THE RETURN OF STONE CANYON CREEK

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Landscape Architecture
Senior Thesis, 2007

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This thesis is dedicated to Steve Roe, whose constant support, good humor, abundant intelligence and excellent shading skills proved invaluable. Without Steve, I could not have finished.

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I'd like to thank my thesis advisor Jim Smith, who scared me into working harder than I've worked in my life. After I have a better handle on my posttraumatic stress syndrome, perhaps I will be able to more properly express my gratitude to him.

Even though Mark Billy, Jerry Hastings, Henry Ansgar Kelly, Patrick Reynolds were not formally my instructors, I benefited so much from their insight, knowledge, encouragement and belief in me. Bless your hearts.

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Finally, I want to thank my colleagues Letisia Marquez and Todd Schindler for their kindness, encouragement and support.

INTRODUCTION

As communities all over the world face mounting pressures to address decaying infrastructure and improve the quality of urban runoff, they are turning with new interest to an overlooked and frequently buried asset. From Seoul to Zurich to Berkeley, they are restoring the dwindling number of rivers and streams that still follow a normal course and liberating those that have either been poured into concrete channels or sunk into storm drains.

Figure 1: Stone Canyon Creek runs through University Elementary School at UCLA and to the west of Anderson School Management.

These projects are not all gently meandering waterways. In many cases, the design vocabulary bears a stronger resemblance to sculpture or water feature than a bucolic stream. But these new-found forms become a source of character, identity and wonder while providing valuable links with a community's natural history, original topography and vast circle of life supported by waterways. They attract wildlife, serve as living educational laboratories, soak up polluted urban run off and reduce the likelihood of flooding.[1]

STONE CANYON CREEK

An opportunity to tap such resources waits just steps from the classrooms of UCLA Extension – along the west side of the university's main campus, which is home to one of the last naturally banked streams in the Ballona Creek watershed.[2] (See Figure 2.) Overall, Southern California has lost 94% of the naturally banked rivers and streams that once laced the region.[3]

Stone Canyon Creek is one of two waterways that flanked UCLA's original campus. (See Figure 1.) An arroyo that filled with water when it rained lay on the east side. Stone Canyon, which is a perennial creek,

Figure 2: Dark blue lines show the Ballona Creek watershed's last remaining creeks. Orange patches are channelized streams; buried streams are turquoise.

ran the length of the campus's west side. (See Figure 3.)

Figure 3: In a 1929 photo of UCLA, Stone Canyon Creek runs at base of Janss Steps.

The creek was partly buried to make way for the construction of the men's and women's gyms. (See Figure 4.)

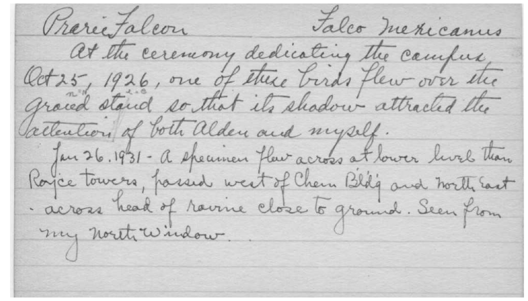
Figure 4: In a 1933 photo, Stone Canyon Creek no longer runs at the base of Janss Steps. But the riparian corridor still lies to the north.

While Stone Canyon Creek can never run as wild it once did without flooding one of the nation's premier public research universities, exploring the opportunity to liberate and gently reroute the creek is a worthy goal. I have devoted the past year to seeing just how much of a historic creek be returned to such a highly developed site. Not only does UCLA lay claim to the highest number of students per acre in the entire University of California system, it does so by a wide margin: UCLA has three times more students per acre than any of the other 10 UC schools.[4] Adjoining Westwood Village also has unparalleled density. The corner of Westwood and Wilshire boulevards lays claim to the nation's highest confluence of vehicular and pedestrian traffic.[5] Solutions that work here may apply under similarly crowded conditions.

SCOPE OF PROPOSAL

The thesis explores the possibility of:

- Strengthening habitat for the animal life particularly birds attracted by the creek. Prior to the burying of the arroyo and creek, the campus was a birder's paradise with more than 115 different species identified, including owls, woodpeckers and predator birds.[6] Less than half the species are seen today.[7] (See Figure 5.)



Prarie Falcon Falco mexicanus
At the ceremony dedicating the campus Oct 25, 1926, one of these birds flew over the grand stand so that its shadow attracted the attention of both Alden and myself.
Jan 26. 1931 - A specimen flew across at lower level than Royce towers, passed west of Chem Bld'g and north east - across head of ravine close to ground. Seen from my north window.

Figure 5: UCLA ornithologist Loye Miller identified 115 different bird species on campus, beginning in 1926.

- Establishing a creek-based, living laboratory for the Corrine A. Seeds University Elementary School (UES), which currently does not allow student access to or use of the creek in science or math instruction.
- Augmenting ongoing attempts to restore the last part of the natural creek that is open to the campus and public.
- Creating safe access points for science instruction for UCLA's Young Einstein summer science camp, neighboring Marymount High School, UCLA students at every level and visiting students regionwide.

- Daylighting the creek in a soft-bottom channel along Broxton Avenue in Westwood to create a creek-front dining and shopping district reminiscent of San Antonio’s Riverwalk.
- Daylighting the creek in a full restoration at two sites: the vehicular turn-around east of Lot 6 at Westwood Boulevard and Strathmore Avenue and on today’s Lot 36 at the corner of Wilshire Boulevard and Veteran Avenue.
- Illustrating normally unseen aspects of a waterway, such as its original meander ratio, the watershed of which it is part and its buried reaches.
- Building in features that complement the research agendas of UCLA faculty.

CREEK’S ROUTE TODAY

The creek runs through UES and to the west of Anderson School of Management at UCLA. (See Figure 6.) Behind the Collins Executive Education Center, it enters a drain pipe that is 66 inches in diameter, which

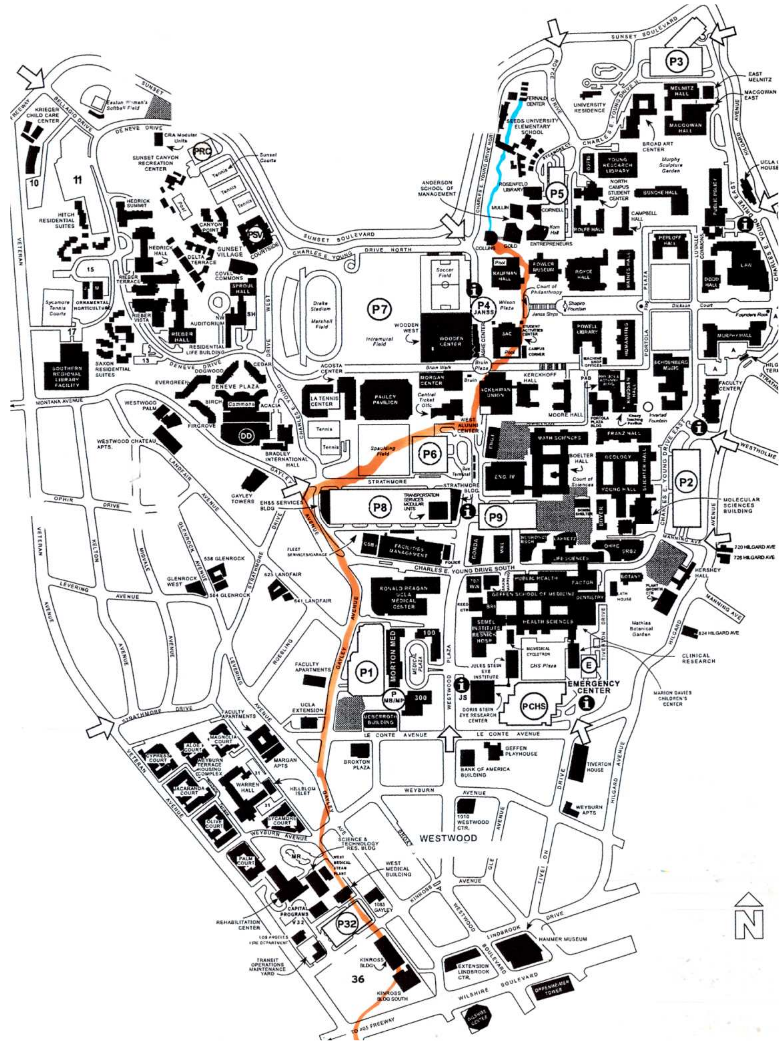
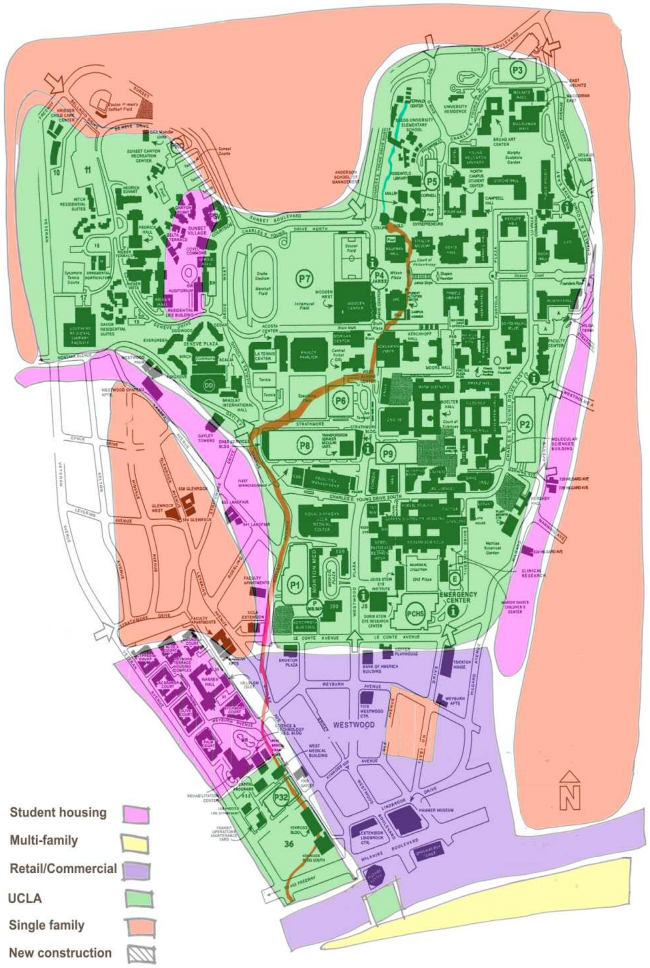
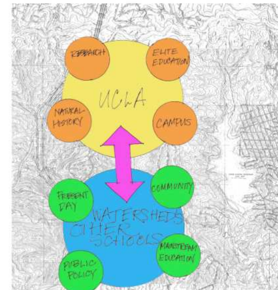


