

University of California, Berkeley  
Strawberry Creek  
Geomorphology- 2006 Status Report



March 2008  
Office of Environment, Health & Safety  
University Hall, 3rd Floor  
Berkeley, CA 94720

Strawberry Creek Geomorphology - 2006 Status Report, March 2008  
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# **University of California, Berkeley Strawberry Creek Geomorphology- 2006 Status Report**

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# **University of California, Berkeley**

## **Strawberry Creek**

### **Geomorphology- 2006 Status Report**

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#### **1.0 University of California, Berkeley Strawberry Creek Management**

Strawberry Creek is a small urban creek draining the western slope of the East Bay Hills in the San Francisco Bay estuary watershed (see maps below). It is a major landscape feature of the University of California, Berkeley, and it was one of the main reasons the site was chosen in 1860 as the location for the campus. The 1163 acre (1.8 sq. mile) watershed draining through the campus and upstream headwaters, is approximately 40% urbanized (residential, commercial and institutional), with the remainder consisting of undeveloped, largely natural wildlands.

Urban creeks are increasingly valued for the aesthetic, recreational and wildlife benefits they bring to a city. Strawberry Creek has been the focal point of educational activities for years. More than 3,000 university students, and many elementary and high school students from surrounding communities, use Strawberry Creek each year as an outdoor laboratory for subjects as diverse as environmental studies, biodiversity restoration, landscape design, engineering, and art.

The greater Strawberry Creek ecosystem, consisting of neighboring watersheds, Tilden Regional Park to the east and tidal mudflats and salt marsh at the Berkeley Marina outfall, provides important habitat for plants and wildlife in the largely urban San Francisco metropolitan area. As a source of nutrients and fresh water, Strawberry Creek supports the fisheries of the San Francisco Bay, and continued pollution prevention and restoration in the watershed contribute to the health of the fisheries.

Urban creeks also provide storm water drainage and serve as a flood control system to prevent damage to the urban environment through which they flow. Historically the creek provided sanitary sewer drainage. These uses led to historic erosion, habitat loss and water pollution. By 1987, water quality and ecosystems were highly degraded and the creek was considered a public health risk due to chronic sewage pollution.

In response to campus and community concerns over the deteriorated environmental quality of Strawberry Creek, the campus Office of Environment, Health and Safety (EH&S) sponsored a comprehensive study of the creek. The results of the study completed by Robert Charbonneau were published in December 1987 as the "Strawberry Creek Management Plan" (1987 Strawberry Creek Management Plan). Implementation of the 1987 Strawberry Creek Management Plan significantly improved water quality in Strawberry Creek, as evidenced by the successful reintroduction of locally native fish species to the creek in 1989 – the first resident fish population in the creek in approximately 100 years.

This status report provides a summary of the geomorphology of Strawberry Creek including a compilation of monitoring completed since the implementation of the 1987 Strawberry Creek Management Plan. This is one of a series of technical reports being issued by the EH&S to commemorate the twentieth anniversary of the restoration program.

## Strawberry Creek Watershed Facts

Strawberry Creek Watershed total area = 1,977 acres (CH2M Hill, 1994)

Length of Strawberry Creek = ~4.5 – 5 miles

Watershed area under jurisdiction of UC Berkeley = ~ 800 acres

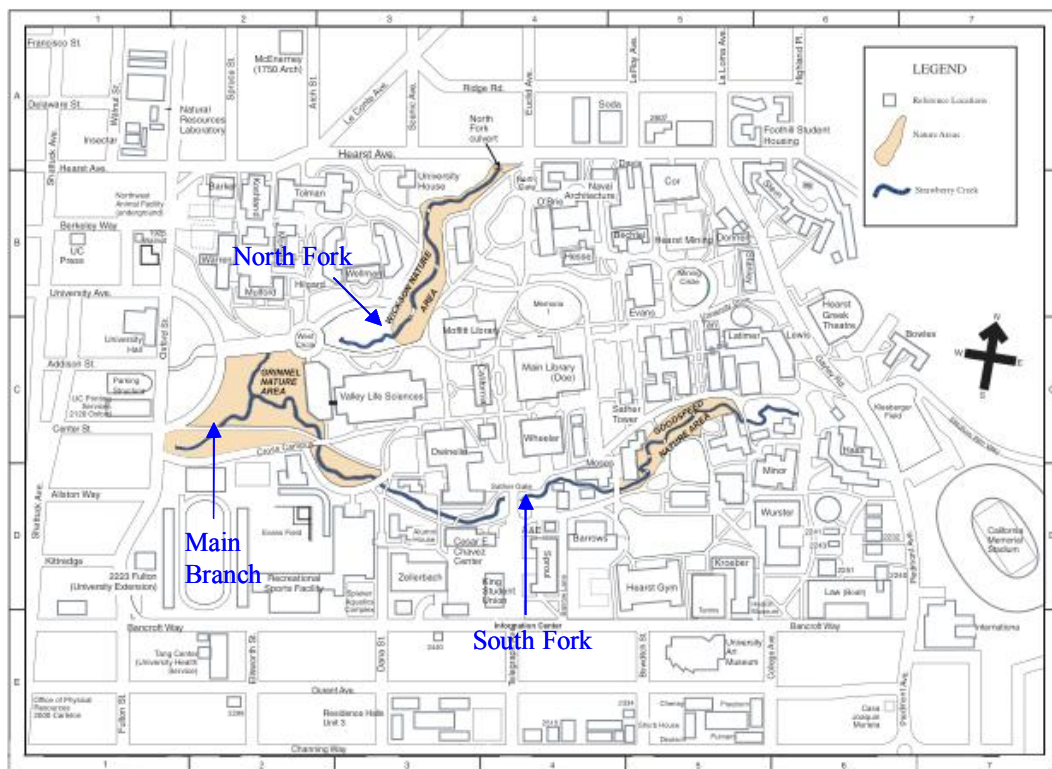
Watershed under jurisdiction of Lawrence Berkeley National Laboratory = 202 acres

