

Water Use at Pomona, a Southern Californian College
A Water Management Plan for the 21st Century



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Pomona College is a premier liberal-arts college in Claremont, California that has consistently been ranked as one of the top ten such institutions in the country since its inception in 1887. It offers a varied curriculum in humanities and the social and natural sciences. When it was founded in 1887 by a group of Congregationalists, it was imagined as a “college in a garden... of the New England type,” even though the campus was surrounded by coastal sage scrub and a semi-desert landscape.

Since the beginning, then, water has been essential to Pomona College and the institution it hoped to become. The drilling of two wells, subsequent appropriation of water rights, and the cheap water coming with those two developments has enabled Pomona to create an aesthetic of affluence, replicating the feel of colleges in the more water-rich Northeastern United States even though it is situated in an area with sparse rainfall. Today, one can wander across Pomona’s campus and find fountains, pools, and expansive lawns; the grass, redwoods and sycamores of Marston Quad, lying between the imposing Big Bridges, Carnegie and Smith Campus Center, are only made possible by Pomona’s ownership of several wells, and the ability of the California State Water Project to deliver water from hundreds of miles away.

Originally, Pomona College did not concern itself with the morality of its water use. In more recent years, however, the idea of sustainability has become a more mainstream idea on campus. One of Pomona’s majors, Environmental Analysis, which brings together students and faculty interested in the “Environmental Complex,” how humanity and the environment relate to each other, has seen particularly impressive growth in recent years. Next year, 40 or about 10 % of Pomona’s seniors will graduate with an Environmental Analysis degree. The tenets of sustainability have also been adopted to a certain extent by Pomona’s administration --- President Oxtoby declared in his 2006 convocation speech that he “looked forward to exploring with all of you in the year ahead how Pomona College can become a leader in educating students for a sustainable world,” and inaugurated the President’s Advisory Committee on Sustainability to oversee sustainability efforts for the College. Later that year, he signed the President’s Climate Commitment, which committed the College to creating an emissions audit and a climate action plan. An ambitious campus-wide audit took place in the summer of 2008, when Sustainability Integrator Bowen Patterson was hired, and the

efforts of the student Sustainability Action Fellowship the following academic year (2008-2009) has led to the writing of the Sustainability Action Plan, currently up for review to President Oxtoby and the Trustees (See Appendix 1 for a quick synopsis of the Water Chapter of the Action Plan).

Similarly, the state of California, and Southern California in particular, have recently experienced a long-term drought and been embroiled in a series of water crises. Endangered Species Act regulation related to the endangered delta smelt in the Bay area has led to the curtailments of water deliveries, and Southern California's water reserves have been dwindling since 2006 due to a continued drought. The Metropolitan Water District, which serves 26 member agencies (including Pomona College's own Three Valleys Municipal Water District) and delivers water to 19 million Southern Californians, recently issued a warning that "Local winter storms haven't restored Southern California's Water Reserve Level." Instead, they merely held water reserves constant, and Metropolitan Water District will "continue to face significant water supply challenges in 2010 and beyond."¹

Considering that Pomona College is located in an area vulnerable to drought, in which rainfall is typically sparse and a significant portion of water has to be imported at great monetary and energy costs from hundreds of miles away, often causing great harm to local ecosystems such as the Colorado River, Owens Lake, Mono Lake, and the Sacramento Delta --- and that Pomona College itself possesses its own local water resources, it is essential that we become better stewards of our water resources, both groundwater and stormwater, and carefully consider how we are using water and how we can use less. If Pomona truly hopes to become a sustainable institution, it is imperative that water becomes a core part of its sustainability initiatives. And to the extent that Pomona College is primarily an undergraduate institution designed to further the education of its students, and particularly their environmental education through its Environmental Analysis program, it is furthermore essential (and natural given the College's goals) that students become involved and educated about Pomona's initiatives concerning water. As is explicitly written in the College's 2010 Sustainability Action Plan: "As the College is a leader in education, it should be a leader in sustainability," and,

“Educational experiences and other awareness-building opportunities should be a cornerstone of the College’s sustainability strategies and means for implementation.”

In this class, a great example of how water education can become part of a college curriculum, we read Robert Glennon’s book Unquenchable, which suggests that we “rethink how and why we use water,” and recommends “a national commitment” to pursue the solutions available to us. (Glennon 17, 20) He also asks: “How do you compete in the media-intensive society we live in to get a water resources message out?” (Glennon 78) Pomona College offers a perfect setting for doing both: rethinking how and why we use water here *and* educating students about the water crisis California is currently facing and what we can do about it. I will discuss both topics below, breaking them down into the following sub-topics: how we use water, where we get our water, how we dispose of our water, and education.

I. How we use water

Because *how* we use water and *what* we use it for to a great extent dictates both how we get water and how we dispose of it, the natural first question to ask is: how *are* we using water, and what should qualify as an acceptable use of water at Pomona?

In academic year 2007-2008, Pomona College used 81.8 million gallons of water: 3% for sinks, 6 % for showers, 6 % for toilets and urinals, 10 % for suspected leaks, 15 % for “other” (including washing machines, fountains, pools, etc.) and 60 % for landscaping. (Pomona College Campus Sustainability Audit 2008)

Out of those uses, the 10 % number for suspected leaks jumps out as a good place to start --- why do we waste so much water on something that provides us with no benefit? The answer is that Claremont has notoriously high water pressure that leads to frequent leaks. To solve this, Pomona’s Grounds Department have been continually attempting to reduce and control water pressure by installing pressure-controllers, and thus far approximately 30-40 % of the system is pressure-controlled.

In terms of the defensibility of our *voluntary* water use --- it seems like we should have a way to dispose of our excrement; that we should have freshly-prepared food, clean dishes and clothes; that we should be able to bathe; and that we should be able to conduct biological and chemical experiments to further the education of our science students. Pools might seem a little more frivolous, but considering that they do allow us to have

both a swimming and water polo team, to host pool-based intramural sports and Phys-Ed classes, and are deemed an essential part of the “Summer Camp Pomona” experience, they can be deemed an acceptable use of our water resources as well. And, as the latest draft of Pomona College’s “Open Space and Landscape Guidelines” points out:

Fountains, though not numerous, play an important role in enriching the total campus experience. They currently either serve as focal points, anchoring important organizing lines, or as smaller scale spatial enhancements adding visual and auditory interest to courtyards or special gardens... Though commonly considered a maintenance liability, properly designed and located fountains provide significant enrichment to campus landscapes. They both accent and impart ambiance more effectively than almost any other device. Their continued, judicious use is encouraged.

The question for these uses then becomes: how do we accommodate them, but in a better way?