Figure 6: Blue line shows where Stone Canyon Creek runs above ground. Orange line shows storm drain that carries creek through campus,

Opportunities abound on campus to restore Stone Canyon Creek where it already runs above ground. Non-native plants line its banks, some channeling exists and riparian trees do not connect with nearby oak woods.

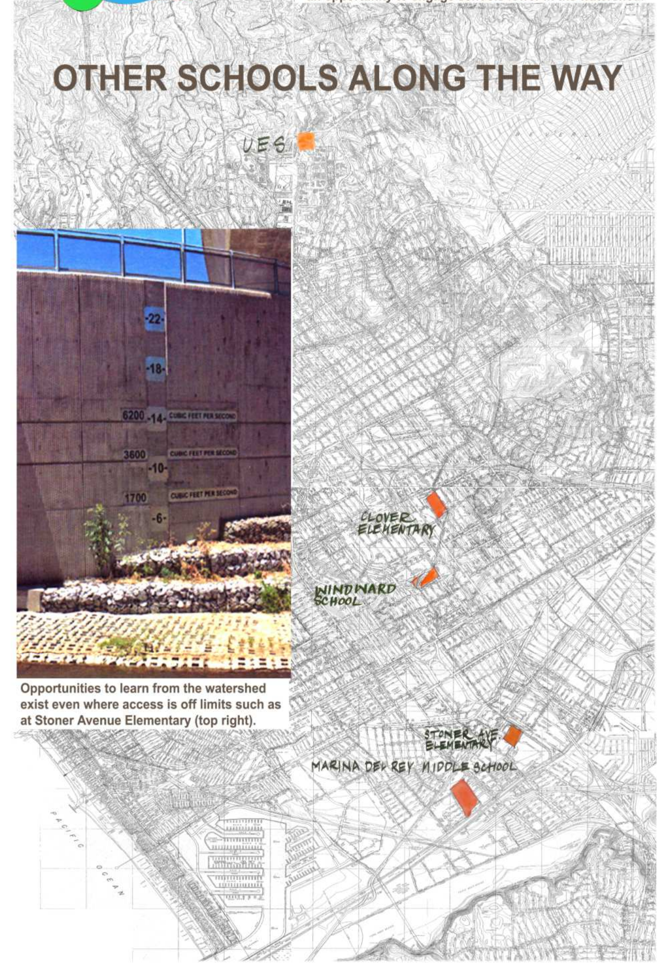


THE ROUTE CANYON CREEK TAKES TO THE OCEAN



Restoring the headwaters of Stone Canyon Creek provides an opportunity to engage schools lower in the watershed.

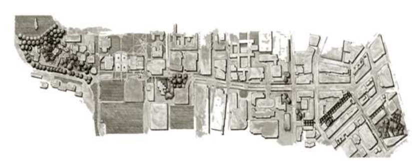
OTHER SCHOOLS ALONG THE WAY



Opportunities to learn from the watershed exist even where access is off limits such as at Stoner Avenue Elementary (top right).

SITE ANALYSIS

THE RETURN OF STONE CANYON CREEK



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carries the creek through campus and Westwood. Along the way, a growing amount of runoff – first from the west side of campus and then from the west side of Westwood – joins the flow. The creek's surface route today has probably been straightened, but the storm drain most likely follows the creek's original route.[8]

Site analysis diagrams on pages 3 and 4 trace the creek's current route to Ballona Creek, and eventually to Santa Monica Bay. They also illustrate adjacent land uses. It is notable that the buried creek runs near new residential developments in parts of Westwood with little green space. It is also notable that the creek surfaces in channels on two occasions before entering the Ballona Creek. While above ground, this water passes four schools, one private and three public. Admittedly, the students currently have no access to these waters, but the adjacencies are suggestive of a multi-school network that could use the creek as a living laboratory and a means of connecting with UCLA, building community and stewardship for the entire watershed.

POTENTIAL ADVANTAGES

The advantages of restoring, partially daylighting and establishing connections with Stone Canyon Creek are environmental, aesthetic, educational and possibly even economic. They include:

- **Environmental**

    1. Improve the quality of Westwood runoff as it enters the Ballona Creek watershed, which has been deemed an impaired waterway under the 1972 Federal Clean Water Act. Daylighting already is one of several strategies under evaluation by the Ballona Creek Renaissance a non-profit group dedicated to restoring the creek.[9] (See Figure 7.)
    2. Serve as an example of good citizenship in the filtration of pollutants in storm water runoff.
    3. Promote groundwater recharge.
    4. Increase awareness of storm water and the importance of water quality by revealing mechanisms for cleaning the water using natural and technologically advanced systems.
    5. Attract and sustain wildlife.
    6. Help the campus better comply with its own goals for sustainability under UCLA's Sustainability Charter, which requires the camps, in part, to "integrate sustainability with existing campus programs, in education, research, operations and community service" and "to instill a culture of sustainable long-range planning and forward-thinking design."

- **Aesthetic**

    1. Establish a vibrant link between north and south campus and between UCLA and Westwood.
    2. Establish a tangible connection with the site's

natural history and original topography.

3. Provide two gateways – one at Westwood Boulevard and Charles E. Young Drive and another at Wilshire and Veteran -- worthy of UCLA's distinction as the nation's most popular undergraduate campus and the nation's top recipient of federal research funds. Today these sites are less than impressive.
4. Provide an attractive and exciting respite from the campus's ever-increasing density.

- **Educational**

1. Create living laboratories for students from kindergarten to the doctoral level, including environmental studies majors.
2. Create living laboratories for the Center for Embedded Network Sensing and other

