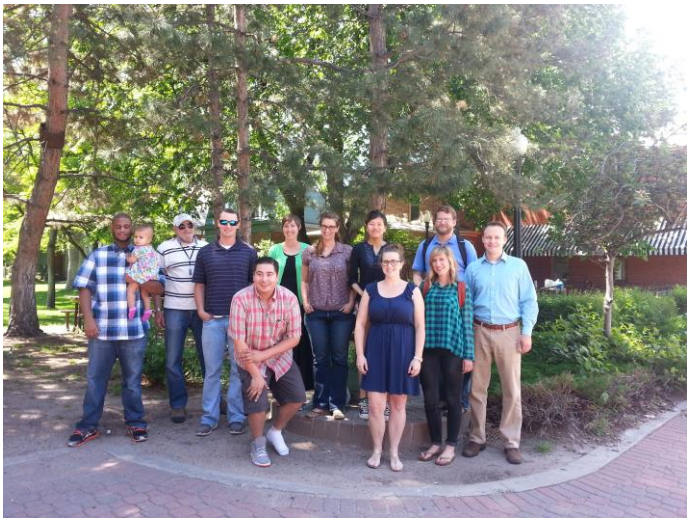

Auraria Conserves
Auraria Campus Water Management Plan

Report by the ENV 290B Water Conservation Management students
Metropolitan State University of Denver
May 31, 2014

Introduction
By Bryan Boykin

By 2050, the world's population is expected to reach 9 million people, but even before this landmark is reached by just 2025, 1.8 billion people are expected to be living in areas of water scarcity. Colorado is one area that can be expected to fall within this camp, as the state is already experiencing water stress. The gap between water supply and demand is growing in Colorado, and our population is expected to nearly double in the Front Range between 2010 and 2050 to a total of 7.2 million.

To exacerbate the man-made demands put on our water supply, climate variability is adding to water stress with incidents of both droughts and flooding, even within the same year. Water supply in the state has gone from a concern to a critical matter that requires water planning and conservation efforts, not only on the state and municipal levels, but also on the part of the citizens and institutions. That is why we are starting on our home campus with Auraria Conserves.

Auraria has already made strides in conservation, especially in reducing water consumption indoors, but now is the time to take our efforts to the next level and become a leading model of water conservation for campuses across the state and region. Auraria Conserves' plan includes water conservation goals, water use guidelines, and best management practices to reach the campus goals. In order to elevate the campus' water efforts we will continue our indoor water conservation, reduce outdoor water

consumption, incorporate landscape mapping, communicate the efforts to the campus at large, and plan for innovative future conservation efforts.

Outdoor Water Usage & Reduction

By Meaghan Owens & Nick Hammett

In 2012 there was an irrigation audit report done on Auraria Campus by Denver Water which gave the campus feedback on irrigation systems and performance to help identify ways to become more efficient. It was found that for each square foot irrigated, thirty-two gallons of water were used to keep the grass alive and only twenty-eight of the thirty-nine controllers were found. That meant when multiplied by the total irrigation area, the campus used 19,263,310 gallons of water to irrigate its grass, with an annual bill of approximately $92,656.50. This amount of water use put Auraria Campus into the severely inefficient category (Denver Water, Irrigation Audit, September 10, 2012). Since Denver cannot afford to waste water because of its limited supply, Auraria needs to become more aware of the water it uses and start trying to conserve more as water uncertainty goes up. This can be done with our 10%, 25%, and 50% water reduction plans as well as having a back-up drought response plan for the future.

10% Outdoor Reduction

There are certain areas on campus that we wanted to concentrate on in order to reduce outdoor potable water use by 10% based on the unpredictable drought conditions here in Colorado. In order to reduce water consumption by 10% we focused more on the smaller areas of turf grass around campus that use a significant amount of water. Although these areas may seem insignificant, there are many small areas of grass that can be taken out in favor of other landscaping methods to reduce water use and save money. One reason why these small areas of turf use so much water is that they are spread all over campus and they are prone to cement watering which is complete waste of water. For example, Zone 22 which is on the west side of the 7th Street parking garage is 90% cement with only small areas of grass in-between (Denver Water, Irrigation Audit, September 10, 2012). It is these areas of turf that need to be replace with more drought tolerant plants in order to conserve water.

Some possible solutions for replacing these small areas of grass are hard-scaping, mulching, mixed use or even metal grates around the trees (as seen in other areas of campus). In addition, there are a few areas on grass on campus that are wilting away in the direct sunlight and need much more water to survive. Those areas should also be replaced with one of the methods mentioned above while areas of grass that are heavily shaded can be left alone. With that being said, replacing the entire small, awkward areas of grass can easily reduce 10% of outdoor use resulting in an annual savings of $9,265.

25% Outdoor Reduction

For the 25% reduction of potable water use on campus, we found that improving and/or upgrading the current irrigation systems can go a long way for conserving water. There are numerous broken heads and leaky sprinkler systems on campus which is currently wasting a lot of water. On campus, there were 28 controllers that were identified in the

Audit report and many zones that had broken heads or leaks. If we upgraded controllers and replaced/fixed broken heads and leaky systems with Toro precision, we could save roughly 3.2 million gallons of water per year. This alone would translate to 20% reduction in outdoor potable water use (Denver Water, Irrigation Audit, September 10, 2012).

Another unexpected way of conserving a substantial amount of water would be to expand all sidewalks on campus to eight feet wide. This could also include areas of turf or shortcuts that sustain heavy foot traffic which could possibly be converted to a cement or gravel path. The expansion of sidewalks could potentially lead to a savings of 32 gallons per square foot (Denver Water, Irrigation Audit, September 10, 2012). In total, upgrading the irrigation system and expanding the sidewalks would lead to a 25% reduction in outdoor use saving the campus $23,165 a year in water bills.