The College has already begun to make progress on these issues. About 1/3rd of Pomona’s urinals are waterless; most sinks have low-flow aerators to reduce water use; and next year a significant number of dual flush toilets will be installed in Mudd-Blaisdell, Smith Campus Center, Walker and Alexander Hall, as well as Carnegie and Pearson due to the recently-accepted proposal of John Hasse PO ’12 to the President’s Sustainability Fund (this step has already taken place in Norton-Clark during its recent renovation). A continued shift towards more efficient plumbing and sinks/showers/etc. will undoubtedly help to provide small but significant water savings in coming years (and is explicitly mentioned in the Sustainability Action Plan; see Appendix 1).

One other source of water use that bears mentioning is Biology and Chemistry labs, both within classes and in extracurricular research for thesis or as an independent study. One chemistry lab, for example, involves leaving the tap running overnight. Overall, labs that use less water should be chosen where possible over those that use a lot, while even just recommending that lab professors mention the idea of water conservation would be a meaningful step towards more mindful water use on campus.

Landscaping is a whole other can of worms, and is central to both Pomona’s image of itself and how it uses water. Almost 2/3rds of the College’s water use is for irrigation. If Pomona is to cut its water usage in any significant way, at least some of those cuts will have to come from water currently used to irrigate. For this to occur, our

landscaping itself will have to change, since we already have a very efficient and currently state-of-the-art irrigation system.

The dominant mode of landscaping at Pomona College used to be purely aesthetic and cultural --- based upon the aesthetic of affluence discussed before --- and enabled by the extremely cheap water rates Pomona gets based on its deal with Golden State Water Company. More recently, the impulse has been to focus on lowering our water use in landscaping significantly, by cutting out turf (see Figure 1) and creating low-water using landscapes. However, what Pomona really needs is a thought-out philosophy of landscaping --- one that brings together how we think about what we're trying to achieve with landscaping *and* how we think about becoming more sustainable in terms of our water use. In this context, consider the following value matrix for landscaping at Pomona:

Aesthetic value: Pretty self-explanatory --- the idea of creating landscapes that are aesthetically pleasing (though this is obviously very subjective).

Recreational/use value: While tearing up all of Pomona's athletic fields, Marston Quad and Walker Beach would assuredly provide significant water savings, they could no longer be used in the way they are now --- for refereed varsity and intramural games, impromptu Frisbee matches, and sunbathing on warm days. It is thus important to consider the value certain landscapes have for athletics, recreation and other uses.

Habitat value: Anyone who walks Pomona College today will notice hummingbirds buzzing by, insects flying around bushes and flowers, acorn woodpeckers pecking on trees, and maybe even a Red-Tailed Hawk perched atop one of the cypress trees on campus. It is pleasant to have wildlife like butterflies and bees on campus, and making sure Pomona's landscapes provide habitat for native or migratory species passing through can help lessen the environmental impact of our campus. As William McDonough and Michael Braungart write in their book Cradle to Cradle, "How can we enrich local species, and invite them into our 'cultivated' landscapes instead of destroying or chasing them away?"

Natural heritage: The value of having locally- or evolutionarily-significant plants --- this would include landscaping with local plants like the Giant Coreopsis (see Appendix

2) or Pomona's Ginkgo tree¹ at the eastern entrance to Smith Campus Center, for example.

Cultural value: While taking a tour at Pomona, one will probably hear that every plant mentioned in Shakespeare's plays can be found around Marston Quad except for hemlock, providing a sense of cultural value. Similarly, plant species used by the nearby Tongva tribe for various uses could qualify for this, as could plants like orange or avocado trees that were an important crop in the early days of American settlement in the area.

Edible value: One value of landscaping that can often be overlooked is *edible* value, like that provided by Pomona's Organic Farm or the kumquat trees on the western side of Scripps' campus.

Within this context, the key becomes to maximize the values desired by the campus while minimizing water, fertilizer and pesticide use, the presence of invasive species (though certain invasives should remain due to some of their other redeeming qualities) and required infrastructure, like pipes, sprinklers, drip irrigators and leaf blowers.

However, it is important to note that such steps will necessarily need to take place within the context of Pomona College's landscape master plan, which is now being revised and redeveloped by Pomona's master landscape architect, Tom Lockett of Land Images, Landscape Architects. Over the years, a number of landscape architects have formulated comprehensive landscape plans and visions for Pomona College's campus, starting with Myron Hunt's (who Cornell remembers as a "very dynamic, positive, aggressive individual" who was "a wonderful man on expediting things and getting them done, and very forceful") original 1908 Master Plan to Ralph Cornell's and Richard Dober's more recent land use plans. Their ideas and work are still relevant and very much a part of current building and landscape plans, as evidenced by the following excerpt from the current drafts of Pomona's latest master plan:

¹ *Ginkgo biloba* is a unique species of gymnosperm with no close living relative and is one of the best-known examples of a living fossil.

The College respects... Myron Hunt's 1908 Master plan for the campus, Ralph Cornell's subsequent landscape master plan leading to the creation of a 'campus in a garden,' and Richard Dober's more recent land use plan, which reflects and builds on the work of Hunt and Cornell. To the extent that is practicable, recognizing that new needs arise over time, the College will honor the concepts of this early work and will, in addition, strive to create a sense of architectural harmony and cohesion as new buildings are constructed and existing buildings are renovated.

And more recently, Robert Herrick Carter and Associates developed a formal campus Landscape Master Plan in 1983 in conjunction with the Richard Dober Centennial Plan, which was completed in 1987, while the landscape component of the 2002 Pomona College Master Plan was outlined by EPT Design, a subconsultant to architectural firm Moule & Polyzoides.

To give an idea of why Pomona College is set up as it is, it is important to understand the rationale of its original campus plan. Envisioned by Pomona President James Blaisdell and George Marston (the first president of Pomona's board of trustees) and planned by Myron Hunt, it proposed classically symmetrical development around a central quadrangle (Marston Quad) --- the "heart of the place." It was "designed in adherence to classical concepts of formality, geometry and order," in which the campus would be a "place of symmetry and proportion, organized through the use of axes, major and minor vistas, and complex spatial progressions." Furthermore, open space was to be the "unifying element of the campus. Buildings are arranged according to classical rules and stand predominantly as single elements in the landscape, connected by pedestrian walks and visual axes throughout the campus." These walks, like those between Mason Hall and Smith Campus Center and between Bixby Plaza and the Seaver Theater building, would "both connect open spaces and support visual and physical regulating lines." Within the "overall geometry and formality of the campus structure," there was to exist a "hierarchy of spaces, ranging from large, public open space to small, intimate courtyards and from major axes connecting one end of the campus to another to suddenly revealed views."²

² All taken from the latest draft of Pomona's current Landscape Master Plan.