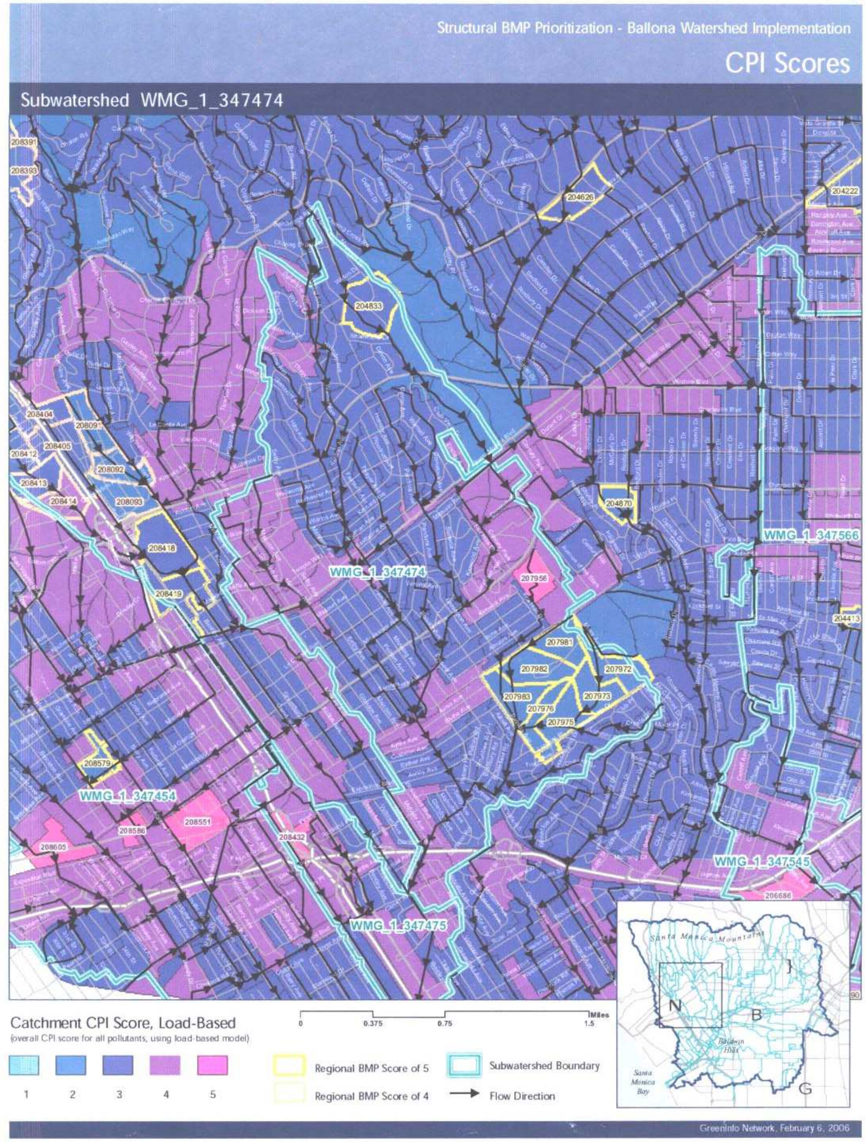


Figure 7: In this professional analysis of the watershed, Westwood runoff rated 4, with 1 being clean and 5 being the most polluted.

high-profile faculty research in environmental topics.
3. Provide a link with schools elsewhere in the watershed.
4. Serve as a model for creek restoration.

- **Economic**

1. Help breathe new street life into Westwood Village, once a pedestrian haven but increasingly eclipsed by other pedestrian-friendly retail destinations on the Westside.
2. Potentially attract outside grants. One San Francisco Bay Area city reaped $1.5 million in grants by day-lighting a creek. The introduction of features that complement ongoing faculty research could help attract addition funds.

OPPORTUNITIES/CONSTRAINTS
Still, many impediments stand in the way of daylighting Stone Canyon Creek, which are detailed in Opportunities and Constraints diagrams on page 8. With the campus so developed, little space remains for water features of any kind, much less a creek. Moreover, any daylighting project that does not remove buildings puts more of a strain on already burdened transit and parking services.

Among constraints:

- **Density**

1. Due to flood risk, the creek's original path can never be fully reclaimed without jeopardizing public health and welfare.
2. The first leg of the water feature would have to run over the top of a multi-story parking structure, ruling out the possibility for any permeability.
3. Gayley Avenue, the original route of the creek through Westwood, has no median or parking strips, and its sidewalks are narrow, leaving no space to be repurposed for daylighting.

- **Burdens on existing parking and transit services**
-

1. A much-used parking turn-around at the campus's southeastern end would either need to be relocated or sacrificed.
2. Vehicular access would be lost on two streets of Westwood Village (Broxton Avenue between Kinross and Le Conte avenues).
3. Parking in a much-used campus lot (36) would have to be diminished, relocated or sacrificed altogether.

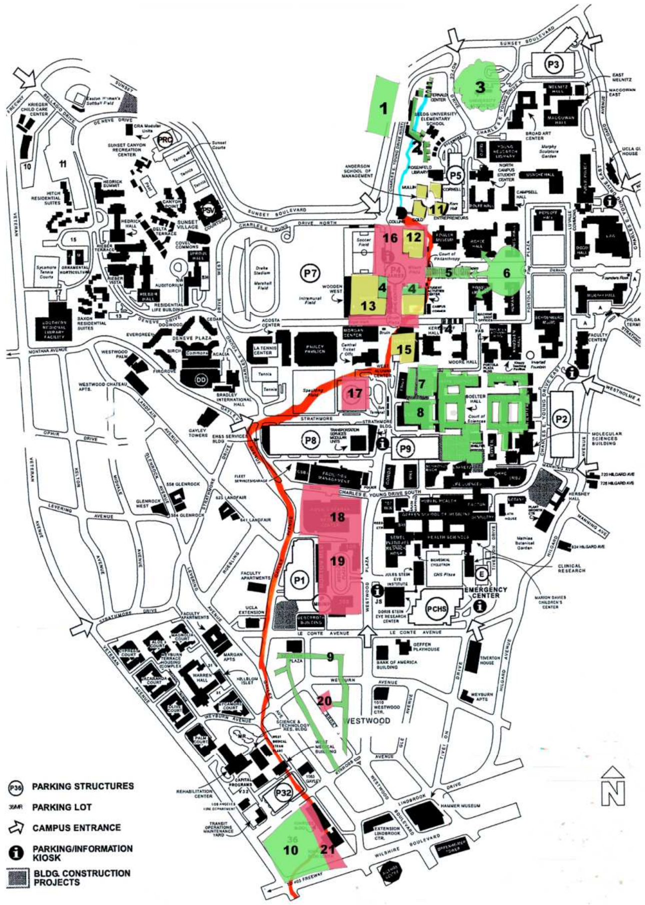
PRECEDENTS
Still, other communities and institutions have succeeded with similar projects. Key precedents [10] include:

- **Thousand Oaks Elementary School**, Berkeley, California. In 1996, residents successfully urged city officials to daylight a 250-feet crumbling culvert next to the school instead of replacing it. Thanks to an outdoor educational classroom and living laboratory centered




A dream set of adjacencies line Stone Canyon Creek's current and potential route, including (from left) remnants of an oak woodland, an elementary school, a high school, an engineering school.

OPPORTUNITIES, CONSTRAINTS ALONG CREEK ROUTE



OPPORTUNITIES, IDEAL ADJACENCIES

1. Marymount High School
2. University Elementary
3. Oak woodland
4. Young Einstein Summer Science Camp
5. Janss Steps
6. Dramatic overlook
7. School of Engineering
8. Court of Sciences, Institute of Environment
9. Alley network
10. Large parking lot (36))

NEUTRAL IMPACTS

11. Business School
12. Dance building
13. Gymnasium
14. Student activity center
15. Student union

CONSTRAINTS, INCOMPATIBLE ADJACENCIES

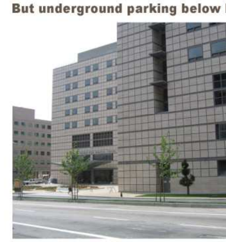
16. Underground parking
17. Parking entrance
18. Hospital
19. Medical offices
20. Parking entrance
21. Structures on culverts
22. Gayley is narrow



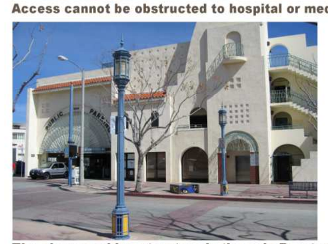
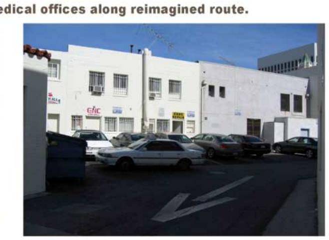
A reimagined Stone Canyon Creek does not hurt or help existing activities at (from top) Ackerman Union, the student activities center and the Anderson School of Business.

Copious open space lies due south of creek.

But underground parking below limits options.




Access cannot be obstructed to hospital or medical offices along reimagined route.

The above parking structure is the only Broxton business without a separate entrance onto Westwood Village's generous labyrinth of alleyways.

SITE ANALYSIS

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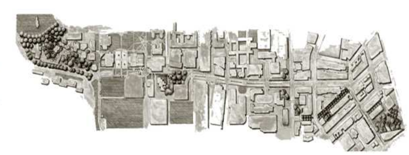

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on the creek, the school has become a premiere magnet school focusing on ecology.

- **Crew View Elementary School**, Boulder, Colorado. In 1989, a restoration ecologist and school parents reclaimed a prairie swale beside the school to recreate a 1.3-acre habitat with three tiny streams, a small pond, shrub thickets, and groves of ponderosa pine and wild plum. With 18 lesson plans that have been developed for the site, it serves as a basis for curriculum requirements for all six of the school's class levels. Teachers describe it as "a place where field trips could be taken at any time without leaving the school grounds." (See below.)

- **San Luis Obispo Creek Walk,** San Luis Obispo, California. Faced with the prospect of replacing 80-year-old culverts, the city instead decided to restore the creek's historic flood channel in terraced stone walls built to prevent bank scouring during high-velocity flows. (See Figure 8.)