50% Outdoor Reduction

On Auraria Campus there is a new irrigation controller for the 9th Street historic Park. There is also an installation of a weather station that reports evapotranspiration (ET) conditions like humidity, rain, temperature and a new hydrometer for the irrigation system. That was important for that specific area because the grass must remain lush and aesthetically pleasing (Final Report: Smart Irrigation for a Smart Campus, July 2013). We are suggesting installing more weather stations across campus or to take existing weather stations and moving them to better locations (Controller 8 has a rain sensor underneath a tree) (Denver Water, Irrigation Audit, September 10, 2012). After making these changes the campus could take advantage of Denver Water Rebates such as a 25% rebate on material costs of the new weather stations, and $2 per head savings for new high efficiency sprinkler heads.

We also would like to see irrigation times being cut down to minimum levels to keep the grass alive. In addition, we would like the replace the majority of turf with native grasses and plants. If we use native plants and grasses, we only need to water them for 10 minutes three days a week as opposed to turf which needs to be watered for 33 minutes using rotary nozzles (Denver Water, Irrigation Audit, September 10, 2012). That will save roughly 300,000 gallons of water a year, that is possibly a 50% reduction right there because the plants will only need 16 gallons of water per square foot instead of 32 resulting in a $46,328 savings annually.

To implement this plan, we would be planting the native grass or plants between the months of April and June (Denver Water: Water Wise Landscape Handbook). This is the best time to plant the native grasses or xeric plants because they require a lot of nurturing and a lot of water to begin with (end of spring is usually when there is an increase of snowmelt and precipitation). We would not be able to plant anything during the months of July and August where the weather is the hottest. In addition to the no planting months, we also would have to take care not to plant grass adjacent to impermeable surfaces. And we would not be able to have a plan or design that was more than 40% turf or a turf area that is less than eight feet wide.

Drought Response Plan

Based on the 2014 Drought Response Plan issued by Denver Water we slightly modified and condensed it in order to be more applicable for Auraria Campus. Similar to Denver Water's Drought Response Plan we have three main stages of drought (Drought Watch, Stage 1 and Stage 2) according the amount of water that needs to be conserved (10%, 35% and 60% respectively) (Denver Water, Irrigation Audit, September 10, 2012). Keep in mind that within all three stages of drought response, there are priority areas across campus that need to be maintained and kept alive to some degree regardless of the severity of the drought. These areas include the athletic fields, the areas around the Student Success Building, 9th Street and Lawrence Street Mall. During a Drought Watch, Auraria Campus needs to reduce its outdoor water use by 10% which includes a maximum of three days of watering per week for turf grass. A Drought Watch also means that you shouldn't water between the hours of 10 AM and 6 PM and there should be no unnecessary waste of water.

In a Stage 1 Drought, we are aiming to reduce our outdoor consumption by 25-35% and have a maximum of two days of watering per week for turf grass. This also means that all gardens, flowers, trees and shrubs have to be watered outside the hours of 10 AM to 6 PM with a low volume spray and athletic fields are irrigated on a strictly monitored schedule or budget. A Stage 2 Drought is considered severe and up to 60% of Auraria's outdoor water use needs to be reduced to accommodate the drought conditions. This means watering \ turf grass only at minimum levels to be kept alive, with the exception of higher priority areas that must be kept relatively lush. Trees, shrubs, gardens and flowers would only allowed to be watered once per week with a low volume, hand held spray (Denver Water, Drought Response, 2014). With these restrictions on the different stages of drought, we believe that it would be feasible to reduce Auraria's outdoor water use by the 10%, 35% and 60% respectively.

Denver is a rapidly growing city. It is predicted that population will continue to rise at a fast pace and that by 2050 there will be seven new cities and 7.2 million people (Filling the Gap, May 2012). We have to start conserving water now and Auraria Campus can lead the way. We want to eliminate any turf that is unnecessary and replace the turf with mulch or rock. We want to improve and update irrigation controllers, sprinkler heads to Toro precision, and expand sidewalks. And we want to fix weather systems and replace almost all of the turf with native plants such as *Callirhoe involucrata* (winecups), *Salvia agentea*, Silver Sage, fescue grass or Bermuda grass. Should a drought occur, Denver Water has a response plan that Auraria Campus would follow depending on the Drought State we are in. These ideas will limit the water use at Auraria and will create a more water-conscious campus that others can look up to.

Indoor Water Usage & Reduction

By Alexander DiFonzo

Buildings on Campus

There are nine buildings on campus dedicated to classrooms. Of these nine, two, the Science Center and the Hospitality Learning Center are LEED certified. There are also

nine buildings on campus dedicated to administration and maintenance. The Student Success Building, CCD Confluence, and the new Academic Building-1 are all LEED certified or pending certification. Auraria Campus is also home to thirteen historic homes that have been converted into offices for use by the schools. The campus is also home to two buildings dedicated to athletics, one student union, and one daycare center. One of the more important aspects to Auraria Campus' indoor water usage is the lack of dorms or official dining halls on campus.

Current Indoor Water Usage

Based on the monthly meter usage provided by Denver Water, the average indoor consumption rate on campus was 1.49g/student/day between 2009 and 2013. Despite this being a very good usage total, 2013 saw a decline in water consumption leading to 1.17g/student/day. The largest indoor consumption on campus occurs in the Tivoli Student Center, with the largest in classrooms being the King Center. Auraria Campus' lowest consumer in all classroom buildings was West Classroom, but the Arts Building saw the greatest improvement in water conservation is 2013 for all classroom buildings. For all buildings on campus, Auraria's PE Events center saw the greatest decline in water usage.