A primary objective of Pomona's current plan is to uphold the original goals of Hunt's 1908 plan and its subsequent reiterations throughout the past century. "Time and evolution have... taken a toll on some of the more outstanding attributes of the campus," and "unity and connectivity have lost clarity" when "building complexes have seemingly inadvertently impinged on major sight lines and axes." The new plan hopes to fix some of these problems by striving to "preserve, enhance and continue the existing hierarchy" of campus open spaces; "provide visual continuity and connectivity throughout the campus, a unified campus image, and a landscape identity" and "improve connectivity throughout the campus by establishing linkages to repair broken or terminated axes and sight lines;" and "create and enhance complex spatial progressions, structuring the sequencing of experiences for a viewer moving through a series of spaces."³

The work done through this process, and Pomona's many landscape and campus architects, should not be overlooked. Many of the students are drawn to Pomona because of its landscaping, and it is an essential part of the institution and its image. The ability of the so-called "strategic master plans" to create continuity, connectivity and a "unified campus image" is invaluable. And while one might suspect that a strict adherence to Pomona's traditional landscaping schemes, divided up into natural, informal and formal areas, could oppose sustainability efforts --- for example in the current master plan's adherence to the "Campus Heritage list" of plants and formal plant materials which are selected "from a limited palette and organized in formal gestures and relationships to one another---" the principles of native landscaping in fact have a long and illustrious history at the College.

In fact, Ralph Cornell, Pomona alumnus and supervising landscape architect for the school between 1919 and the late 1960's, was greatly in favor of native, low water-using landscaping. In a 1912 essay entitled "Wanted: A Genuine Southern California Park," he writes:

What could be more interesting and educational, to the people at large, than a public park devoted to plants indigenous to our dry and semi-arid lands, and representative of the many forms of plant life that are found along our coast slopes? A dry ground park, planted only to native trees, shrubs and flowers, would be one of the greatest possible

³ Again, from the latest draft of Pomona's Master Plan.

assets to Southern California, and especially to the community whose park board was sufficiently aggressive and far seeing to establish such a system of planting. Not in all California can one find a collection of the native flora of sufficient consequence to warrant its recognition as such... It is true that many native plants and seeds are found in our markets, accessible to those who know, but the masses of people are unaware of the abundant wealth of flower and foliage, lying on all sides of us, inviting recognition and adoption... A park should present a series of living pictures, in plant life, executed along the lines of greatest possibility. (300)

Cornell decried the fact that “it seems to be our general tendency to make parks as artificial as possible,” and described how “a city very often purchases dry hillsides or rugged slopes for park purposes;” no sooner is this done than “an elaborate water system is installed at enormous expense, and plants entirely foreign to such an environment are *grotesquely perched* where they must serve a *life-long sentence of struggle for existence* under conditions entirely adverse to their developments.” They occur frequently enough, and “act as a living advertisement of what man can do if he has time, water and ample funds, in sharp contrast to nature’s own creations,” but seemed to be a somewhat foolish endeavor in Cornell’s eyes. (303)

Instead, Cornell asked, why not “plant dry hillsides in such a manner that they will produce maximum results at minimum expenditure? Plant a *dry ground park*. Use native plants already accustomed to the semi-arid conditions of our soil and climate.” Such a park would be “at once unique and individual; it would be decidedly typical and distinctive of California; it would be a garden spot of nature, a mecca for birds, a plant paradise; it would be a delight alike to the student, the botanist, the sight-seer and nature lover, each in his own way... There is no limit to the end that might be attained with such a park, if it were properly conducted.” (303, and see Appendix 2 for illustrations)

In this context, Pomona College need only examine its past to find the compass to a more sustainable future. All it has to do is embrace its heritage by heeding the words of one of its most prominent landscape architects in order to make significant water cuts.

There are a number of local resources for doing so (see Appendices 3 and 4). Pomona College should hire landscapers with a specific background in sustainable, native landscapes, work with organizations like Middlebrook Gardens or the Foundation of Ralph Cornell’s friend Theodore Payne, use tools like WUCOLS (Water Use Classifications of Landscape Species) and solicit feedback directly from those who take care of our landscapes in Buildings and Grounds. Landscapes should become more

interactive, and less dictatorial, artificial and manicured. Space should be made for (administration-supported) guerilla farming, native landscapes and spaces that interrogate more formal landscape areas, and areas that provide habitat for local species and recall the natural local landscape before development.

To conclude, I'd like to return to the idea of Pomona as a "campus in a garden." I don't think we need to abandon this concept, or the idea of a landscape master plan --- as Cornell says, "there is real social and economic value in attractive surroundings," and ones that work together comprehensively --- but I do think we need to extend our ideas about landscaping and introduce new, different aesthetics alongside the old aesthetics that have been embraced up until now. (Oral History 166) The Landscape Master Plan that is currently being drafted recommends the adoption of "aesthetic sustainability," which includes "visual appeal and harmony combined with ecological integrity, issues of human well-being, and place identity," but how will this be defined at Pomona College? If, as Richard Dober writes in his book Campus Landscape: Functions, Forms, Features, "campuses will be centerpieces in our twenty-first century culture," and if we hope to both create and be a part of a twenty-first century culture that is dedicated to sustainability, we will have to define those words for ourselves. As Cornell writes, "What the environment does, and this applies to education... is to create habits and tastes." (Oral History 167) If we hope to instill sustainable habits and tastes in Pomona's students, we should reduce negative externalities in landscaping (like fertilizer and pesticide use, the amount of water needed to grow plants, etc.) while increasing positive externalities (like those listed above: recreational, edible, etc.). And we need to be open to students, faculty and staff taking a greater role in helping to envision and create Pomona's landscape. They are the ones who live, teach and work here, thus they should be an intrinsic part of the planning and planting process. If Pomona's physical environment will "help shape its academic purpose for generations to come," and will represent the potential for "an understanding of the interdependence of all human endeavor and a growing awareness that stewardship of nature must be an integral part of our existence," as is written in Pomona's 2002 Strategic Master Plan, then environmentally- and agriculturally-oriented students and faculty should most definitely have ways to get involved in landscaping, even if there is still a need for a cohesive and comprehensive campus planning process.

For our environment to “provide the opportunity for students to learn by being leaders in civic discourse and in the process of sustainability,” and if the future of the Pomona campus is being “[envisioned] through the process of strategic development planning,” it is essential that students, faculty and staff are present at the table of decision-making.

II. How we get water

Pomona College gets its water from the Claremont branch of Golden State Water Company, which in turn gets its water from 50 % local sources (including Pomona’s groundwater) and 50 % from the California State Water Project, which brings water down through the Central Valley from the Sacramento-San Joaquin Delta. Pomona owns two wells (College #1, or Wilcox, and College #2, or Giboney) that produce roughly 15% of all pumped groundwater in the area. Ironically enough for Pomona’s location in an area characterized mostly by water *scarcity*, we have had more problems with *too much* groundwater than too little: one of the primary goals of the Giboney well, which is located immediately to the northeast of Clark 1 along the walk to CMC’s Collins dining hall from the west, was to mitigate the threat of too-high groundwater, according to Pomona’s water representative John Giboney. The drilling of the on-campus well (Giboney #2) was accomplished in 1983 after a 1981 study entitled “Groundwater Model of Claremont and Vicinity” --- and carried out by consulting geologist Robert Bean and Dr. Donald McIntyre of Pomona College’s Department of Geology at the time --- found that rising groundwater levels would continue to be a problem on Pomona’s campus if there weren’t some way to directly draw down groundwater levels within the campus area.

