

Water Conservation Initiatives

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Coming into the semester I had the preconceived notion that Western Michigan University was a university not focused or dedicated to promoting sustainability. I had assumed the campus was an inefficient entity that consumed large amounts of resources and was not concerned with the environmental impacts it made while doing so. When presented with the challenge of creating a campus greening project, these assumptions lead me to the idea of a water conservation plan for the university. The plan involved installing low flow devices that would reduce the amount of water consumed, while maintaining the quality expected by each member of the campus society. The plan would involve a campus wide water consumption audit that would quantify the amount of water the campus consumes monthly. By analyzing the water audit I would then identify areas where the majority of the water consumption is taking place. Then based on those identified areas, I would make recommendations on water savings strategies.

Upon my first meeting with campus personnel, the scope of my project quickly changed. I had discovered my prior assumptions were incorrect and that Western Michigan University is a university dedicated to sustainability. I was informed about the initiatives Western has made concerning water conservation and was, to say the least, impressed with the progress that has been made. This led me to develop a new project scope which involved tracking the progress, documenting the success and failures of the water conservation initiatives.

The campus has employed many new technologies that have aided in the improvement in resource management. A collaboration of changes in many different areas can be attributed to the success the university has incurred. The main areas I looked into were irrigation controls, occupancy sensors for non continuous flow in urinals, low flow water closets, low flow shower heads, high efficiency laundry equipment, cooling tower acid program, and air cooled condensers. These initiatives along with other have reduced water consumption over the last ten years by roughly 25%. Although the university is not always successful in the technologies they employ students should be informed that the university is continuously working towards the improvement of campus efficiency and sustainability.

In order for the campus to continue its successes, it must continuously be updating old technologies as well as begin communication with the students. The students need to be aware of efforts being made and the impact they have on a campus this size. They need to become aware of their current consumption as well as being educated on actions they can take in order to add to the successes that have been made by the university. Working in collaboration with one another each side can ensure that the campus operates efficiently, minimizing waste and the overall environmental impacts a large campus such as Western can produce.

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INTRODUCTION

Western Michigan University hosts roughly 30,000 students, faculty, and employees on an average of eight months per year. Providing resources for this large population while maintaining the quality and standards expected as well as incorporating the campus's decreasing budget, is a task no one person can manage. The campus must continuously test new technologies, gather data, and make the decision to invest in the technologies or continue use of the current system. Maintaining a sustainable campus is a goal campus employees are committed to, although we seldom see their efforts.

PROJECT SCOPE

The purpose of my project is to quantify the initiatives taken by the campus that promote sustainability in the area of water conservation. Gathering and analyzing the data given to me by campus staff will provide the basis for my conclusions. From this analysis I will deduce whether or not the initiatives and improvements made on the campus have successfully reduced water consumption on campus. By performing this analysis I hope to inform the students of the initiatives taken by the campus regarding water consumption, empowering them with the knowledge to make better decisions based on the examples set by the university.

CONSERVATION INITIATIVES ON OUR CAMPUS

The campus is a complex entity that incorporates the use of many different technologies in order to provide water to campus. Water is a valuable resource with many different purposes therefore; it is distributed across campus by different systems. In order to narrow the scope of my project to a manageable workload, I have limited the scope to include these main areas: irrigation controls, occupancy sensors for non continuous flow in urinals, low flow water closets, low flow shower heads, high efficiency laundry equipment, cooling tower acid program, and air cooled condensers. Although these areas define the scope of my project, the campus employees are continuously working on and researching new technologies in order to optimize the current system and efficiently provide services to accommodate a growing population.

Irrigation Controls

Properly irrigating the campus green space is an issue that has taken into consideration. Maintaining the green lawns and the colorful array of flowers consumes large amounts of water. The previous methods for irrigation were inefficient and unsuccessful. Initiatives have been made to change the way campus irrigates the green space.