Completed Water Conservation Projects

Auraria Campus has already completed a large number of projects in order to increase water conservation and decrease costs. This began with the installation of new water-efficient fixtures across campus. This includes three-hundred toilets, one-hundred and fifty urinals, and two-hundred faucets. The Auraria Events Center retrofitted the showers in the building, leading to an increase in efficiency of sixty-five percent. Auraria Campus has also installed a large number of water bottle filling stations, or hydration stations. These not only help reduce the bottled water consumption, but they also help reduce the overall consumption by being a more efficient way for students to fill water bottles than from a traditional water fountain or sink.

Which Projects Will Help Fulfill Auraria Campus' Goals

For our five percent reduction, it is recommended to change the towel policy in the gym to a bring your own towel policy. There should also be water saving tips published in *The Metropolitan* each issue. Auraria Campus should also install hand sanitizer machines around campus. For a further reduction, Auraria Campus should install high efficiency laundry machines for use by the athletics department. These machines use forty percent less water than a traditional washing machine. It would also be helpful to install motion sensors for lighting and climate control to help reduce cooling costs. Auraria Campus should also work with Denver Water to help ensure an increase in cycles for the water used in the cooling towers around campus. The largest amount of reduction will also require cooperation from all institutions on campus as well as Auraria Higher Education Center. The first major step would be to close the pool in the Auraria Events Center. The second would be to close all nonessential classrooms during the summer semester, and Auraria Campus should only hold classes in the most water efficient and energy efficient building

Indoor Water Usage & Reduction cont.
By Alex Martinez

Indoor water audits, performed by Denver Water from January 7^{th} – 18^{th} , were able to give Auraria campus an idea of how efficient Auraria's indoor water fixtures performed and also showed Sustainable Auraria and Auraria campus administration some new practices to save water and money. The audit reported on the amount of fixtures on campus, the amount of savings from upgrades that were installed during the audit and recommendations for fixture upgrades that will help Auraria save money in the future. During Denver Water's audit, they replaced 14 aerators in sink faucets and upgraded 10 showerheads to efficient water savings heads, altogether saving 33.8-gallons/ minute. Currently Auraria's water consumption consists of 23gal/ sqft of well water and 32 gal/ sqft of potable water for irrigion and daily average of 1.49 gal/ student for domestic water. With new technologies and conservation practices, Auraria can become a leader in the community for water conservation and set the standard for other universities.

The Auraria Sustainable Campus Program (SCP) continues to have some ideas and plans in progress to further conserve water on campus. The digital water meter and Denver Water AMI project, provides technology and infrastructure to measure how much water is being used by digitally recording the amount discharged from plumbing pipes. SCP also plans to upgrade 26 urinals, 21 faucets and 39 sink aerators to help make them more efficient in water savings. Two buildings are also in the process of being LEED certified; the newly renovated library and newly constructed AB-1 building. The CU Denver Urban Horticulture club is also helping with xeriscaping ideas around campus, to save water outdoors.

While studying the efforts already done by Auraria Campus to save water, we also looked at how other institutions and countries were saving water, and if Auraria would be able to implement some of the ideas and plans. One way to save water would be to give students the option of using hand sanitizer instead of using soap and water to wash their hands. Currently, most hand sanitizers and located at the end of halls in a few buildings, but if they were also placed inside or near restrooms, students can choose their preference of hand sanitation, and hopefully save water from sink use. The recently upgraded shower heads could also be supplied with a timer, so that when students turn on the shower, a five minute timer can start counting down to make students more aware of how much time they are spending in the shower, and will help reduce water consumption. Providing more hydration stations, students can refill their reusable water bottles instead of buying new bottles of water while on campus.

For air conditioning uses, using the TDS system (Total Dissolved Solids), water from cooling towers can be reused, instead of being used only one time and sent back into the wastewater system. The TDS system measures the conductivity of minerals in water so that the water can be recirculated into the cooling towers. Increasing the number of cycles to 8 will largely help reduce water consumption.

Auraria could also install reflective blinds or window tinting to reduce the amount of solar heat from entering classrooms to help reduce the need and frequency of air conditioning. Weather stripping doors can also help reduce the amount of outside air getting into the buildings. Class scheduling can also improve the reduction on energy use by condensing classes into one building during summer months, or filling classrooms that are facing away from direct sunlight in the summer and vice versa, and also the possibility of scheduling classes outdoors depending on weather.

Besides water being used for air conditioning, it is also used to produce electricity. If Auraria was able to reduce its energy costs, they will also help reduce water consumption. Installing motion sensors for lighting and air conditioning can help save energy for parts of buildings that aren't being used during the day. Xcel energy offers rebates for motion sensors, $30 for wall mounted occupancy sensors and $50 for ceiling mounted sensors. Some vending machines on campus have motion sensors installed, but with more "vending misers" which save 900 kWh a year on vending machines, and 300 kWh on snack machines, Auraria could save even more energy on unused machines throughout the day. Continuance of retrofitting old lighting fixtures with energy efficient tubes will save energy costs and provides rebates from Xcel energy. Xcel gives a $13 rebate on 4ft T12 fixtures and $20 on 8ft T12s. Sleeping computers also use up electricity, Auraria could install computer software that turned off computers when not in use, Xcel also offers rebates on energy saving software through the Customer Efficiency Program. Computer monitors could also be upgraded throughout campus, old cathode ray monitors use 100-120 watts, compared to LCD which use 30-45 watts. Removing carpet could also reduce the amount of electricity needed for vacuuming.

Auraria student can also help do their part in achieving a sustainable campus. Each new student or transfer could take a Water Assessment Test to learn about how much water they use daily/ yearly. The use of refillable water bottles and utilizing the hydration stations will help save water and landfill space. Some places encourage the "If it's yellow let it mellow" campaign in restrooms, Auraria could use stickers in restrooms to help remind people that they can reuse toilet and urinal water. The PE Building could start implementing BYOT (bring your own towel) to reduce water consumption from laundry machines. Students could also start more conservation clubs on campus to help Sustainable Auraria, and could possibly make a conservation video and post it on YouTube or on campus TVs. The student newspaper should also publish water saving tips in their weekly newspaper.