This strange turn of events begins to make sense only when you consider Pomona’s position along San Antonio Wash. As is clear from the Lloyd Cooper picture on the cover page, entitled “View of San Antonio Wash and San Antonio Peak,” Pomona College and the other Claremont Colleges lie directly on top of the western portion of San Antonio Wash, clearly visible fanning out from the canyon that leads up to Mt. Baldy. As is visible in Figure 2, rainfall this side of Mt. Baldy rushes along the wash towards Pomona College and indeed caused serious flooding problems in the past, most notably during the 1938 flood. The percolation of that rainfall down into the groundwater basins underneath Claremont, and Pomona College’s water rights to a certain portion of

that groundwater, means that we are today enthroned atop a cache of groundwater wealth, the liquid treasure of Mt. Baldy.

Today, however, local water resources are governed carefully by a complex system of related institutions of which Pomona College is an important part. Pomona College owns water rights in the Six Basins, a ground water basin adjudicated in 1998, based on both riparian rights (its ownership of the land directly above part of the basin) and appropriative rights (based upon its historic water use). The Six Basins Watermaster Board was established after the 1998 judgement *Southern California Water Company v. City of La Verne, et al.*, which established pumping rights for each party involved, and includes provisions for spreading, storage, ground water levels and water quality in the Six Basins. The Board includes ten individuals, one member from each of the parties included in the judgement, and meets several times a year. Each party is given a weighted vote based on whether it is a major or minor producer. For example, Golden State Water Company gets five votes, while San Antonio Water Company and Pomona College each get only one vote. The board is responsible, in short, for monitoring water production, consumption and percolation in order to determine “operating safe yield” for that year and how much each party is allowed to pump. John Giboney, a former head of Campus Planning and Maintenance, has represented Pomona College on the Six Basins Watermaster Board for many years.

The other two pieces of the puzzle are the Pomona Valley Protective Association and the Three Valleys Municipal Water District. The Pomona Valley Protective Association was established in 1909 by way of a “mutual agreement between the major water interests in the greater Pomona Valley,” and was formed “to protect the rights of the water users in the Claremont, Pomona, Upland, and La Verne areas from outside interests developing and exporting local water from the area, to protect the rights of its stockholders [of which Pomona College is one], and to ensure an ongoing supply of water to the Pomona Valley.” Today, it operates eleven hundred acres of land called the San Antonio and Thompson Creek Spreading Grounds, and uses flood control reservoirs to selectively “spread” runoff water over their land, the most notable of which is San Antonio Dam, built and owned by the U.S. Army Corps of Engineers in 1956. There, it

percolates downward into the under-ground basins from which it can be pumped at a number of well sites in the Six Basins area.²

The Three Valleys Municipal Water District is a public agency organized under the State Water Code. In 2000, it was awarded an administrative contract by the Six Basins Watermaster Board, and is currently responsible for monitoring the water levels of the basins and reporting back to the Watermaster. The District is thus an intrinsic part of how water is managed locally in the Six Basins.

Pomona College currently finds itself in a relatively comfortable situation with regards to its water rights. During fiscal year 2009, for example, Pomona's wells produced 2480.37 acre-feet of water and generated a combined gross revenue of \$111,224.77 for the College. We were then able to buy approximately 94 million gallons of water from Golden State Water Company for \$116,452, a much cheaper rate than is available to most local households and corporations. According to Trustee Buddy Moss, our water rights and wells generated annual savings of \$241,821 for Pomona during 2009 exclusive of water meter service charges.

It is important, however, for Pomona to remain informed about its groundwater resources and contract with Golden State Water Company. Over the past 16 years, for example, water use has stayed about the same, going from 95,042,244 total gallons purchased to 97,579,636 total gallons. The cost, on the other hand, has gone from \$1,461.60 to \$119,399.07, more than an 80-fold increase, and even though we have produced about the same amount of water for them during this time period.⁴ How is this contract negotiated and updated over time? Are there possibilities to negotiate a better one? Also, over the past 10 years or so, trichloroethylene and arsenic levels in our tap water have popped up over both the legal and health limits for drinking water.⁵ How is this happening if our well-water is relatively pure, according to reports by the Three Valleys Municipal Water District? And lastly, a major development is currently planned near College Well # 1, and could possibly affect its operations. All of these developments

⁴ See <http://www.pomona.edu/administration/sustainability/initiatives/water/impacts-trends.aspx> under "Resources."

⁵ <http://www.ewg.org/tap-water/whatsinyourwater/CA/Gswc---Claremont/1910024/>

should receive careful investigation, numeric analysis, and data collection in order to ensure that Pomona College is getting the best deal (and purest water) that it can.

III. How we dispose of water

Pomona College disposes of its water in two ways: stormwater that lands or flows onto our campus is taken by a stormwater system managed by the L.A. County Department of Public Works (LACDPW) first to the Prado Dam and then Orange County; and our wastewater is taken to the Pomona Water Reclamation Plant via Claremont's sewer system, both of which are operated by the Los Angeles County Sanitation District (LACSD).

The College produces about 18.4 million gallons of wastewater each year, including both grey water and black water, and produces approximately 28 million gallons of stormwater runoff per year. Including water flowing from off-campus, Pomona's campus intercepts approximately 53.7 million gallons of stormwater per year from the north (on average- see audit).

In her 2007 thesis, Femke Oldham concludes that because "the government organizations in control of storm water and sewage are currently processing and applying the water in an efficient and sustainable way," and that "almost all of the water in both instances is either reused for purposes of another entity or is put back into the hydrologic cycle," neither stormwater or sewage should be a focus of sustainability efforts. (Oldham 49) However, I will argue that in both cases, Pomona's long-term goals should be to keep its stormwater and wastewater on campus, based on the fact that doing so will allow it to cover a significant portion of its water use, particularly irrigation, as well as replenishing its relatively pure groundwater reserves. When stormwater and wastewater leave our campus, we are both losing a valuable resource and reinforcing an out-of-sight, out-of-mind mentality. Finding ways to reuse our water on campus will both reduce the amount of water we need to buy from Golden State Water Company and will also educate students about more sustainable ways to deal with storm- and wastewater, if combined with proper signage and publicity campaigns.