Previously watering the lawn was set on a time scale. Rain or shine the sprinklers were set to come on at specific times during the day. This is why on rainy days as you walked across campus you would still see the sprinklers on and if an initiative was made to turn off the sprinklers, the lawn personnel would have to manually turn off the sprinklers at each location.

Along with these flaws, there was no way to detect leaks in the water lines, therefore if a leak had occurred it would be undetected for long periods of time. With these inefficiencies WMU has invested in a new irrigation system.

The new method of irrigation consists of an automated system that incorporates soil and weather conditions into the irrigation process. The system will turn on and off based on the needs of the soil reducing water consumption, while still maintaining the colorful landscape. The new system automates the entire irrigation system campus wide, allowing a person to shut off water to a specific area, without physically having to be at that location. The automated system can detect breaks and leaks in water lines sending out an alert allowing personnel to promptly fix the problem. These new technologies have vastly increased the efficiency of the irrigation process, which will hopefully aid in reduction of water consumption for the campus. Currently the campus is working on installation of this system and is about 70% complete with the process.

Instantaneous Water Heaters

Heating the water provided to dorms is another system that WMU has upgraded. Previously the water heated in the dorms was stored in three 12000 gal tanks that continuously circulated the water through the system, in order to heat the water in the tanks. Due to the troubles of draining the pipes and exposing them to oxygen, which would corrode the pipes and damage the system, the system remained on during the summer. Heating and circulating the water, when no students occupied the dorms. To improve the system and reduce the amount of resources consumed, a new system was installed. This system uses an instantaneous water heater eliminating the large tanks and the need to heat them. Instead the amount of water heated is directly correlated to the amount of hot water needed. The water is heated as it travels through the pipes, having the ability to heat 120-130 gal/ min. The new system reduces costs and energy consumption for a process that is costly even when operating efficiently.

Laundry Machines

Updated laundry machines provide reduction in the amount of water consumed in the resident halls. New machines reduce water consumption by about 60% and amount to a savings of 1,637,856.00 gal/yr. This investment is an improvement that depicts the campus's dedication to resource conservation.

Low Flow Devices

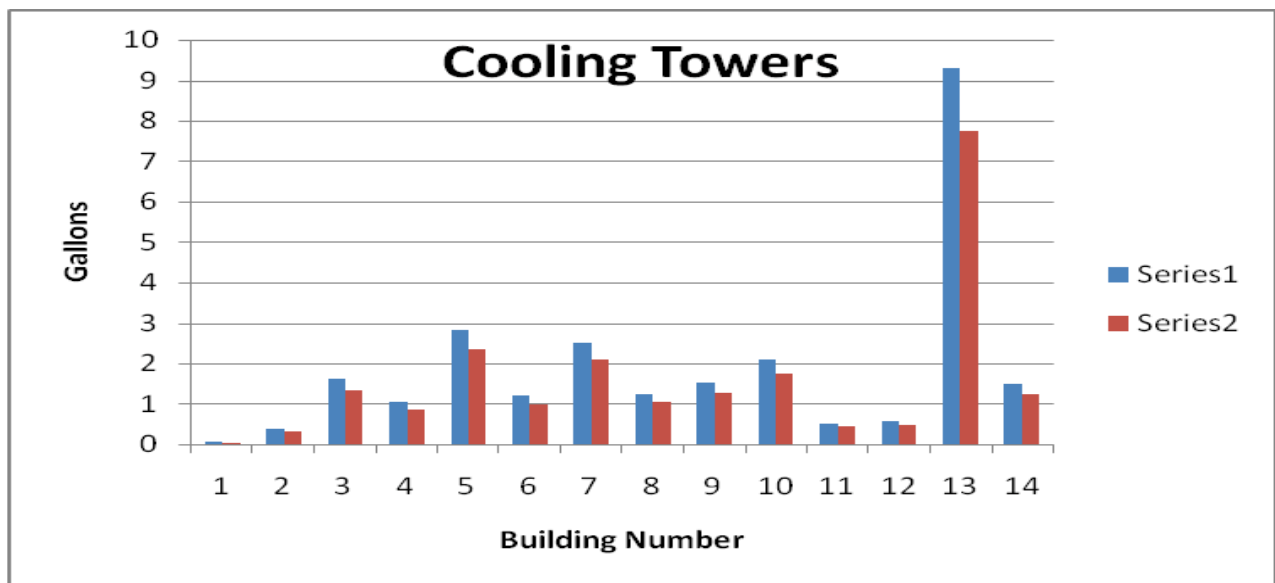
Low flow devices have been installed throughout campus in an effort to reduce water consumption across campus. New showerheads reduce consumption from 3-5 gal/min to 1.5 gal/min also low flow toilets and urinals have been installed in order to minimize consumption from 3.5gal/flush to 1.5gal/flush and 2gal/min to 1gal/min respectively.

