge! Rock climbing is a real adventure and a fun workout. Join us and learn how to take on the vertical world! OLE will provide all necessary equipment and lunch.

\$10.00 Deposit Required\*

Register Online

### Spring Break Trip

Mar. 11 - 18

### Spring Break Adventure Tour of Western North Carolina

Spend your spring break on this jam-packed trip full of fun and adventure! On this trip, we will mountain bike at Tsali State Park, whitewater raft the Nantahala River, rock climb in Pisgah National Forest, backpack in Cataloochee Valley, and give back by doing a service learning project on the French Broad River. Yes, all of that, in one week! We will experience the best of Western North Carolina! OLE will provide all necessary equipment, transportation, and food.

Cost: \$175.00 (\$50 deposit due Feb. 6)

Register Online

Apr. 2

9 a.m. - 5 p.m.

#### Rock Climbing Weekend Trip

Join OLE on a day of rock climbing adventure! You will learn the basics of rock climbing, safety, and get in a lot of time on the rock polishing your skills. OLE will provide all necessary equipment and food.

\$10.00 Deposit Required\*

Register Online

Apr. 22

9 a.m. - 4 p.m.

#### Service Learning Project

OLE takes full advantage of our amazing natural spaces in North Central PA. It is time to give back! We are teaming up with the Susquehanna Greenway Partnership for a service learning project helping to clean-up one of our local rivers. OLE will provide lunch.

Event is Complimentary.

Registration Opens Apr. 3

\*Deposits are required to assure that you will attend the trip. If you register and do not attend the trip, then your deposit will be lost. Your deposit will be returned to you when you board the van for the trip.

## First Year Outdoor Experience

Can't wait to start college? Get started early with Lycoming College's First Year Outdoor Experience. Choose your week of beautiful vistas, rugged trails and scenic rivers for a backpacking adventure.



July 24 – 28 or August 14 – 18

Bond with future classmates while learning outdoor living skills including cooking, camping and backpacking in northcentral Pennsylvania's picturesque forests near campus. Take advantage of this unique opportunity and gain new skills, friendships, and valuable strategies to help you have a successful first year of college.

Jae Ellison, the College's director of Outdoor Leadership and Education, and a trained student instructor will guide students through each 5-day program suitable for outdoor adventurers of all levels. Ellison is a certified Wilderness EMT and has extensive experience guiding in wilderness settings.

The number of participants is limited to 15 each week and will be selected from applicants who submit a letter about how this experience will help with the transition to college.

Selected participants will be sent via email:

An information sheet including location and contact information

Suggested personal packing list

Medical form

Informed consent and assumption of risk forms

Program cost of \$50 per participant includes all food and industry-leading equipment including:

Healthy, energy-filled food, with care taken for dietary restrictions

Tents and sleeping bags

Cooking gear

Safety equipment

Participants will be required to bring clothing appropriate for the weather, personal toiletries and proper footwear. A light-weight but sturdy hiking boot is recommended; students arriving without proper footwear will not be allowed to participate.

Participants must mail the medical and consent forms along with a payment of \$50 made out to Lycoming College by:

July 3 for the July trip

July 24 for the August trip

Forms and payments not received in time will forfeit a participant's spot, which will be offered to other applicants. No refunds will be provided after the deadline for each program.

Program Overview

July 24 – 28

Arrive at Lycoming College on July 24 at 10 a.m.

Introduction activities, inspections, and packing equipment

Leave at noon for a local state forest area  
Remaining days will be spent hiking and camping  
Leave forest area on July 28 at noon and arrive at 1:30 p.m.  
Unpacking and debrief activities  
Students available for pick up at 3 p.m.

August 14 – 18

Arrive at Lycoming College on August 14 at 10 a.m.  
Students given time to put personal belongings into a temporary location while on the trip  
Introduction activities, inspections, and packing equipment  
Lunch  
Leave at 3 p.m. for local state forest area  
Remaining days will be spent hiking and camping  
Leave forest area on August 18 at 3 p.m. and arrive at 4:30 p.m.  
Unpacking and debrief activities  
Students released to their respective rooms at 6 p.m.

## **Rental equipment also available through OLE!**

### ***The Lycoming College Fly Fishing Club (FLYCO)***

The Lycoming College Fly Fishing Club (FLYCO) is campus organization that incorporates the art of fly-fishing with service projects such as stream clean-ups. Members of FLYCO have the chance to learn the basics of the fly fishing technique and take trips to fishing areas along waterways located in the Susquehanna Basin, Pine Creek, and Lycoming Creek watersheds. Last fall, the club participated in steelhead fishing in Erie, Pennsylvania. In addition, members regularly participate in stream clean-ups, which help to keep streams clean for other fishermen, as well as for sensitive fauna such as brook trout, brown trout, caddisflies, mayflies, and stoneflies. The most recent clean-up conducted by the club was the Brandon Park Clean-up, which was done last spring in partnership with LEAF. Also, FLYCO has recently become involved with the Trout Unlimited chapter, which is another way in which it has taken steps to help ensure the health of surrounding watersheds. Currently FLYCO is inactive, but if students are interested they could restart the organization again.

### ***Athletics***

A number of ideas for future involvement in the campus' sustainability efforts have been proposed by the athletics department, but none of the projects are currently in use. The proposals would be important additions to the college's efforts considering that the athletic department is home to seventeen intercollegiate sports, intramural sports, and multiple

facilities that are available to students, faculty, alumni, and even members of the Williamsport community. It is estimated that one out of every four students become involved in an intercollegiate team, and between 475 and 600 students visit the Recreation Center and use its facilities every day. A sustainable project therefore, would prove to be an important addition to the athletics department, especially considering the frequency of its daily visitors.

While the projects that have been proposed take time to be implemented, they can be effectual in the campus' efforts to "Go Green." In 2012, the college participated in its first annual Game Day Challenge, a competition in which recyclables were collected from the stands by volunteers from LEAF, Phi Kappa Psi, and various athletic organizations. In addition, bins were installed around the periphery of the field to encourage fans to recycle their waste. The Game Day Challenge, a competition similar to RecycleMania, was sponsored in part by the Environmental Protection Agency, and helped to promote sustainability by educating the community about proper recycling techniques and waste reduction methods. The competition was similar to the University of Arkansas' sustainability program, "Recycling with the Razorbacks." The sustainability sector of the University of Arkansas would place green recycling boxes at all home games to encourage fans to recycle and as a result, collected more than 36.5 tons of recyclables and reduced the amount of trash by 61.5 tons (Patrick et al. 2008). The amount of trash reduced by the University of Arkansas speaks for itself, and shows just how much waste can be reduced if these practices were employed regularly at Lycoming.

Proposals to eliminate or at least lower the waste that is produced in campus athletic facilities have been proposed by other institutions. For instance, the University of Colorado at Boulder has taken steps to eliminate their waste by creating a zero waste football stadium, which has prevented at least 90% of their waste from going to a landfill. The university eliminated their waste by replacing all of their trash containers with recycling bins and relying solely on public food containers and beverage cups that are made of recyclable or compostable materials.

Another idea that has been introduced is that of recycling used sports equipment. This proposal suggests that rather than throwing away gently used equipment, the materials could be sent to local clubs and schools for further use. This initiative would not only keep materials out of landfills, but would save money for organizations, and would also help to promote physical health by allowing sport participation to be possible for more of the local community.

Although the implementation of these projects could have a huge impact on campus, there are other issues that could be addressed that would improve our sustainability efforts. For instance, if announcers at athletic events could repeat the announcements made of the locations of recycling bins so that fans knew where to drop their recyclables, signs were posted by the garbage cans as a reminder for fans to recycle, and recycling bins were installed at outdoor games, recycling on campus could rise simply by helping the community to become aware that there is an alternative to throwing their waste away.

The athletic department will be a significant help to the college's overall sustainability project; despite the direction they choose to take with their sustainability efforts. Also, by implementing

these projects at one of the campus' largest areas of student, faculty, and community involvement, an increase may be seen in all of the campus-wide sustainability efforts in the very near future.

### ***Campus Grounds***

Lycoming College's Building and Grounds (B&G) staff are essential to making campus more sustainable. In addition to having routine maintenance responsibilities, the B&G staff attends to several projects pertaining to sustainability. One of these projects includes a large generator of waste that needs to be dealt with on a daily basis. Currently, the grass and tree clippings and leaves are being sent to the landfill after being collected, but a future project could involve an evaluation of composting grass clippings and leaf litter in conjunction with a local farmer, or in partnership with an institution like Penn College.

Each spring, the lawns are treated once with fertilizer and herbicides supplied by TruGreen ChemLawn in Lamar, PA. The concentrations of the materials used for application are:

Liquid fertilizer 13-0-7	0.75LBAI/M; (3/4 nitrogen per 1,000 Sq.ft.)
Barricade 4FL	0.375 LBAI/A; (pre-emergent herbicide)
TruPower3	0.3.25 Pint/A; (broadleaf weed control)

In addition, B&G has replaced all but three trucks with golf carts and there are now twelve carts that are used for everyday campus chores. Two of these golf carts and one security vehicle are electrically powered, using \$400 batteries that last for five years, while ten of the golf carts are still gas-powered and use four-stroke engines. The current plan is to replace the gas-powered golf carts with electrically powered golf carts as they wear down. In addition, B&G uses one tractor and three mowers that are all fueled with diesel. The current hope is that the tractors and mowers can be fueled with the biodiesel that is being produced with the help of the new biodiesel project on campus. Also, B&G wants to purchase diesel trucks in the future in order to possibly create a 50/50 mix of gasoline and biodiesel that would help them use energy more sustainably.

### ***LEED Certification for Future Exploration***

The push to become more sustainable is quickly spreading throughout American higher education institutions. Lycoming College needs to improve the ways in which it efficiently uses, and maintains energy in the process of constructing and reconstructing its buildings. Green designs are building plans that have environmental, economic, and social elements that benefit

all building stakeholders, including owners, occupants, and the general public. With simple building techniques, operating costs can be lessened, building marketability can be enhanced, worker productivity can be increased, and most importantly, harmful greenhouse gas emissions can be reduced.

Leadership in Energy and Environmental Design (LEED) is a performance oriented system in which credits are earned for satisfying criterion designed to address specific environmental impacts inherent in design construction, operations, and maintenance of buildings. Based on the total credits earned, different levels of green building certification are awarded. The system of LEED certification is designed to be comprehensive in scope, yet simple in operation, and can be seen below:

Points Scale:

Certified: 26-32 points

Silver: 33-38 points

Gold: 39-51 points

Platinum: 52-69 points

LEED addresses the following for new construction: sustainable sites, water efficiency, energy and atmosphere, materials and resources, indoor environmental quality, and innovation in design. In order for a project to become LEED certified for a new construction or renovation plan, it must be registered at the U.S. Green Building Council's website: [www.usgbc.org](http://www.usgbc.org).

As a requirement of the Lycoming College Climate Commitment, any new construction on campus has to meet at least a silver LEED rating. The college could meet this requirement, or a requirement meeting a LEED gold or platinum standard in a variety of ways. For instance, Cape Cod Community College received a gold LEED certification for its use of windows and reflective surfaces to promote natural lighting to illuminate the interior of its buildings during the day. By maximizing the amount of daylight during the day, Cape Cod reduced the amount of energy many other establishments need for electricity (Patrick et al. 2008).

Lycoming College has the potential to improve its environmental sustainability, and with the current economic climate, as well as the 60% increase in the PPL Plug electricity rate, the difficulty posed by rising electric bills is pushing the campus toward making more sustainable choices. With a list of key objectives and solutions, the college could use their LEED certification to promote environmental awareness to current and prospective students as well as a way to receive a tax benefit.

Currently, Lycoming College did not follow its original Climate Commitment as the construction of Lynn was not done in accordance to LEED certification. While guidelines were looked over, Lynn itself is not silver or gold LEED certified. With the edition of the new Welcome Center on campus in the next few years, reconsidering Lycoming College's Climate Commitment and stance on LEED certified buildings would be beneficial for the project.

## ***Greenhouse Gas***

In the future, Lycoming College's greenhouse gas emissions should be calculated using the Clean Air-Cool Planet: Campus Carbon Calculator. This calculator is the most thorough way to assess a campus's emission output because it analyzes six greenhouse gases specified by the Kyoto Protocol, carbon dioxide, methane, nitrous oxide, hydrofluorocarbons, perfluorinated compounds, and sulfur hexafluoride (CO<sub>2</sub>, CH<sub>4</sub>, N<sub>2</sub>O, HFC, PFC, and SF<sub>6</sub>). The extensive spreadsheet that is provided allows emissions to be calculated for years ranging from 1990-2060 when completed in its entirety. When Lycoming College can gather all of the information necessary for this endeavor, an accurate and almost literal carbon footprint will be achieved.

## ***The Lycoming College Climate Commitment***

On April 20, 2011, former college president, James E. Douthat, signed the Lycoming College Climate Commitment during a small ceremony held on the steps of Long Hall. The pledge was brought forward by the sustainability committee, which was led at that time by both Dr. Neil Boyd and Dr. Mel Zimmerman, and called for a solid action plan to reduce the college's carbon footprint. This action plan includes but is not limited to the following: the requirement of new construction meeting at least a silver LEED rating, an energy-efficient appliance purchasing policy that requires the purchase of ENERGY STAR certified products, a specified set of environmental guidelines for renovations, continued campus involvement in RecycleMania, and access to public transportation for faculty, staff, and students. Lastly, the commitment requires that the action plan initiated by Douthat's signing and any new reports are publically available to students in order to encourage involvement in the sustainability effort. Currently, as Lycoming College has changed president's the goals of the climate commitment have gone unmet. In 2016, a Climate Commitment task force of students, faculty, and staff was assembled and hopefully there will be an updated Lycoming College Climate Commitment for the next audit in 2017.

## **Environmental Sustainability Curriculum Offered by Lycoming College:**

Lycoming College offers two minors, Environmental Sustainability and Environmental Science, and a major, Sustainable Business Management, in order to educate students about environmental issues so that they are better able to promote conservation and awareness. In addition to these courses, the college offers an Ecology track specifically for biology majors that differs only in the lab time and biological focus that is required for the major.

## ***Environmental Sustainability***

The Environmental Sustainability minor educates students about the delicate balance that exists between our climate and the earth's other natural processes and the need of society to satisfy its needs. At Lycoming College, students have a unique opportunity to work with experienced faculty to develop effective solutions. The minor requires the following courses:

BIO 220 – Environmental Biology  
ECON 225 – Environmental Economics

And three from the following:

ANTH 232 – Environmental Anthropology  
ANTH 310 – Food and Culture  
BIO 200 – The 4th and 5th Kingdoms  
BUS 313 – Sustainable Business Management  
BUS 334 – The Business of Energy  
ECON 224 – Urban Problems  
PHIL 228 – Philosophy and the Environment  
PSCI 338 – Environmental Law and Politics  
PSY 221 – Environmental Psychology

Students are encouraged to work outside of the classroom by participating in a practicum or an internship in the field of environmental sustainability. The course the student chooses will often pertain to his or her future career choice and there are several choices for practicum experiences, including:

ANTH 470 – 479 – Anthropology Internship  
BIO 400 – Biology Practicum  
BIO 401 – Environmental Practicum  
BIO 470 – 479 – Biology Internship  
BUS 439 – Business Practicum  
BUS 470 – 479 – Business Internship  
ECON 349 – Management Practicum  
ECON 470 – 479 – Economics Internship  
PHIL 470 – 479 – Philosophy Internship  
PSCI 470 – 479 – Political Science Internship  
PSY 470 – 479 – Psychology Internship  
SOC 448 – Practicum in Sociology – Anthropology

The Environmental Sustainability minor is supervised by coordinators, Dr. Mel Zimmerman and Dr. Ryan Adams.

### ***Environmental Science***



The Environmental Science minor was created for students who wish to further their knowledge concerning conservation and issues that are affecting the environment.

An interdisciplinary minor in Environmental Science consists of two introductory biology courses, one of which must be Environmental Biology (BIO 220), two additional courses numbered 200 or higher, Environmental Economics (ECON 225) and Principles of Geology (ASTR 102).