Currently, the ~ 37 % of the campus that is "hardscape" generates a variety of pollutants including phosphorus, nitrogen, fecal coliform and e. coli bacteria. The approximately 53.7 million gallons of stormwater our campus intercepts then flows into

the local polyvinyl chloride pipe drainage system, a material known to leach plasticizers and other chemicals into water, and flows south to the Prado Reservoir where it mingles with a significant portion of the stormwater pollutants of the Inland Empire, assuming a lowest-common-denominator of water quality. There it is used to recharge groundwater in Orange County, though when the dam is over-capacity during storms, water and stormwater pollutants are released to the ocean. This was the case in both 2005, when flood-control workers released 10,000 cubic feet per second from the dam, and this January, when 2,390 cubic feet per second were released in response to a series of winter storms (See Figure 3 to get a sense of where Pomona's stormwater ends up and how it gets there).³

Considering that rainwater is the purest water available in this area, followed by groundwater and then reservoirs (according to Buddy Moss), and that fully utilizing our stormwater resources on campus is within our grasp, Pomona College should prioritize a comprehensive stormwater management plan that deals with stormwater locally. First, Pomona should reduce the total area of non-permeable surfaces as much as possible in order to reduce the amount of stormwater runoff. Second, Pomona should funnel rainwater through the use of bioswales and natural gradients such that plants are irrigated and water infiltrates into the ground. Whereas conventional storm water systems remove runoff from the site as quickly as possible, thus interrupting the natural hydrologic cycle, increasing the retention and infiltration of rainfall onsite means that plants will need less water and irrigation requirements will be reduced. Lastly, where impermeable surfaces cannot be removed, runoff should be directed to rain gardens and other natural infiltration zones.

It should be noted here that, even in Pomona's 2002 Strategic Master Plan, plans were already being made to bring Low Impact Development --- a term that has been adopted to describe "a comprehensive and integrated watershed-based approach to storm water management" --- to campus. Since then, Bowen Close and the Sustainability Integration Office have come up with a plan to funnel all of North Campus's stormwater to a storage basin in the Wash, a laudable goal and significant step forward. Important considerations for this project are: capacity needs to be big enough for the "100-year-flood;" geological models should be consulted to ensure that a clay layer won't cause

flooding in basements; and the project should be expanded if possible to include as much of the campus as possible. Where project expansion is not possible, the College should look into the use of cisterns and other systems to capture rainwater for irrigation use. Pomona should also explore the potential for drilling another well so that ground-water levels in the wash can be regulated through pumping, and directly returned to the municipal water system.

Finding a more local solution for our wastewater is desirable in terms of sustainability as well. Currently, Pomona sends about 50,400 gallons of wastewater to the Pomona Water Reclamation Plant (WRP) per day, where about 31,000 gallons is recycled, most of it used at over 90 reuse sites, while the other 19,400 gallons is released into the San Jose Creek channel, a tributary of the San Gabriel river.⁶ It is true that downstream users benefit from this – although in an insignificant way (our yearly 18 million gallons of wastewater represent less than two days of normal operations of the WRP). However, Pomona College should strive to reclaim its own wastewater innovatively on campus because doing so would raise awareness of both water management on campus and sustainable alternatives to typical treatment techniques; would bypass the harsh chemicals like chlorine that are used in the “Standard Activated Sludge” method featured at the Pomona Water Reclamation Plant; and would more efficiently make use of our wastewater since it would not be mixed again to the lowest-common-denominator of waste, and could be used to both irrigate and recharge our relatively-pure groundwater (which could then be pumped to serve local people through Golden State Water’s distribution system).

Though technology is constantly improving and there are many potential solutions, here are three that could work well for Pomona. Two of them --- MBBR or the moving bed biofilm reactor type, and MBR or membrane bioreactor --- are currently being advocated, respectively, by Bob Bowcock, the founder of Integrated Resource Management, LLC, and Marilee Scaff, the co-chair of Sustainable Claremont’s water task force. The membrane bioreactor would be larger and more expensive, but would treat water to a higher standard, while the moving bed biofilm reactor type would be smaller

⁶ See Pomona College Audit and the PWRP website.

and cheaper.⁷ In both cases, Pomona should explore the potential for collaborating on such a project with the other 5C's and Claremont, but would almost certainly have enough space to build a small satellite water reclamation plant on its campus by itself in order to reclaim its 18 million gallons of wastewater. A last option would include exploring the installation of one or several "Living Machines," a 21st century technology that "treats wastewater to the highest quality without caustic chemicals... industrial processes... high energy costs... and without expensive investments in public infrastructure."⁸ Any one of these options could be as cheap as \$5-20 million dollars, well within Pomona's 10- or 20-year budget, and though they wouldn't generate huge financial savings due to the cheap rates we get on water, reclaiming our wastewater would yield significant educational and environmental dividends.

IV. Educational opportunities (and responsibilities)

The first way to educate Pomona's students, faculty and staff about water and water issues is already partly underway: an improvement of signage. This could involve the current stickers provided by the Sustainability Integration Office reading "Please use water; every drop counts;" identification of landscape plant species and informational signs detailing certain native plant areas and steps that have taken place like turf removal; and information about less water-intensive toilets that have been installed. Having a part of Chirps featuring water news in California could also be a good way to bring consciousness of water issues onto campus, as could the installation of a widget on the TV screens in Smith Campus Center detailing the current status of the Metropolitan Water District's current reserve levels.

As discussed before, students and faculty should continue to take a more active role in rethinking how and why we use water at Pomona. Writing this paper, for example, has opened my eyes to Pomona's landscaping, sprinkler systems, on-campus well and the general design of the campus. An ID class in the art, art history or even biology department specifically on Pomona's landscaping, where materials on Ralph Cornell,

⁷ Personal correspondence, Elena Brandford.

⁸ <http://www.livingmachines.com/about/>

Theodore Payne and the other various landscape master plans were read and discussed, current managing landscaper Tom Lockett made several visits, and in which the class frequently explored and experienced Pomona's different landscapes first-hand would be a fascinating way to open students' eyes to how Pomona is landscaped and how it relates to our water use (many of Ralph Cornell's papers and photography are also available through UCLA's special collections). And just as Pomona's E.A. Department hires two sustainable architects to teach a "Green Urbanism" class, if plans to make a native plant garden out of the lawn north of Alexander Hall go through, Pomona could hire a sustainable landscaper to teach a class based on making the garden, choosing plants and soliciting community feedback.

And this class, for example, one of the best examples of bringing water issues into the classroom on campus, could go on field trips to both of Pomona's wells, the Pomona Valley Protective Agency headquarters in the village and their spreading grounds at Thompson Creek and San Antonio, the Pomona Water Reclamation Plant, Prado Dam, or attend one or more of the regular board meetings of the Three Valleys Municipal Water District (held on the third Wednesday of each month and open to the public). The genius of this class was the number of fascinating individuals who made guest appearances --- especially Bowen --- and the amazing field trip to Steelhead Park on the L.A. River. Continuing this tradition but including more local institutions, individuals and infrastructure that directly relate to Pomona's water, water use and disposal could help to locate Pomona (and other) students in our waterscape here, making water issues more real and immediately apparent.

