

Summary

The overall goal of the water conservation project is to measure and reduce the unnecessary water use at IU Bloomington, mainly through providing students and staff with information about the Leak Line, a number where they can report leaks to IU Utilities staff. Water conservation has been part of the Utilities division goals for several years, and is largely handled by the Utility Information Group, which manages most of the utility information for IU. This year some changes were made to the program: Swain Hall was added to the list of buildings in the water conservation program, and the Optometry Building was removed because of its professional and public nature. The water conservation project also focused more on outreach this summer. In order to provide more publicity about the Leak Line and water conservation at IU, attempts were made to update the Utilities webpage to provide more information about water conservation. Another major part of the water conservation project this summer was preliminary studies of bottled water use on campus.

To chart progress in conservation and to build up a database of standard usage, bi-weekly meter readings were taken for all the buildings in the water conservation project. Graphs of these readings are in the Appendix. Sticker placements are noted on the graphs to provide visual demonstrations of the effect greater information has on both water use and the number of reports.

The number of water bottles purchased on campus last year is examined, and a number of recommendations to reduce bottled water purchases or reducing littered bottles are presented. A potential study of bottled water use was created for use in the fall, and is discussed. Also, various poster designs and placements are presented and their potential effects outlined.

Throughout the report, various issues that appeared during the summer are examined and findings presented. One example of this is the high rate of the disappearance of stickers. This resulted in stickers being tested in variety of circumstances and in interviews with Building Services staff and students. My conclusion is that a common cleaning fluid destroys the sticker backing. Minor changes in sticker creation and placement can significantly prevent sticker removal. Additional issues arise from not having students available to interview about their bottled water use.. To work around this, a study was created for use in the fall, which can be accessed by a link and emailed to a large number of people. Posters were also designed, but not created. These can be finished by the fall intern if bottled water is still an area of concern.

Introduction

Section I: Water Conservation

Water conservation at IU Bloomington is largely focused on preventing water loss

through leaks and unauthorized use. This goal has led directly to the Leak Line and the use of stickers to inform students and faculty of the Leak Line. Working to reduce the number of leaks has also inspired a great deal of informal outreach efforts.

The Leak Line program was the primary focus of this project. Eight stickers designs were created initially and four were chosen to be placed on the walls of the water conservation program buildings. An update for the Utilities webpage was created to inform viewers about the Leak Line program. However, this update has not yet finished working its way through the approval process and is not available for the public yet. Approximately 250 stickers were placed in or near fountains, bathrooms, classroom laboratories and research laboratories in the designated buildings. Approximately 30 more stickers were given to office workers, lab administrators and research assistants as a part of informal outreach attempts. The Leak Line program was a great success. As of June 2008, leak reports had increased 73% over of the previous year's number of Leak Line reports.

However, the water conservation program must contend with research water use, which often eclipses savings made from leak detection and repair. This is a particular issue for the Leak Line program, because many of the buildings on in the program are largely research buildings. Stickers and leak awareness are an essential part of water conservation, but even significantly reducing the number of leaks does not always result in a direct reduction of water use, as shown in the chart of Jordan Hall's water use in the Appendix. Instead, the water conservation efforts in the research area should focus on more efficient use. Great strides have been made in the efficiency of washers, autoclaves, and water or steam transportation devices since Jordan Hall and other science buildings were constructed. However, the researchers at IU are still using old, inefficient devices. According to the MIT sustainability website, MIT has saved 3,360,000 gallons per year since it installed water tempering limiters in 12 autoclaves. Better maintenance of steam traps has resulted in savings of approximately \$223,000 per year in formerly wasted steam, and \$20,000 from steam traps that did not need maintenance. Wasting less water and energy is important to many of IU's students, staff and faculty. Taking steps similar to MIT's would clearly benefit IU.