By implementing new technologies and ideas on campus, Sustainable Auraria can help create a larger environmental community and generate student awareness for Auraria's sustainability goals. I hope that Auraria will one day be known as the leader and model for other institutions for water conservation, as water is our most precious resource.

Campus Maps with Irrigation and Drought Layers

By Ian Ennis & Lindsey Abbott

In response to Colorado's perpetual state of drought, Auraria Campus is making strides to increase the efficiency of their water consumption. As the demand on Colorado's water resources continues to increase, Auraria Campus recognizes the need for the creation and implementation of a water conservation plan.

In order to better visualize Auraria Campus's irrigation needs, drought response priority areas, as well as the average water consumption of the buildings on campus, a series of maps have been created as supplemental material to the campus's water conservation plan. These maps are intended to convey current water consumption information, future planned changes to landscape types, and changes in building water usage from the five-year average, 2009 to 2013.

In creating the Auraria Campus water conservation maps, first, a spatial representation of the campus had to be created. This was achieved using the program ArcGIS. Two shapefiles, acquired from Denver Water: (an Auraria Campus boundary shapefile and an irrigation shapefile), became the foundation for the maps. Additionally, two shapefiles, (buildings and street centerline), obtained from Denver Open Data Catalog, were imported into the map, to complete the spatial representation of the campus. Furthermore, an inventory of the campus landscape was completed in order to classify each polygon, within the irrigation shapefile, as land cover type.

The following maps were created with the purpose of displaying the Auraria Campus landscape, recommended landscape changes, priority areas for drought response, as well as the average water consumption of the main buildings located on campus compared to just the 2013 numbers (which should give an idea as to which buildings have improved water conservation and which buildings actually have done worse).

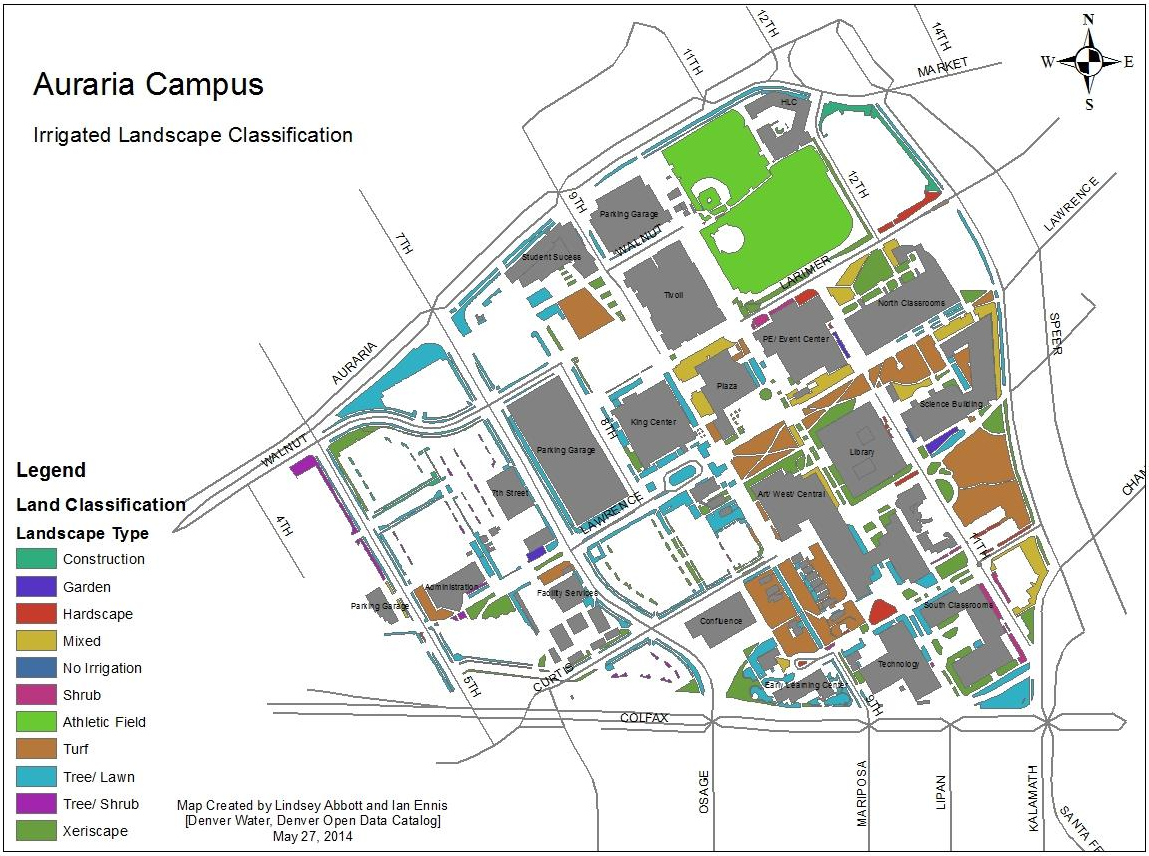

Figure 1: Irrigated Landscape Classification

The above map shows the landscape type of all irrigated land on Auraria Campus. Each polygon is classified as one of the following: an area under construction, a garden, hardscaped, mixed, no irrigation, shrub, athletic field, turf, tree/ lawn, tree/ shrub or Xeriscape. To fully understand the classification scheme in the above the map, a few landscape types require further clarification. Mixed is defined as one land area that contains a combination of land covers, such as Xeriscape and tree/ lawn. It was defined due to a limitation within ArcGIS in that, each specific polygon could not be given partial or multiple classifications. Tree/ lawn is defined as a generally narrow strip of land, containing both trees and lawns; it is commonly found alongside public roads as it is a required by zoning regulations (which may be subject to change). Similarly, tree/ shrub is a type of land cover that generally exists in a narrow strip. However, rather than lawns, the base of the trees are surrounded by shrubs. Lastly, the term Xeriscape encompasses areas requiring substantially less water: native grass, native/ Xeric plants, mulch and/ or rocks.