Biology majors who minor in Environmental Science must complete all requirements of the biology major. In addition to these requirements, they need to complete Environmental Biology (BIO 220), Environmental Practica (BIO 401), Environmental Economics (BIO 225), Principles of Geology (ASTR 112), and one course selected from Economic Geography (ECON 240), Cultural Anthropology (ANTH 229), or an advanced biology course numbered 328 or higher.

### ***Energy Studies Minor*** (New in 2016!)

The minor in Energy Studies is designed for students majoring in one of the Natural Science disciplines to combine their knowledge of energy systems in the natural sciences with an understanding of the policy, economic, and social issues surrounding energy production and utilization at the local, national, and global level.

Open only to students with majors in the natural sciences, namely Astronomy, Astrophysics, Biology, Chemistry, and Physics. No more than two courses may count toward other majors or minors.

Students who complete the energy studies minor will:

Develop an understanding of the political and economic context for energy production and consumption at the local, national and global level.

Learn the language and underlying science of energy.

Be able to analyze the connections between the science of energy, its production and consumption, and the political and economic contest across energy systems.

Be able to communicate effectively to a variety of audiences the complex connections between the science of energy and the politics and economics of energy.

### **Required Courses**

PSCI 226 The Politics of Energy

ECON 225 Environmental and Resource Economics

Select two of the following courses:

ANTH 232 Environmental Anthropology

BUS 200 The Business of Energy  
CCOM 335 Public Communication of Science  
HIST 200 Energy, Security, and Global Competition  
PHIL 228 Philosophy and the Environment  
PSCI 338 Environmental Law and Politics

Select two of the following courses (must come from two prefixes):

ASTR 104 Field Geology  
ASTR 112 Fundamentals of Geology  
BIO 220 Environmental Biology  
BIO 224 Ecology  
CHEM 330 Physical Chemistry I  
PHYS 337 Thermodynamics

### ***Energy Sciences Minor*** (New in 2016!)

The Energy Science Minor is designed for students with majors outside the natural sciences to combine their understanding of the policy, economic, and social issues surrounding energy production and utilization at the local, national, and global level with science literacy on issues of energy drawn from the disciplines of biology, chemistry, geology, and physics.

Open only to students with majors other than the natural sciences, namely Astronomy, Astrophysics, Biology, Chemistry, and Physics. No more than two courses may count toward other majors or minors.

Students who complete the energy science minor will:

Develop literacy in the science of energy across its forms.

Develop an understanding of the political and economic context for energy production and consumption at the local, national and global level.

Be able to analyze the connections between the science of energy, its production and consumption, and the political and economic contest across energy systems.

Be able to communicate effectively to a variety of audiences the complex connections between the science of energy and the politics and economics of energy.

### **Required Courses**

PSCI 226 The Politics of Energy  
CHEM 200 The Science of Energy

Select one of the following courses:

ANTH 232 Environmental Anthropology  
BUS 200 The Business of Energy  
CCOM 335 Public Communication of Science  
ECON 225 Environmental and Resource Economics  
HIST 200 Energy, Security, and Global Competition  
PHIL 228 Philosophy and the Environment  
PSCI 338 Environmental Law and Politics

Select three of the following courses (at least one of which must be numbered 200 or above):

Students may request to substitute relevant, upper-level natural science courses to complete the minor's natural science course requirements.

ASTR 104 Field Geology  
ASTR 112 Fundamentals of Geology  
BIO 220 Environmental Biology  
BIO 224 Ecology  
CHEM 110 General Chemistry 1  
PHYS 106 Energy Alternatives

*Remember that we must all  
Reduce, Reuse, and Recycle for a  
more sustainable campus!*

## ***Acknowledgements***

***Dr. Zimmerman and Dr. Smith for all their support***

***Everyone who attended the Environmental Audit PDR***

***My friends, family, and you for reading the Audit!!!***

# Appendices

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## Appendix 1: Raw Electrical Usage in kWh (2007-2016): Charts

<i>Dorms</i>	Asbury	Crever	East	Forrest	Rich	Skeath	Wesley	Williams	Commons
<b>2007</b>	196,416	152,152	216,128	129,184	125,728	259,456	180,064	415,451	-
<b>2008</b>	181,024	129,166	194,304	112,544	102,033	233,924	157,504	162,956	377,327
<b>2009</b>	159,173	136,987	140,159	92,918	178,530	154,344	133,101	148,825	287,909
<b>2010</b>	118,633	115,955	100,770	83,031	171,385	119,645	100,400	123,084	240,104
<b>2011</b>	137,336	131,277	118,886	90,115	176,048	130,873	117,464	127,363	272,907
<b>2012</b>	138,687	114,849	111,528	82,442	172,300	126,001	110,665	128,452	277,791
<b>2013</b>	156,170	127,891	117,267	85,373	183,563	138,755	123,880	153,204	316,436
<b>2014</b>	127,454	117,385	105,760	80,253	186,802	131,774	118,264	156,741	289,075
<b>2015</b>	129,614	128,067	106,343	92,007	196,228	144,287	144,278	168,269	315,035
<b>2016</b>	138,490	126,381	95,701	101,709	188,968	136,024	142,132	157,024	285,496

<i>Apartments</i>	3 <sup>rd</sup> & Basin St	209 E 3 <sup>rd</sup> St Unit R	609 Mulberry	627 Mulberry	635-635 ½ Mulberry
<b>2008</b>	7,503	4,182	3,660	18,107	19,805
<b>2009</b>	7,394	7,227	5,491	17,706	13,548
<b>2010</b>	7,273	7,838	3,797	17,741	13,892
<b>2011</b>	7,177	9,000	6,646	17,735	17,631
<b>2012</b>	5,576	11,505	6,442	18,609	13,091
<b>2013</b>	6,540	10,815	9,241	13,480	14,020
<b>2014</b>	6,692	11,487	5,949	14,043	18,097
<b>2015</b>	6,804	8,474	6,511	13,057	18,045
<b>2016</b>	6,798	10,071	5,248	10,367	11,889

<i>Apartments</i>	<b>40 Ross St</b>	<b>60-60 ½ Ross St</b>	<b>71-71 ½ Ross St</b>	<b>73 Ross St</b>	<b>117 Washington St</b>
<b>2008</b>	22,093	11,251	16,094	8,364	4,773
<b>2009</b>	21,539	11,443	17,252	7,329	3,072
<b>2010</b>	21,769	13,075	15,854	9,507	3,143
<b>2011</b>	21,041	11,178	16,576	7,777	4,105
<b>2012</b>	19,920	11,181	12,136	7,970	3,877
<b>2013</b>	18,065	13,858	12,313	9,118	3,788
<b>2014</b>	17,930	14,534	14,372	10,523	6,094
<b>2015</b>	19,909	16,584	16,208	9,132	5,004
<b>2016</b>	18,653	12,274	7,993	5,605	2,993

<i>Academic Buildings</i>	<b>Academic Center</b>	<b>Heim</b>	<b>Mass Comm</b>	<b>Clarke Chapel</b>	<b>Fine Arts</b>	<b>Lynn Science Center</b>	<b>Honors Hall</b>
<b>2007</b>	3,101,312	2,139,200	152,832	165,312	31,552	-	-
<b>2008</b>	3,102,208	1,721,569	200,192	164,352	29,056	-	195,760
<b>2009</b>	3,146,880	1,712,470	202,741	166,208	294,011	-	205,840
<b>2010</b>	2,704,123	1,584,805	174,092	137,732	273,438	-	200,800
<b>2011</b>	2,785,712	1,685,574	190,085	234,565	306,583	-	175,600
<b>2012</b>	2,365,209	1,586,359	192,535	307,085	289,040	-	104,160
<b>2013</b>	2,528,256	1,721,809	361,824	342,912	228,102	-	116,080
<b>2014</b>	1,974,338	1,814,317	211,379	308,281	127,868	-	106,640
<b>2015</b>	2,285,549	2,046,034	246,078	459,051	115,505	429,547	135,440
<b>2016</b>	1,933,039	1,946,763	208,440	626,253	132,451	1,036,527	218,960

<i>Other Lycoming Buildings</i>	<b>Adm.</b>	<b>GSB</b>	<b>South Campus</b>	<b>Lamade Gym</b>	<b>Long Hall</b>	<b>Rec Center</b>	<b>Wertz</b>	<b>Athletic Complex</b>
<b>2007</b>	10,304	180,000	-	1,131,264	196,192	1,007,210	1,124,891	-
<b>2008</b>	8,986	102,313	50,209	1,148,511	190,176	1,159,092	1,251,570	111,564
<b>2009</b>	29,018	79,443	45,949	1,154,432	175,307	1,166,679	1,133,849	79,322

<b>2010</b>	36,582	50,603	72,190	1,040,003	157,433	1,091,506	1,008,193	77,715
<b>2011</b>	36,979	54,790	51,074	868,905	161,680	991,469	1,145,116	81,300
<b>2012</b>	32,545	8,679	39,461	1,179,279	150,983	898,432	1,020,081	83,647
<b>2013</b>	36,168	5,343	36,471	1,315,712	178,095	1,031,671	1,180,933	94,804
<b>2014</b>	35,166	23,570	38,945	2,099,885	163,789	1,041,521	1,063,243	139,488
<b>2015</b>	40,178	35,779	39,851	1,207,033	169,260	1,071,553	1,117,653	94,868
<b>2016</b>	30,093	55,442	37,792	1,160,678	151,033	1,281,829	1,103,386	107,180

<i>Other Lycoming Properties</i>	<b>Franklin St Lights</b>	<b>Lighting</b>	<b>325 Grampian Blvd</b>	<b>Edwin St Lot P</b>
<b>2007</b>	-	-	-	-
<b>2008</b>	5,542	759	15,322	-
<b>2009</b>	5,332	754	15,253	-
<b>2010</b>	2,351	751	13,882	-
<b>2011</b>	3,942	754	18,465	-
<b>2012</b>	4,438	751	14,252	-
<b>2013</b>	3,602	725	14,734	-
<b>2014</b>	3,702	759	16,069	-
<b>2015</b>	3,746	754	17,145	-
<b>2016</b>	3,357	735	17,964	3,588

<i>New Apartments</i>	<b>47 Ross St</b>	<b>119 Washington St</b>	<b>145 Washington Blvd</b>	<b>314 E 4<sup>th</sup> St</b>	<b>316 E 4<sup>th</sup> St</b>	<b>162 E 4<sup>th</sup> St 1FL</b>
<b>2014</b>	-	-	-	-	927	-
<b>2015</b>	-	248	-	1,802	3,109	-
<b>2016</b>	850	569	2,796	6,436	8,925	19,712

<i>New Apartments</i>	<b>162 E 4<sup>th</sup> St</b>	<b>164 E 4<sup>th</sup> St</b>	<b>166 E 4<sup>th</sup> St</b>	<b>25 W 4<sup>th</sup> St</b>	<b>29 W 4<sup>th</sup> St</b>
<b>2014</b>	-	-	-	-	-
<b>2015</b>	-	-	-	7,793	-
<b>2016</b>	20,476	4,751	1,9009	8,308	12,021



## Appendix 2: Raw Water Usage in Gallons (2008-2016): Charts

<i>Dorms</i>	Asbury	Crever	East	Forrest	Rich	Skeath	Wesley	Williams	Commons
<b>2008</b>	1,324,000	2,004,000	1,151,000	1,125,000	2,154,000	1,455,000	1,052,000	1,798,000	752,000
<b>2009</b>	1,148,000	1,920,000	1,047,000	849,000	1,826,000	1,232,000	943,000	1,194,000	712,000
<b>2010</b>	1,164,000	1,833,000	950,000	866,000	1,872,000	1,379,000	899,000	1,210,000	872,000
<b>2011</b>	1,173,000	1,482,000	1,226,000	834,000	2,011,000	1,276,000	846,000	1,224,000	691,000
<b>2012</b>	1,117,000	1,341,000	1,461,000	652,000	2,132,000	1,469,000	1,024,000	1,208,000	746,000
<b>2013</b>	981,000	1,523,000	1,255,000	993,000	1,588,000	1,345,000	948,000	1,087,000	730,000
<b>2014</b>	1,214,000	1,190,000	1,150,000	858,000	412,000	1,377,000	267,000	1,204,000	701,000
<b>2015</b>	1,220,000	907,000	1,042,000	761,000	1,260,000	1,338,000	1,056,000	1,103,000	996,000
<b>2016</b>	1,118,000	840,000	962,000	777,000	1,315,000	1,251,000	15,000	1,199,000	776,000

<i>Apartments</i>	314-316 E 4 <sup>th</sup> St	601-603 Mulberry	609 Mulberry	635-635 ½ Mulberry	40 Ross St
<b>2008</b>	64,000	231,000	93,000	109,000	88,000
<b>2009</b>	99,000	95,000	80,000	52,000	68,000
<b>2010</b>	70,000	99,000	13,000	47,000	62,000
<b>2011</b>	77,000	66,000	78,000	74,000	70,000
<b>2012</b>	15,000	-	53,000	79,000	67,000
<b>2013</b>	29,000	-	39,000	60,000	30,000
<b>2014</b>	26,000	-	45,000	87,000	42,000
<b>2015</b>	36,000	-	37,000	98,000	49,000
<b>2016</b>	85,000	-	30,000	51,000	34,000

<i>Apartments</i>	60-60 ½ Ross St	117 Washington Blvd	145 Washington Blvd	151 Washington Blvd	247 Washington Blvd
<b>2008</b>	102,000	-	18,000	-	-
<b>2009</b>	84,000	-	19,000	-	-
<b>2010</b>	61,000	32,000	20,000	34,000	5,000
<b>2011</b>	55,000	39,000	26,000	33,000	1,000
<b>2012</b>	151,000	38,000	37,000	43,000	-
<b>2013</b>	210,000	26,000	27,000	33,000	-
<b>2014</b>	233,000	39,000	37,000	38,000	-
<b>2015</b>	109,000	29,000	36,000	17,000	-
<b>2016</b>	67,000	21,000	21,000	26,000	-

<i>Academic Buildings</i>	<i>Academic Center</i>	<i>Heim</i>	<i>Lynn</i>	<i>Mass Comm</i>	<i>Fine Arts</i>	<i>Chapel</i>
<b>2008</b>	1,991,000	357,000	-	66,000	-	-
<b>2009</b>	2,092,000	382,000	-	55,000	-	-
<b>2010</b>	2,344,000	336,000	-	60,000	-	-
<b>2011</b>	4,938,000	304,000	-	38,000	-	-
<b>2012</b>	1,654,000	349,000	-	51,000	-	-
<b>2013</b>	1,625,000	372,000	-	68,000	-	-
<b>2014</b>	1,610,000	416,000	162,000	60,000	-	-
<b>2015</b>	1,893,000	356,000	114,000	39,000	-	-
<b>2016</b>	1,819,000	304,000	92,000	48,000	-	-

<i>Other Lycoming Buildings</i>	<i>Adm.</i>	<i>GSB</i>	<i>Lamade Gym</i>	<i>Long Hall</i>	<i>Wertz</i>	<i>Honors Hall</i>	<i>Stadium</i>	<i>President's House</i>
<b>2008</b>	31,000	66,000	833,000	180,000	3,948,000	11,000	602,000	-
<b>2009</b>	36,000	55,000	901,000	170,000	3,534,000	11,000	645,000	-
<b>2010</b>	43,000	31,000	1,029,000	190,000	3,357,000	13,000	402,000	75,000
<b>2011</b>	28,000	29,000	1,114,000	138,000	2,865,000	10,000	297,000	88,000
<b>2012</b>	38,000	5,000	1,331,000	136,000	2,698,000	12,000	593,000	59,000
<b>2013</b>	31,000	-	977,000	114,000	2,814,000	13,000	371,000	50,000
<b>2014</b>	31,000	-	901,000	431,000	3,067,000	11,000	431,000	29,000
<b>2015</b>	31,000	-	847,000	-	3,330,000	15,000	513,000	27,000
<b>2016</b>	27,000	-	1,280,000	-	3,254,000	16,000	467,000	34,000