- **Strawberry Creek**, Berkeley, California. In 1984, Berkeley residents and others uncovered 200 feet of Strawberry Creek at Strawberry Creek Park, one of the first high-profile openings of a creek anywhere in the United States, and a model for the rest of the nation.

- **Bimini Slough Ecology Park**, Los Angeles, California. In 2004, a private foundation day-lighted storm drainage on Second Street between South Bimini Place and Juanita Avenue to create a 180-foot biofiltration vegetated swale, which serves as a filter for runoff.

Figure 8: Crest View (left) and San Luis Obispo boast successful daylighting projects.

Nationwide, at least 20 creeks have undergone some degree of day-lighting, according to the Colorado-based Rocky Mountain Institute. Meanwhile, more than 2000 school yard habitats of varying stripes now exist, according to the National Schoolyard Habitat Program. Many include a waterway.

DAYLIGHTING CRITERIA
While preferred, returning a buried creek to its historical course is not considered the only approach of value. As articulated in the CalPoly Pomona thesis "Seeking Streams: A Landscape Framework for Urban and Ecological Revitalization in the Upper Ballona

Creek Watershed'' criteria for successful designs of liberated water-ways are far more flexible.[11] Strategies are considered valuable when they:

- raise awareness about a watershed or lost waterway.
- are permeable.
- have a soft bottom.
- have one soft side.
- have an additonal soft side.
- occupy the original location of the waterway.
- have the original meander ratio.
- promote native habitats.
- are gravity-fed.
- promote the original hydrology.
- support native vegetation.
- support vegetation with a phytoremediating role.
- allow future meandering.

By tallying the number of criteria accomplished, it is possible to arrive at a rough measure of the biological and environmental value of any given attempt to return a buried stream. For instance, Codornices Creek in Berkeley could be considered an A+ daylighting project because it hits all 12 criteria.

The gutters of Zurich accomplish less, but still make good use of a limited amount of space. Where bringing a creek to the surface is not possible--such as running a stripe of paint down the middle of the street under which a culvert runs – is better than doing nothing at all. (See Figure 9.)

Figure 9: An objective sense of the value of any project can be derived by tallying how many criteria it meets.

DESIGN CONCEPT/ METHODOLOGY

Despite the plethora of avenues to pursue in unearthing a buried creek, no single approach provides maximum benefit for Stone Canyon Creek as it winds through UCLA and Westwood. Applying the single approach that would work throughout the creek's entire course results in a project with a C grade – good for raising awareness, but with little environmental benefit.

Only by carving out four different water levels and velocities across six sites do benefits dramatically increase. Delineating six distinct sites, each employing a different approach to conveying the returned creek, provides the project with the highest environmental benefit or overall rating while preserving safety. Indeed, the approach yields two new sites for full restoration – sites roughly equivalent in length to Cordornices Creek -- and one long site with the environmental power of Zurich's gutters. At each site, the amount of available space and maximum water volume and velocity drove the design solution.

Two approaches were used to determine water volumes and velocities for the creek's buried portions. In some cases, the information was already available in the public record. In other cases, the information had to be derived with Manning's Equation, which uses slope, pipe size and pipe material to derive the maximum flow for which a culvert was designed. Once the maximum flow has been determined, the equation can then be used to figure out the size of the creek's new conveyance – be it an impervious channel or a creek bed with soft sides and a soft bottom.

See "Four Waters, Six Sites" (next page) for an illustration of the way an array of approaches would work in this case. Through UES and west of the Anderson School, existing volumes and velocities were retained. Across the parking deck at the base of Janss Steps – or Wilson Plaza – only the creek's low flow – or roughly 5 feet by five inches at less than one cubic foot per second -- is pumped to the surface. The existing culvert continues to convey any volume above that amount, and it is used during and following rainstorms. At Ackerman Union, an impervious channel hands the entire volume of the creek, including storm flows, and some drainage from the west side of Janss Steps. Those same levels would be maintained throughout Westwood until Lot 36, when existing capacity more than doubles in volume and velocity increases nearly tenfold. For the full calculations behind the treatment of volume and velocity at each site, refer to the appendix.

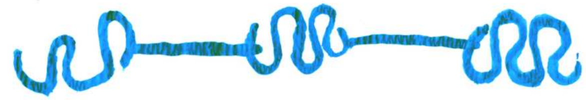
Precedents include:
Wilson Plaza – Salk Institute rill, Santa Monica paving pattern.
Ackerman Union – Mesa Art Center.
Morgan Athletic Center/West Alumni Center – Friends' Central School in Wynwood, Pennsylvania.
Lot 6 – Plan for downtown Berkeley.
Westwood Boulevard –Zurich gutters.
Broxton Avenue – European canals.
Kinross Avenue – Berkeley street with line tracing storm drain.
Lot 36 – downtown San Luis Obispo.

The result is like a string of pearls: a succession of distinct sites, each with individual character bound by a common thread – Stone Canyon Creek.

DESIGN CONCEPT: STRING OF PEARLS

The concept treats a reimagined route of Stone Canyon Creek as a series of separate, interlocking spaces. The amount and character of existing space and volume and velocity of water drives the design at each point.

BIG IDEA:



FOUR WATERS, SIX SITES

Using a range of strategies, Stone Canyon Creek can once again run through campus and Westwood -- albeit along a reimagined route with four different water levels. The new route moves through six basic sites with similarities to other daylighting, storm water cleaning and creek celebration projects.

RAISES AWARENESS
PERMEABLE
SOFT BOTTOM
ONE SOFT SIDE
TWO SOFT SIDES
ORIGINAL LOCATION
ORIGINAL MEANDER RATIO
PROMOTES NATIVE HABITAT
GRAVITY FED
ORIGINAL HYDROLOGY
NATIVE VEGETATION
PHYTOREMEDIATION
ALLOWS FUTURE MEANDERING

C

Santa Monica paving depicts watershed.

RAISES AWARENESS
PERMEABLE
SOFT BOTTOM
ONE SOFT SIDE
TWO SOFT SIDES
ORIGINAL LOCATION
ORIGINAL MEANDER RATIO
PROMOTES NATIVE HABITAT
GRAVITY FED
ORIGINAL HYDROLOGY
NATIVE VEGETATION
PHYTOREMEDIATION
ALLOWS FUTURE MEANDERING

A

Berkeley plans to daylight creek in city center.

RAISES AWARENESS
PERMEABLE
SOFT BOTTOM
ONE SOFT SIDE
TWO SOFT SIDES
ORIGINAL LOCATION
ORIGINAL MEANDER RATIO
PROMOTES NATIVE HABITAT
GRAVITY FED
ORIGINAL HYDROLOGY
NATIVE VEGETATION
PHYTOREMEDIATION
ALLOWS FUTURE MEANDERING

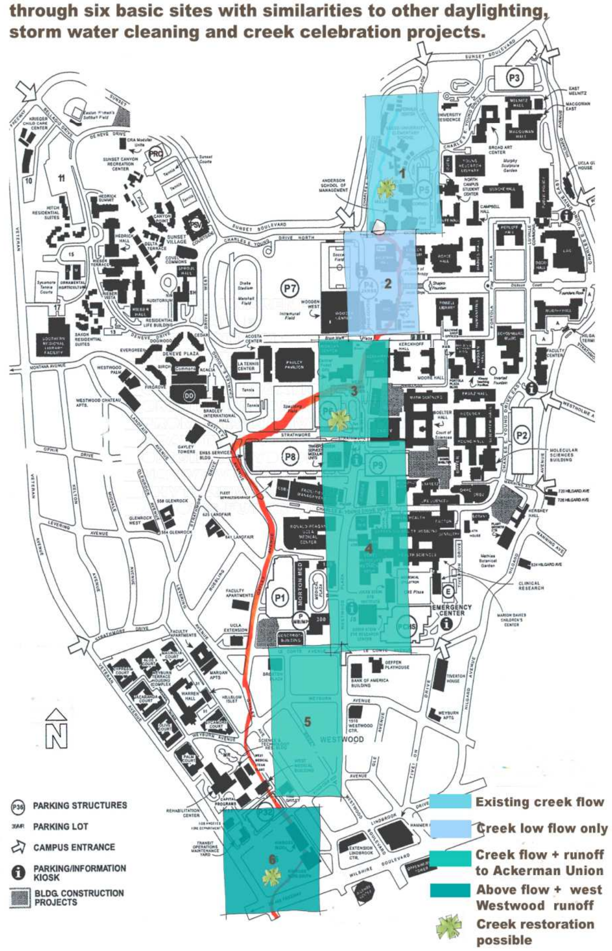
B

San Antonio's River Walk offers creek-side dining.

RAISES AWARENESS
PERMEABLE
SOFT BOTTOM
ONE SOFT SIDE
TWO SOFT SIDES
ORIGINAL LOCATION
ORIGINAL MEANDER RATIO
PROMOTES NATIVE HABITAT
GRAVITY FED
ORIGINAL HYDROLOGY
NATIVE VEGETATION
PHYTOREMEDIATION
ALLOWS FUTURE MEANDERING

C

Paint traces culvert.