Another goal of the water conservation program this summer has been outreach to faculty, staff and students to convince them to use water responsibly. Using the stickers as a talking point, I have described the Leak Line and water conservation efforts to office workers, students, lab assistants and faculty in almost every building on the water conservation route

Section II: Bottled Water Use

Bottled water use at IU is a major issue in terms of environmental and social impact. Bottled water has lower standards of testing than tap water and has been found to be severely contaminated at the consumer level (Food and Water Watch, 2008). Bottled water also frequently takes advantage of false advertising and other illegal tactics. Also, water bottles themselves have been shown to be hazardous to drinkers' health, as per the FDA report released this summer.

Creating water bottles wastes about a gallon of water per bottle, and the bottles must

than be transported over long distances, wasting fuel and contributing to smog and air pollution all along the transportation route. With the number of bikers and walker at IU, air quality is a significant concern. Also, water bottles are often not placed in appropriate receptacles, and make up a substantial portion of the litter at IU Bloomington. In light of these facts, reducing bottled water use on campus was deemed an important part of water conservation.

One aim of the water conservation project in this area was to obtain preliminary information about the number of water bottles used on campus each year, and the ultimate destination of those bottles. The other aim was to prepare materials for future interns and IU personnel to use in estimating and combating bottled water use.

Methods

Section I: Water Conservation

Much of the decision making with regard to water conservation is driven by data contained in the database of meter readings from the conservation route. This route is a bi-weekly route containing all of the buildings in the water conservation program. Every two weeks, Glenn Moulton, a member of the Utility Information Group, takes meter readings for each building. The readings are fed into a database. The database required some work when I arrived this summer, because of some incorrect calculations and assumptions imbedded in the data. Some meters recorded data in 1000 gallon increments; others recorded data in 10,000 gallon increments. However, the database did not distinguish between the two, which occasionally resulted in apparent negative water use when the numbers were examined by building. However, Mr. Moulton and I worked together over the course of several routes to fine-tune the database. I believe that the data collected from the water conservation route is now more accurate and useful than it was before.

Examining spreadsheets is useful for spotting trends and random events. It is not, however, useful for tracking down an explanation for odd occurrences. Also, spreadsheets can lull users into a false sense of security if common sense is not used when examining the data. For example, the Fire water meter in Jordan Hall has consistently registered water use. This use has fluctuated greatly over the past few years, but there had been constant flow since early 2006. The Fire system in Jordan Hall is a fire sprinkler system, and is therefore not supposed to be using water. I discovered that it was using several thousand gallons a week, but could find nothing in the spreadsheet data to indicate if this was supposed to be happening. The irregular pattern of pre-2006 use argued against the conclusion that the Fire system was supposed to be using water all the time. To track down the reason for the excessive water use, I had to contact several people, including workers in Jordan Hall utilities, contractors and maintenance workers. Eventually, one of the members of the Utilities Information Group (UIG) told me that the Fire system suffered from a leak, and the parts had been on order for six months. This incident clearly demonstrates that the meter data, in addition to knowledge of the situation and working together with members of the Physical Plant, can be used to spot unusual occurrences with water

use. It also shows that an increased emphasis on quick and reliable maintenance could save the university significantly. This incident clearly shows that while spreadsheets can help determine which situations are anomalous, they are not the most useful tool for determining what is going on in a given situation. To find out what the numbers mean, interviewing staff, faculty and students is an essential tool.

One of the major issues this summer was the disappearance rate of stickers from the water conservation buildings. In just two months, some buildings lost more than half of their stickers in public locations such as fountains and bathrooms. The loss rate for labs was lower, but still significant. Geology is the only building where stickers from more than two semesters are visible in the hallways. Given that nearly 250 stickers were placed this summer and my predecessor doubtless placed a similar amount, this is a matter of concern. When investigating the disappearing stickers, interviews proved essential to understanding what was going on.