Central Campus, Oxford to Gayley (base of Hill Campus) = ~ 165 acres

Change in elevation between headwaters and mouth (SF Bay) = 1,760 feet

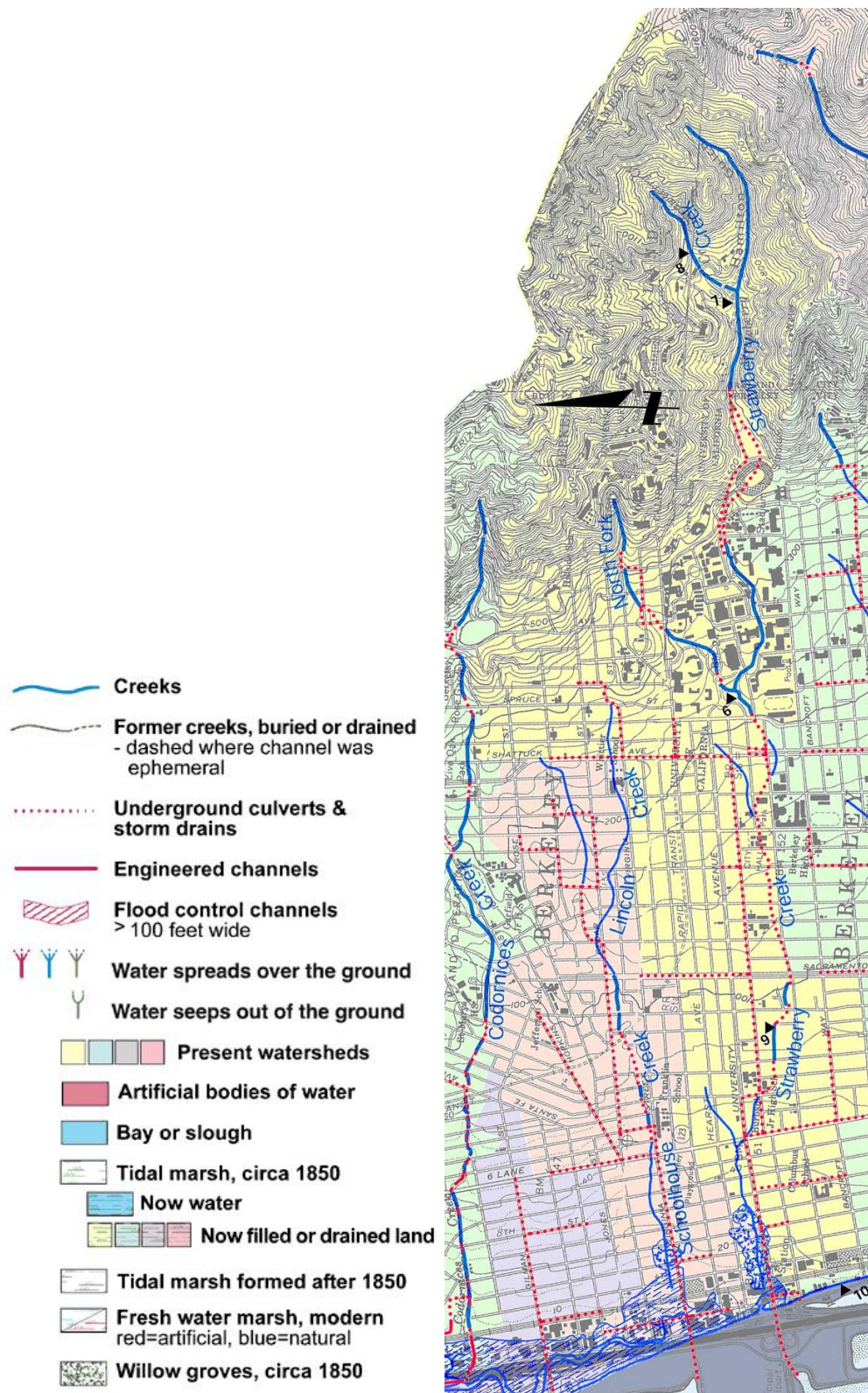
Change in elevation from Grizzly Peak (1, 1760 ft) to Oxford St. (200 ft) = 1,560 ft

## Strawberry Creek on University of California Campus Park



*Strawberry Creek and Natural Areas on UC Berkeley Central Campus Park*





**Strawberry Creek Watershed.** *Courtesy of the Oakland Museum, [www.museumca.org](http://www.museumca.org).*

## 1.1 Description of the Creek Channel

The geomorphic condition of Strawberry Creek on the UC Berkeley campus is typical of urban streams. Both forks are partially culverted upstream from and on the Central Campus. Over the past 150 years, peak flows increased with channelization and urbanization of the watershed as the area of impervious surfaces increased, preventing rain from infiltrating and instead causing runoff to flow directly into the creek. Increased peak flows and channelization caused the creek to downcut, and become less geomorphologically complex.

UC Berkeley straightened the creek and built retaining walls and check dams to counter the effects of increased flooding and erosion and to prevent Strawberry Creek from changing course. Since 1889, 54 check dams have been installed on both the North and South Forks throughout central campus to help prevent further incision (Maranzana, 1998). About 400 linear feet of the creek's bed on campus is completely cemented (not including underground culverts). Very little of the creek is allowed to meander because the banks and/or bed are either cemented or downcut, confining the creek to its existing channel.

Strawberry Creek has reacted to channelization and cementing by incising its channel. The flash flood flows that occur in the creek coupled with incision cause the structures in the creek to become gradually undermined and dismantled by the constantly moving water. As a result, many of the grade control structures in the channel have begun to come apart, in turn causing more erosion in some cases. At the confluence of the North and South Forks, for instance, a check dam collapsed into the channel in December 2003, causing water to rush around it and eat away at the unarmored bank. The check dam above it has also begun to erode, and probably will also fail in the near future. The stability of the banks in this area is questionable. On the South Fork there are several structures, including roads, facing imminent threat of loss if the walls currently holding them up fail.

In other areas, the channel appears to be in relatively stable, if not natural, condition. There are no sections that have not been impacted by urbanization, but some seem to be functioning within their constraints. It has not been determined which factors are responsible for a check dam or wall failing or remaining stable, but further study could determine which structures need to be replaced or removed. Culverted reaches, as well as walls, check dams and other in-stream structures are shown in the maps below.