RAISES AWARENESS
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ORIGINAL HYDROLOGY
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ALLOWS FUTURE MEANDERING

C

At Salk Institute, rill runs into ocean, setting sun.

RAISES AWARENESS
PERMEABLE
SOFT BOTTOM
ONE SOFT SIDE
TWO SOFT SIDES
ORIGINAL LOCATION
ORIGINAL MEANDER RATIO
PROMOTES NATIVE HABITAT
GRAVITY FED
ORIGINAL HYDROLOGY
NATIVE VEGETATION
PHYTOREMEDIATION
ALLOWS FUTURE MEANDERING

B

Zurich has opened storm drains to clean runoff.

RAISES AWARENESS
PERMEABLE
SOFT BOTTOM
ONE SOFT SIDE
TWO SOFT SIDES
ORIGINAL LOCATION
ORIGINAL MEANDER RATIO
PROMOTES NATIVE HABITAT
GRAVITY FED
ORIGINAL HYDROLOGY
NATIVE VEGETATION
PHYTOREMEDIATION
ALLOWS FUTURE MEANDERING

B+

Portland strip contains swale.

RAISES AWARENESS
PERMEABLE
SOFT BOTTOM
ONE SOFT SIDE
TWO SOFT SIDES
ORIGINAL LOCATION
ORIGINAL MEANDER RATIO
PROMOTES NATIVE HABITAT
GRAVITY FED
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A+

Daylighting project cuts through San Luis Obispo.

STRING OF PEARLS CONCEPT

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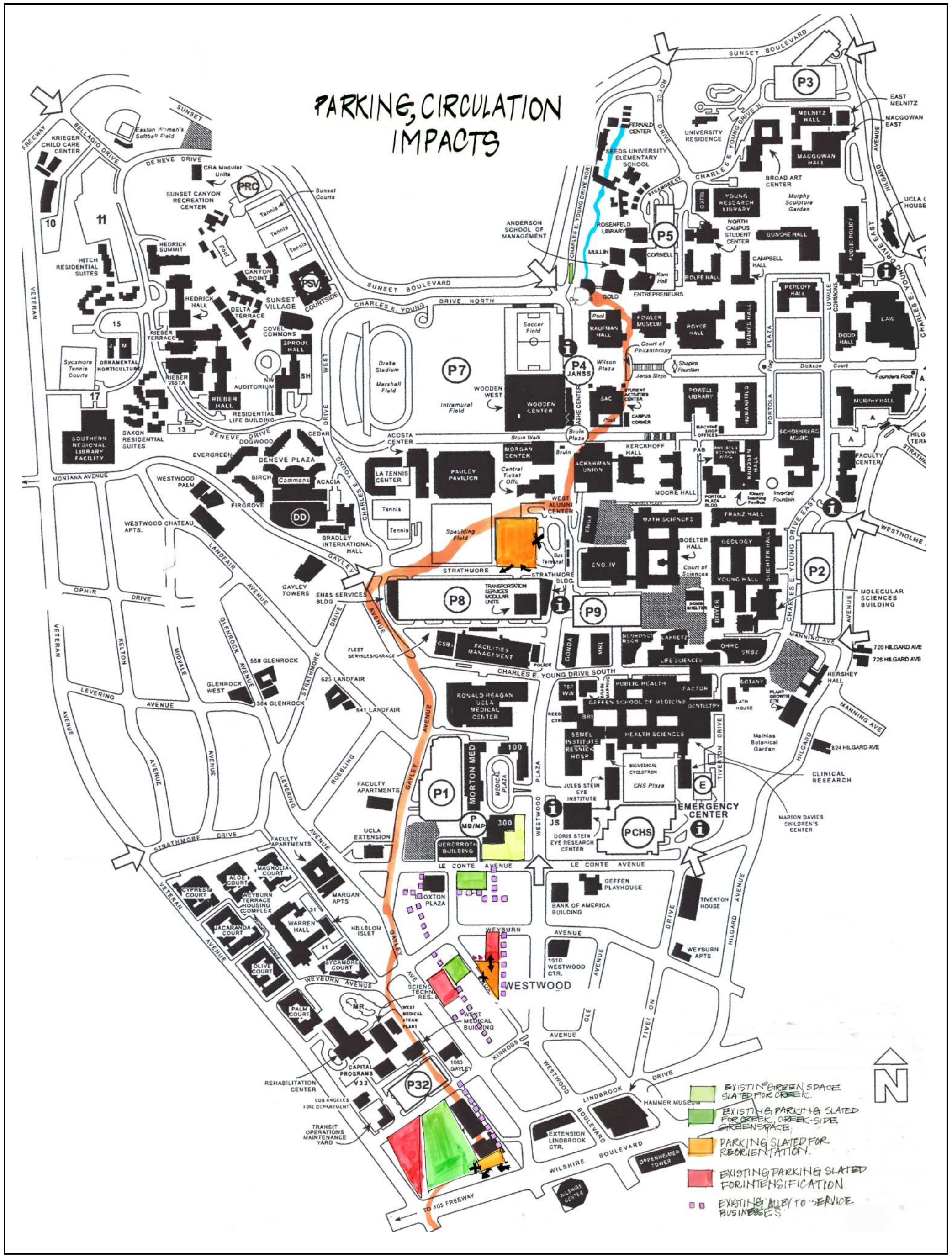

IMPACTS FOR PARKING, VEHICULAR CIRCULATION

The reimagined route's biggest impacts are in the form of parking, vehicular access and circulation. (See Figure 10.)

Two parking structures are reoriented: Lot 6 and the structure south of Weyburn Avenue on Broxton Avenue. (See orange squares.)

Alleyways on either side of Broxton become the only way of accessing Broxton businesses by vehicles. (See purple dashes.)

Three parking lots (represented in green) become creek beds. Largely to compensate for lost surface parking, structures are added to three sites. (Represented in red.)

The master plan that illustrates the overall design solution follows. The first page is the project's north end. The south end is on a separate page. Elaborations of four individual sites follow: UES, the Lot 6 turnaround, Broxton Avenue and Lot 36.

Figure 10: For parking, the ramifications of returning Stone Canyon Creek are considerable but not insurmountable.






SEEDS ELEMENTARY

1. Canopy connecting to oak grove
2. Access points for students
3. Riparian canopy, understory
4. Original meander ratio returned
5. Channel walls removed
6. Soccer field moved south
7. Shared picnic area with Anderson

ANDERSON SCHOOL

8. Original meander ratio returned
9. Access point for study
10. Riparian canopy, understory
11. Pedestrian path on east side
12. Metered parking removed

JANSS PLAZA

13. Rill with creek's low flow
14. Decomposed granite
15. Cactus, euphorbia, succulents
16. Dracena drago

ACKERMAN UNION

17. Sparkling pavement tracing creek's original route
18. Incised concrete map of watershed
19. 17-foot-wide channel to accommodate creek's full flow

LOT 6

20. Constructed wetland, retention basin
21. BMP testing
22. Meandering creek with soft sides, bottom
23. Riparian canopy, understory
24. Entrance to parking structure via second-story ramp

WESTWOOD BOULEVARD

25. Median strip replaced by soft-bottom rill

DESIGN SOLUTION / NORTH END

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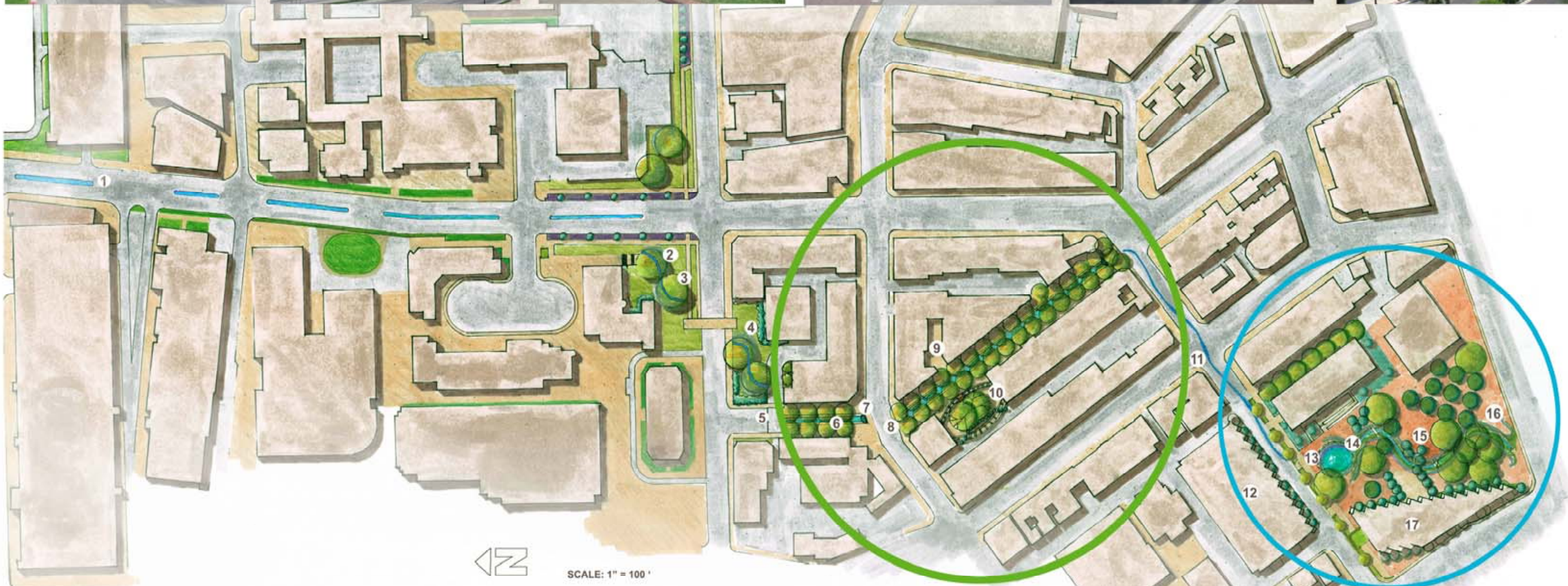
Summer, 2007