The biggest recommendation I have for Pomona College, however, is that the school inaugurate a formalized "Water Committee" to deal specifically with the management of Pomona's water resources. Currently, water management at Pomona is dealt with by a handful of "disparate elements" including Trustee Buddy Moss, who helps the trustees deal with Pomona's wells, Sustainability Coordinator Bowen Close, and long-time Pomona College employee and water representative John Giboney. Luckily for the College, those three are extremely knowledgeable, competent individuals who have served Pomona well. But it makes sense --- both in terms of education and management --- to create a more formal working group to carry on the work of water

management and more specifically implement the water-related actions recommended by the Sustainability Action Plan, so that the three aforementioned individuals' wisdom can be passed on through some sort of institutional memory. The group would "have to include" John Giboney, Buddy Moss, Professor Miller, Bowen, and Bob Robinson, according to Mr. Moss. Another candidate could be Professor Heather Williams, who teaches a class entitled "Global Politics of Water." But it should also include 4-5 student members, including the Water Sustainability Fellow for next year if the program is continued, one student to serve simultaneously in the President's Advisory Committee on Sustainability, one student with a chemistry background (who could be advised by environmental chemistry Prof. Chuck Taylor), one with an economics background (who could be advised by Prof. Jurewitz), and one with a geology/hydrogeology background (who could be advised by Prof. Reinen). Because time is short, the group would most likely only meet once every 3 or 4 weeks, but could also respond to actions initiated by students involved with Pomona's main environmental club, PEAR, on the condition that the club has an active water working group next year.

Centralizing water management at Pomona College by bringing together the disparate (if talented) elements of the process together under one roof would result in better reporting on water and would help to institutionalize memory and knowledge, whereas now knowledge about water is fragmented and not well-known on campus (though the Sustainability Integration Office has made a lot of progress on this front on its website). This could help to bring together knowledge about the history of our wells, historic water usage and prices, our contract with Golden State Water Company, etc. etc., and would help ensure that issues that come up are dealt with in the best possible way. Furthermore, doing so would provide an opportunity to involve students (and their labor) who would bring a valuable perspective (since they would be directly affected by decisions made by the group --- they drink the water the College buys!). Serving on the committee would also be a great experience for students interested in water issues, water management and sustainability.

A little anecdote on what this type of education --- involving students in sustainability issues through innovative classes and institutional decision-making --- could help achieve. Ralph Cornell, the first and arguably most important landscaper of

Pomona College, remembers his relationship to a Pomona Biology professor: Professor Charles Fuller Baker was a biologist, principally a botanist, who “was closest to me [Cornell] personally and perhaps shaped my destiny.” Continuing, “As far as I know, and of course this would have no statistical significance --- he sent more men out into the useful world, all full of fire, than any other Pomona instructor of his day.” (Oral History 37-38) Cornell recalls he took botany with him during his first year at Pomona, and that Baker “sort of singled me out I guess and decided that maybe I ought to be a landscape architect, and so he initiated a little work—you couldn’t call it a course—in what he called landscape architecture, and I was the only one concerned. He gave me projects and work of that sort, and he didn’t know anything about design either.” This was his background and foundation, he said. (Oral History 39-40) A little later in his College career, he remembers that the first time he developed a personal relationship with Pomona’s President Blaisdell was when he was put, as a student, on the campus planning committee around 1912 when Myron Hunt was the architect for the campus. “By that time I had become somewhat oriented toward my future life and profession,” he said during an interview for an oral history publication about him, “and so they put me on the Pomona campus committee with Myron Hunt and “Chem” Jones and Blaisdell, I think, to discuss plans. I have felt increasingly, as I have grown older, that that was a courtesy to me [in order] to fan a little flame of interest and enthusiasm, because at that stage I could have nothing to contribute, you see.” (Oral History Program 32-33) These early experiences at Pomona College led to Cornell’s acceptance at Harvard Graduate School of Design, where he spent three years, and undoubtedly helped set him up for his job as Pomona’s supervising landscape designer from 1919 on for more than 40 years. In his long and illustrious career, he was significantly involved in landscaping Torrey Pines Park, the Los Angeles Music Center, the La Brea Tar Pits, Griffith Park, and also served as the supervising landscape architect at UCLA between 1937-1972. He was a constant champion of California native plants, energetically advocating the use of California natives in Southern California landscaping throughout his life, and cultivated a long friendship with fellow native plant lover Theodore Payne.

As an educational institution dedicated to sustainability, Pomona should strive to educate the leaders of tomorrow both in and outside the classroom by modeling ideal

behavior in how it deals with water --- landscaping, groundwater, wastewater, stormwater, etc --- and directly involving students in doing so. On one side of the Pomona College gates is written: “They only are loyal to this college who departing bear their added riches in trust for mankind.” (see Figure 4) In our modern world, one affected by climate change, environmental injustice, and severe water problems, particularly in Southern California --- sustainability needs to become a core part of Pomona’s goals, discourse, administration, and education if its students will have the “riches” required to fulfill the duty described above. And since water will no doubt become an even more important aspect of the idea of sustainability as time goes by, it should forever remain a prominent part of both Pomona’s sustainability efforts and education. Who knows how many Ralph Cornells are waiting for just such an opportunity?

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Appendix 1: Water Chapter of Pomona's Sustainability Action Plan Objectives for 2020

- >> 5% annual reduction in 3-year average water use, adjusted for cooling degree days
- >> Use of reclaimed/gray water (if possible)
- >> No net increase in impermeable surfaces (except where runoff is channeled into natural treatment infrastructure)
- >> Increased use of sustainable stormwater management techniques
- >> Complete metering of major buildings for water use within 2 years⁵⁴
- >> Complete metering of all buildings for water use within 5 years

Recommended Actions

Key to Financial Estimates

\$ = Under \$5,000

\$\$ = \$5,000-50,000

\$\$\$ = Over \$50,000

Issue 1: Reduced water use

>> Retrofit plumbing fixtures

The use of dual-flush toilets, waterless urinals, pint-flush urinals, low-flow showerheads, faucet aerators, and low-flow dishwashing nozzles should be expanded across campus. Retrofits should be used where possible, instead of complete replacement of fixture.

Responsibilities: Maintenance | New funding required: \$\$

>> Stop force-thawing in dining facilities

Food is currently thawed under continuously running water, a practice that could be ended with advanced planning and increased staff training.

Responsibilities: Dining Services | New funding required: None

>> Training program for Grounds staff on maintenance of sustainable landscapes

Training for Grounds staff can help with water-saving techniques and in ensuring the success and effectiveness of sustainable landscaping design.

Responsibilities: Grounds | New funding required: None

>> Public encouragement of campus community to report water waste

Encouraging the community to report examples of water waste, most notably broken sprinklers, not only encourages conversation about our landscaping-related sustainability programs but also assists Grounds in identifying problems.

Responsibilities: SIO | New funding required: None

>> Move forward with identified turf removal projects

Land Images, the College's landscape architect, has identified opportunities for potential turf removal projects (see Figure 3, following page). These opportunities should be further studied based on current/future use of those spaces, feasible alternative designs, and cost.

Responsibilities: Grounds, Facilities and Campus Services | New funding required: \$\$

>> If available, begin using reclaimed water for landscaping

If the City of Claremont makes available reclaimed water sources, the College should begin to explore the feasibility of using this water source on campus.