In areas where continuous flow urinals used to exist, tanks above the urinal would provide a continuous stream of water to the urinal, consuming water even if the facility was not being used. In places where applicable the tanks have been shut off and removed and in other places an occupancy sensors has been installed that controls a solenoid valve that opens and closes when the facility is being used. Although these reductions may seem miniscule, on a campus of this size, small reductions in these areas repeated for each facility across campus, may amount to significant savings for the campus.

Cooling Towers

Cooling towers are heat rejection devices that use cooling water to cool a working fluid. The water cools the fluid and rejects the heat into the atmosphere. Water which acts as the primary coolant is circulated through the tubes cycling three times before more water is added. Since the cooling water is being evaporated the water has to be properly treated so it will not clog the pipes with the inerts left behind from evaporation. Make up water is added to the operation to account for the water that has been evaporated after the cooling process. The make up cooling water was being treated with two types of biocide adding 50% city water to blend the proper mixture. This allowed for a maximum of three cycles before adding the make up water. In order to increase the efficiency of this process, an acid treatment program has been introduced. The acid treatment allows for the water to cycle up to five times before adding the makeup water. Figure 1 below shows the savings each building that has the new cooling tower cycle system. This new system has increased the efficiency of the cooling system therefore decreasing the amount of water used.

Figure 1. Cooling Tower Water Savings, blue lines show previous method red new method.



Air Cooled Condensers

Condensers are heat transfer devices used to cool a working fluid. Western uses condensers in the summer as a part of the building cooling system. The hot working fluid travels through the condenser and is contacted by a cooling fluid. The warmer fluid transfers heat to the colder fluid and heat transfer occurs. Previously Western was using cool city water as the colder fluid for the condensers. This cooling water is continuously circulated through the unit and discarded as warmer city water at the end. In an attempt to reduce consumption WMU is moving towards air cooled condensers. Although air's heat capacity properties are much lower than water's the air will provide sufficient cooling of the medium. The system will only need to use cooling water on the days when the air temperature may be too warm or humid.

DATA ANALYSIS

Over the last ten years Western Michigan University has been working hard to increase the efficiency of campus operations. The processes I have described are only a few changes they have made in order to reduce the amount of resources the campus uses. These initiatives sound great but have they been effective in reducing the amount of water the campus consumes? The graph below in Figure 2 shows how the water consumption has decreased over the ten years. From the graph you can deduce that the total water usage for campus has decreased over the ten year period, dropping significantly over the last five years. Figure 4. Consumption per building sq footage per year also concludes consumption has decreased. The decrease in consumption has been especially significant due to the fact the building square footage has increased over the last ten years.