WESTWOOD BOULEVARD

1. Soft-bottom channel in median strip

UCLA GATEWAY

2. Soft-bottom creek
3. Riparian canopy
4. Buenos Ayres Park
5. Bridge

BROXTON AVENUE

6. Soft-bottom creek
7. Weir to raise water level at low flow
8. Cottonwood allee
9. New retail courtyard
10. Premiere Park

KINROSS AVENUE

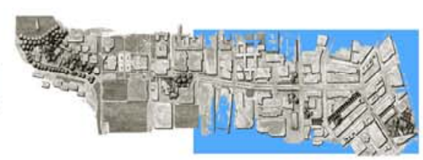
11. Painted stripe traces culvert route

LOT 36

12. Existing parking structure wrapped in senior housing
13. Rock-lined 'vernal pool'
14. Creek with soft bottom, sides
15. Existing eucalyptus grove
16. Riparian canopy
17. New parking structure wrapped in senior housing

DESIGN SOLUTION / SOUTH END

THE RETURN OF STONE CANYON CREEK



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UCLA Extension

UES
The plan calls for three basic strategies: creek restoration, native planting and providing access for students to the creek and surrounding habitat.

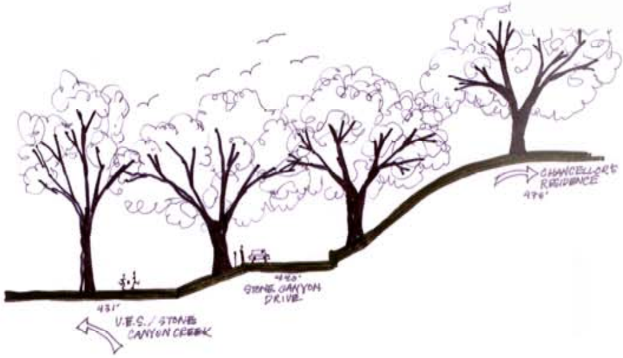
Creek Restoration
The first strategy involves restoring the creek, which has been straightened and partly channelized. The plan calls for returning the creek's original meander ratio, which restoration experts have determined to be 1:1[12] (See illustrations on following page.) That means the creek originally traveled east or west for the same distance that it moved south or downstream. The original meander ratio can be achieved by removing metered parking on the shoulder of the creek at the Anderson School. Metered parking is an inappropriate adjacency for such a precious site. (See Figure 11.) By eliminating the parking, space becomes available to relocate the school's current soccer field about 40 feet south. In combination with relocating permanent seating for UES's lunch yard to higher grounds, the site of the current soccer field can resume serving as a flood plane, which should eliminate the need for channelization. Additional soccer needs can be met by walking 300 feet south of the school to UCLA's intramural soccer field.

Figure 11: Handicapped parking is needed, but 16 metered spots are inappropriate here.

Native Planting
Today's planting palette at UES is garden variety, with an abundance of plants typically seen in private gardens throughout the Southland. Pittosporum, loquat, liquid amber and other plants valued for their ease in maintenance abound. Algerian ivy, favored by landscapers for its ability to hide litter and discourage weeds, lines the creek's banks. While the scheme gives a manicured feeling, it does not provide anything for the school's students to study – except if they plan to go into the landscape business.

Native plants would promote habitat with high educational value. As the diagram on the upper right hand corner of the next page shows, the plan calls for the removal of non-native trees. In their place is planted an unbroken canopy of oak woodland trees, transitioning into a riparian tree palette (sycamores, willows, California laurel). According to a 2000 survey, the school already lays claim to 38 oaks and California walnut trees, which are the building blocks of an oak woodland.[13] Most of these trees are volunteers. This is what the site wants to be. The unbroken canopy would link with the chancellor's residence, which is home to the remnant of an historic oak woodland, providing an aerial wildlife corridor between the creek and this especially rich nesting ground.[14]

Access
Dock-like wooden planks that raise and lower with water levels provide access to the creek for supervised study.



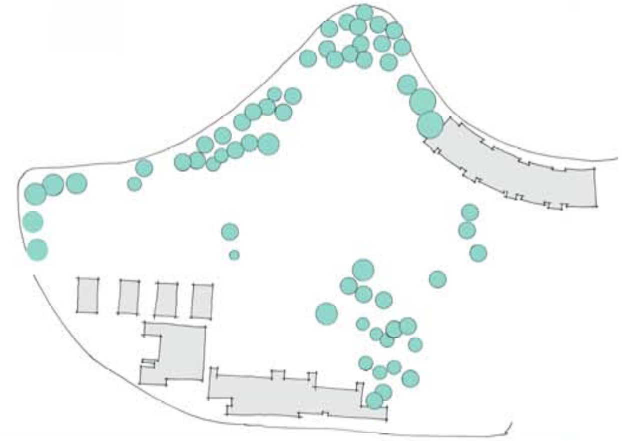
An unbroken canopy of native trees creates a wildlife corridor between the school and the chancellor's residence, which has remnants of an oak woodland. Such habitats are especially interesting to study.

Outdoor theater studded with black walnut trees provides a gathering space without interupting canopy.

Oak woodlands support 320 vertebrates and 5000 insects, making them a rich laboratory, classroom.

Dock-like platforms that raise and lower with the water level provide access for recreation and education.

The yellow line traces the straightened route of today's Stone Canyon Creek. The blue line shows the proposed course, which is true to the creek's original meander ratio. Scale is 1"=60'



Non-native trees, most of them garden-variety, would be removed to make way for the native canopy.

Oak woodland and native riparian trees would remain as well as the school's exceptional grove of sequoia.

Schools all over the country are using waterways for science and math education.

Removed trees could be used to make a path along the creek.

SEEDS ELEMENTARY SCHOOL

THE RETURN OF STONE CANYON CREEK

Meg Sullivan
UCLA Extension
Summer, 2007

SEEING THE BIG PICTURE

For the benefit of visitors and students alike, features throughout the project attempt to show aspects of a waterway and watershed that could not be discerned in a natural setting.

Wilson Plaza

Sparkling pavement running from the base of Janss Steps to Bruin Walk marks where the original route of Stone Canyon Creek diverges from its reimagined route. (See following page.)

Ackerman Union

A concrete medallion with a map of the entire Ballona Creek watershed commands attention on the ground in front of Ackerman Union.

Morgan Center to James West Center

A 17-foot-wide channel broken up with long horizontal bands looks as good while carrying low flows as during higher-flow periods of the year. The channel largely replaces the ceremonial lawn in front of the Morgan Center and runs west of Ackerman Union.

Figure 12: Arizona's Mesa Arts Center inspires the channel west of Ackerman.

Parking Lot 6

The project appropriates the turnaround at Parking Lot 6 as one of two sites for a full creek restoration. Traffic that now enters the parking structure at grade instead will travel up a new second-story ramp from the corner of Westwood Boulevard and Strathmore Avenue. A wide ring of paving edges the new riparian corridor in an approach similar to the daylighting design proposed for downtown Berkeley. (See String of Pearls page.) Both the paving and the tree-planting pattern underscore the creek's original meander ratio, which the restoration respects. Typically, the ratio cannot be discerned in the wild without the benefit of maps showing the creek's original route.

Westwood Boulevard

The linchpin to the entire design is a system of conveying the creek from campus to Broxton Avenue and beyond. With conditions so tight on Gayley Avenue and a treacherous grade change along Strathmore Avenue, Westwood Boulevard affords the best opportunity for a continuous, gravity-fed system. Because analysis of the creek's current route to Santa Monica Bay revealed that it travels underneath streets and other roadways, I chose to daylight the creek in Westwood Boulevard's medians. The feature illustrates the fate of much the creeks in our watershed. The design includes a bypass channel so that water levels never exceed 18 inches – a legal limit.