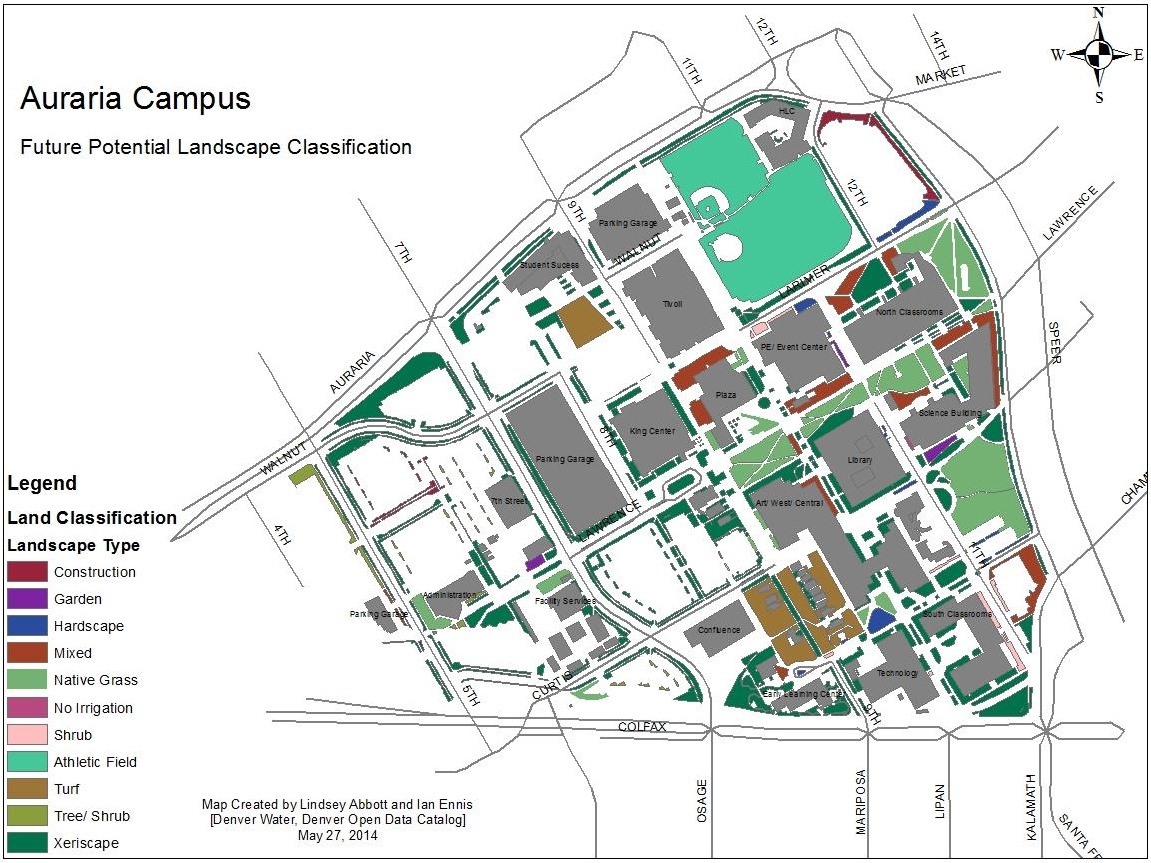

Figure 2: Future Potential Landscape Classification

The purpose of the Future Potential Landscape Classification map is to recommend areas where implementing a more sustainable landscape would be of benefit. Much of the irrigated land should ideally be converted using Xeriscape techniques in order to reduce water use while maintaining a naturally beautiful landscape. In this map, native grass has been listed as a separate category from Xeriscape, to clarify areas that should undergo turf removal, to be specifically replaced with a grass variety that require substantially less water. Two turf areas have been left intact: the turf in front of the Student Success building due to the intricate storm system located underneath it, as well as the turf surrounding the 9th Street Historic District.