Using the stickers as a talking point, I interviewed graduate students who ran labs, office workers and Building Services staff about stickers they had seen and what they had seen happen to them. I also looked at how many stickers had survived from previous semesters, and what those stickers were like. I enlisted my fellow interns, a fairly balanced mix of graduate and undergraduate students, and my coworkers to get a picture of their suspicions about the disappearance of the stickers. Two main hypotheses emerged. My fellow students suspected that the stickers became loose and were then thrown away as useless when they were brushed or fell off, possibly by the general public. This would explain why the stickers in the most public areas were the first to go. My coworkers suspected that there was a breakdown of some sort in Building Services, specifically between the upper-level managers and the night staff. An interview with Building Services evening staff turned up the fact that there was, in fact, a breakdown with the Building Services night staff and that the night cleaners did not know that the stickers were important or that they were part of an IU program. However, the interview also showed that Building Services staff were not deliberately removing the stickers.

Further investigation via some quasi-scientific experiments showed that the likely ultimate culprit for the sticker's disappearance is cleaning fluid. I tested two stickers which were identical to stickers found ruffled and discolored on fountains in Jordan Hall. The stickers were subjected to water and cleaning fluid to determine which could reproduce the loose backing and discoloration which appeared in the stickers I found. I tested the stickers on the 10th St. facility's water fountain, which is very similar to the fountains found throughout IU campus. The experiments showed that the multi-purpose disinfectant used in public areas can quickly strip the backing from a sticker and will produce discoloration and ruffling shortly afterward. Combining the raw data of the disappearing stickers with in-depth interviews and experimentation solved the issue of the missing stickers.

My interviews were largely informal and did not involve recordings, strict note-taking or other forms of official interviewing. I deliberately chose to collect data informally because I did not want to put my sources on the defensive. In this way I was able to enlist the help of several graduate students in placing stickers in locations that were difficult or inconvenient for me to access, such as restricted labs and the men's room. I gained access to several labs that had never

had stickers through this method. By personally speaking with students and lab assistants about the Leak Line and water conservation at IU, I was able to raise the profile of the water conservation at IU, encourage others to feel invested in the program and gather rough data about how many people knew about the Leak Line and whether they would participate in the program or not.

Section II: Bottled Water

I also investigated how many water bottles are used on campus. To get an idea of how many bottles are bought on campus, I contacted RPS administrative services, the IMU retail and storage managers and IU's Purchasing department to collect the number of bottles of water sold on IUB in the last calendar year. Collecting this data required patience, understanding and firmness, especially when working with the Purchasing department's off-campus vendors such as Coke.

Estimating the number of bottles brought onto campus was a more difficult task, especially given that many students, faculty and staff members are not on campus during the summer. I attempted to interview students about bottled water use, but the influx of new freshman and the unrepresentative sample rendered this tactic less valuable. Instead, a short online survey was created to be distributed during the fall semester.

Findings & Conclusions

Section I: Water Conservation

The investigation of sticker disappearances have led to the conclusion that cleaning fluid removes the backing, and the stickers are then thrown away by the custodial staff. There are several steps that are likely to be effective in preventing this. First, placing stickers on walls next to fountains and fixtures seems to be effective. Walls are not cleaned as regularly as fountains, and stickers on walls have a much higher retention rate than stickers directly on fountains and bathroom fixtures. Also, increasing the size of laminate on the front of the sticker so that it forms a border around the edge of the sticker will likely be effective. This will increase the area available for sticking onto things, which is important because stickers do not hold onto most walls as easily as they do onto fountains, and it will create a border that will hopefully lessen the amount of cleaning fluid that makes contact with the sticker backing. Working more closely with Building Services managers, especially the night staff managers, might help make cleaners aware that the stickers should not be cleaned off or sprayed with cleaning fluid. However, the placement and design changes will likely render the point moot, as the sticker will be sufficiently protected and not in an area that is cleaned frequently.

In terms of outreach and spreading information about the Leak Line program, personal interviews with whoever is in charge of the area where stickers are placed seems to be the most effective. This is usually more than one person. A graduate student, Building Services staff member or office worker is likely the only person immediately available. Talking with this

person is usually sufficient. However, there is often a professor or administrator who oversees a section, especially in classroom laboratories and research areas. Talking with these people is especially helpful, because they can grant access to a wider area and give more official support to water conservation.