### Appendix 3: Water Usage in Gallons/Square Foot (2008-2015): Charts

<i>Dorms</i>	<b>Asbury</b>	<b>Crever</b>	<b>East</b>	<b>Forrest</b>	<b>Rich</b>	<b>Skeath</b>	<b>Wesley</b>	<b>Williams</b>	<b>Commons</b>
<b>2008</b>	34.51	69.77	30.30	48.77	65.55	31.35	21.09	46.09	44.94
<b>2009</b>	29.93	66.85	27.56	36.80	55.48	26.54	18.91	30.61	42.55
<b>2010</b>	30.34	63.82	25.01	37.54	56.88	29.71	18.02	31.02	52.11
<b>2011</b>	30.58	51.60	32.28	36.15	61.10	27.49	16.96	31.38	41.29
<b>2012</b>	29.12	46.69	38.46	28.26	64.78	31.65	20.53	30.97	44.58
<b>2013</b>	25.57	53.02	33.04	43.05	48.25	28.98	19.01	27.87	43.62
<b>2014</b>	31.65	41.43	30.28	37.19	12.52	29.67	5.35	30.86	41.89
<b>2015</b>	31.80	31.58	27.43	32.99	38.28	28.83	21.17	28.28	59.52
<b>2016</b>	29.14	29.25	25.33	33.68	39.95	26.95	0.30	30.74	46.37

<i>Apartments</i>	<b>314-316 E. Fourth St.</b>	<b>609 Mulberry</b>	<b>635-635 1/2 Mulberry</b>
<b>2008</b>	27.84	92.81	41.43
<b>2009</b>	43.06	79.84	19.76
<b>2010</b>	30.45	12.97	17.86
<b>2011</b>	33.49	77.84	28.13
<b>2012</b>	6.52	52.89	30.03
<b>2013</b>	12.61	38.92	22.81
<b>2014</b>	11.31	44.91	33.07
<b>2015</b>	15.66	39.93	37.25
<b>2016</b>	36.97	29.94	19.38

<i>Apartments</i>	<b>40 Ross St.</b>	<b>60-60 1/2 Ross St.</b>	<b>117 Washington Blvd.</b>
<b>2008</b>	47.01	47.22	-
<b>2009</b>	36.32	38.89	-
<b>2010</b>	33.12	28.24	21.62
<b>2011</b>	37.39	25.46	26.35
<b>2012</b>	35.79	69.91	25.68
<b>2013</b>	16.03	97.22	17.57

<b>2014</b>	22.44	107.87	26.35
<b>2015</b>	26.18	50.46	19.59
<b>2016</b>	18.16	31.02	14.19

<i>Academic Buildings</i>	<i>Academic Center</i>	<i>Heim</i>	<i>Communications</i>
<b>2008</b>	10.39	5.56	2.16
<b>2009</b>	10.92	5.95	1.80
<b>2010</b>	12.24	5.24	1.96
<b>2011</b>	25.78	4.74	1.24
<b>2012</b>	8.63	5.44	1.67
<b>2013</b>	8.48	5.80	2.22
<b>2014</b>	8.40	6.48	1.96
<b>2015</b>	9.88	5.55	1.28
<b>2016</b>	9.50	4.74	1.57

<i>Other Lycoming Buildings</i>	<i>Admissions</i>	<i>General Services</i>	<i>Lamade Gym</i>	<i>Long Hall</i>	<i>Wertz</i>	<i>Honors Hall</i>	<i>Stadium</i>
<b>2008</b>	5.17	4.66	9.52	9.39	80.93	0.57	-
<b>2009</b>	6.01	3.88	10.30	8.86	72.45	0.57	-
<b>2010</b>	7.18	2.19	11.76	9.91	68.82	0.67	-
<b>2011</b>	4.67	2.05	12.73	7.20	58.73	0.52	-
<b>2012</b>	6.34	0.35	15.21	7.09	55.31	0.62	-
<b>2013</b>	5.17	-	11.17	5.94	57.69	0.67	-
<b>2014</b>	5.17	-	10.30	22.47	62.87	0.57	-
<b>2015</b>	5.17	-	9.68	-	68.26	0.78	-
<b>2016</b>	4.51		14.63	-	66.71	0.83	-

#### Appendix 4: Raw Natural Gas Usage in CCFs (2009-2015): Charts

<i>Dorms</i>	Asbury	Crever	East	Forrest	Skeath	Wesley	Williams	Commons
<b>2009</b>	17,410	33,143	22,735	3,254	30,608	18,293	18,625	7,147
<b>2010</b>	24,996	47,741	34,949	5,138	43,261	25,920	27,225	10,157
<b>2011</b>	36,346	75,710	51,763	6,864	66,742	40,553	42,399	15,604
<b>2012</b>	31,777	71,259	46,166	5,666	60,122	35,053	34,934	15,128
<b>2013</b>	19,024	58,553	34,704	3,747	46,712	21,873	23,479	12,249
<b>2014</b>	23,448	32,504	34,491	3,549	44,434	26,934	22,327	10,767
<b>2015</b>	25,448	12,353	29,767	3,351	37,892	25,124	19,563	9,229
<b>2016</b>	21,319	11,747	21,025	3,098	35,925	17,092	22,502	9,424

<i>Apartments</i>	40 Ross St	60-60 ½ Ross St	71-71 ½ Ross St	73 Ross St	117 Washington St	627 Mulberry St	316 E 4 <sup>th</sup> St
<b>2009</b>	1,970	3,509	752	287	1,164	1,138	2,687
<b>2010</b>	3,483	4,802	1,294	532	1,580	1,732	4,134
<b>2011</b>	3,928	6,690	1,295	896	2,352	2,452	3,941
<b>2012</b>	7,188	11,441	2,548	1,583	2,634	4,554	-
<b>2013</b>	1,661	2,074	475	359	750	859	20
<b>2014</b>	3,124	3,830	818	733	1,302	1,468	326
<b>2015</b>	2,856	3,259	517	602	1,166	1,283	674
<b>2016</b>	3,280	3,395	671	275	1,028	1,199	1,388

<i>Academic Buildings</i>	Heim	Academic Center	Mass Comm	Lynn Science Center	Honors Hall
<b>2009</b>	68,870	123,594	3,189	517	2,401
<b>2010</b>	90,129	160,152	3,530	379	2,247
<b>2011</b>	133,057	223,437	-	-	-
<b>2012</b>	171,522	140,396	8,134	-	-
<b>2013</b>	115,582	120,464	5,959	415	2,963
<b>2014</b>	128,262	113,463	7,106	890	5,327
<b>2015</b>	136,790	104,149	6,397	719	4,990
<b>2016</b>	121,891	104,886	5,272	581	2,990

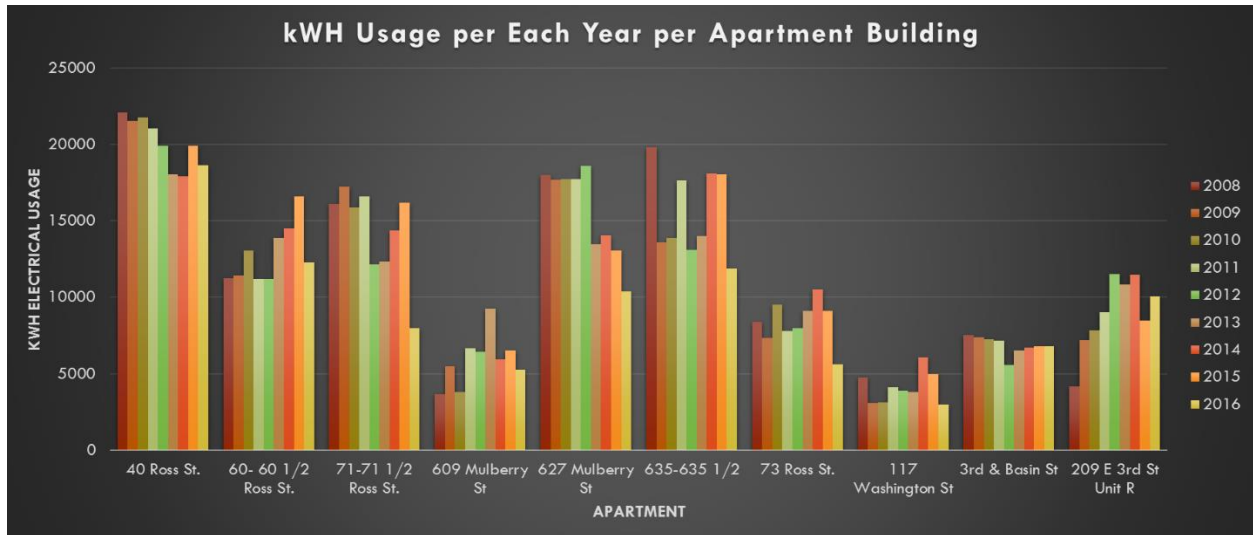
<i>Other Lycoming Buildings</i>	Adm.	GSB	Lamade Gym	Long Hall	Rec Center	Wertz	Athletic Complex
<b>2009</b>	1,227	2,981	39,844	8,329	29,303	28,284	7,075
<b>2010</b>	1,114	3,209	84,689	12,452	56,460	48,487	7,454
<b>2011</b>	-	-	106,304	18,860	70,869	69,013	-
<b>2012</b>	-	-	88,633	16,324	59,433	40,879	-
<b>2013</b>	973	930	73,109	12,314	-	39,710	21,585
<b>2014</b>	1,595	1,901	42,806	11,661	28,538	46,018	37,411
<b>2015</b>	1,446	1,434	41,245	10,561	27,497	45,083	18,957
<b>2016</b>	1,358	1,174	37,758	10,426	25,901	48,145	15,599

<i>Other Lycoming Properties</i>	College Place	325 Grampian Blvd
<b>2009</b>	-	2,390
<b>2010</b>	-	2,403
<b>2011</b>	-	-
<b>2012</b>	-	-
<b>2013</b>	-	2,050
<b>2014</b>	-	3,443
<b>2015</b>	-	3,016
<b>2016</b>	28,623	2,622

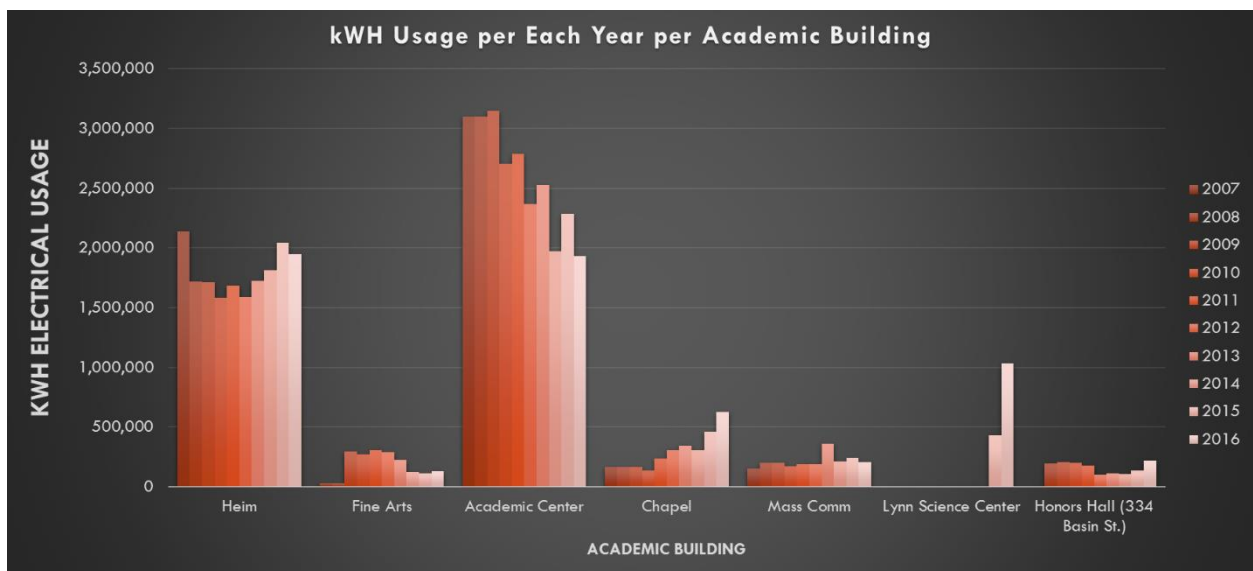
<i>New Apartments</i>	100 Washington Blvd	119 Washington Blvd	25 W 4 <sup>th</sup> St	314 E 4 <sup>th</sup> St	166 E 4 <sup>th</sup> St
<b>2016</b>	4,949	705	1,410	1,491	1,610

## Appendix 5: Raw Electrical Energy Usage in Kilowatt-Hours (2007-2016): Graphical Displays

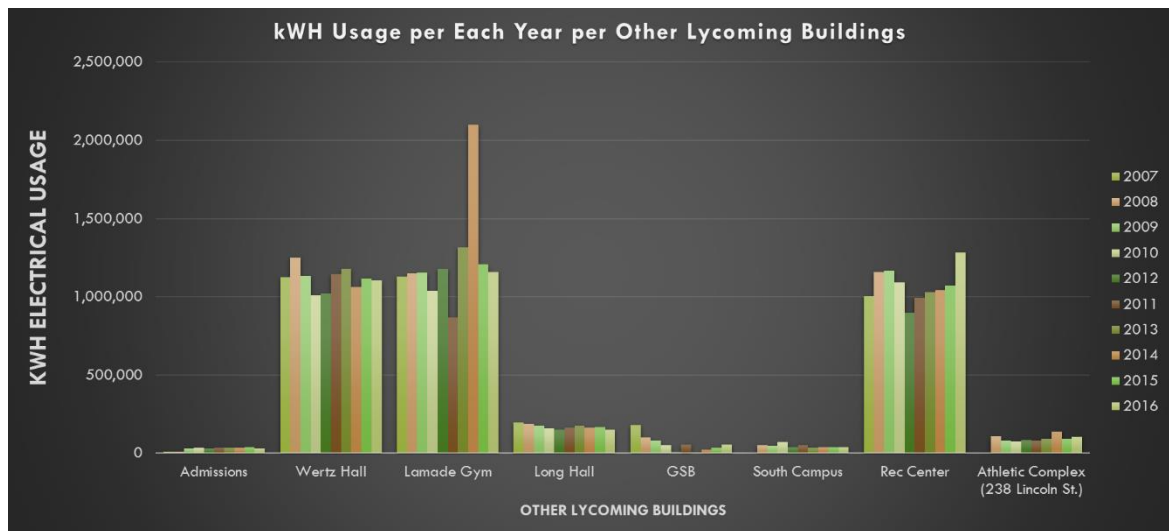
Apartment energy usage from 2008-2016



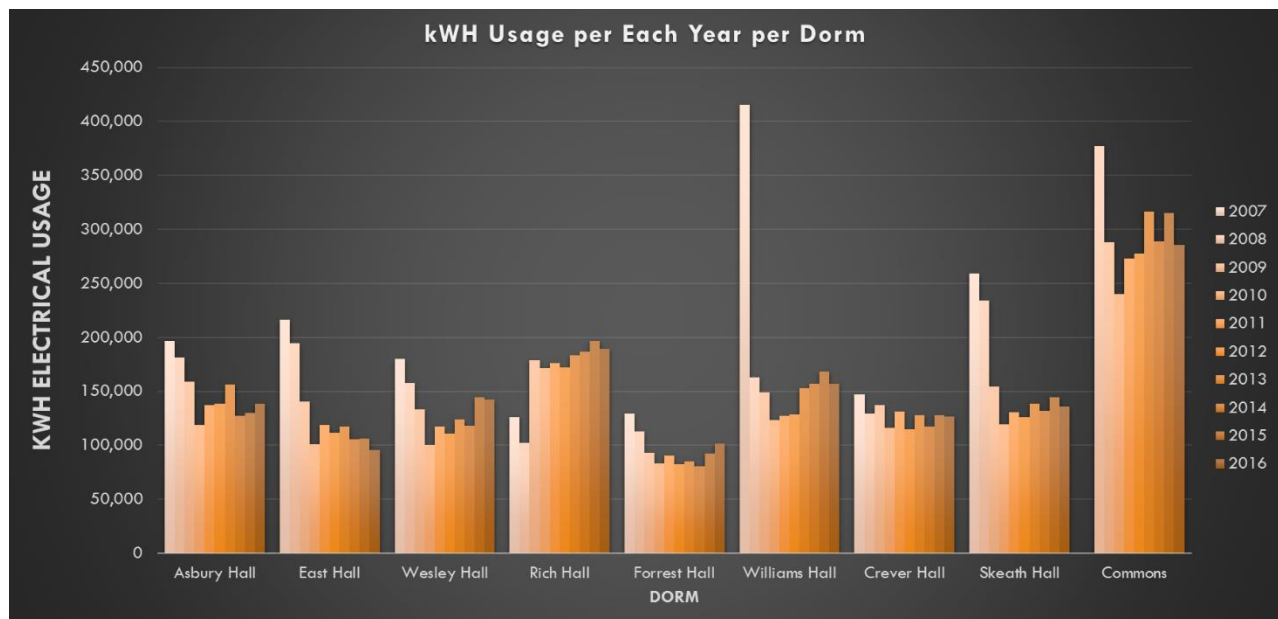
Academic Buildings energy usage from 2007-2016