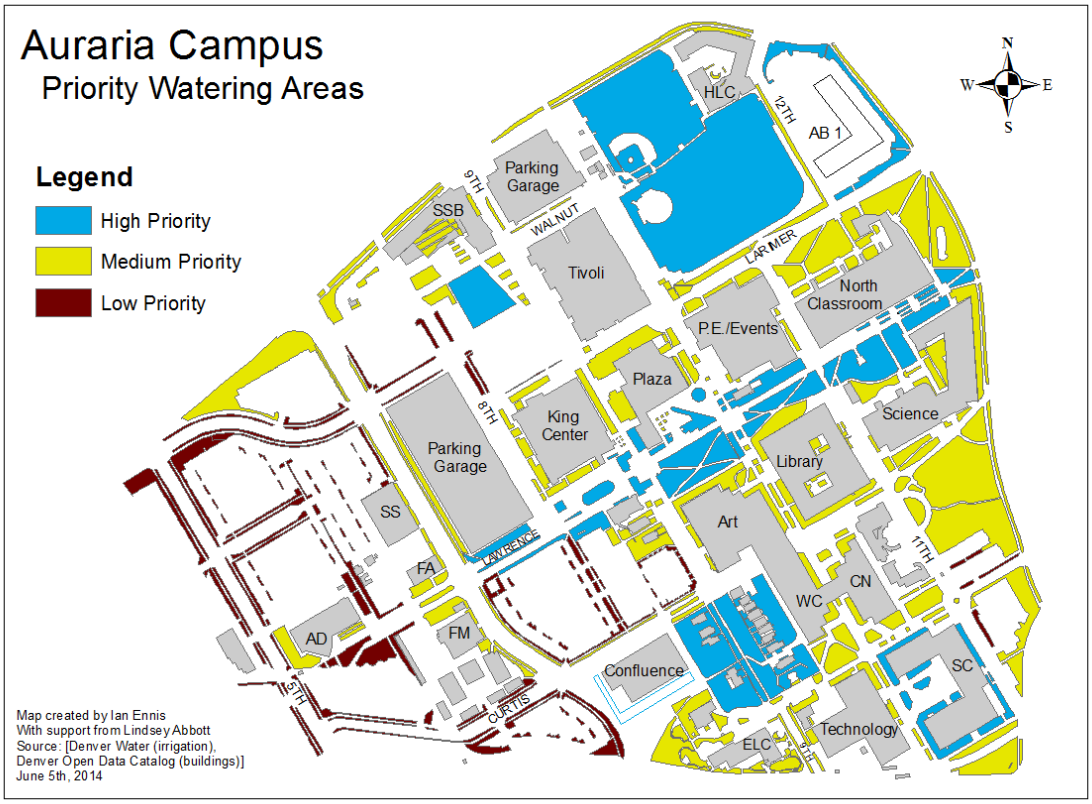

Figure 3: Priority Watering Areas on Campus

The highest priorities are the sports fields, the walkway along Lawrence Street, and the 9th Street Historic District. Priority areas were also given to each institution; MSU Denver has priority grass near the sportsfields and Student Success Building, CCD has priority grass around the Confluence and South Classroom buildings, and CU Denver has priority grass around the new AB-1 Building.

The colors in brown indicate areas that can be watered less during a 10% water-reduction scenario. During a 25% reduction, all of these areas should be watered at a minum, and during a 50% reduction, these areas in addition to the areas in yellow should also be watered at a minum to keep the grass alive; merely the blue areas are to be watered with aesthetic prioritization in mind.

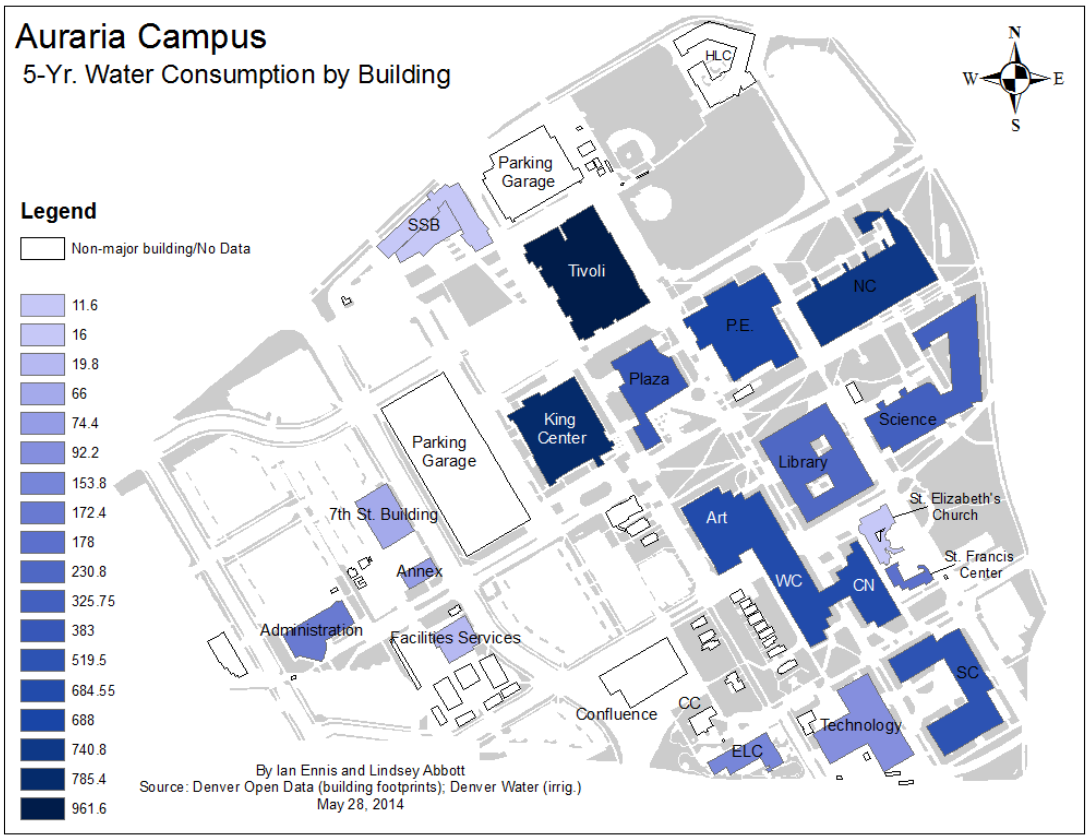

Figure 4: Five-year averages (2009-2013) of indoor water use

This map shows the five- year average of water consumption per building. Only the major buildings on campus were analyzed. The units of the legend are in kGa (kilogallons). The darker the shade of blue, the higher the water consumption is. The Tivoli, King Center, and North Classroom tended to use more water than the other buildings. It should be noted that the Art, West Classroom, and Central Classroom buildings are combined into one building. Therefore, the water use numbers for each separate building have been added together. There is no data for the newer buildings and for the parking garages.