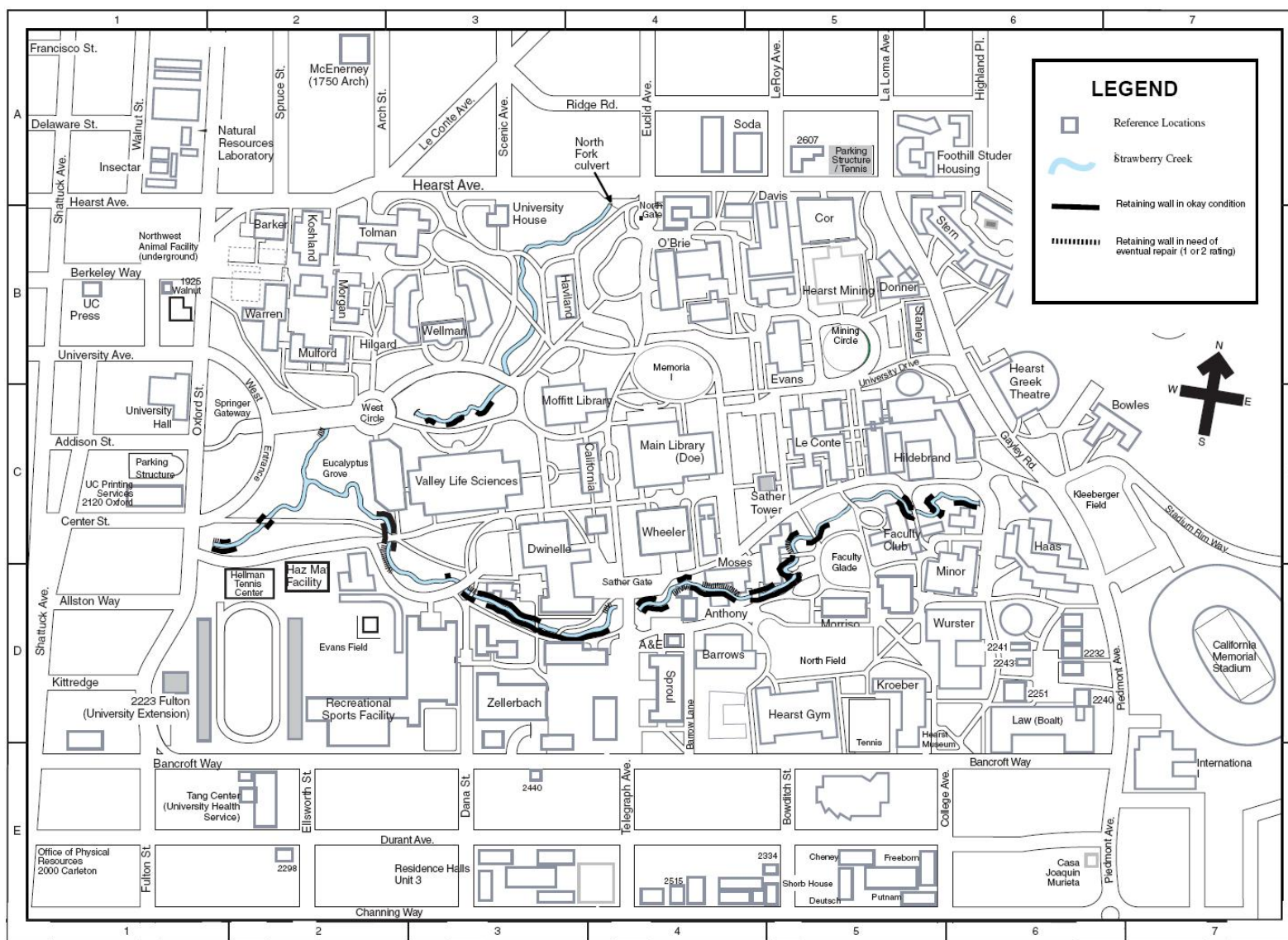


Figure 1. Retaining walls on Strawberry Creek, Central Campus. Dashed lines show walls in need of repair as identified by PWA (1999).



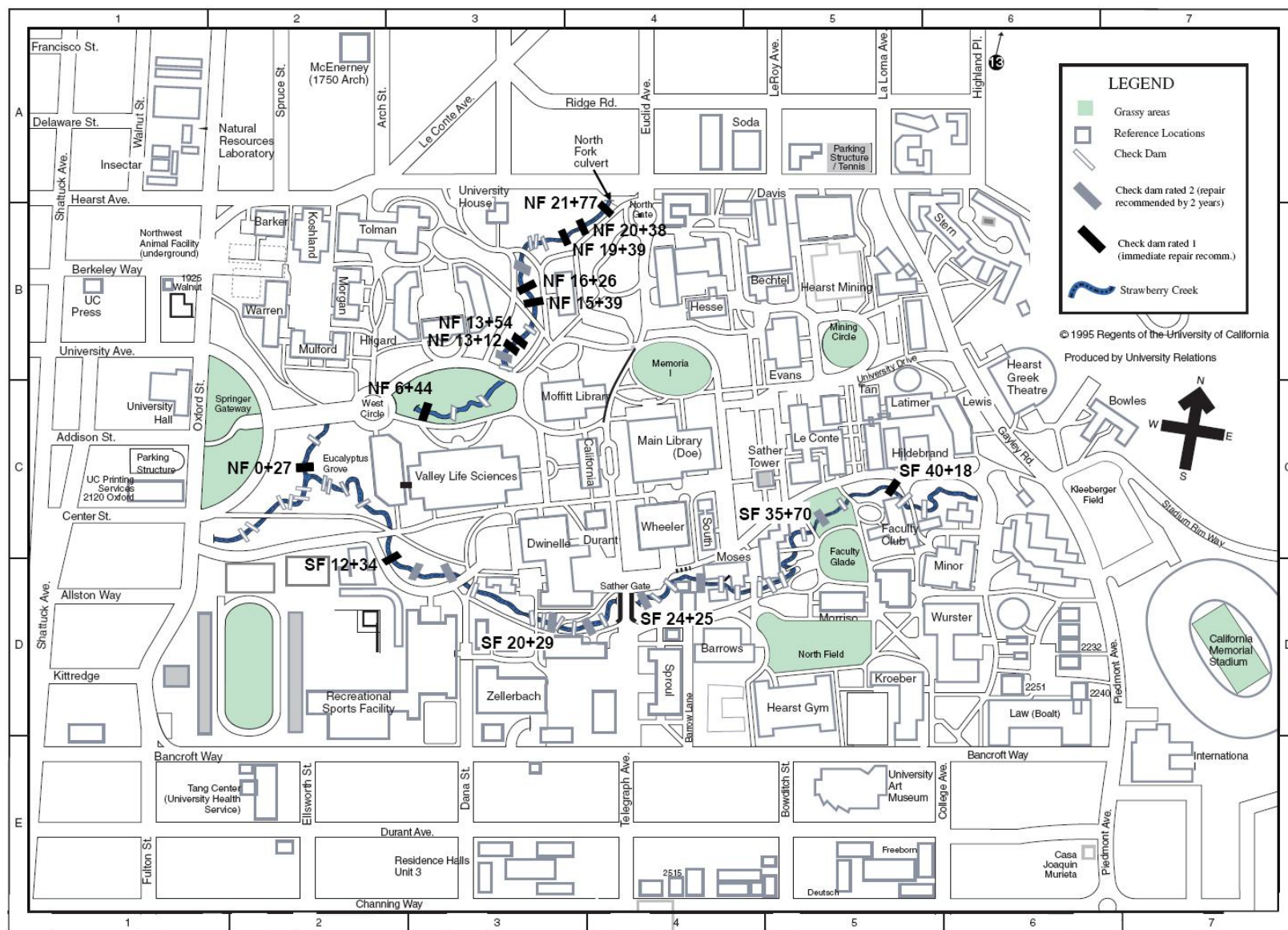


Figure 2. Check Dams on Campus. Check dams in need of imminent or future repair are shown larger than check dams in fair condition. (PWA, 1999)