Kinross Avenue

On the one occasion in which the creek must return to the culvert on its 1.5-mile journey through Westwood, a painted stripe marks the course. This occurs between Broxton Avenue and Lot 36 on Kinross Avenue.

The paving pattern and planting design at Lot 6 underscore Stone Canyon's original meander ratio, which is not easily discerned in a natural setting. Similarly, other features of the entire project allow visitors to appreciate the big picture, including the watershed of which the creek is part.

Incised paving in front of Ackerman Union depicts the entire watershed.

Art projects celebrate the fate of buried waterways and celebrate the creek's existence.

Sparkling pavement traces where the creek's original route diverges from the reimagined one.

SEEING THE BIG PICTURE

THE RETURN OF STONE CANYON CREEK

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BROXTON AVENUE

Currently, Broxton Avenue is struggling. A survey of businesses found five vacant storefronts in two blocks. Nevertheless it is the site of much of iconic Westwood, and it includes Spanish Colonial courtyard architecture, sidewalk dining and two vintage movie palaces that regularly host movie premieres. The plan attempts to breathe new life into Broxton by running the creek down the middle of the narrow, two-lane street.

The move is not too much of a stretch: The street already stands on the brink of being a car-free pedestrian walkway with very wide sidewalks, limited street parking and a comprehensive network of alleyways that parallel and bisect the street, carrying most of today's service traffic. Due to the alley network, the large-scale public parking garage is the only Broxton Avenue business that could not operate if the road were closed. But by building a parking structure on the existing parking lot north of the site, reorienting the entrance of the existing garage is possible. (See figures 12 and 13.)

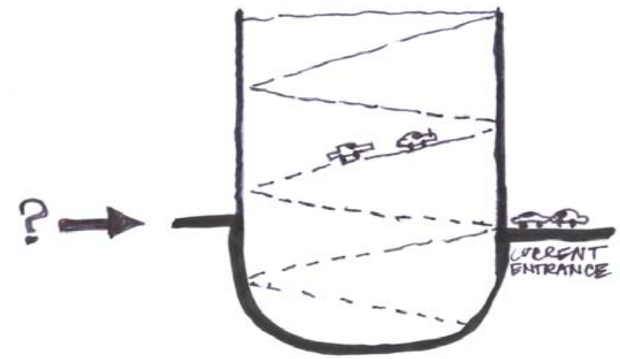
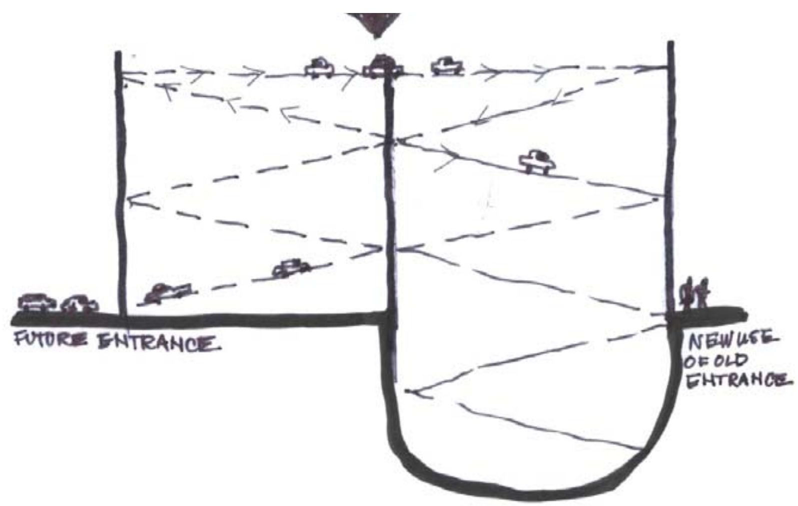
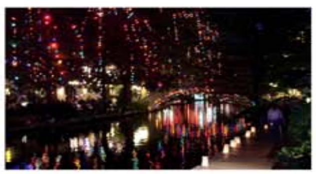


Figure 12: Reorienting a parking structure poses the dilemma of meeting the existing interior ramp with the new entrance.

Figure 13: A parking structure on the Weyburn Avenue parking lot between Westwood Boulevard and Broxton Avenue could "talk" to the existing structure on the top level.



A stately bridge spans Stone Canyon Creek at Weyburn.



Similar sites by day and by night.

Music emanating from the bandstand in Premiere Park serenades diners at creek-side restaurants.

Cottonwoods line the creek along this reach. A weir keeps water levels higher than they otherwise would be. A stripe of paint follows the culvert that takes the creek along Kinross to the next site.

With the reorientation of Broxton's parking structure (above), an adjacent alley becomes a retail courtyard.

BROXTON AVENUE

THE RETURN OF STONE CANYON CREEK

Meg Sullivan
UCLA Extension
Summer, 2007

PARKING LOT 36

Today's Lot 36 is a massive heat sink – a huge, unsightly parking lot that attracts sunlight and then reradiates heat. It also represents a missed opportunity for a signature gateway to UCLA. The plan calls for ripping up the lot and running the creek down the middle.

Because the maximum velocity of water flowing to the site reaches extraordinary levels, the water enters the site in what is being called a vernal pool of storm water – or a deep, boulder-lined pool. (See graphics on following page.) The rocks will dissipate some of the water's velocity.

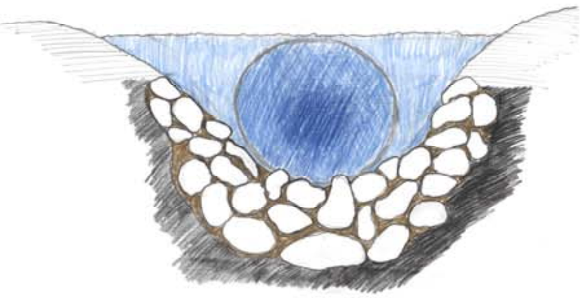
Stone Canyon Creek then moves through the site in the project's third and final creek restoration. Some of existing parking has been moved into a new parking structure erected on the western edge of the site. The structure, along with existing Parking Lot 32, is wrapped in small scale residential oriented toward the creek. In keeping with a longtime ambition, the residential units are envisioned as senior housing for either alumni or emeriti faculty. Dimensions: 450-square feet. Proximity to excellent health care, inexpensive restaurants, extensive public transportation and abundant free cultural opportunities makes this an excellent location for senior housing. The size was determined by an Internet search of new senior housing projects in Manhattan. (See Figures 14 and 15.)

Figures 14 (above) and 15 (below) illustrate a 450-square-foot pied-á-terre in Manhattan.

Most of the tree palette is riparian. Willows, sycamores and California laurel predominate. However, the site's existing eucalyptuses are retained because mature trees generally drink more storm water than younger trees.[15]

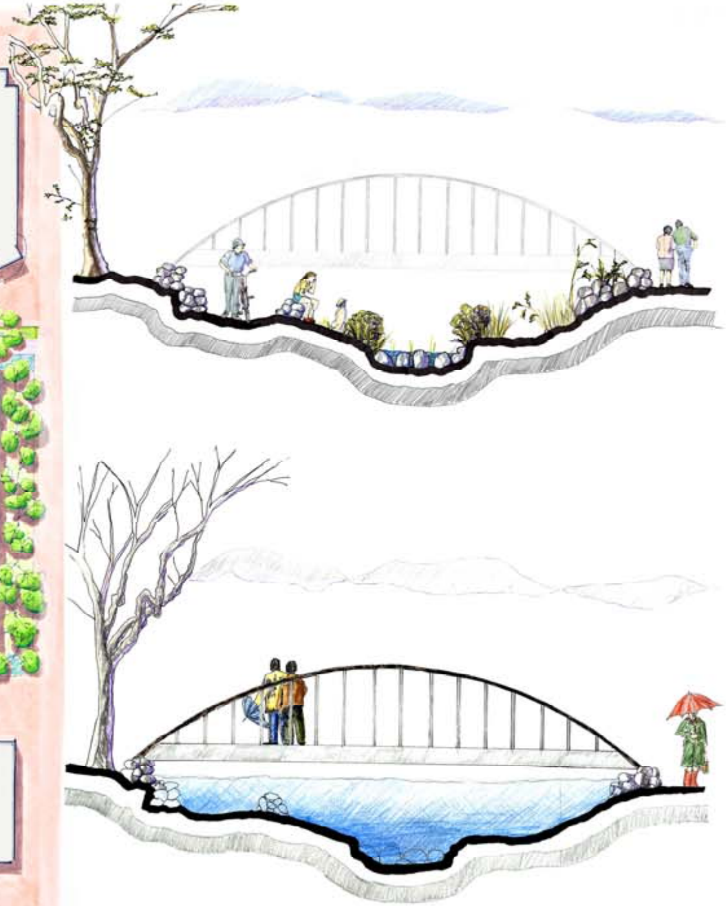
The parking strip on the south side of Kinross Avenue is actually a swale that sops up and cleans run off from the street on this block.