Several people who worked or studied in the water conservation buildings were interviewed to obtain their opinion about the stickers and the Leak Line program. Several of them mentioned feeling confused when they first saw the stickers because they did not know what the stickers were for. The best method for dealing with this issue turned out to be obtaining official support for the Leak Line program from whoever was in charge of the locations where stickers were placed. This provided official backing for the Leak Line program, and created more opportunities for explaining about the program. Talking individually with lab assistants and their advisors, for example, took more time and energy than simply placing stickers. However, it also allowed me to discuss the Leak Line program with most of the Chemistry graduate students I saw, and allowed me into labs that were locked or otherwise unavailable. Research water use is the major component of water use in most of the scientific buildings on campus. Jordan Hall's water use, for example, continued to rise throughout the summer despite having the largest number of stickers placed in it, as can be seen on the chart in the Appendix. This is because Jordan Hall is largely a research building and uses a great deal of water year round. Though repairing leaks usually has a demonstrable effect on water use, as shown in Swain Hall's water use chart, relying on leak repairs to make up most or all of water conservation at IU is not sufficient.

Charts demonstrating total water use and chronological water use with sticker placement are in the Appendix, as well as pictures of some of the stickers I placed in science buildings.

Section II: Bottled Water

Through my discussions with Residential Programs and Services, the Indiana Memorial Union and off-campus vendors, I determined that IU Bloomington uses approximately 1.4 to 1.9 million individual use bottles of water a year. These bottles are often mingled with trash, which unnecessarily increases the amount IU must pay for storage and disposal. Also, the bottles are often left in public places instead of in the proper receptacles. This is easy to see when one walks around campus during busy parts of the day, and has been remarked upon by other students. IU Building Services staff does an excellent job of removing inappropriately placed litter, but the sheer amount of it makes keeping IU clean into a Herculean task.

Some other impacts of bottled water are: (Food and Water Watch, 2008; Pacific Institute, 2005, 2007)

- Bottled water has less stringent testing requirements than tap water, so it's less likely to be healthy.
- Plastic bottles last for a long time - they don't break down like most trash does.
- Bottled water has repeatedly used false claims on labels and in ads.
- Bottled water companies have also repeatedly been found liable for improper testing and

for impure water that has resulted in people getting sick.

- Bottled water is 1,000-8,000 times more expensive than tap water.
- Plastic bottles can leach poisonous chemicals into the water inside them. Bottled water is more likely to have chemicals in it after it's been sitting in a hot area, like a car, or if the bottle has been reused frequently. Water bottles should also be kept out of direct light.

All of these facts point out that while bottled water is wonderfully convenient, it is not the wisest choice from an individual and administrative perspective. Advocating for increased use of tap water seems like a better way to encourage students to drink water instead of processed drinks. Another way to encourage lower bottled water use is a Take Back the Tap campaign, or a similar non-branded publicity campaign. Several poster designs and slogan suggestions have been provided to the supervisor of the Water Conservation internship for a future intern's use. This campaign should take place in the fall, and help students understand pertinent facts about the expense, lower testing requirements and corporate abuses that have dogged bottled water.