Figure 2. Water consumption and building square footage report for over ten year period

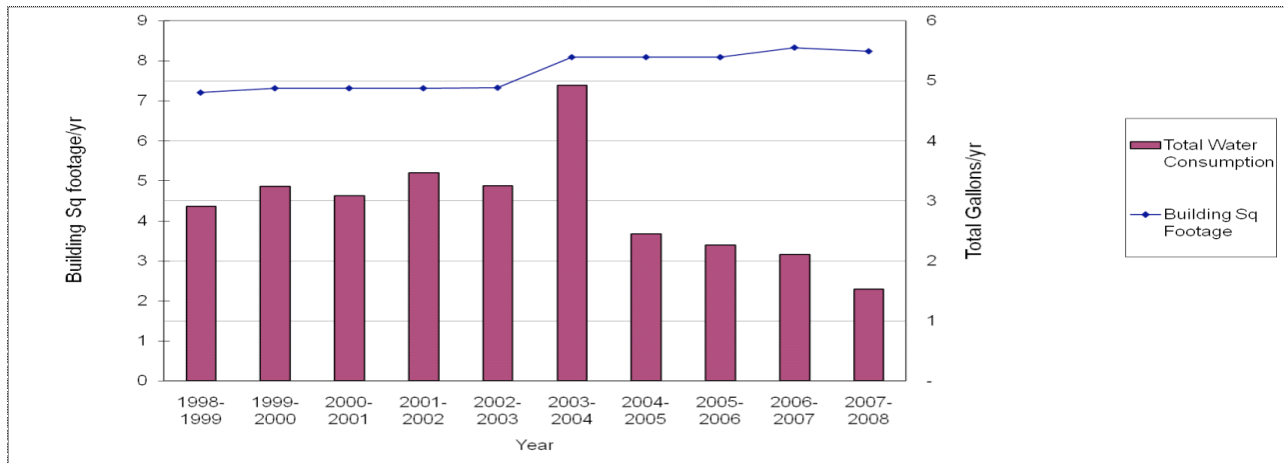
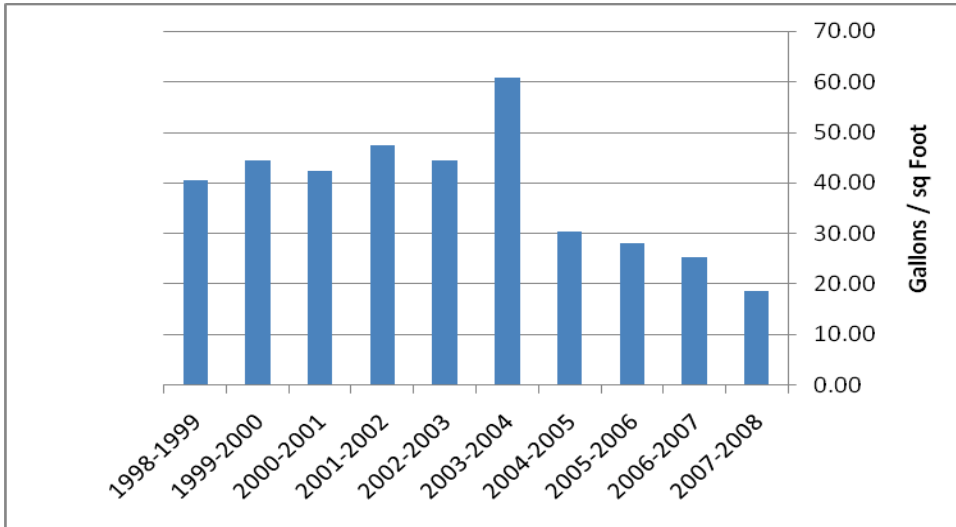


Figure 4. Consumption per Building sq Footage



Western currently enrolls almost 25,000 students when comparing campus water consumption over the last ten years per capita consumption, I would conclude that per capita water consumption has decreased. Although enrollment fluctuates over the years this decrease has not been significant enough to be the cause of the major decreases seen above in Figure 2 for water consumption. As seen in Appendix 1 Figure 3 the freshmen enrollment has fluctuated over the last ten years causing student populations to increase and decrease over the years. This fluctuation has been no more than a 10% decrease from 1998 to 2007, which I would conclude is not enough to cause the drastic decrease in water consumption.