## Substrate Composition

Strawberry Creek's morphology and substrate composition are important because certain plants and animals prefer different habitat, and greater habitat complexity encourages greater species diversity. For example, young Sacramento Suckers prefer to live in shallow, gravel bedded areas, while adults prefer to live in deep pools and spawn in gravel bedded reaches. Sticklebacks, on the other hand, can spawn in sand or gravel (McGinnis, 1984). Some macroinvertebrates, such as *Hydropsychidae* (caddisfly) cannot survive if the rocks they live on are blanketed with fine sediment, while others, such as *Oligochaeta* (an aquatic worm) are tolerant of high fine-sediment conditions (Wilderholm, 1984).

Strawberry Creek's substrate on Central Campus ranges from silt to cobbles to boulders, and substrate composition changes with the seasons. In the summer when there are no high flows, much of the bed is covered in a layer of fine sediment, and during winter high flows, sand bars form and shift in some reaches. UC Berkeley EH&S completed a pebble count survey of 8 transects in spring 2001, and found that there was no obvious trend in substrate size from upstream to downstream reaches. Due to the impacted nature of the creek, it is difficult for sensitive species to survive. However, despite these impacts, the creek is capable of supporting a stable population of native and non-native invertebrates, (see the Biological Conditions section) and reintroduction of four native fish species has been successful. Additional re-introductions of riparian organisms, such as steelhead salmon, will likely be successful, particularly if additional geomorphic and vegetative improvements are completed.

**Table 1. Sediment size, distribution and percent embeddedness at 7 cross-sections on Central Campus and one in the Botanical Gardens, April 2001.**

Location	Cross-section #	D <sub>50</sub>	D <sub>16</sub>	D <sub>84</sub>	% embedded
<b>South Fork</b>					
Strawberry Creek/Botanical Garden	None	49	<4	59	2
Senior Hall	28	12	<4	130	24
Stephens Hall	22	50	11	120	7
Sather Gate	15	33	4.2	160	28
VLSB Annex	7.1	10	<4	60	12
<b>North Fork</b>					
Giannini	36	55	<4	91	5
Valley Life Science Bend	34	77	7.9	200	20
<b>Main Fork</b>					
Confluence A (main channel)	4	40	4.1	180	21
Confluence B (point bar)	4	<4	4	18	8

Note: A D16 of <4 means that over 16% of the clasts counted were smaller than 4mm.

## **1.2 Changes in Creek Geomorphology Since 1987**

Since 1990, UC Berkeley students have completed four duplicate cross-section surveys of Strawberry Creek to determine whether the channel shape has changed (location shown in map below). Cross section results are shown in Figure 4 (a-d), and they illustrate that the bed did not significantly change between 1990 and 1999 at three of the four cross-section sites surveyed. There was downcutting at one check dam just downstream of the power substation (cross-section # 17.2), likely due to altered flow caused by the dam. Significant change to most parts of the creek is unlikely due to extensive hardscaping of the creek banks and bed.

### **Strawberry Creek Cross Sections**

These four cross section sites, surveyed four times each over 10 years, show several areas of the creek that have changed little or not at all during this time period. All of these cross sections are located on the South Fork in heavily armored areas of the channel, where significant measures have been taken to stabilize the channel with concrete banks and check dams. These cross sections represent stable areas of the creek that currently require little or no channel maintenance, though there are other reaches that are in significant danger of failure or damage.