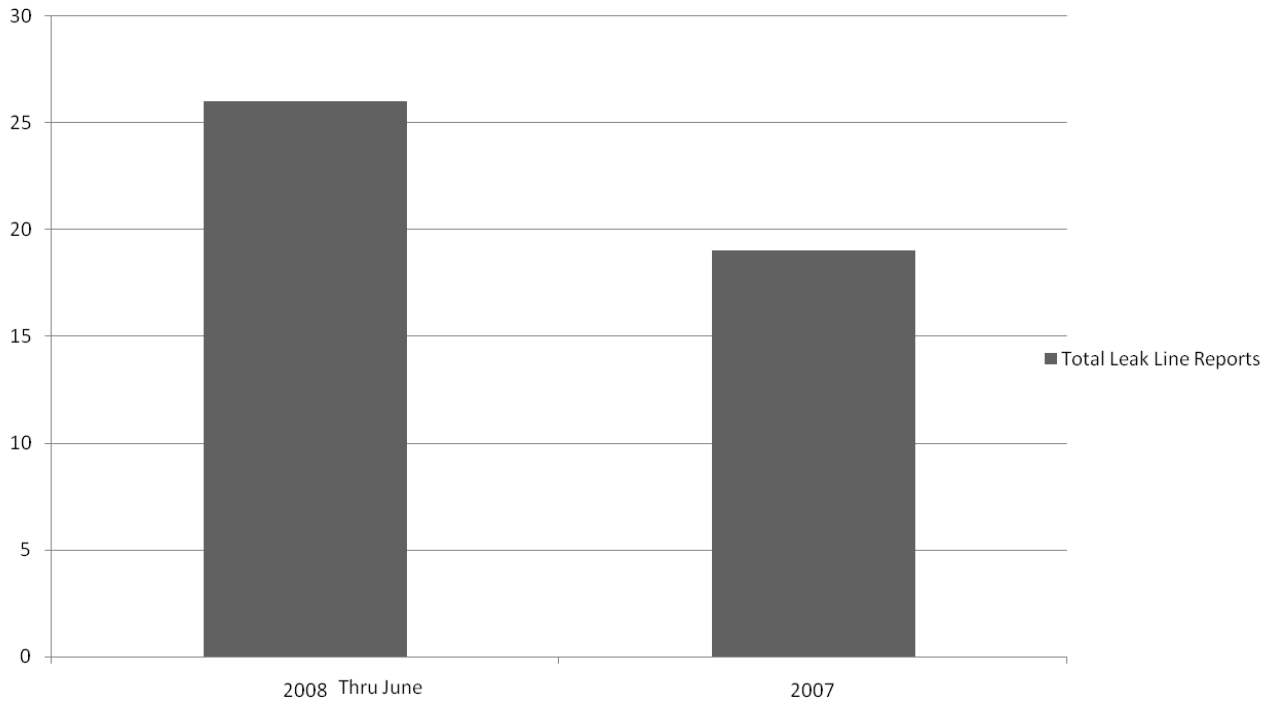
A way to reduce the number of plastic bottle waste on campus would be to push for more recycling. The recycling rate for plastic water bottles nationally is about 10 percent. At IU, the Sustainability Task Force Recycling intern's estimate places the overall recycling rate at approximately 38 percent. However, there are no firm figures for how much of that is post-consumer recycling and how much is departmentally sponsored. In order to reach a 38 percent recycling rate, each person at IU should recycle 20 bottles per year. I believe that documenting plastic bottle recycling and meeting this target is a worthy goal for the next few years. The recycling internship report contains more detailed information on the current state of recycling at IU and how to increase the amount of recycling on campus.