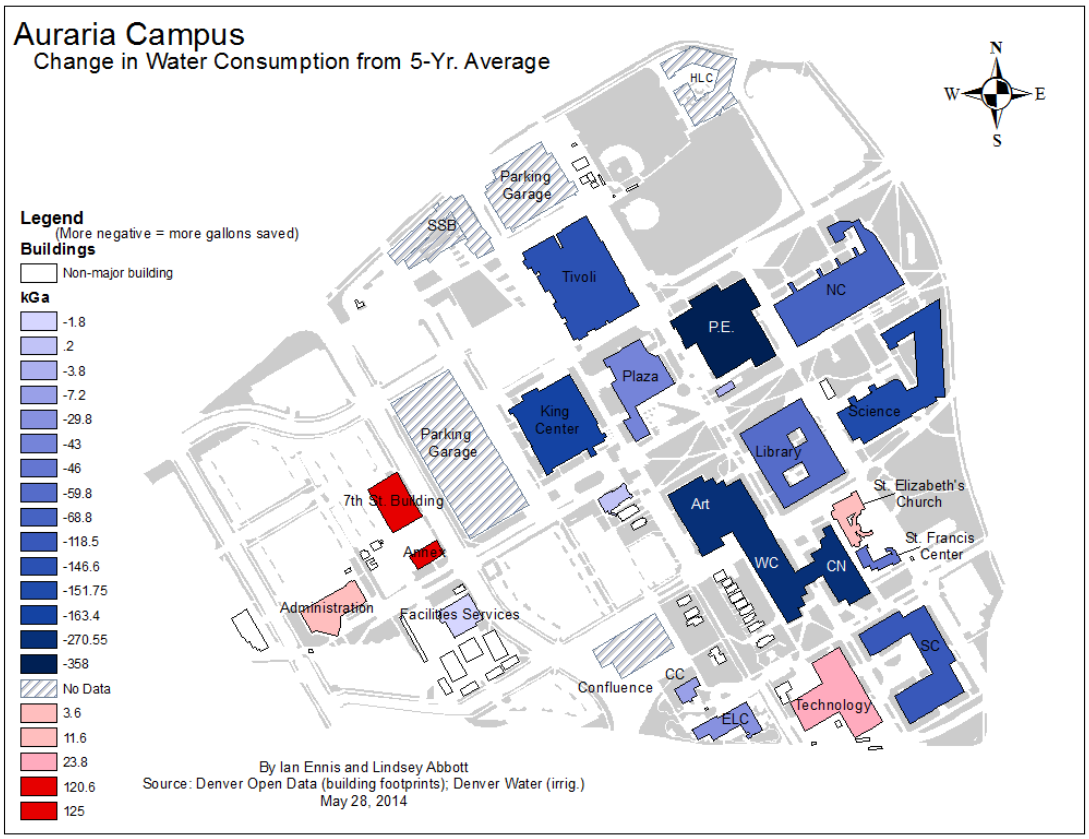

Figure 5: 2013 indoor use compared with five-year averages

This map compares the five-year averages from the previous map with the usage numbers for 2013 alone, to give an idea of which buildings have used more water than in the past and which buildings have improved water efficiency. The P.E. building has the darkest shade of blue, indicating this was the most efficient building when compared to the five-year average; this is most likely due to the recent water audit by Denver Water where inefficient fixtures were replaced with low-flow/water saving fixtures. Five buildings actually used more water in 2013 than during the previous five years, which are shown in red.

The outdoor land cover types were mapped to the best of our ability. Assigning broad categories of landscape cover types allowed for easier conversion of the current land use type to a one-type future planned landscape change (for instance, we converted a mixed area of grasses, Xeriscape gardens, and trees to just fescue/prairie grass for reasons of simplicity. When considering implementing these designs, the ROI will need to be taken into account.

The drought response/priority watering areas are not exact when it comes to 10, 25, and 50% watering reductions. Issues with the software were encountered that demonstrated differences between the actual campus acreage and the square footage within the data.

For the two maps showing building usage, some buildings were left out. This is because these buildings are newer and therefore lack any significant data. In the legends for these two maps, more than nine colors were used, which is typically the limit of decipherable color categories; however, because of the nature of the software and our current working knowledge of the software more than nine colors were used. The smaller buildings were left out so as to not over-complicate the map.

Communication Plan

By Rachel Willis

In order to achieve the goals of the Auraria Water Conservation Plan, communication with all of the relevant stakeholders is key. Stakeholders include, but are not limited to:

- Grounds staff
- Campus administration
- Students
- Faculty
- Sporting teams
- Greater metro community

These groups will all have different needs and objectives when it comes to water conservation.

To achieve out outdoor water reduction goals, the long term plans can be used as a helpful guideline. Communicating to the ground staff the positive aspects of projects that may require more work up front, such a xeriscaping, could be a challenge. The long term benefits, such a no future mowing, enlisting the help of student clubs for initial implementation, and less work overall after an initial period of time can be highlighted in order for the grounds staff to become interested and invested in the water conservation goals presented. The staff will also need to learn the areas of importance and suggested watering guidelines offered in the drought response plan that will need to be executed if drought conditions occur.

To successfully reach the indoor water goals set forth in this water conservation plan, the maintenance staff will first need to complete the fixture replacement and maximize the number of cooling tower cycles. Increased water savings will come by way of additional funding for building efficiencies. Administration can be informed of the specific positive effects of projects such as these and special note of additional energy savings that would lead to the initial investment paying for itself. Having students take an online Water Footprint Assessment may also lead to increase indoor water savings and providing informational brochures and fact sheets can spread the conservation message campus wide allowing students to understand how and why this project is so important.

In our future projects, seeing classroom consolidation during summer and wintertime will appeal to financial stakeholders as a strong cost-benefit. Redesigning the campus drainage system can be made more cost effective by enlisting engineering or urban planning students to draw up plans and assist in the project. Not only could this save

money but including students in the process is a wonderful, hands on learning opportunity. Extending the Water-Wise learning garden will also be beneficial for student involvement and can also form a collaboration between departments such as biology, environmental science and geology. Involvement of student clubs could also increase the water conservation message and make it a personal endeavor for all involved.