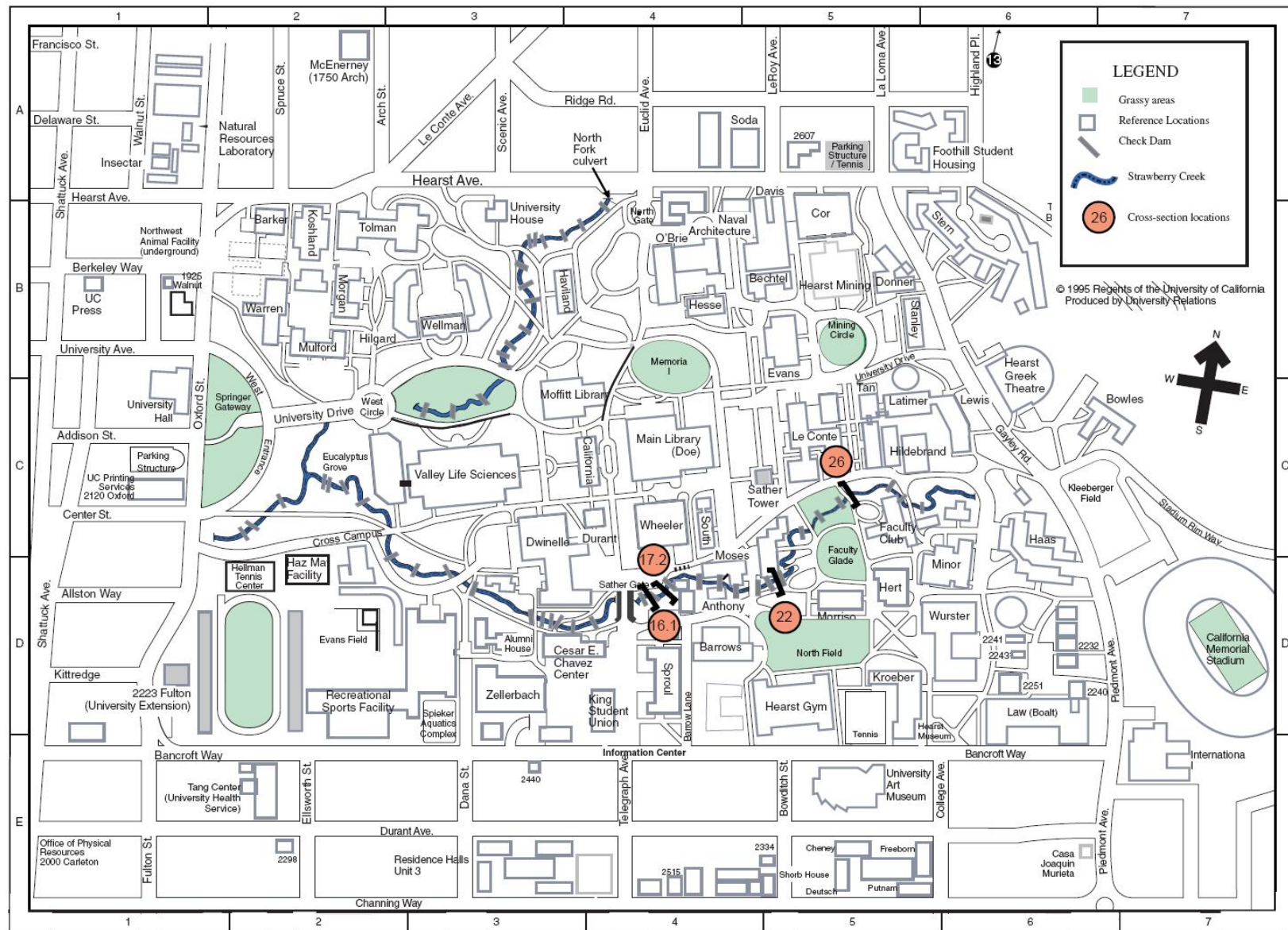
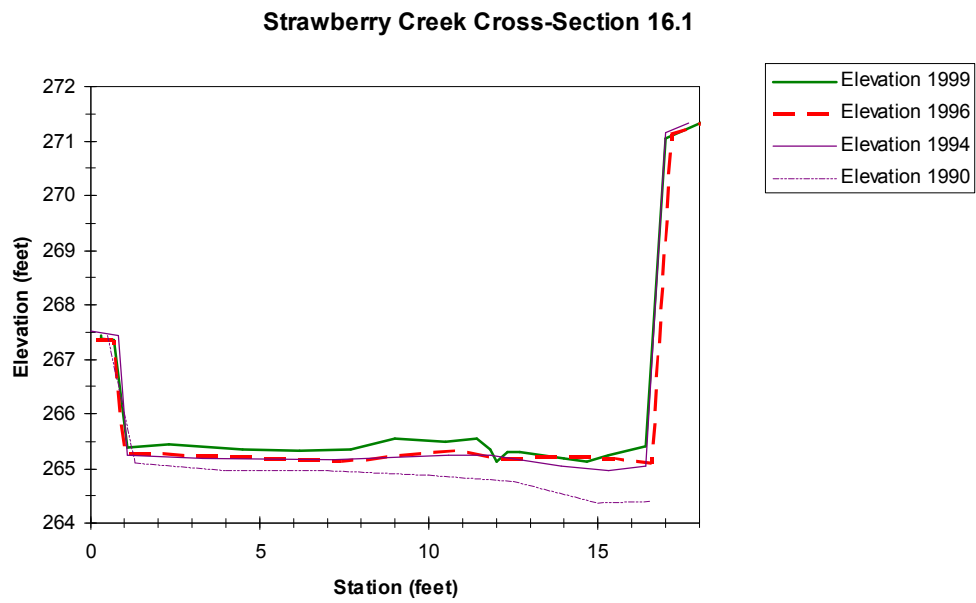


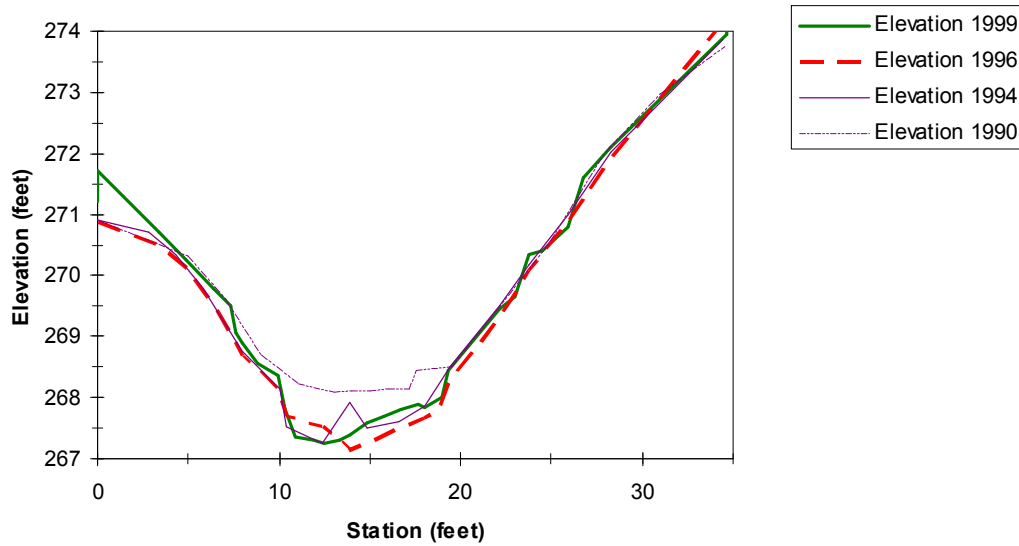
Figure 3. Strawberry Creek cross section sites. Individual cross sections are shown in Figures 4a-d