Other Lycoming Buildings energy usage from 2007-2016

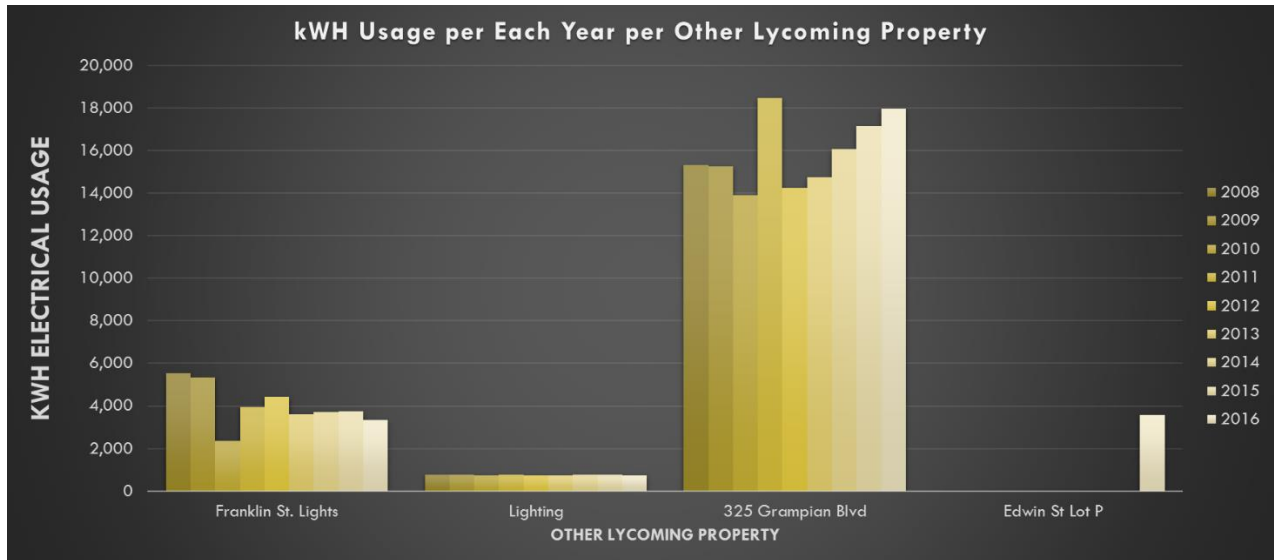


## Dorm energy usage from 2007-2016

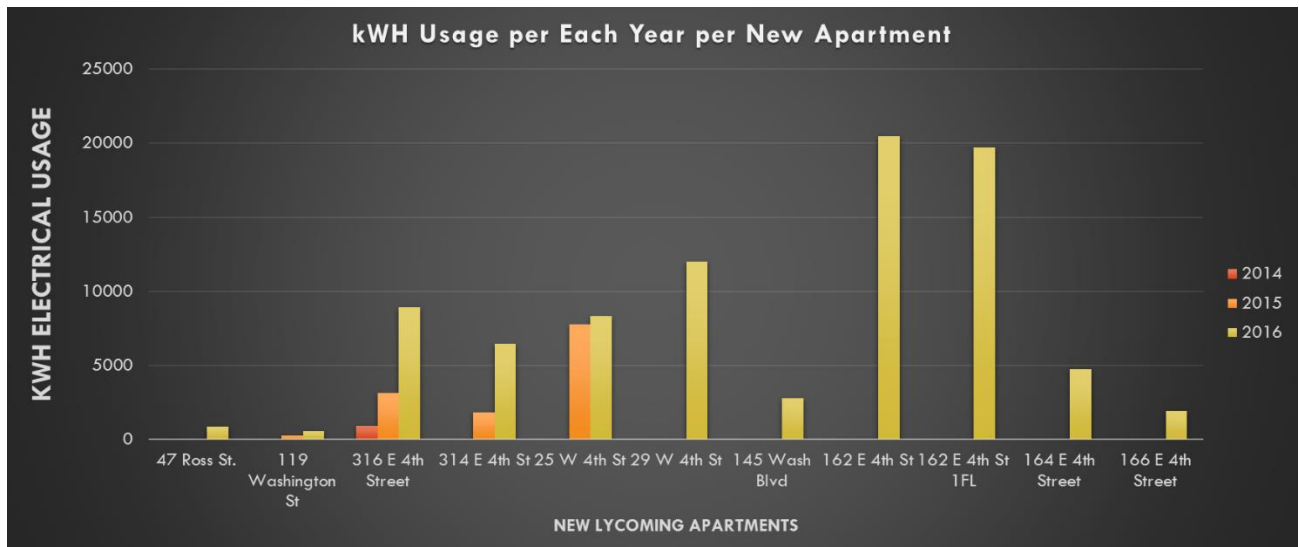




## Other Lycoming property energy usage from 2008-2016

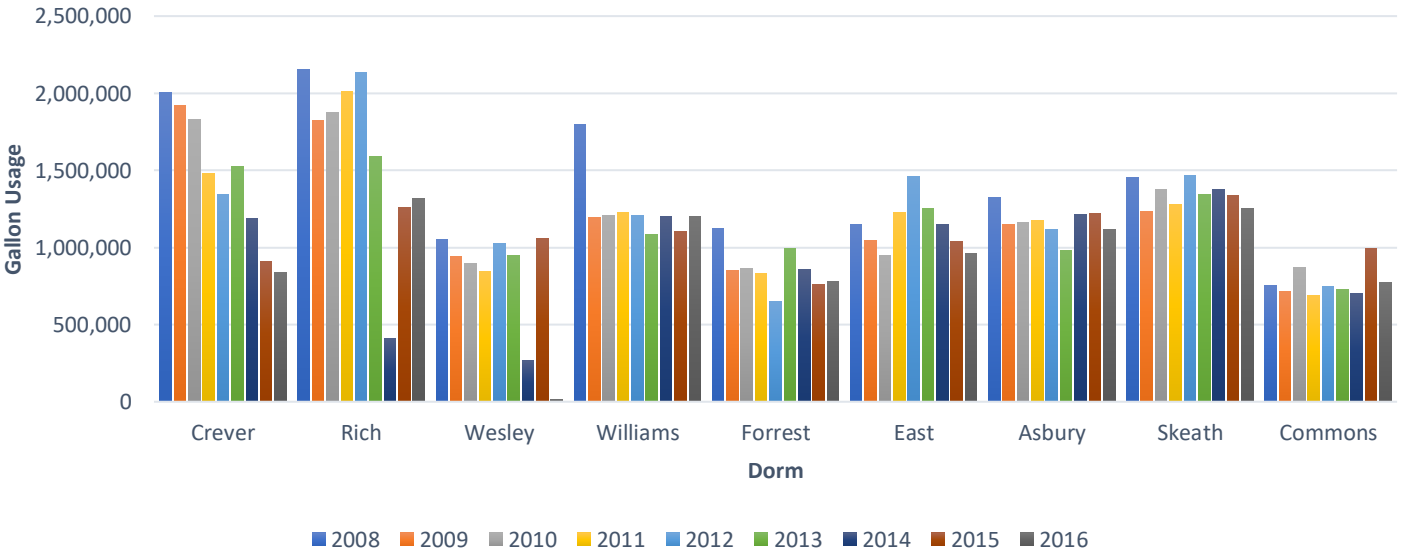


## New apartment energy usage from 2014-2016

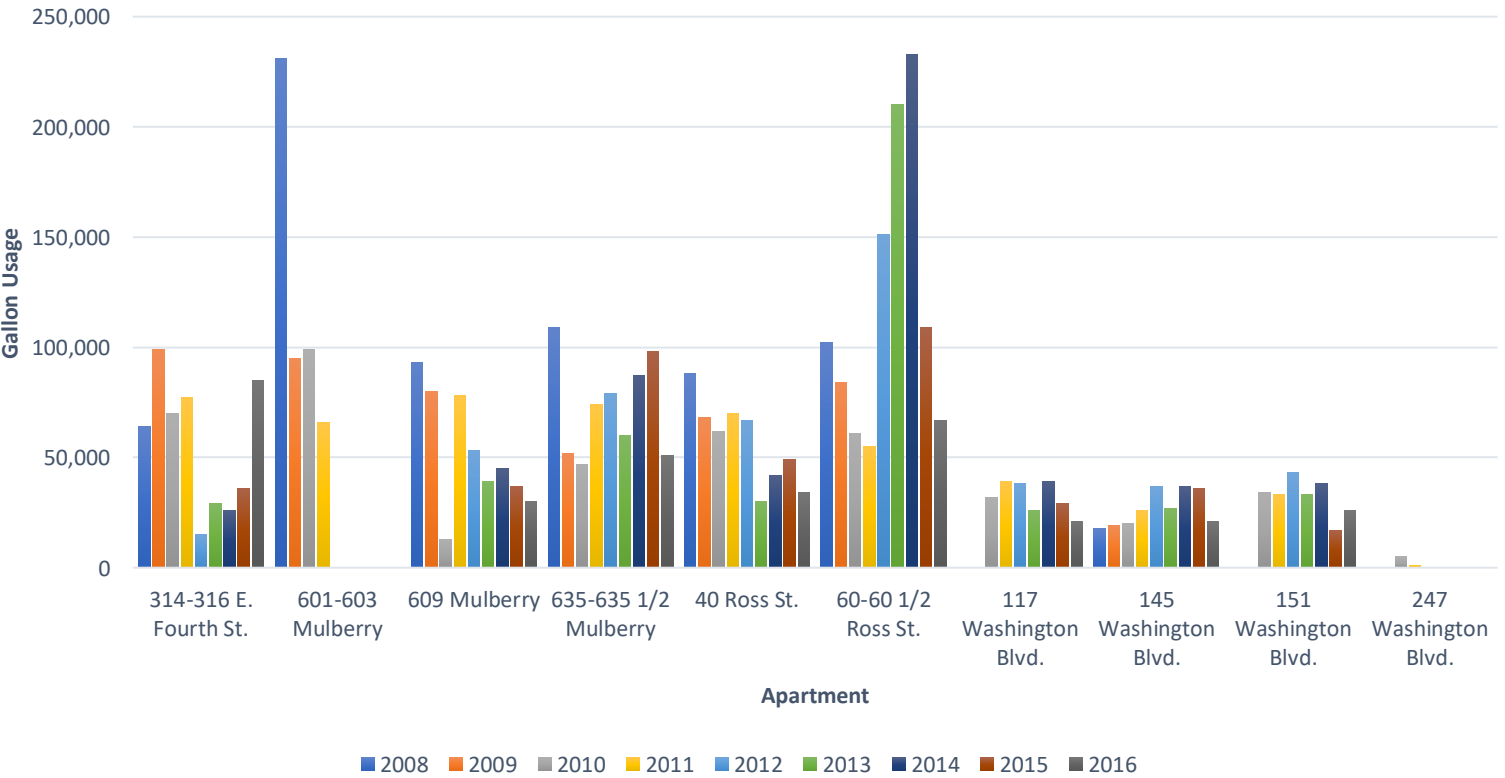


Appendix 6: Raw Water Usage in Gallons (2008-2016): Graphical Displays

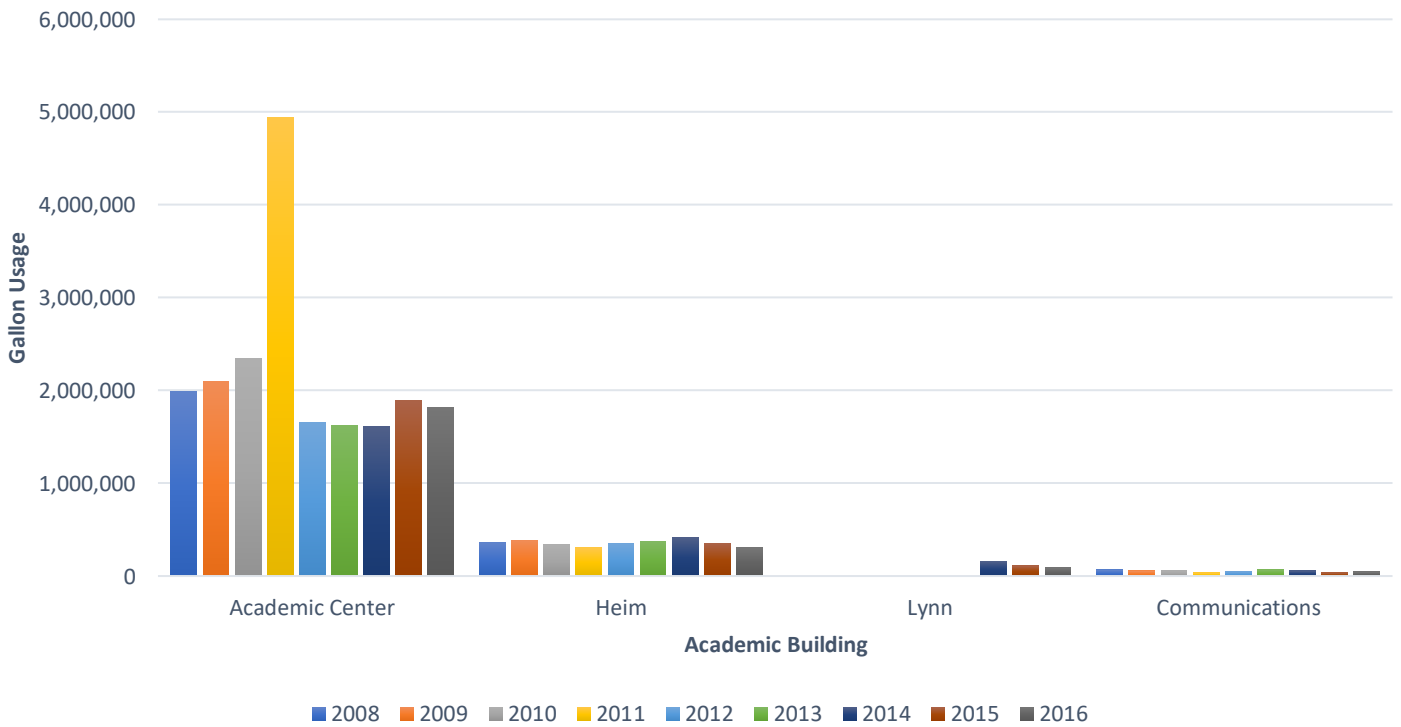
Gallon Usage per Each Year per Dorm



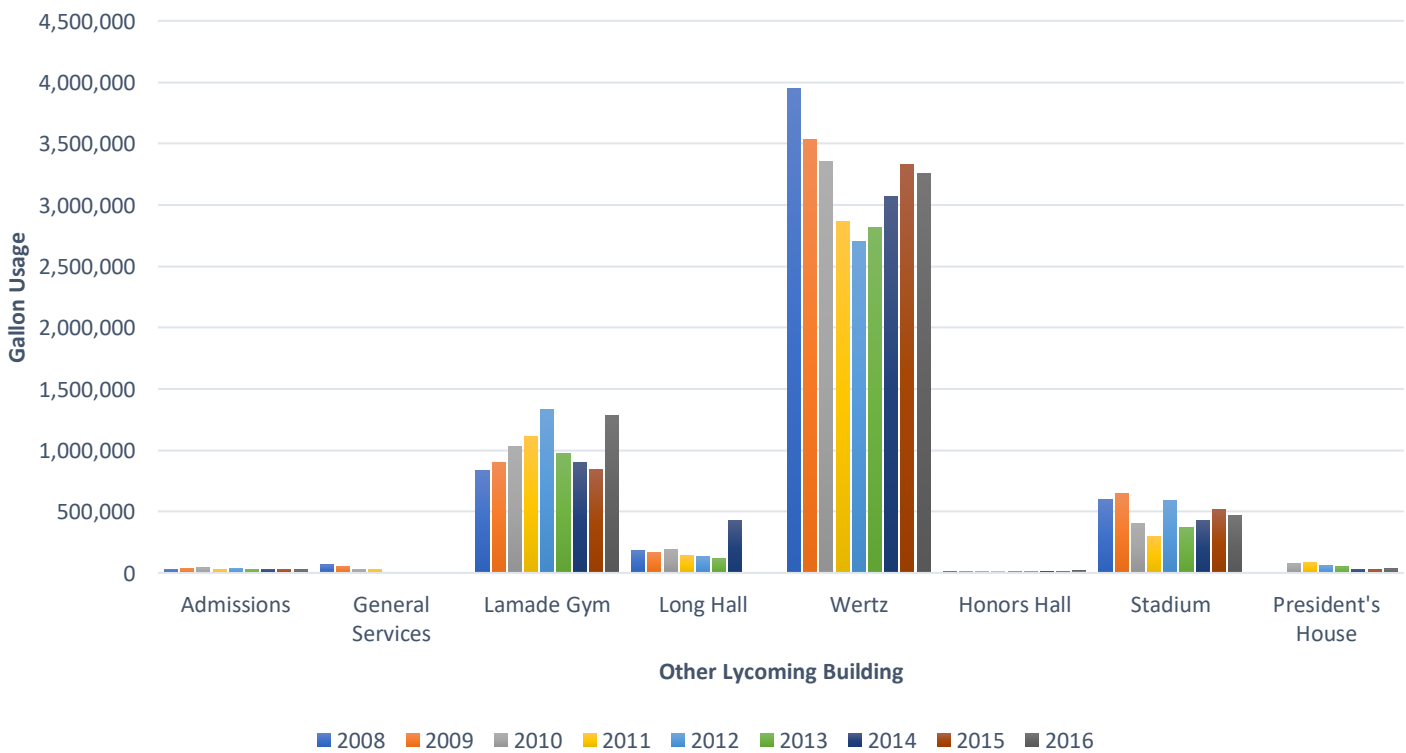
Gallon Usage per Each Year per Apartment