Responsibilities: SIO, Grounds, Facilities and Campus Services

| New funding required: Unknown

>> Examine opportunities for water re-use on campus

Some campus waste water (e.g. shower water, laundry water, condensate from chilling

infrastructure) may be reused on campus for other uses.

Responsibilities: SIO, Maintenance, Grounds | New funding required: Unknown

Issue 2: Increased capacity of sustainable stormwater management infrastructure

>> *Move forward with identified sustainable stormwater management opportunities*

Opportunities for sustainable stormwater management have been identified across campus and should be further studied based on feasibility and cost.

Responsibilities: Grounds, Facilities and Campus Services | New funding required: \$\$

Issue 3: Better water-related data and information

>> *Move forward with building-level water metering and conduct annual assessment*

Individual buildings, starting with the largest buildings on campus, should be monitored individually for water use. Systems should be submetered to accurately assess domestic, landscaping, and mechanical uses of water. Information from these meters should be monitored at least annually to assess progress and potential problem areas.

Responsibilities: Facilities and Campus Services | New funding required: \$\$

>> *Provide user-friendly public access to water use data and tracking*

Provide user-friendly online access to water tracking data, including meters where available.

Responsibilities: SIO | New funding required: None

Issue 4: Increased awareness of issue

Along with actions covered in Education section.

>> *Create educational signage and programs for domestic water use*

Create and post stickers, signage, and other educational programs that encourage water conservation in domestic uses (e.g. bathrooms and kitchens).

Responsibilities: SIO | New funding required: None

>> *Develop interpretive program for sustainable landscaping efforts*

The program could incorporate signage, tour events, self-led tour brochures, and/or other events and materials.

Responsibilities: Grounds, SIO | New funding required: \$

>> *Develop sustainability garden on campus*

A sustainable garden site would include demonstrations of sustainable landscaping techniques and technologies (e.g. drip irrigation), and could potentially include innovative stormwater management and rainwater collection techniques.

Responsibilities: Facilities and Campus Services, Grounds, SIO | New funding required: \$\$

Timeline and Priorities

Years 1-2

Higher priority

>> Retrofit plumbing fixtures

>> Stop force-thawing in dining facilities

>> Move forward with building-level water metering and conduct annual assessment

>> Provide user-friendly public access to water use data and tracking

Lower priority

>> Training program for Grounds staff on maintenance of sustainable landscapes

>> Public encouragement of campus community to report water waste

>> Create educational signage and programs for domestic water use

Years 3-5

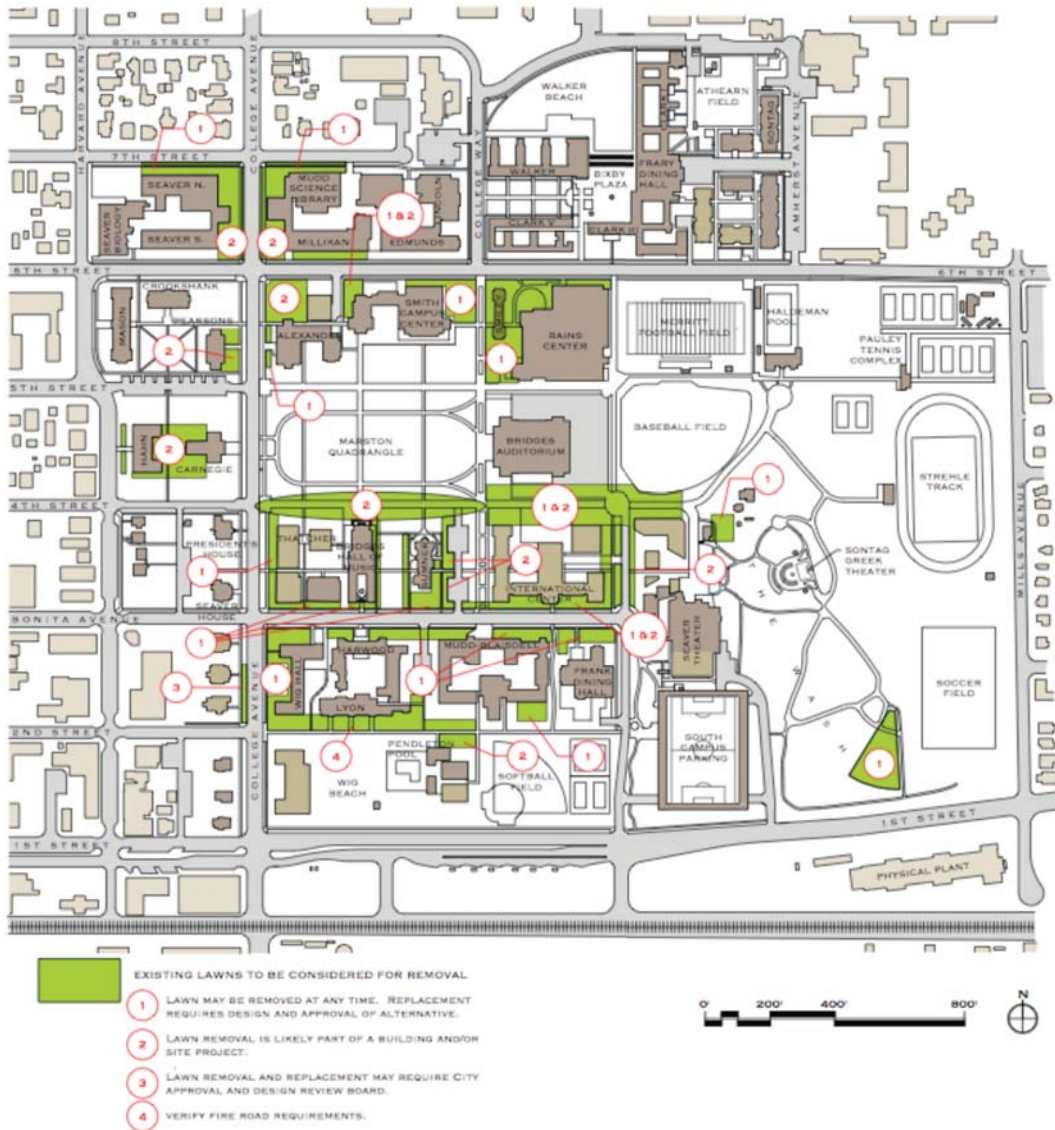
Higher priority

- >> Move forward with identified turf removal projects
- >> If available, begin using reclaimed water for landscaping
- >> Move forward with identified sustainable stormwater management opportunities
- >> Develop interpretive program for sustainable landscaping efforts
- >> Develop sustainability garden on campus

Lower priority

- >> Examine opportunities for water re-use on campus

Figure 1: Opportunities for Turf Removal



Appendix 2: *Cornell's effusive praise of native plants, illustrated*



Figure 135. Where in all the artificial surroundings of the conventional park can so inviting a path be found?