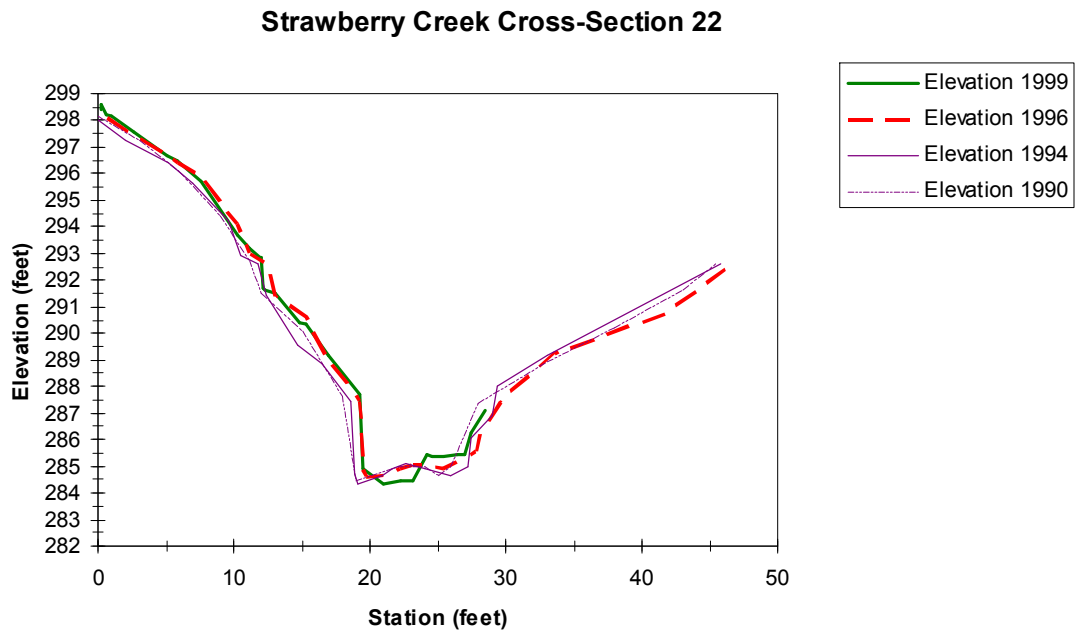
**Figure 4a.** Cross-section 16.1 on Strawberry Creek on UC Berkeley's Central Campus. 1990, 1994, 1996, and 1999. According to this data, the cross-section aggraded between 1990 and 1999. 1994 data from Morley, 1996 data from Maranzana, and 1999 data from Jain & Davis. Photograph taken October 2005, EH&S.

### Strawberry Creek Cross-Section 17.2

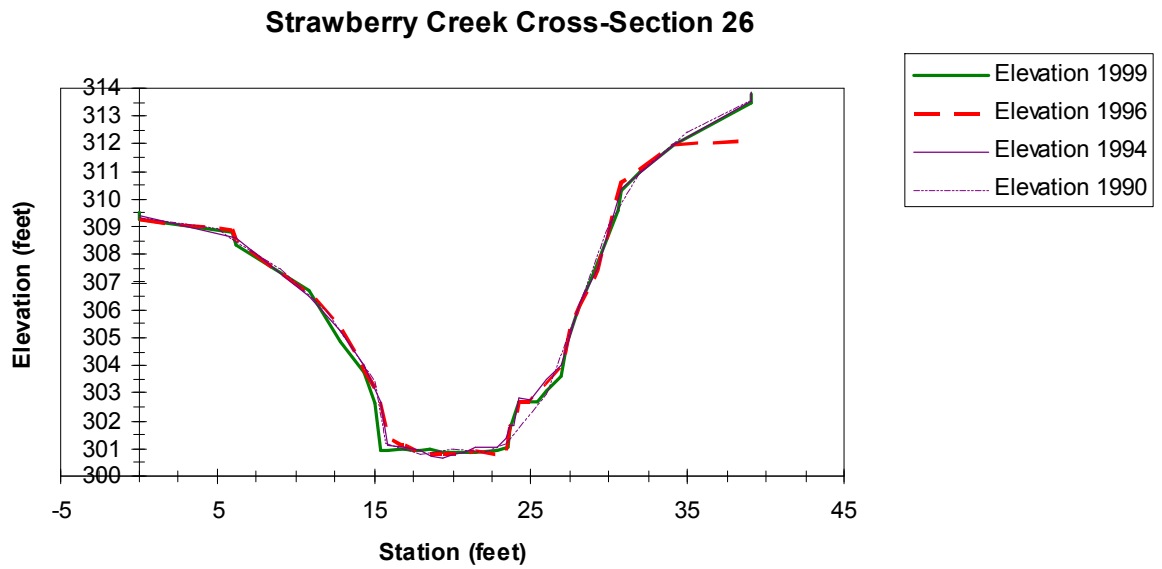


**Figure 4b** Cross-section 17.2 on Strawberry Creek on UC Berkeley's Central Campus. 1990, 1994, 1996, and 1999. The largest change was between 1990 and 1994, when the thalweg downcut about 1.5 ft. 1994 data from Morley. 1996 data from Maranzana, and 1999 data from Jain & Davis. Photograph taken October 2005, EH&S.





**Figure 4c** Cross-section 22 on Strawberry Creek on UC Berkeley's Central Campus. 1990, 1994, 1996, and 1999. 1994 data from Morley. 1996 data from Maranzana, and 1999 data from Jain & Davis. Photograph taken October 2005, EH&S.



**Figure 4d** Cross-section 26 on Strawberry Creek on UC Berkeley's Central Campus. 1990, 1994, 1996, and 1999, showing almost no change between 1990 and 1999. 1994 data from Morley. 1996 data from Maranzana, and 1999 data from Jain & Davis. Photograph taken October 2005, EH&S.



Phillip Williams Associates (PWA) completed a longitudinal profile of both forks of Strawberry Creek on Central Campus in 1988, but the longitudinal profile has not been resurveyed since. Although visual observations and three cross-sections suggest a fairly stable creek, a resurveyed longitudinal profile is necessary to show whether the creek is mostly stable throughout its on-campus reach.

The only areas of the creek that have significantly eroded or meandered since 1987 are areas adjacent to some check dams, retaining walls and debris barriers. In particular, when check dams are not sufficiently tied into the banks or the creek bed, water can find its way around the check dam and cause erosion. Check dams that are tall and vertical tend to cause erosion directly downstream in the drop pool because water flowing over the dam obtains high velocity and high erosive energy. Some erosion has also occurred under retaining walls when the bed is below the wall's foundation. While this undercutting is detrimental to the stability of the wall, it creates ideal habitat for fish and other aquatic animals.

Another place along the creek where noticeable erosion has occurred is near the Oxford culvert, just downstream of the debris barrier. There, the creek scoured a hole on the right bank in 1995 when the debris barrier filled with debris and blocked water from entering the Oxford Culvert. The water flowed to the right of the debris barrier and flooded onto Oxford Street. The scour hole was filled with rocks to avoid further erosion, but water flows into the hole numerous times each rainy season. Since erosion occurred mainly near manmade structures, we can conclude that Strawberry Creek's shape remained stable between 1987 and 2001 except in areas where lack of maintenance or improper design of manmade structures led to erosion (Jain & Davis, 1999; Maranzana, 1998).

Two maintenance projects were completed in summer 2003 to repair seriously undercut or eroded banks by Stephens Hall and Substation 1 and at the Botanical Gardens at a total cost of approximately \$390,000. Annual surveys of the repairs completed by EH&S have found the repairs to be functioning well.