Figure 5. Cost of Consumption per Year

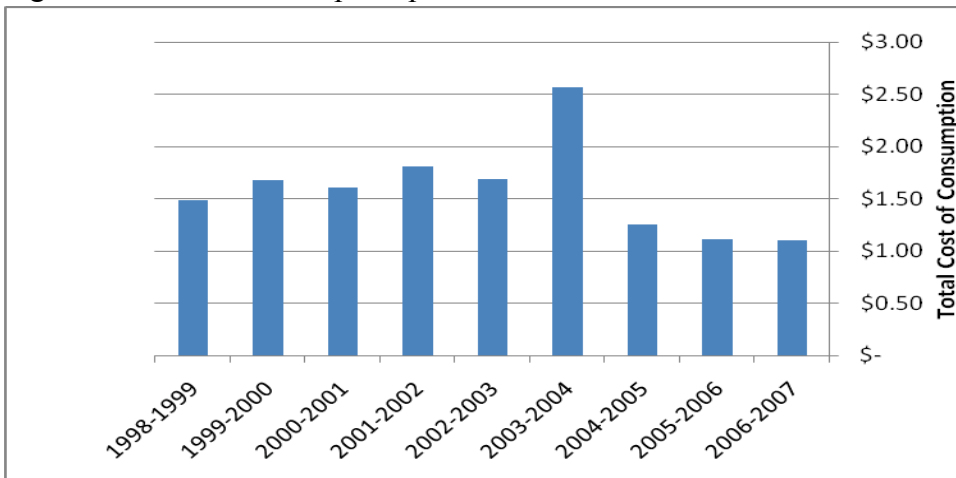


Figure 5. Cost of Consumption per Year, shows how the reduction of the consumption saves the campus money per year. Since most water used on campus is bought from the city and

then discharged to the city reclamation plant, savings in water consumption also lessens the loads for the city sewer. The only water bought from the city and not discharged to the reclamation plant is the irrigation water. This water is more costly than the other water. However, this price discrepancy is not depicted in the graph above, because a complete water audit is not available for me to determine how much water is going to that area. Decreasing the cost in both of these areas can amount to huge expected savings.

From the data I have gathered I would infer that Western Michigan University's initiatives towards water reduction have been a success. This achievement in the reduction of water consumption can be attributed to many different ideas and initiatives. However, it is the careful thoughts and planning's of the people employed at the university that have made the changes needed to work towards a sustainable campus. Their efforts although mostly unheard of have positively impacted the campus.

CONCLUSION

Western Michigan University is a vast entity that hosts a large population. This population consumes a large amount of resources on a daily basis. Since efforts are not directly recognized on campus, students are quick to negatively judge the university, assuming nothing is being done to promote a sustainable campus. Lack of information and communication between the university and the students can be attributed to this problem. Students are not aware of actions that have been or are currently taking place in order to improve campus operations. Although not all initiatives taken by the university have been a success it is important that students remain positive about the actions that have been done, realizing the complexity of the universities situation.

RECOMMENDATIONS

In order for water reduction on campus to continue the students and the university must work together. Students need to be aware of the resources they consume, working towards reducing their consumption where ever possible as long as the university continues to provide the proper technologies and resources for the students. Each side must communicate their efforts assuming each one cares about conservation. Assuming that nothing is being done on either side is not the right idea, instead the two should collaborate thoughts and ideas always working towards a more efficient campus.

My second recommendation is that a campus wide water audit must be preformed. In order for the campus to continue reduction in water consumption, they must know the areas of major uses. Once the areas are identified, campus personnel will be able to work towards building a water savings plan for these major areas. Knowledge and awareness is a huge part of conservation. Knowing how much is consumed is what area as well as making people aware of their own consumption habits may be something the campus should look into.

References

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Table 19A *Freshman Applications, Admittances and Enrollments*, Office of Student Academic and Institutional Research, www.wmich.edu/ir/fackbook/2007/student/tapp.pfd