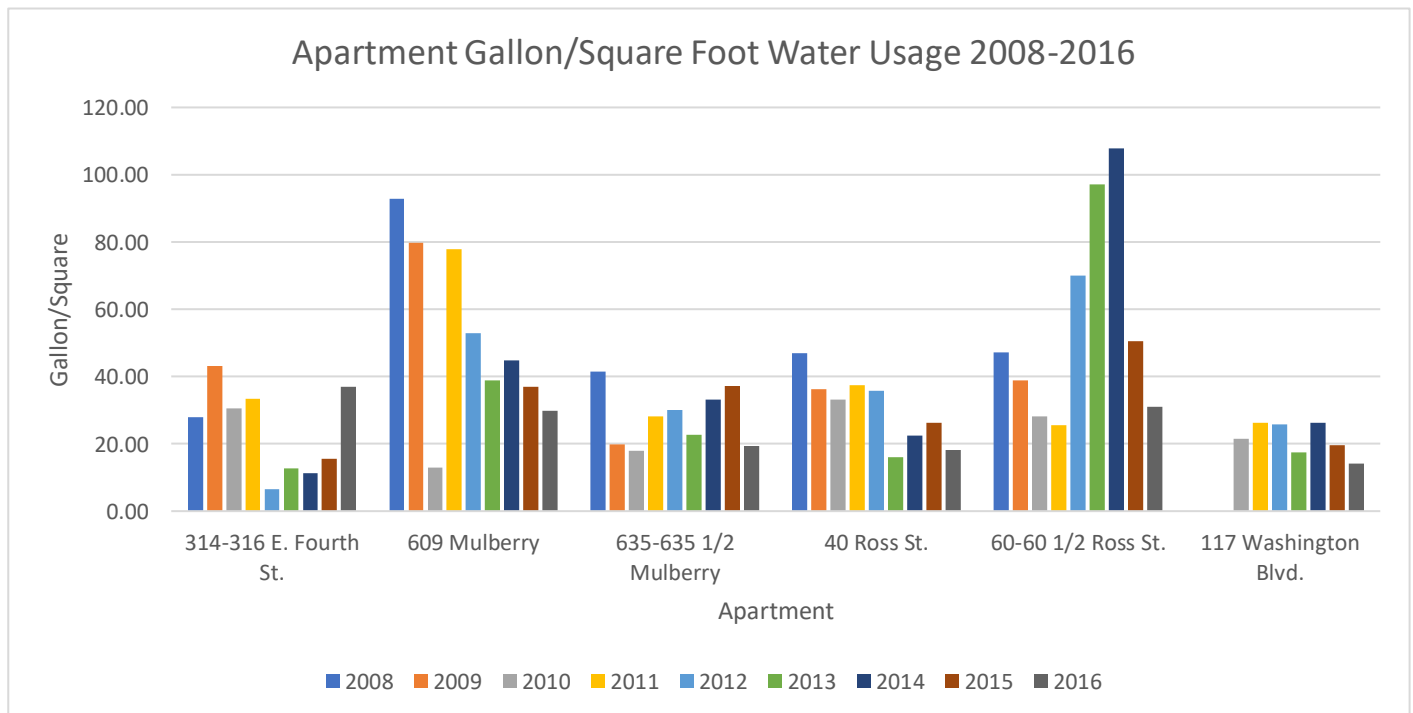
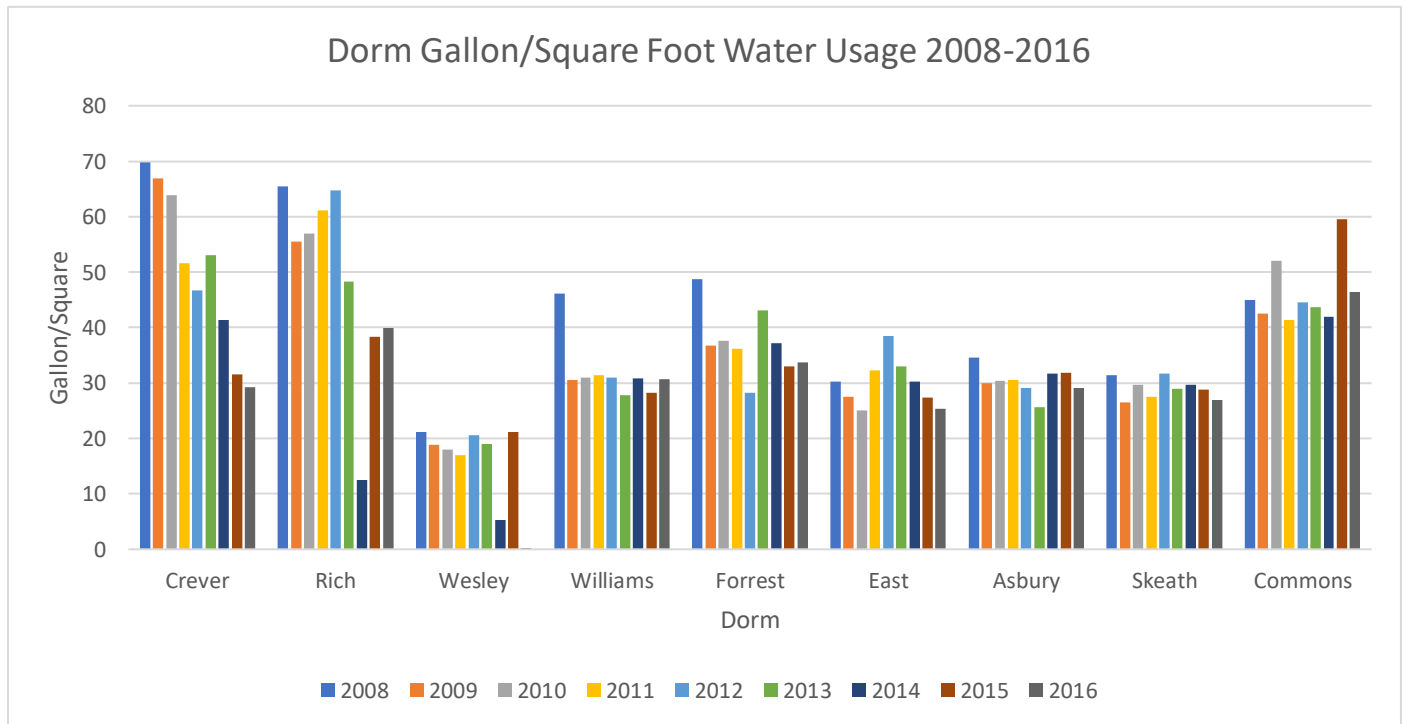
## Gallon Usage per Each Year per Academic Building



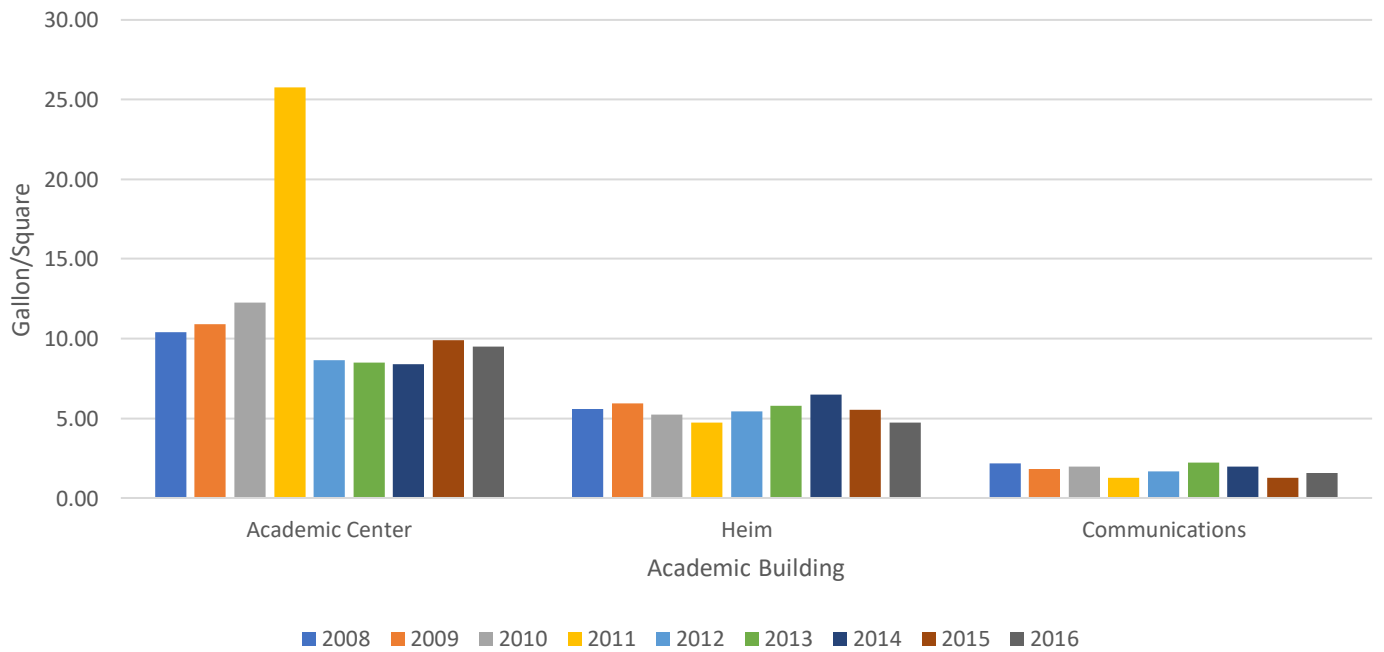
## Gallon Usage per Each Year per Other Lycoming Building



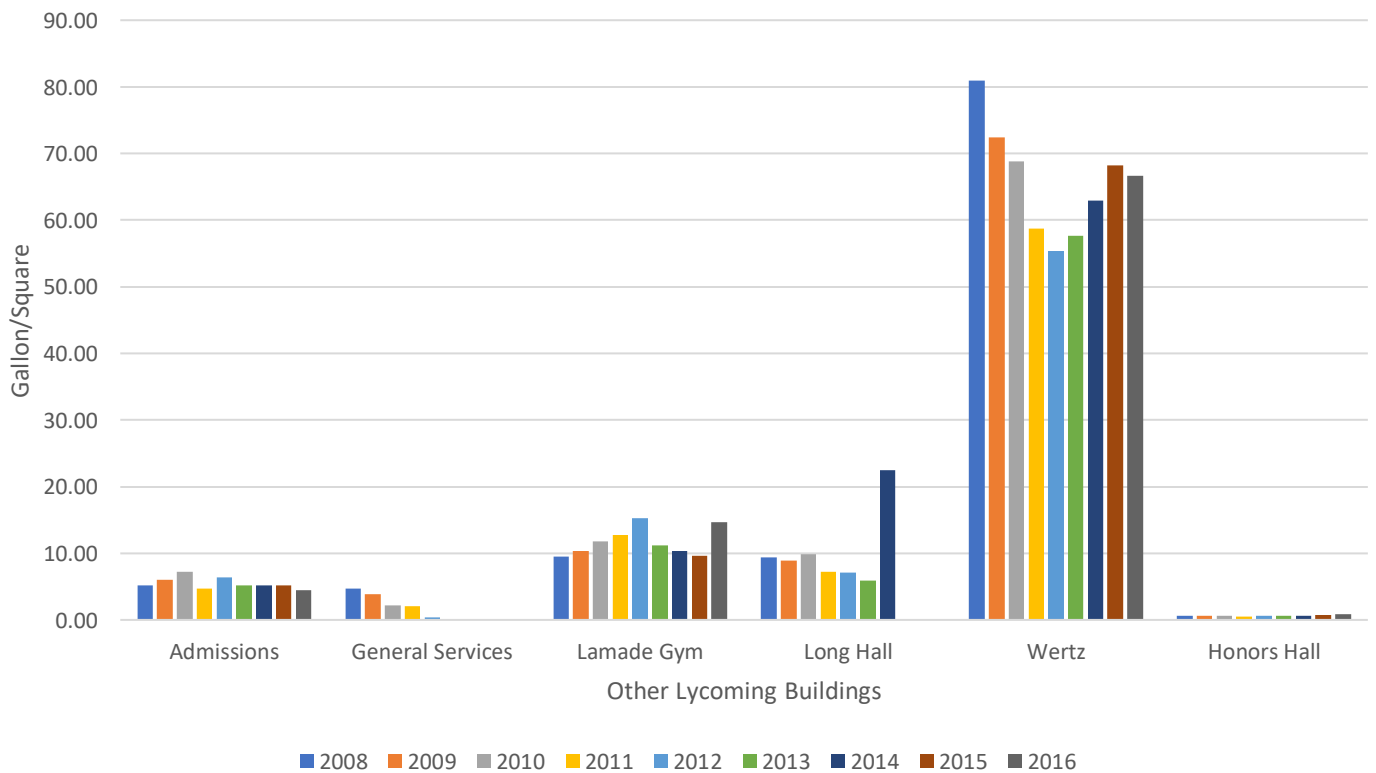
## Appendix 7: Water Usage in Gallons/Square Foot (2008-2016): Graphical Displays