## **1.3 Channel Stabilization and Grade Control Structures**

### **Check Dams**

Charbonneau's 1987 Strawberry Creek management plan contained a list of grade control structures and other channel stabilization measures in the creek that were in need of repair. Haltiner (1988) of Philip Williams and Associates completed a more thorough description and map of high priority stabilization sites, and UC Berkeley used recommendations in the PWA 1988 Bank Stabilization Study to plan and implement stabilization projects on the creek between 1988 and 1990. PWA wrote a follow-up report on their stabilization efforts in 1991 and an updated channel stabilization review in 1999. This current report provides an update for Charbonneau (1987) and the 1988 PWA reports, using information from PWA's 1991 and 1999 reports and UC Berkeley EH&S staff observations.

Today, many of the 54 check dams and other structural controls on Strawberry Creek are old and damaged. The first check dams were built in 1882 (Charbonneau, 1987), and most were built before the 1970's, although 9 were installed after 1987. Check dams were built to slow the velocity of high flows and prevent channel erosion. While check dams are built to reduce erosion, and are effective for preventing downcutting upstream of the dam, they often induce erosion directly downstream because of the high velocity of water falling from the dams. Further, when check dams are not properly tied into banks, water can erode around the sides of the dam, and this sidecutting can threaten the integrity of the dam or other nearby structures.

Check dams were constructed to reduce erosion, but they also play an important role for aquatic fauna. By lowering the creek's velocity, check dams help prevent fish and macroinvertebrates being washed downstream by high flows, and pools scoured directly downstream of the dams provide important low velocity habitat for fish. However, although check dams help improve aquatic habitat in some ways, they also act as barriers to fish migration. Sacramento Suckers prefer to spawn in upstream gravel-bedded areas (McGinnis, 1984), and check dams may prevent them from reaching their preferred spawning areas. Threespine stickleback can be anadromous (adults live in salt water but spawn in freshwater streams and rivers), but in Strawberry Creek, they are prevented from moving upstream by culverts and check dams. Further, fish planted upstream are often washed downstream during winter flows, and check dams prevent them from returning. Therefore, although fish have been planted upstream in Strawberry Creek, they are more prevalent in the downstream reaches (Gold, 1998). Replacing deteriorating check dams with dams that fish could migrate past could allow fish to utilize a greater extent of suitable habitat and perhaps also improve their spawning success.

A 1998 study (Maranzana, 1998) reported that over half of the check dams on Strawberry Creek in central campus are damaged to some degree. On Strawberry Creek's North Fork, Maranzana reported that 32% of the 19 check dams were "severely damaged", meaning that they are at risk of collapsing during high flows. He determined that 36% of the check dams on the north fork had "moderate damage", with some undercutting or

cracking that could present future structural problems, and he determined that the remaining 32% had negligible damage. Maranzana found that the dams on the South Fork were relatively more structurally sound, with 17% showing severe damage, 14% showing moderate damage, and 69% with negligible damage. Maranzana (1998) identified 11 check dams that are in immediate danger of failure and should be repaired or replaced to avoid serious erosion, while PWA (1999) determined that 7 check dams on Campus should be repaired immediately. PWA identified 14 dams that should be improved over the next few years, and 3 in need of longer-term maintenance. PWA based their ratings on the condition of the structure as well as the consequences of structural failure. The check dams in need of immediate repair are shown on Figure 2 and detailed in Table 2 below.

Table 2: Check Dam High severity channel stabilization sites identified by PWA (1999), and change from their condition as described in PWA (Haltiner, 1988).

1999 Severity Rating	1988 Severity Rating	PWA Location	Charbon- neau (1987) Location	Feature	Comments
1+	2	NF 0+27	38	Check dam	Severe scour on right bank.
1+	3	NF 13+12	none	Check dam	Failing by toe scour
1	3	SF 12+34	31	Check dam and apron	Scour around apron and undermining left bank rock wall.
1	2	SF 30+00 to 30+30	17	Bank erosion	Both left and right banks undercut. Sink hole on right bank.
1	2	SF 40+18	9	Check dam	Erosion around left bank of dam, proceeding upstream
1	3	NF 6+44	none	Check dam	Failing by toe scour. Stabilizes 3 foot drop.
1	3	NF 13+54	none	Check dam	Erosion on left bank, large scour pool.
1	2	NF 15+39	none	Check dam	Severe scour, check dam collapsing
1-	2	SF 29+27 to 29+37	20	Pedestrian bridge	New check dam failing on the left. Undercutting of left bank wall.
1-	3	SF 38+95	7	Pipe overcrossing	Erosion of left bank pier
1-	2	NF 16+26	37	Check dam	Right bank protection failed, scour at check dam toe
1- to 2+	1, 2	NF 19+39	none	Check dam	New check dam helped stabilize channel, but is failing.
1- to 2+	1, 2	NF 20+38	none	Check dam	Repair of previous dam successful, but end erosion continues
1- to 2+	1,2	NF 21+14 to 21+19	none	Pedestrian bridge	Tree undercut, 1988 check dam stability questionable
1- to 2+	none	NF 21+77	none	Check dam	Left bank not properly tied into bedrock
2+	2	SF 7+29	none	Check dam	Completely collapsed, but

1999 Severity Rating	1988 Severity Rating	PWA Location	Charbon- neau (1987) Location	Feature	Comments
				(remnant)	still stabilizing channel some
2+	none	SF 0+87	39	Debris barrier	Right bank threatened by scour
2+	4	SF 11+82 to 13+09	32	Rock wall (left bank)	Toe scour and loss of grout between rocks
2+	2	NF 16+71	none	Check dam	Downstream apron undercut. Threatens wall and road
2+	none	NF 17+41 to 17+49	none	Check dam/cascade	Check dam undercut above cascade, toe scour at base
2	2	SF 0+00 to 0+21	39	Grouted rock wall (RB)	Right bank eroding. Erosion undermining trees.
2	3	SF 13+79	none	Check dam/storm drain outfall	Deterioration of concrete apron. Toe scour at check dam
2	2	SF 24+75	24	Check dam	Large drop. Check dam undercut at left bank
2	3	SF 29+60 to 30+50	18	Concrete channel	Most of this repaired in 2003
2	3	SF 35+70	11	Check dam	Scour on left end. Consequences of failure not serious
2	3	NF 1+50 to 2+00	37A	Retaining wall (RB)	Entire wall scoured and failing
2	2	NF 6+22	none	Debris barrier	Debris barrier repaired, but needs to be maintained
2-	3	SF 15+34	29	Check dam	Right side of check dam failed
2-	3	SF 16+43 to 16+74	28	Pedestrian bridge and check dam	Scour at base of check dam undercut one bridge pier.
2-	2	SF 20+29	none	Check dam	Scour under dam and left bank wall
2-	3	SF 21+70	none	Check dam	Check dam undermined and scour under walls
2-	4	SF 23+04 to 23+39	25	Retaining wall (RB)	Undercutting of wall. Wall is unaesthetic.
2-	none	SF 28+16	none	Check dam	Scour of left bank wall, but raising of check dam successful for stabilizing upstream wall.
2-	none	SF 33+67 to 33+82	none	Bank erosion (RB)	Scour under retaining wall. Wall and staircase threatened
2-	2	SF 45+17	none	Culvert outlet ("Little in.")	Scour under culvert lip (about 7 feet)
2-	2	NF 12+13	none	Check dam	Seepage around right end of check dam.
2-	3	NF 17+86	36	Pedestrian bridge	Bridge support threatened by undercut concrete apron.