Bibliography

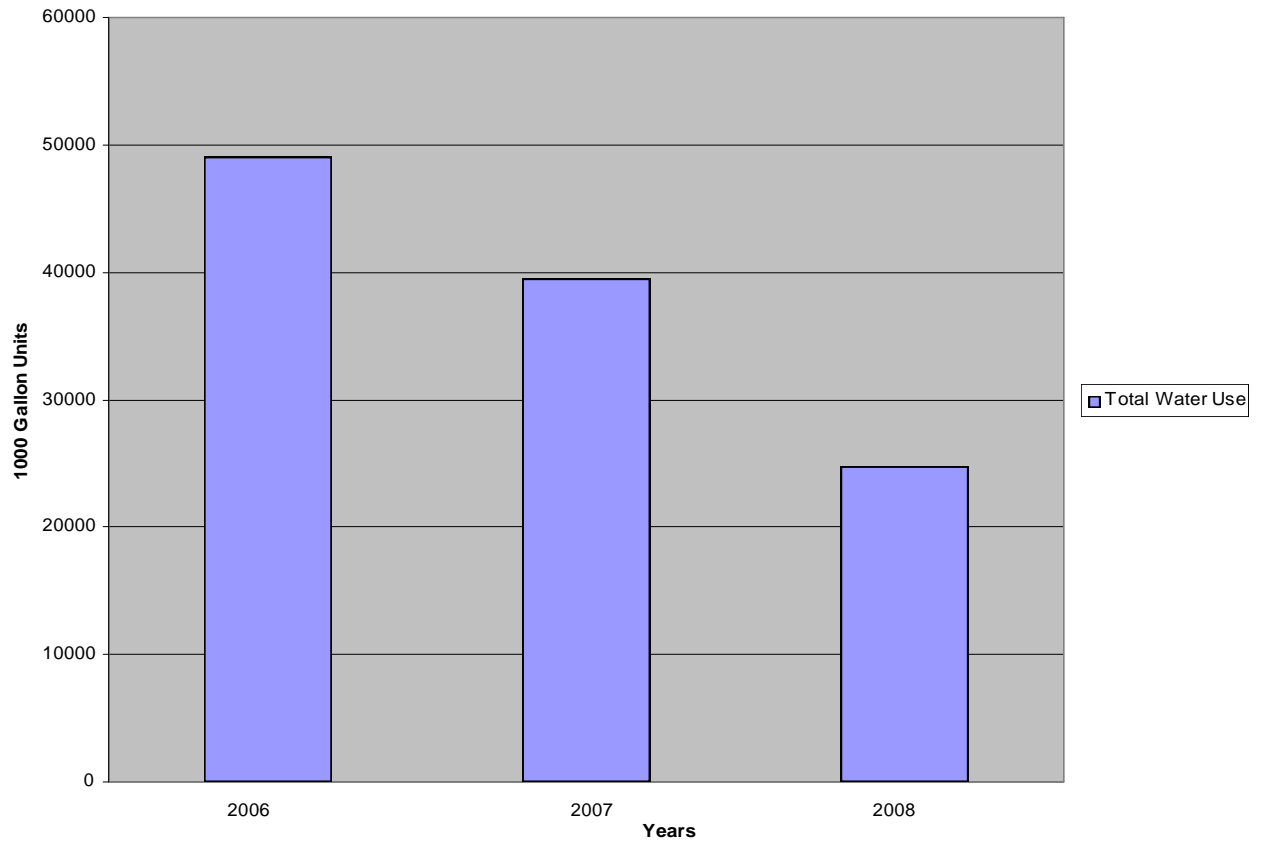
- "Facilities Saves Water, Steam, and Time." MIT Department of Facilities Sustainability. 2006.
Retrieved 8/10/08 from <http://web.mit.edu/facilities/environmental/conserves-facts.html>
- Food and Water Watch. "Bottled Water, Get the Facts". Retrieved 9/17/2008 from
<http://www.foodandwaterwatch.org/water/bottled>
- Pacific Institute. "The Worlds Water: 2004-2005", "The Worlds Water: 2006-2007" Retrieved
9/17/08 from <http://www.worldwater.org/books.html>