### Academic Buildings Gallon/Square Foot Water Usage 2008-2016

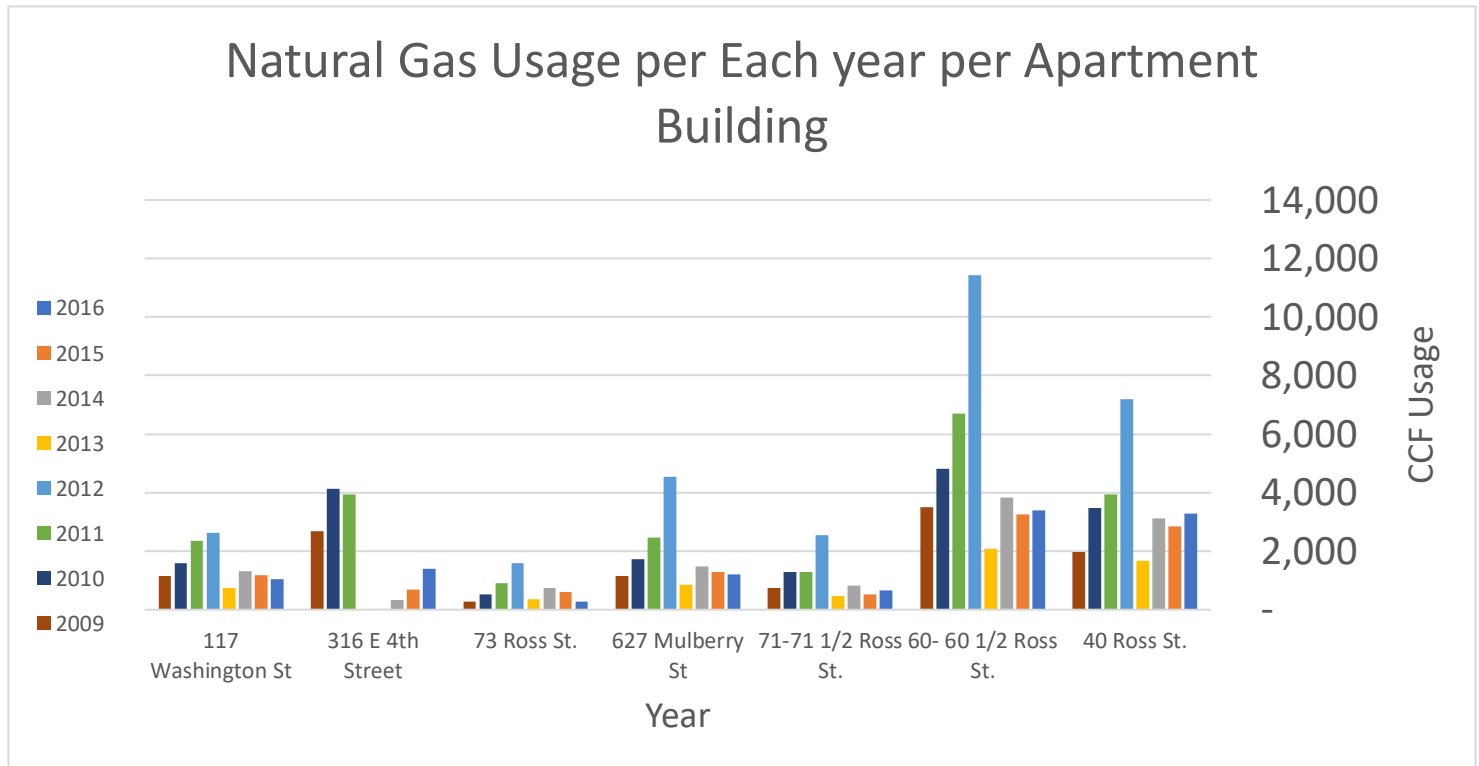


### Other Lycoming Buildings Gallon/Square Foot Water Usage 2008-2016

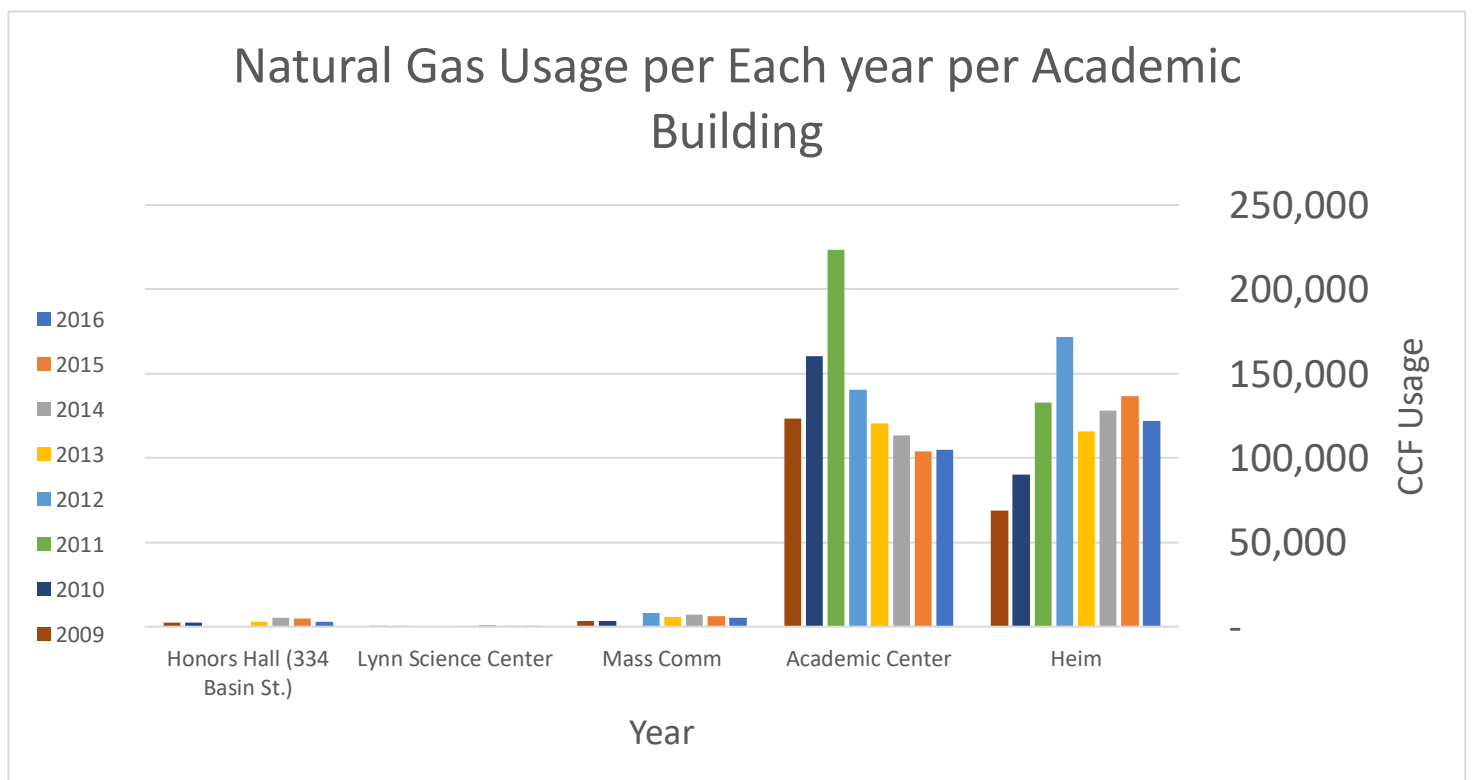


## Appendix 8: Natural Gas Usage in CCFs: Graphical Displays

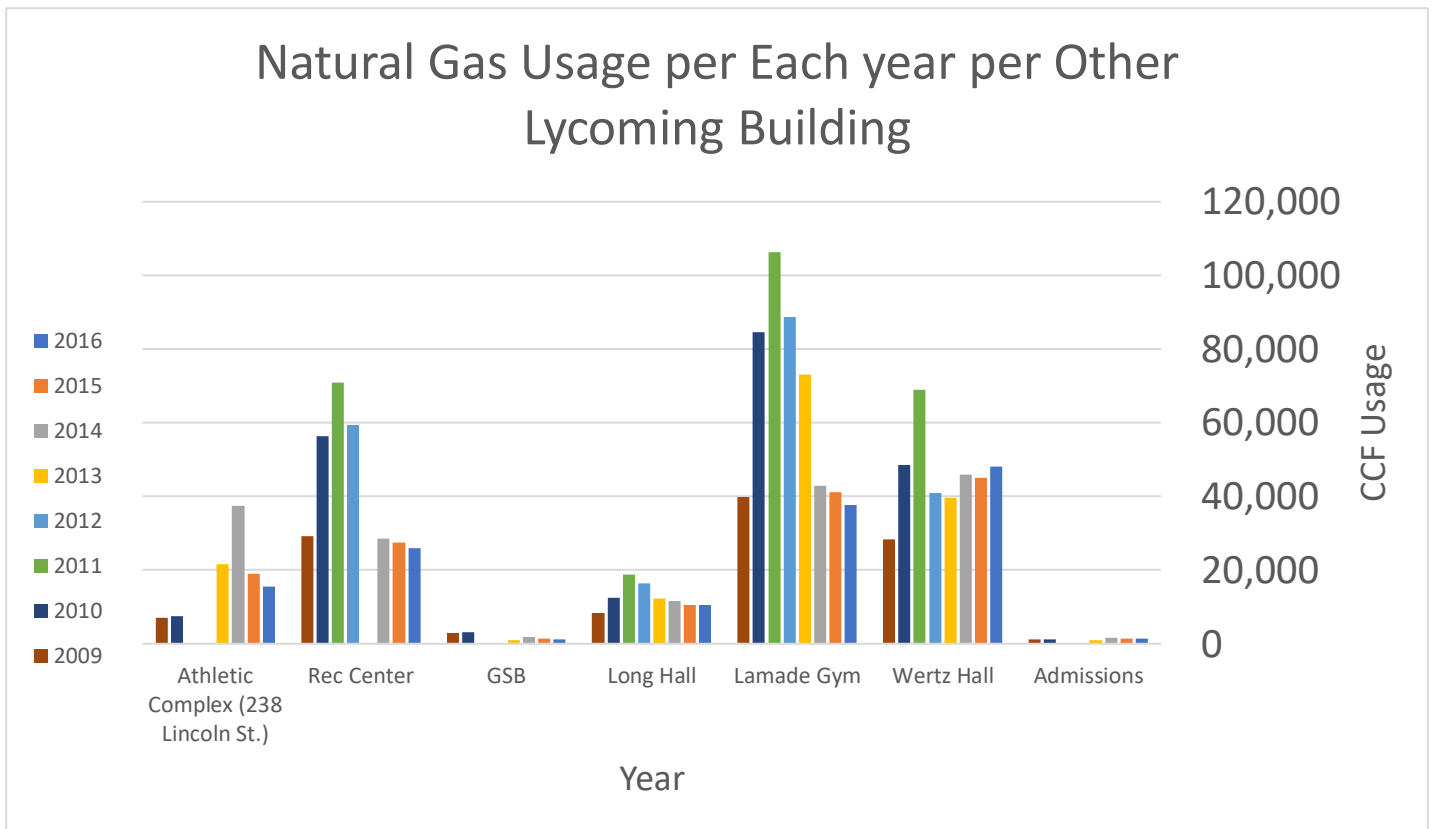
### Apartment Natural Gas usage from 2009-2016



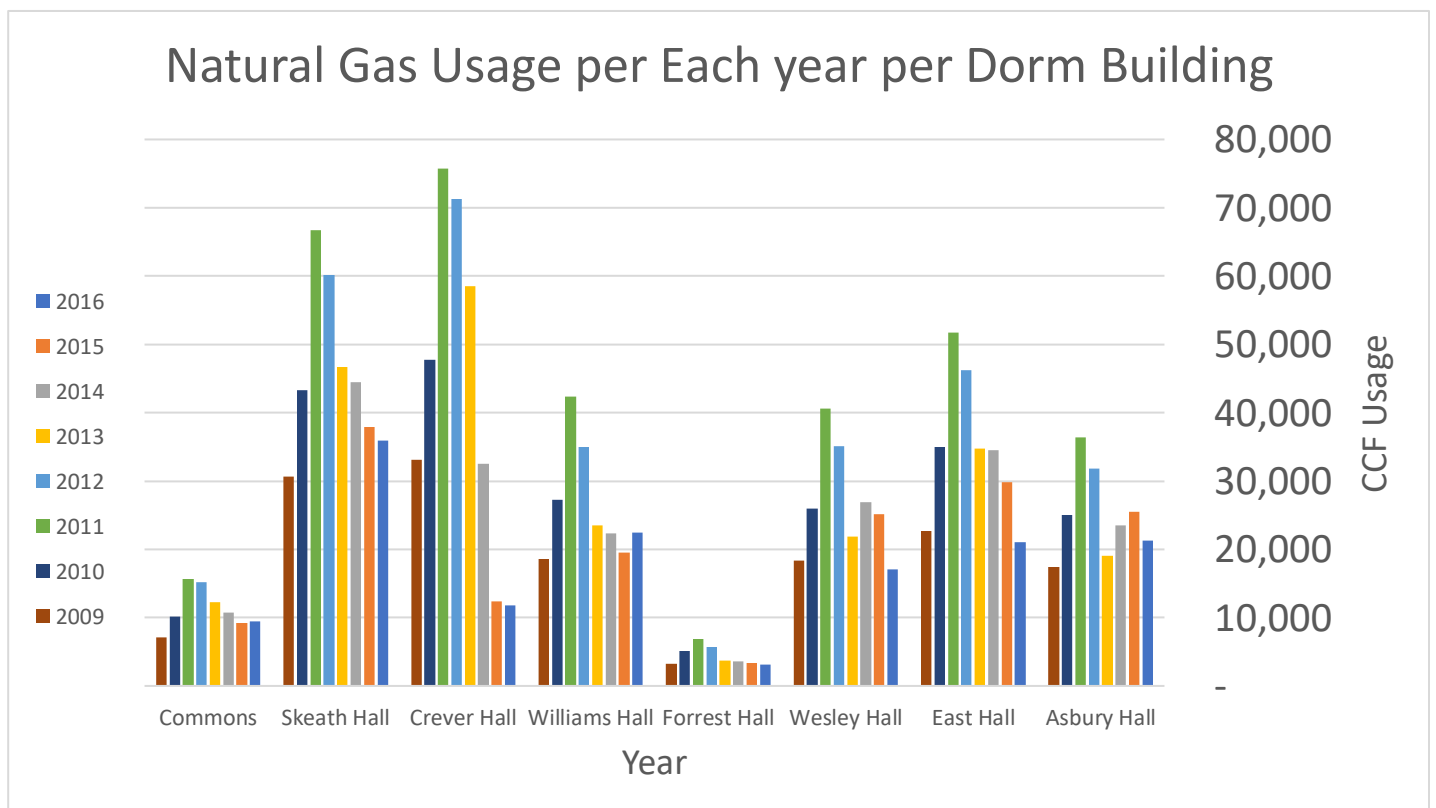
### Academic Buildings Natural Gas usage from 2009-2016