Further Ways to Reduce Potable Water Use

By Kristen Martin

Sustainability Liaisons

Each institution on the Auraria Campus will select a Sustainability Liaison to report their conservation and efficiency efforts to Jon Bortles, Sustainability Director for Auraria. The Sustainability Liaison's duties will be:

- Actively involved in Sustainable Campus Program's plans, programs, and the conversation in general.
- Relay information (especially during building construction or renovation) between their respective institution and the SCP regarding landscaping, energy, water, waste management, food systems and anything else similar.

The benefits will be to have all parities "on the same page." If one institution replaces and irrigation system, or lighting schemes, AHEC is aware and can relay information to their staff as necessary.

Close buildings when they are not in use.

The costs of heating and cooling buildings are quite expensive, closing building when they are not in use will be a financial savings. Here are some buildings that could be closed when the classes are not in session:

- Boulder Creek
- ½ Cherry Creek
- North Classroom-Main (not wing)
- Emmanuel Gallery (when there is not exhibit)
- 7th Street Classroom
- Plaza Building, excluding the Health Center

These buildings, do not house offices like most others on campus. If it were possible to only heat/cool offices in each respective building, this would also be a financial savings. During Maymester, Winterm and Summer, the campus operates at about 25-30% of the Spring and Fall semesters. Using only one or two buildings for these classes could save a tremendous about of energy.

Campus Community Garden

This project has already started and removing sod for a garden is a great example of smart land use on this more urban setting. In the spirit of collaboration, across majors and institutions, The Colorado Wildlife Federation, MSU Denver Student Branch has started a bat house project and this garden would be a prime spot for one. The bats being

so close to Cherry Creek should love this location, the bat droppings will help fertilize the garden and the bats will also eat pests and insects that could otherwise damage the plants.

Water-Wise Learning Gardens
On the southwest corner of the library, CU Denver's Urban Horticulture Club planted their Water-Wise Landscape Garden. We could take this one step further and make it an educational Water-Wise garden and have biology and geology departments add placards to name the species and genus of all the plants, rocks, trees and other organisms that spend time in this type of ecosystem.

Drainage
The many detention and drainage systems on campus are often covered in turf grass. In addition to retrofitting them where possible, new detention area designs could consider French drains with large rocks instead—further eliminating the need for so much sod.

Auraria Arboretum
- add beauty to the landscape and preserve natural heritage
- provide food and habitat for native wildlife (bats, birds, squirrels...)

- help slow down the spread of fire by staying greener longer
- decrease the amount of water needed for landscape maintenance
- require very little long-term maintenance if they are properly planted and established
- produce long root systems to hold soil in place
- protect water quality by controlling soil erosion and moderating floods and droughts

One World, One Water Center for Urban Water Education & Stewardship at MSU Denver- Campus Education
The One World, One Water Center (OWOW) provides a great resource and a great mouthpiece on campus for water conservation. They have done and sponsored some really great projects. Perhaps in the future, a "no plastic water bottle" and a "no plastic bag" policy?

#aurarialeaks
Most students on campus use social media as well as the restrooms and water fountains on campus. Combining the two, students could "tag" leaks, running faucets, and other water problems under the hastag, #aurarialeaks. SCP, OWOW, or another appropriate entity can respond immediately to the leak and can also post the repair on #aurarialeaks, to provide a gratification aspect to the program.

Further Projects cont.
By Wiley Douglas

Just what is the future of water on Auraria campus… and beyond? This presentation took on the research for fragments of just that. It is also tilling the groundwork for two ongoing projects which could best be enhanced by the voices of students in the know and as much media coverage as possible. This would certainly engage many conversations and/or action along the lines of water conservation and create a demand for this theme of water reuse.

Leadership from organizations such as OWOW, WASSUP and Denver Water has pushed this passion from a wave to a tidal wave. With people like Tom Cech, Jon Bortles and Mark Cassalia, the top-down informational path to us students can help save millions of gallons in the future. And perhaps this wave can spread like a torrent, putting Denver on the map as a leader in the water conservation and reuse arena.

The Auraria campus pool is one of the two ongoing projects where water reuse plays a significant role. Instead of draining the pool to the storm sewage system, why not reuse that entire amount for irrigation on campus in some of the adjacent areas of the P.E. building? Mother Nature could also be utilized into that same realm of thought. Some downspouts lead to nothing but over-watered earth. How could we divert that water to a more desirable location, such as a native flowerbed, xeriscape or turf through a drip-line? The pool and gutters might be a drop in the bucket for the water budget and conservation, but it could stir the imagination of many with the significance of water reuse.

The second ongoing project is replacing the existing irrigation water with recycled water from Denver Water. This is not if, but when we can tap into this valuable resource. The Water Reuse Program director, Jennie Murray, has claimed that the demand needs to be there before Denver Water will continue on the purple-pipe extension from Knox and Colfax to the Auraria campus. Fortunately, another big player is very interested in this water. That happens to be XCEL Energy for their cooling systems. Perhaps we can team up with XCEL to incorporate the necessary action. Teamwork makes the dream work! And downtown Denver would be experiencing water used more than once. Just think of the media coverage!

On the Auraria campus, the strength is in numbers. Why not use some of that muscle and voice in spreading the words and actions of conservation and reuse of water in all aspects of their lives? We can implement a plan of action through these possibilities and more. Student fundraisers could help add monies to the sustainability program. The bookstore and other locations could sell metal water bottles and canteens with logos and catchphrases. Same could be true with t-shirts and ball caps. Anything to gain increasing awareness of what we are up to would be adequate to ask for donations to the cause and relief. And before long, students may feel more inclined to accept a small increase in charge for the sustainability program funding and the exceptional value looking forward.

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