The ground cover is a by-product of brick manufacturing. Because UCLA's design guidelines demand that all new construction feature a specially sized brick that is unique to the campus, this is not just a distinctive and sustainable solution but a fitting one.



A boulder-lined pool helps dissipate the engery of incoming storm water. Storm water from Westwood's west side joins Stone Canyon Creek, flowing into Lot 36 at tremendous velocities.

The residential units that wrap the Lot 36 parking structures overlook the creek, whose banks are similar to San Luis Obispo Creek (center). The riparian plant palette includes California laurel (right).



The creek's banks come alive with activity during periods of low flow (top). But the creek's highest flows temporarily submerge paths and seatwalls.

From the left, the images show the restored Stone Canyon Creek at Lot 36, a creek-side path in San Luis Obispo, a low-flow crossing point and an existing wrapped parking structure. The parking strip at the site's north end doubles as a swale. A byproduct of brick manufacturing serves as an environmentally friendly ground cover.

LOT 36

THE RETURN OF STONE CANYON CREEK

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Summer, 2007

CONCLUSION

Stone Canyon Creek deserves to be considered more than a storm channel, which is how current UCLA planning documents classify the waterway. In fact, the creek is a precious resource. Not only does it hold promise for the welfare of the region's troubled watershed and ever-dwindling habitat but for the most fundamental activities of the campus itself – research and education.

UCLA's sister campus, the University of California, Berkeley, similarly located its campus astride a creek. Unlike UCLA's Stone Canyon Creek, UC-Berkeley's Strawberry Creek today runs the length of campus. As a result, some 3,000 Berkeley undergraduates each year take courses that interact in one way or other with Strawberry Creek.[16] While parking and circulation impacts are unavoidable in daylighting Stone Canyon Creek, the measure could be expected to offer UCLA as many benefits as Berkeley now enjoys with Strawberry Creek.

Thanks to Stone Canyon Creek's immediate proximity to nursery, elementary and high school activities, these benefits could be expected to spread from the most basic level of the educational system to the most advanced. Potential benefits for outreach to the region's struggling public school systems are equally exciting. How the four elementary and middle school campuses lower in the watershed might best interact with the creek that flows by their doorsteps would need to be investigated further, but UCLA can use Stone Canyon Creek as a means of connecting to these schools, and instilling math and science principles and a sense of stewardship for the watershed. Indeed, with the addition of senior housing along the banks of a daylighted creek at Lot 36, the potential exists for building a cradle-to-grave network of stewards of the watershed.

Beyond the case of UCLA and Stone Canyon Creek, this thesis demonstrates the possibilities for returning lost waterways in very dense urban settings. Just because a site is highly developed, daylighting buried creeks should not be dismissed without investigation. An approach that combines gestures that range from low to high environmental impact appears to offer the most promise for maximizing the project's overall environmental impact. Moreover, stewards of sites near the headwaters of a creek have a special responsibility to the lower reaches of a watershed, where water volume and velocity may preclude restoring the waterway. Stewards of headwater sites need to investigate what role they can play in returning these precious resources so that users all along the watershed can come to understand and appreciate the resource and the many forces that threaten it in today's highly polluted environment.

Finally, builders, planners, architects and landscape architects owe it to their clients, their professions and the environment to investigate how each site they tackle fits into the watershed. They may well find that a buried treasure lies under their site, just waiting to be discovered.

Lot 6 Channel Flow Calculations based on mannings equations

Mean Velocity

$V = k/n*R^{2/3}S^{1/2}$ 410

	top	bottom	depth
Channel A	17.5	17.5	1.5
Channel B	15	5	5
rect. channel		9	4

	R=A/p	x-sec channel A	wetted perimeter p	p data		
Lot 6 channel A	1 280487805	26.25	20 5	17 5	1.5	1.5
Lot 6 channel B	2.61203875	50	19.14213562	5	7 071068	7 071068
westwood channe	2.117647059	36	17			

	V (ft/sec)	k	Manning's Roughness Coefficient n	hydraulic radius R	energy slope S
		1.486			
L 6 Channel A	21.31223973	1.486	0.013	1 280488	0 025
L 6 Channel B	11.14077062	1.486	0.04	2 612039	0 025
westwood Channe	17.32764458	1.486	0.02	2.117647	0.02
	2 063077679	1.486	0.075	2 612039	0 003014

	Q	=	v	A
Lot 6 Channel A	559.4462928		21 3122	26.25
Lot 6 Channel B	557.0385312		11.1408	50
Rect. Channel	623.7952048		17 3276	36
	54.15578907		2.06308	26.25
	10.33031376			
	0 896842888			

potential n values		
smooth concrete	0 012	
ordinary concrete	0 013	
vitrified clay	0 015	
shotcrete, earth channels in "good' condition	0 017	
straight unlined earth channels in "good" condition	0.02	
rivers and earth canals in fair condition-some growth	0 025	
winding natural streams and canals in poor condition-c	0 035	
mountain streams with rocky beds and rivers with varia	.040- 050	
from Jeffrey Mount, modified from Chow 1959		
small streams - less than 100' w		
clean straight bankfull no riffles or deep pools	.025- 033	0.03
straight, no riffles or pools, no stones or veg	.030- 04	0 035
clean, sinuous, some pools and riffles	.033- 045	0.04
sinuous, some p&r, some stones and veg	.035- 050	0 045
sinuous, lower stages, more stones	.045- 060	0.05
sluggish reaches, weedy, deep pools	.050- 080	0.07
deep pools, very weedy, floodway with timber & brush	.075-.15	0.1
major streams - wider than 100'		
no boulder or brush	.025- 060	
irregular and rough reach	.035-.1	
mountain streams		
clean channel, steep banks w/veg on banks, submerged at high flow, bed of gravel and cobbles	.030- 050	0.04
same as above but w/bed of cobbles and large boulders	.040- 070	0.05
floodplains		
pasture, no brush, short grass	.025- 035	0.03
pasture, no brush, high grass	.030- 050	0 035
scattered brush, many weeds	.035-.7	0.05
medium to dense brush	.045-.160	0.07
heavy stand of timber, little undergrowth, flood below branches	.080-.12	0.1
heavy stand of timber, little undergrowth, flood reaching branches	.1-.160	0.12

Lot 36 Channel Flow Equations using Mannings equations

Mean Velocity

V = k/n*$R^{2/3}S^{1/2}$

	top	bottom	depth
L36 A	30	5	6
Broxton Channel	30	22	2
		9	4

	R=A/p	x-sec channel A	wetted perimeter p	p data		
Lot 36 channel A	3.207982757	105	32.73084925	5	13 86542	13 86542
Broxton Channel	1.680440249	52	30.94427191	22	4.472136	4.472136
	2.117647059	36	17			

	V (ft/sec)	k	Manning's Roughness Coefficient n	hydrau ic radius R	energy slope S
		1.486			
L 36 Channel A	12.64823357	1.486	0.04	3.207983	0.0245
	13.11695906	1.486	0.02	1 68044	0.0156
	17.32764458	1.486	0.02	2.117647	0.02
	1.537486178	1.486	0 075	1 68044	0.003014

	Q	= v	A
Lot 36 Channel A	1328.064525	12.6482	105
	682.081871	13.117	52
	623.7952048	17.3276	36
	161.4360486	1.53749	105
	8 22656734		
	2.129007269		

potential n values		
smooth concrete	0.012	
ordinary concrete	0.013	
vitrified clay	0.015	
shotcrete, earth channels in "good' condition	0.017	
straight unlined earth channels in "good" condition	0.02	
rivers and earth canals in fair condition-some growth	0.025	
winding natural streams and canals in poor condition-c	0.035	
mountain streams with rocky beds and rivers with vari	.040- 050	
from Jeffrey Mount, modified from Chow 1959		
small streams - less than 100' w		
clean straight bankfull no riffles or deep pools	.025- 033	0.03
straight, no riffles or pools, no stones or veg	.030- 04	0.035
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floodplains		
pasture, no brush, short grass	.025- 035	0.03
pasture, no brush, high grass	.030- 050	0 035
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medium to dense brush	.045-.160	0.07
heavy stand of timber, little undergrowth, flood below branches	.080-.12	0.1
heavy stand of timber, little undergrowth, flood reaching branches	.1-.160	0.12

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http://schools.bvsd.org/crestview/habitat/Habitat.pdf
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http://www.creativedifferences.com/baxtercreek/news01.html
Heal the Bay
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National Wildlife Federations's National Schoolyard Habitat Program
http://www.nwf.org/schoolyard/
"Strawberry Creek Fund." University of California, Berkeley.
http://strawberrycreek.berkeley.edu/fund.html
University of California Water Resources Center
Urban Creek Council
www.**urbancreek**s.org/
http://repositories.cdlib.org/wrca/
Wolfe, Mason design firm
http://www.wolfemason.com/

FOOTNOTES

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