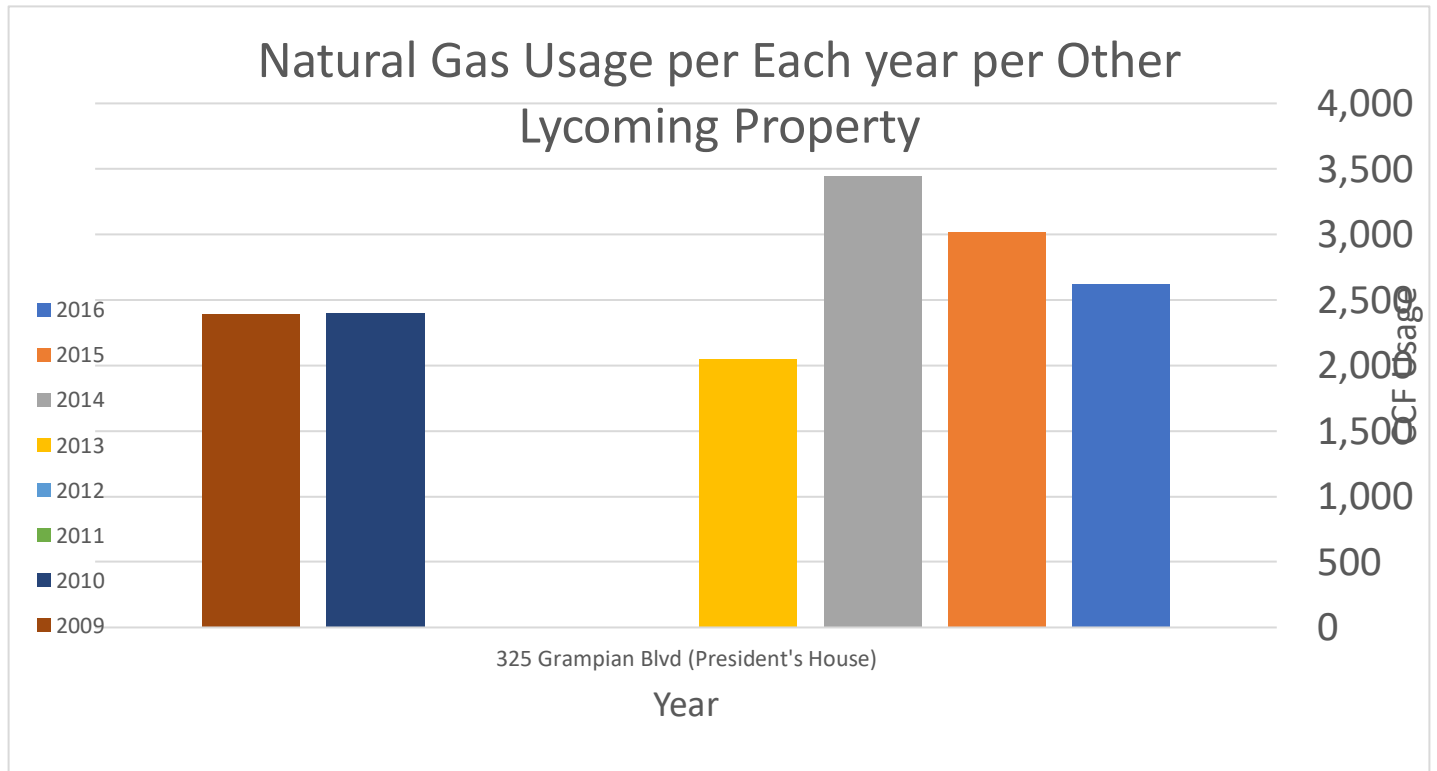
## Other Lycoming Buildings Natural Gas usage from 2009-2016



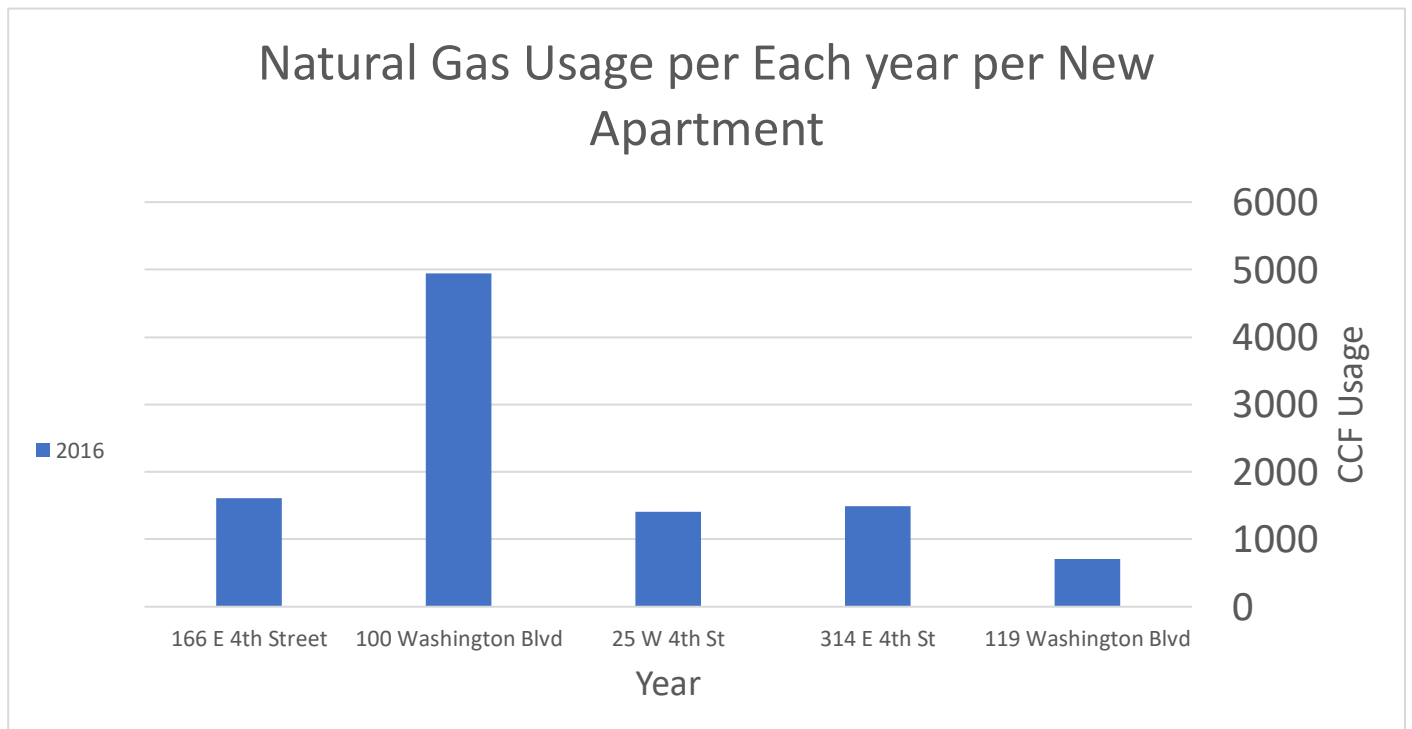
## Dorm Natural Gas usage from 2009-2016



# Other Lycoming property's (The President's House) Natural Gas usage from 2009-2016



## New apartment Natural Gas usage from 2016





## Appendix 9: Total Campus Usages: Charts

Total Electricity Consumption (kWh)	
Year	Totals
2007	10,909,844
2008	11,223,705
2009	11,157,471
2010	9,913,095
2011	10,213,731
2012	9,649,958
2013	10,711,018
2014	10,603,116
2015	11,071,812
2016	11,606,079

Total Electricity Consumption Per Building Grouping (kWh)						
	Dorms	Apartments	Academic Buildings	Other Lycoming Buildings	Other Lycoming Properties	New Apartments
2007	1,674,579	-	5,590,208	3,649,861	-	-
2008	1,650,782	115,742	5,217,377	4,022,421	21,623	-
2009	1,431,946	112,037	5,522,310	3,863,999	21,339	-
2010	1,173,007	113,889	4,874,190	3,534,225	16,984	-
2011	1,302,269	118,869	5,202,519	3,391,313	23,161	-
2012	1,262,715	110,307	4,740,228	3,413,107	19,441	-
2013	1,402,539	111,238	5,182,903	3,879,297	19,061	-
2014	1,313,508	119,721	4,436,183	4,605,607	20,530	927
2015	1,424,128	119,728	5,717,184	3,776,175	21,645	12,952
2016	1,371,925	91,891	6,102,433	3,927,432	25,644	86,753

Total Water Consumption (Gallons)	
Year	Total
<b>2008</b>	21,605,000
<b>2009</b>	19,249,000
<b>2010</b>	19,368,000
<b>2011</b>	21,131,000
<b>2012</b>	18,559,000
<b>2013</b>	17,339,000
<b>2014</b>	16,069,000
<b>2015</b>	17,259,000
<b>2016</b>	15,929,000

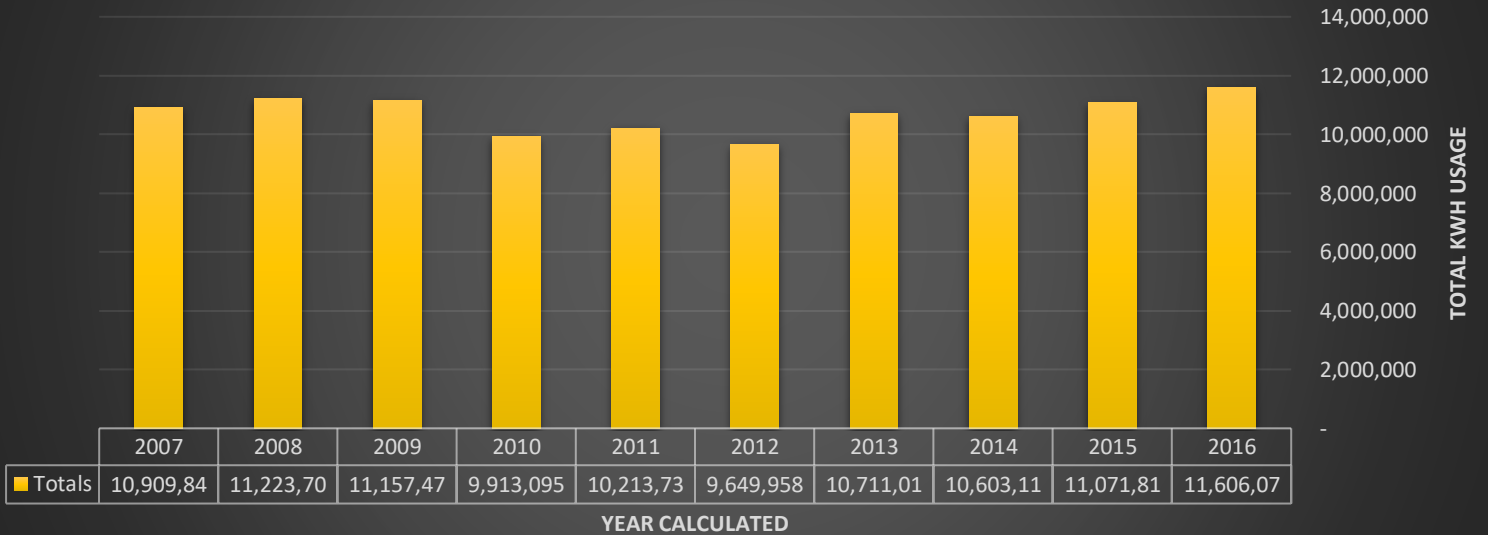
Total Water Consumption Per Building Grouping (Gallons)				
	Dorms	Apartments	Academic Buildings	Other Lycoming Buildings
<b>2008</b>	12,815,000	705,000	2,414,000	5,671,000
<b>2009</b>	10,871,000	497,000	2,529,000	5,352,000
<b>2010</b>	11,045,000	443,000	2,740,000	5,140,000
<b>2011</b>	10,763,000	519,000	5,280,000	4,569,000
<b>2012</b>	11,150,000	483,000	2,054,000	4,872,000
<b>2013</b>	10,450,000	454,000	2,065,000	4,370,000
<b>2014</b>	8,373,000	547,000	2,248,000	4,901,000
<b>2015</b>	9,683,000	411,000	2,402,000	4,763,000
<b>2016</b>	8,253,000	335,000	2,263,000	5,078,000

Total Gas Consumption (CCF)	
Year	Totals
2009	480,726
2010	709,649
2011	979,075
2012	855,374
2013	622,593
2014	638,476
2015	575,368
2016	570,759

Total Gas Consumption Per Building Grouping (CCF)						
	Dorms	Apartments	Academic Buildings	Other Lycoming Buildings	Other Lycoming Properties	New Apartments
2009	151,215	11,507	198,571	115,816	2,390	-
2010	219,387	17,557	256,437	212,751	2,403	-
2011	335,981	21,554	356,494	265,046	-	-
2012	300,105	29,948	320,052	205,269	-	-
2013	220,341	6,198	245,383	148,621	2,050	-
2014	198,454	11,601	255,048	37,411	3,443	-
2015	162,727	10,357	253,045	146,223	3,016	-
2016	142,132	11,236	235,620	140,361	31,245	10,165

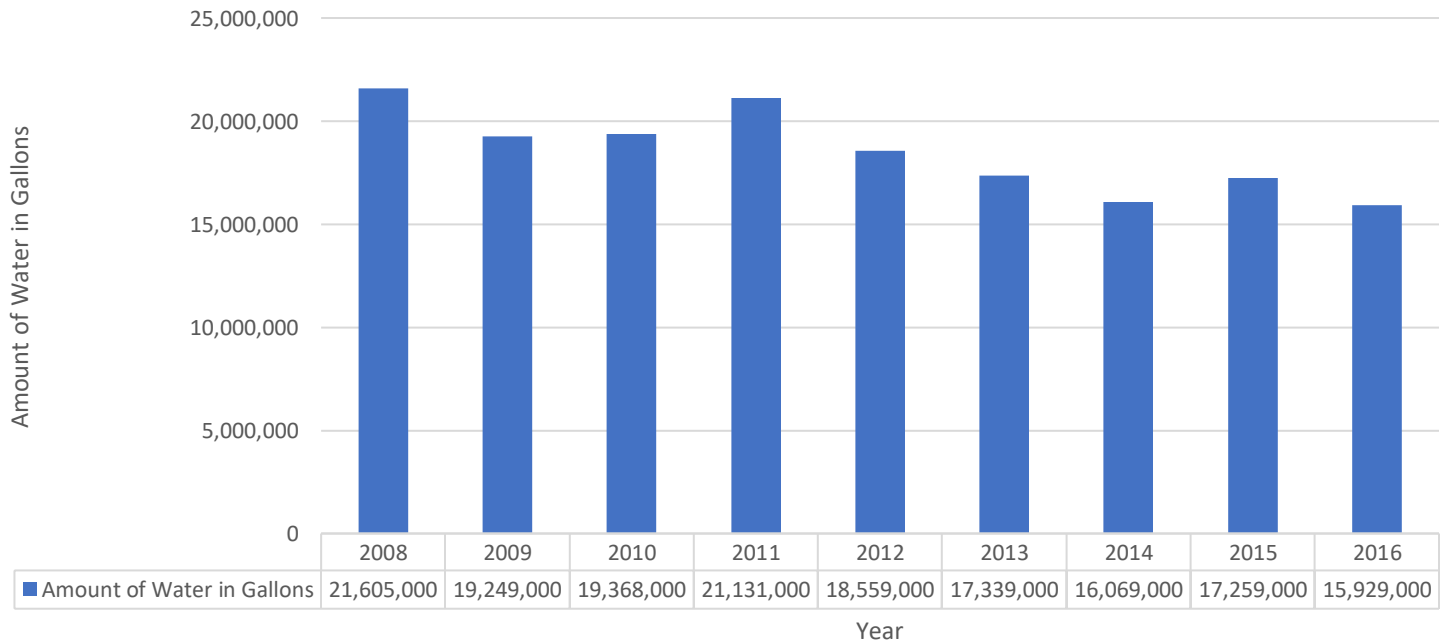
## Appendix 10: Electrical Energy Totals in kWh: Graphical Displays