Appendix

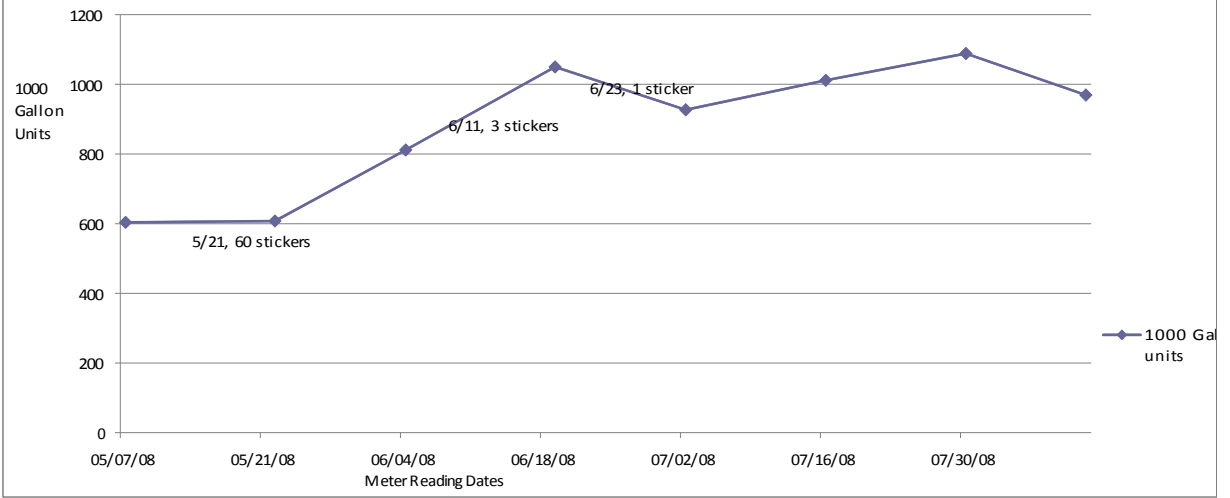
Total Leak Line Reports

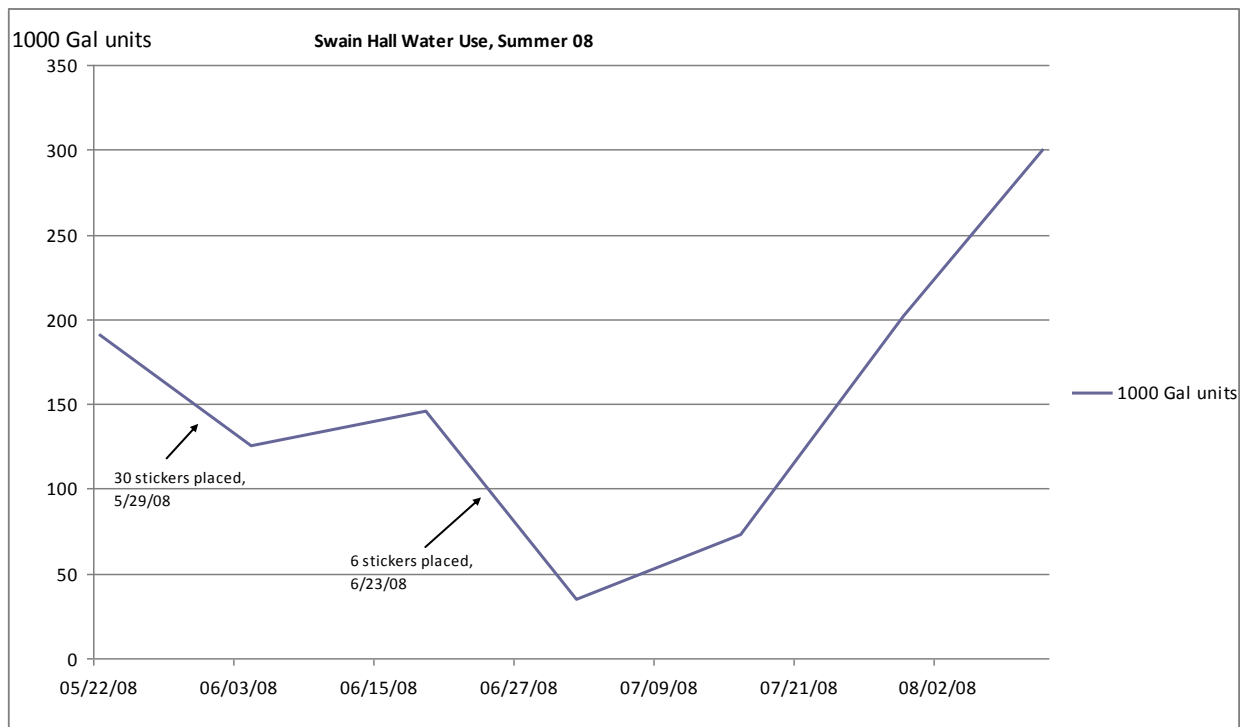
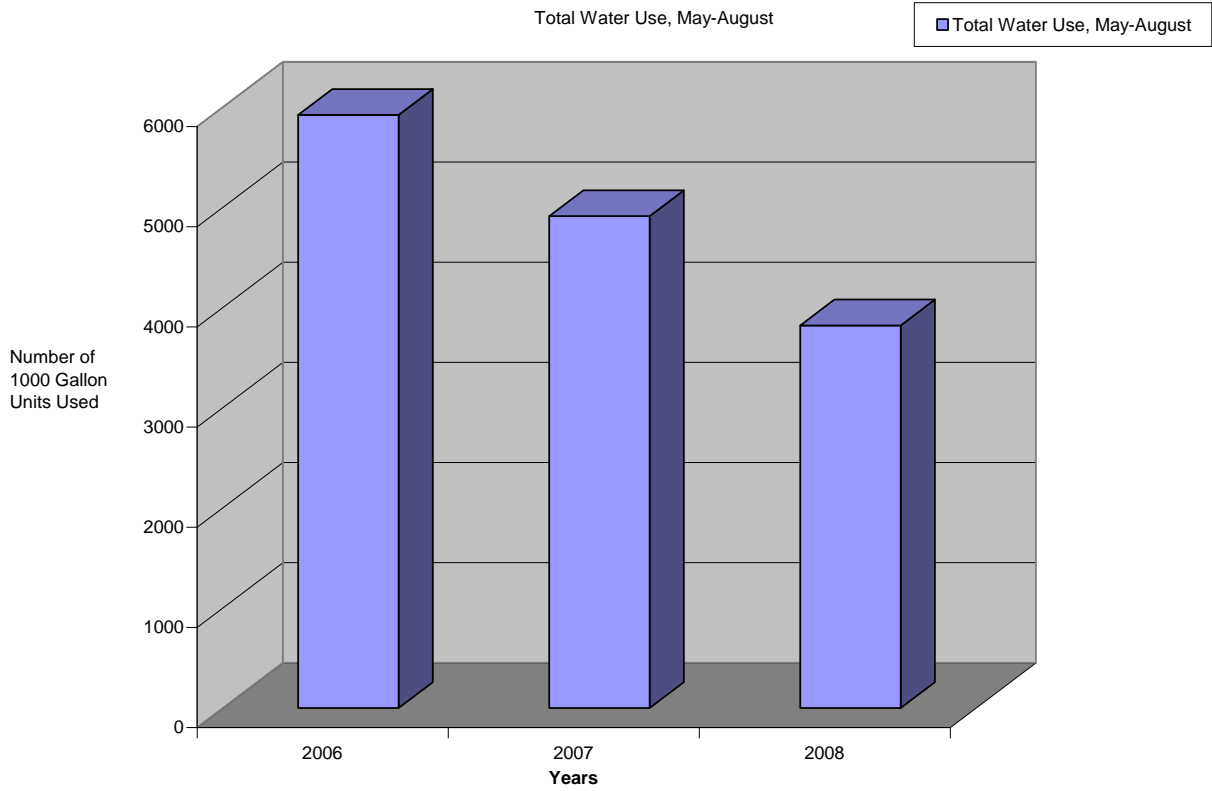


Water Use by Year



Jordan Hall Water Use





Leaks Cost Lots.
Call 855-3740



IU Physical Plant Utilities
Water Conservation Project

Don't wait for this.

Report leaks to
855-3740

IU Physical Plant Utilities
Water Conservation Project