Modified from PWA (1999) and Charbonneau (1987). Severity rating 1: "Immediate resolution recommended" Severity rating 2: "Resolution over the next several years recommended" Severity rating 3 & 4: "Longer-term maintenance"



Most check dams on Strawberry Creek are too tall to allow upstream fish migration, and their height also may contribute to their potential to cause downstream erosion and reduce their usefulness and lifespan. According to Philip Williams & Associates (1988) check dams over 18 inches (~46 cm) tall are more likely to be unstable, although a later study suggested that in actuality, height was not directly related to stability (Maranzana, 1998).

On Central Campus, 20 of the 54 dams on Strawberry Creek are vertical drop dams over 18 inches and, according to Maranzana (1998), 15 of those check dams have at least moderate damage. All of the dams over 18 inches tall are likely impassable by the fish species currently in the creek.

Nine check dams were constructed in 1988, and since then, no new check dams have been built and only the check dams in the Stephens Hall to Substation 1 reach have been repaired. Most dams identified as in very poor condition by PWA in 1988 (Haltiner, 1988) are still in very poor condition today (PWA 1999). Three of the 9 dams built in 1988 are already showing sign of deterioration, with one of those three failing to trap sediment and reduce velocity. Five other new dams are not yet deteriorating but are not adequately tied into banks and are in danger of failure. A redwood log check dam built in 1988 is still in good condition.

Since PWA's 1988 report, severe erosion has occurred at the check dam on the North Fork near the confluence of the North and South forks (NF 0+27). PWA (1999) reports that most check dams that were being undercut or endcut in 1988 are more severely threatened today, except two that were repaired.

Although check dams on Strawberry Creek have caused plunge pool erosion, sidecutting, and are barriers to fish passage, today they are necessary to prevent serious erosion and protect campus infrastructure. Much of the creek's watershed is severely altered from its historical condition, and the creek is in culverts or channelized for almost its entire length. As long as those conditions persist, flash flows will continue and therefore check dams or other grade control structures are necessary.

In areas where there is room to allow the creek to meander, it is possible that check dams could be removed. This would be possible because if the creek meandered in a reach, the creek's length within the reach would be greater, and the same drop in elevation would be accommodated in a longer distance. Therefore, water would move more slowly through the reach than if it was straight, and check dams might no longer be necessary to slow the water's velocity.

### **Retaining Walls and Hardbed**

Much of the length of Strawberry Creek on campus is channelized, with vertical cemented walls on one bank, both banks, or both banks and the bed. The cementation of the channel was for flood and/or erosion control, preventing the creek from meandering and speeding water up so that it would quickly move off campus and into the Bay. Much

of the cement was placed in the early 1960's in response to destructive floods, and little flooding has occurred since then, except for minor overflows of undersized culverts, such as the West Circle culvert north of the Valley Life Sciences Building.

Many of the retaining walls on Central Campus are undercut, threatening the wall itself as well as buildings and infrastructure protected by the existing walls. In many of the areas where walls are undercut, remnant hardbed (that was intentionally removed or eroded over time) is also undercut. PWA (1999) documented retaining walls in need of repair in the immediate or near future as shown in Figure 1.

Since the 1987 Strawberry Creek Management Plan was written, a few improvements have been made to walls and areas with concrete channel bed, most of which occurred near the Stephens Hall Bridge. A concrete wall directly upstream of the bridge was failing, and it was replaced with a redwood crib wall planted with native vegetation. Further, low check dams were placed at and upstream of the cribwall to help reduce downcutting. The designers of the wall chose to make it out of biodegradable redwood for aesthetic, ecological and longevity purposes. As the redwood decomposed, native shrubs and trees planted on the cribwall grew and eventually, their roots will control erosion when the cribwall is entirely decomposed. In the future, when walls need to be replaced, bioengineering solutions such as the redwood cribwalls should be used whenever space allows to provide attractive, long-term, habitat improving solutions to bank erosion.

Near the redwood cribwall, Charbonneau and California Conservation Corps workers intentionally removed some sections of hardbed to increase habitat value in the area. Otherwise, all hardbed sections remain unchanged.



Redwood cribwall near Stephens Hall

Cement retaining walls next to the creek are necessary in some places where bank erosion would threaten the stability of nearby buildings or infrastructure. Although retaining walls are necessary in some reaches of Strawberry Creek, they are not necessary where there is plenty of open space next to the creek and bank erosion would not threaten any structures or where vegetation stabilizes banks. Further, flood potential can be reduced through methods other than channel cementation.

Cement creek bottom was placed to prevent the creek from downcutting and causing banks to collapse and threaten infrastructure. However, with so many check dams controlling Strawberry Creek's grade, cement creek bed is likely not necessary to prevent downcutting in most reaches today. Therefore, cement creek bed in all areas where it is not directly downstream from a check dam or at the inflow or outflow of a culvert to improve habitat can be removed.

In areas where walls need to be replaced or repaired and cannot just be removed, bioengineering methods as described by Charbonneau, including using wood walls planted with native vegetation and live material soil bioengineering methods, are preferred for improved habitat and aesthetic values. Often, these types of stabilization techniques are less expensive than using hardscape armoring, and they enhance, rather than harm, riparian habitat.

It is a goal of this Management Plan, as well as of the Campus New Century Plan and related maintenance plans, to incorporate these types of soil bioengineering concepts into future design and repair of aging instream structures and neglected habitat. The first bioengineering solution applied on Strawberry Creek on UC Berkeley campus, the Stephens Hall redwood cribwall, was an overwhelming success, and still remains an example of the viability of these types of biotechnical applications to Strawberry Creek. Improving the geomorphological health of the channel will lead to improved ecological health and channel aesthetics.

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