**Total Campus kWh Usage Per Year**

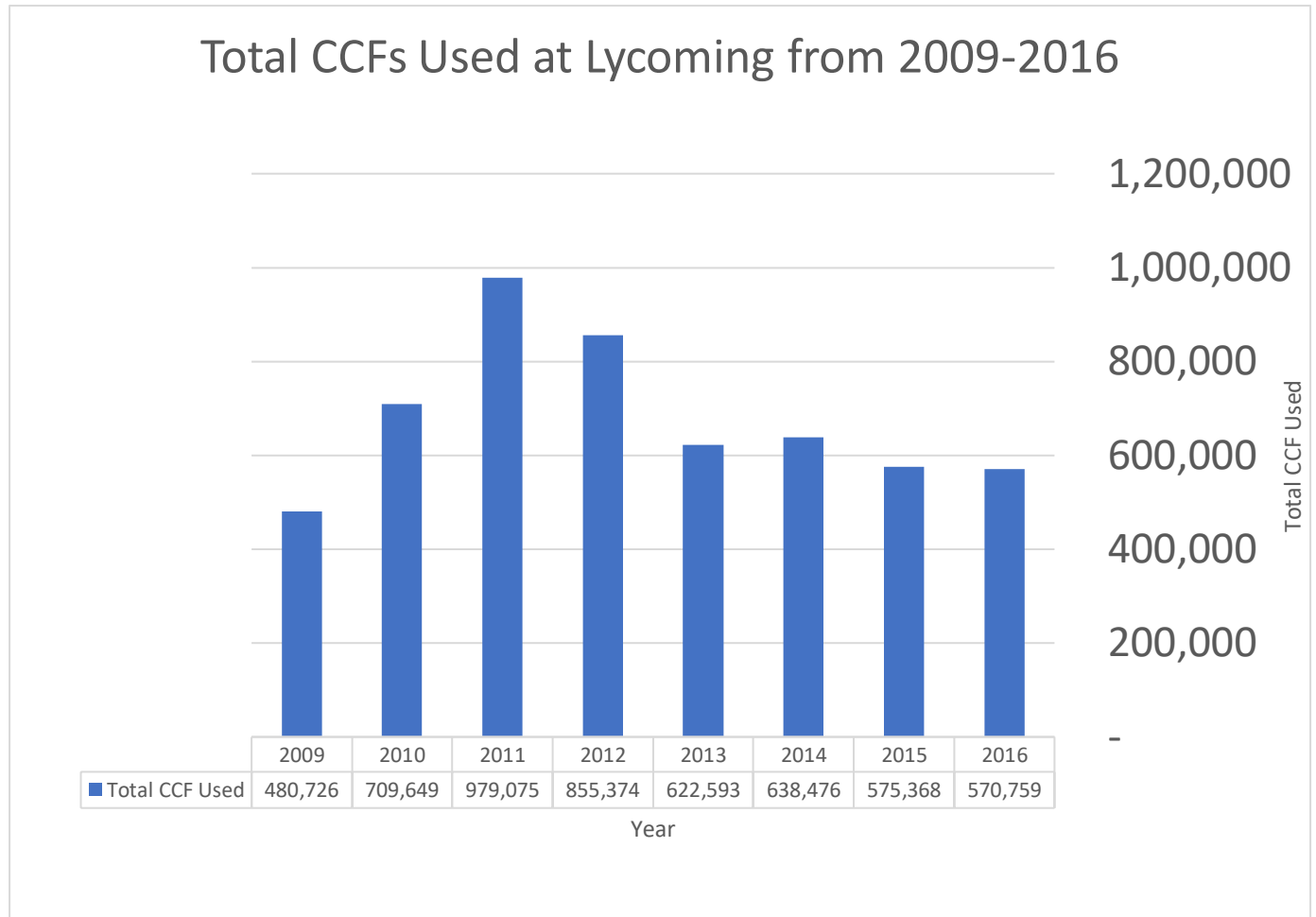


## Appendix 11: Water Usage Totals in Gallons: Graphical Displays

**Total Amount of Water Lycoming College Used from 2008-2016**

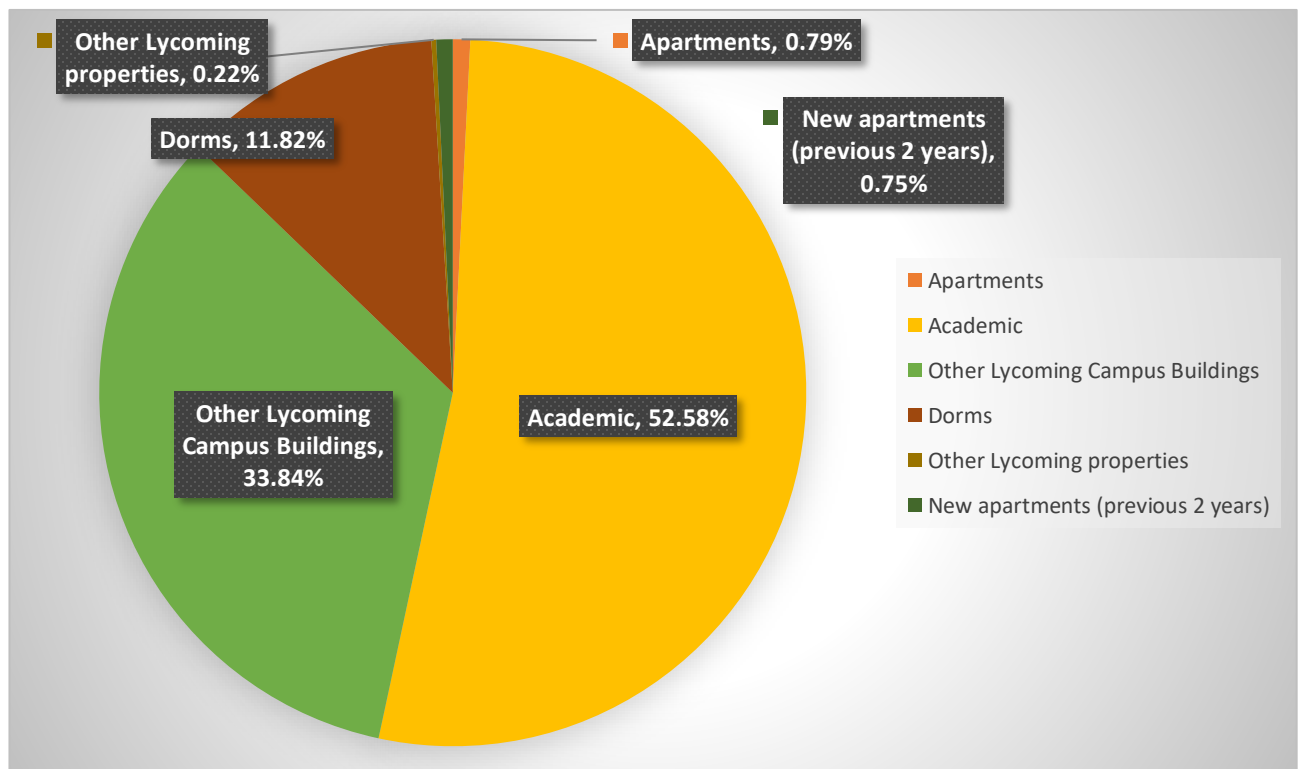
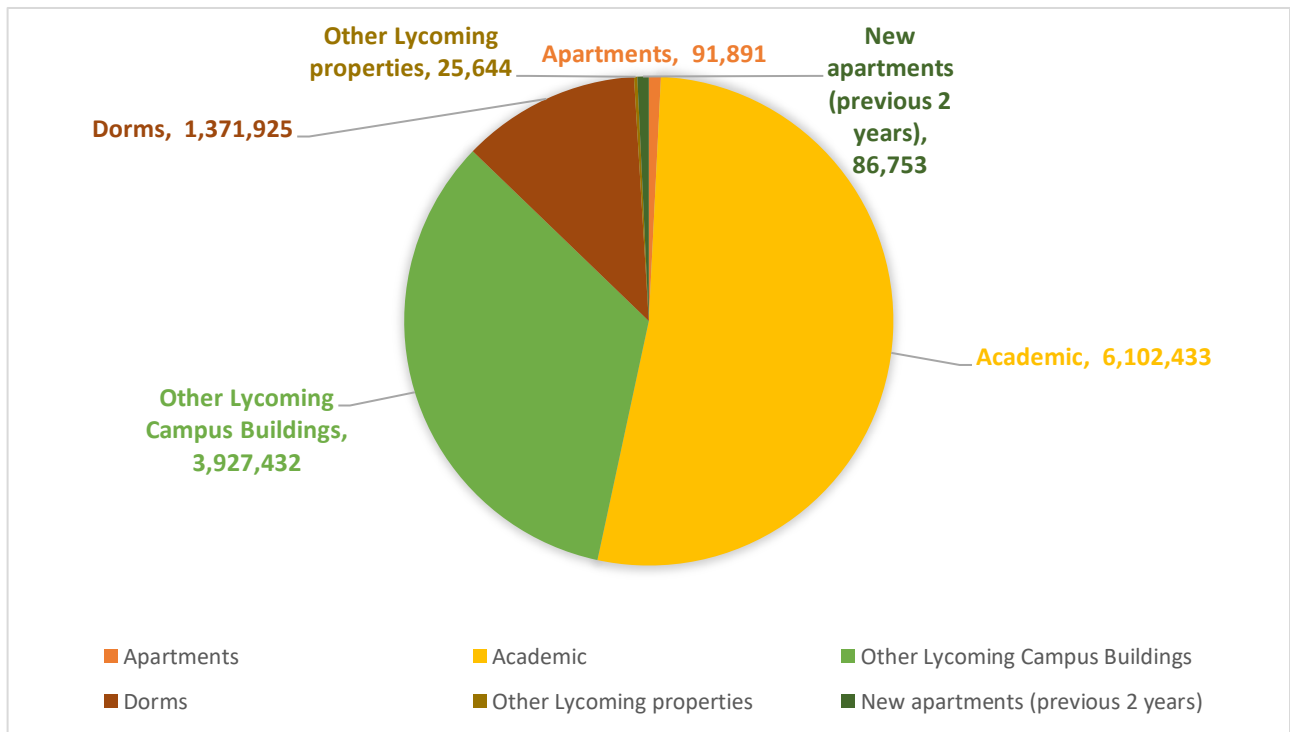


## Appendix 12: Natural Gas Totals in CCFs: Graphical Displays



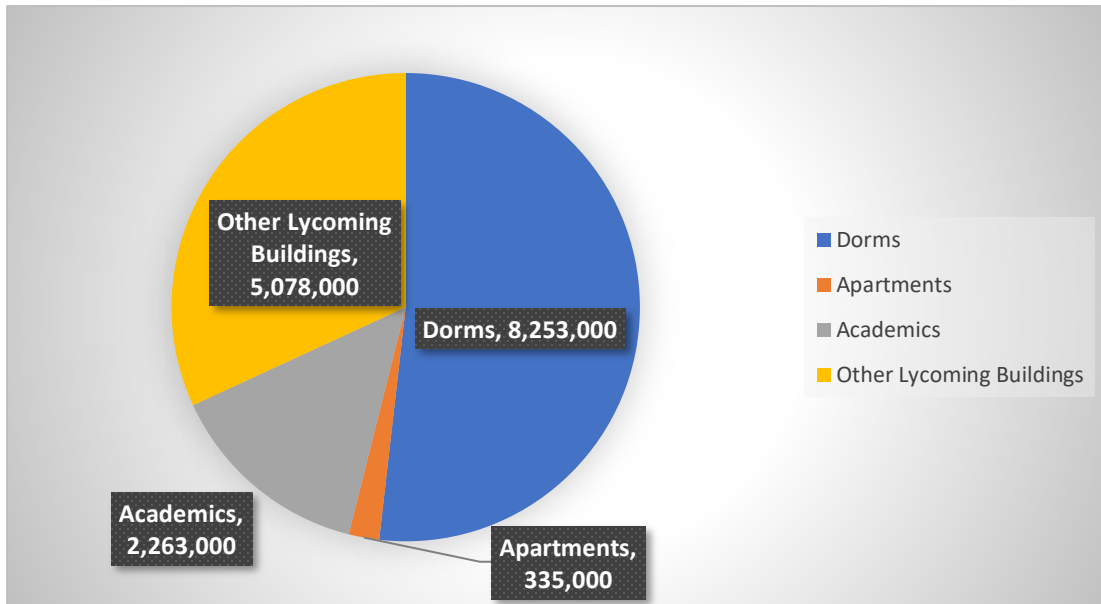
## Appendix 13: Electrical Usage Breakdown for Lycoming College Buildings (2016)

## Total Electrical Consumption per Building Group at Lycoming College for 2016

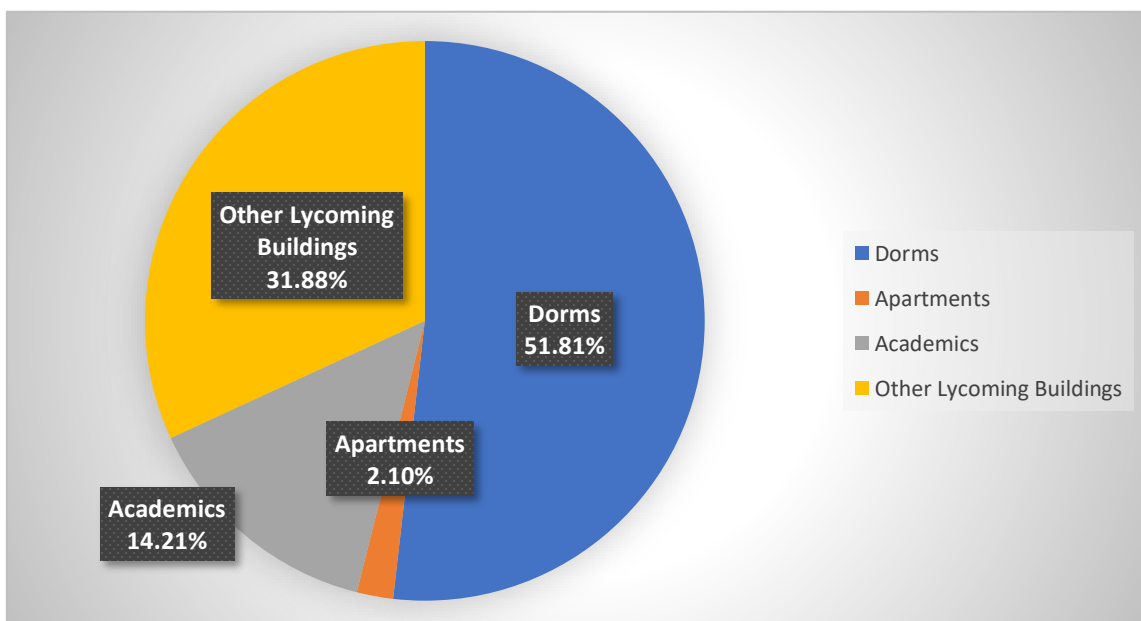


## Appendix 14: Water Usage Breakdown for Lycoming College Buildings (2016)

### Total Water Consumption per Building Group at Lycoming College for 2016

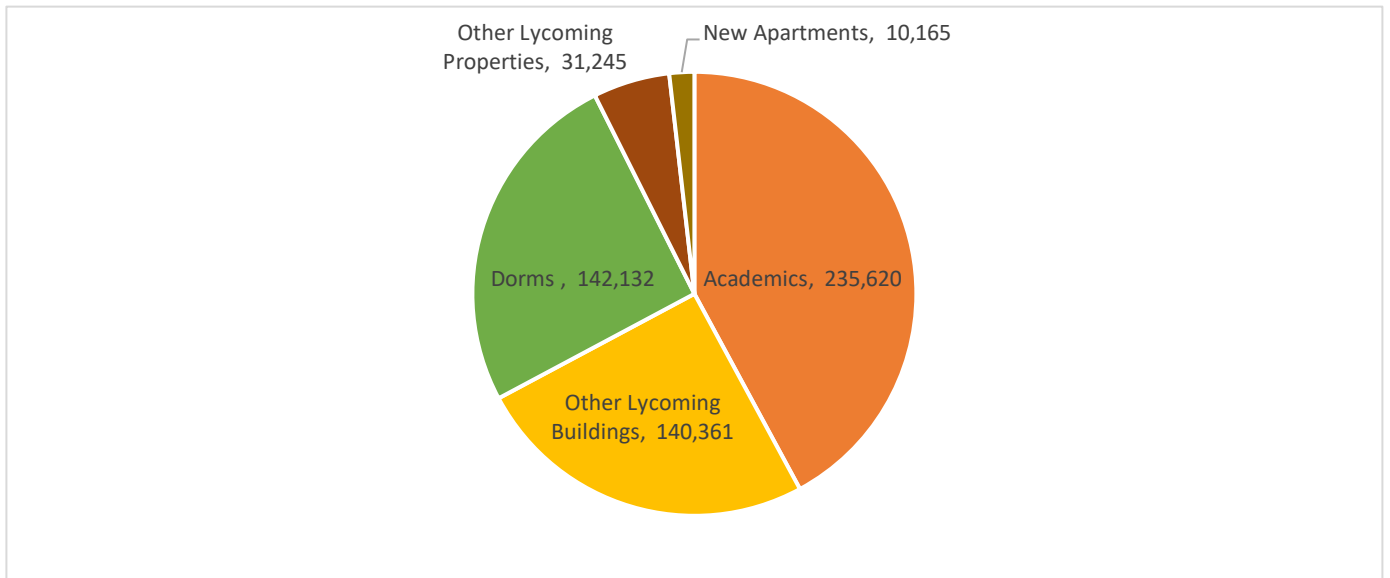


### Percent Water Consumption per Building Group at Lycoming College for 2016



## Appendix 15: Natural Gas Usage Breakdown in CCFs for Lycoming College Buildings (2016)

### Total Natural Gas Consumption per Building Group at Lycoming College for 2016



### Percent Natural Gas Consumption per Building Group at Lycoming College for 2016