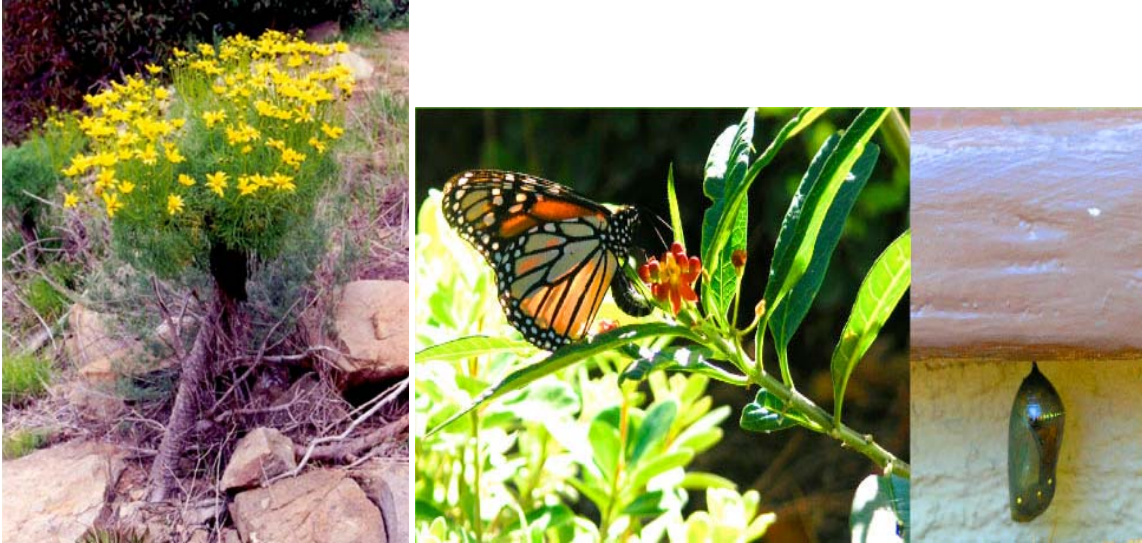


Figure 139. The sycamore is ever a picturesque feature of the Southern Californian landscape, with its intricate outline in winter and soft foliage in summer. One would like to tarry here and revel for awhile in the play of lights and shadows.



Figure 141. All the creative genius of man could not improve on some of the scenes along this delightful driveway.

Appendix 3: Examples of sustainable landscaping



Giant coreopsis (*C. gigantea*) Gardens can provide valuable habitat for local organisms



Examples of sustainable landscaping from Grace Phillips Garden Design.⁴

Appendix 4: *Resources for sustainable landscaping*

- Middlebrook Gardens, San Jose. <http://www.middlebrook-gardens.com>
- Grace Phillips Garden Design, Santa Monica. <http://www.gracescapes.com/>
- The Theodore Payne Foundation, Sun Valley. <http://www.theodorepayne.org/>
- Rancho Santa Ana Botanic Garden, Claremont. <http://www.rsabg.edu>
- California Native Plant Society, Sacramento. <http://www.cnps.org/>
- California Native Garden Foundation. <http://www.cngf.org/>
- WUCOLS = Water Use Classifications of Landscape Species.
<http://www.owue.water.ca.gov/docs/wucols00.pdf>

Figure 2: *Rainwater rushing south along San Antonio Wash*



Figure 3: *Pomona's location within the Santa Ana River Watershed*

Santa Ana River Watershed

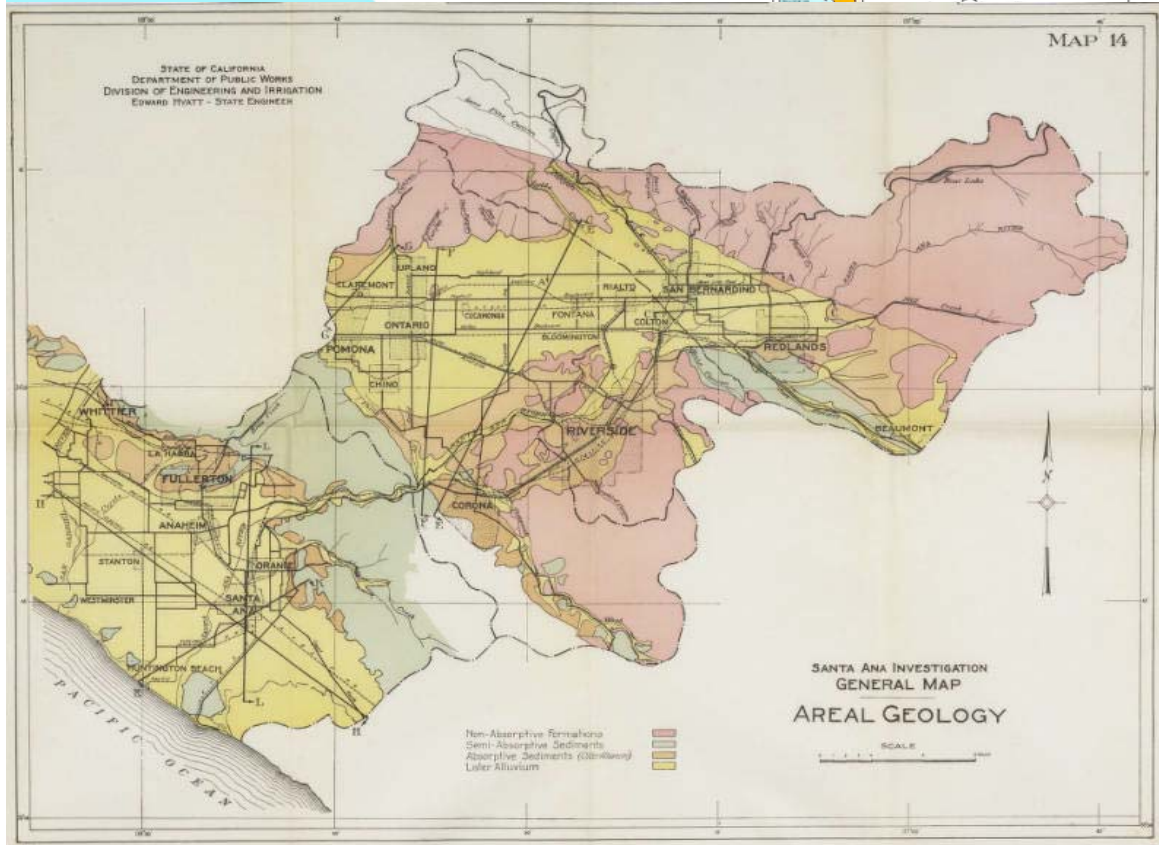


Figure 4: Pomona College gates



¹ <http://www.mwdh2o.com/mwdh2o/pages/yourwater/WaterAlert/#>

² <http://www.pvpa.info/>

³ <http://www.ocregister.com/news/dam-230023-water-feet.html>

⁴ <http://www.gracescapes.com/>