Contra Costa
Volunteer Creek Monitoring Program
GPS Creek Surveys

DATA COLLECTION PARAMETERS AND PROTOCOLS

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50 FT INTERVAL

GPS Survey: 50 Ft Interval

WHAT IS AN INTERVAL MEASUREMENT?

Some parameters need to be documented at regular intervals along the creek channel. The **50 FT INTERVAL** will provide basic information creating 'snap-shots' of water flow, substrate, shade cover, and bank slope.

HOW DO WE COLLECT DATA ON THESE FEATURES?

The GPS unit will log your location every second. Collect a minimum 90 counts of satellite communication (90 seconds). Be sure to answer all the questions and check the count before moving on to the next data collection segment

SURVEY QUESTIONS

IS WATER PRESENT?

- ☐ Flowing
- ☐ Not Flowing (disconnected pools)
- ☐ Dry

DEPTH OF WATER:

- ☐ 0 ft
- ☐ 0.1 to 6 inches
- ☐ 6.1 inches to 1 ft
- ☐ 1.1 ft to 2 ft
- ☐ 2.1 ft to 3 ft
- ☐ 3.1 ft to 4 ft
- ☐ >4.1 ft
- ☐ Do not know

SUBSTRATE COMPOSITION:

Substrate describes the material that makes up the bed of a creek. Evaluate the nature of the particles in the creek in a 5-foot wide transect between channel banks. You will often find that the substrate is composed of a variety of sizes of material. Record the type of substrate in the percentage classes (see below) for the transect. Percentages should add up to 100%.

☐ 0% ☐ 1-25% ☐ 26-50% ☐ 51-75% ☐ 76-100%

WHY SHOULD WE COLLECT DATA ON SUBSTRATE, CANOPY, AND SLOPE?

WATER levels can change dramatically. By recording the depth and whether or not water is present on a given date, we can begin to compile basic data on seasonal water flow.

SUBSTRATE describes the material on the bottom of the stream. Substrate can tell us about upstream sediment loading and potential habitat for fish and other aquatic life. Many areas appear to have a silty substrate. Often what you see is silt on top of gravel or cobble. It is important to document the composition of the substrate – not just the silt that has deposited over the substrate.

SHADE COVER describes the amount of vegetation and other shading features directly over the stream. A canopy is formed by the crowns of trees and is typically defined as the uppermost layer of a forest. The canopy provides shade that helps cool the water and may benefit fish. Organic material that falls from the canopy and surrounding vegetation can be an important food source for in-stream organisms. Additionally, canopies provide habitat for birds and other wildlife. By knowing what canopies along our creeks look like we can better predict and explain some chemical and biological characteristics of our streams. We measure shade from all sources because of the cooling effect of shade regardless of source.

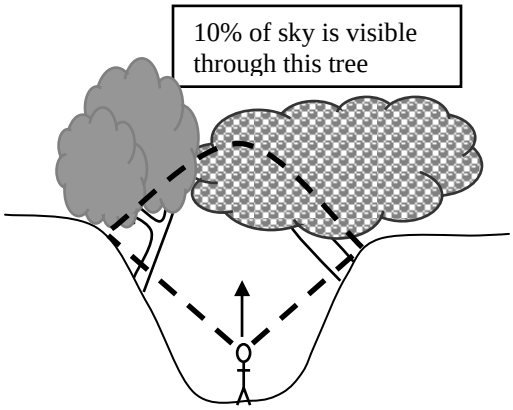
SLOPE describes the angle of the stream bank relative to a horizontal surface. In conjunction with other data, slope can be used to predict erosion patterns. It is also a useful indicator of access and safety issues for community members and wildlife.

UNDERCUT refers to a bank that overhangs the stream. This type of bank generally provides good cover for macroinvertebrates and fish and is generally resistant to erosion.

PHOTODOCUMENTION is a good visual tool to assess habitat conditions and to document variations.

Pink Team: 50 ft intervals and Curve Points

- ☐ Silt/Clay/Mud – substrate has a sticky cohesive feeling. Smallest size, unable to distinguish particles (not gritty between fingers)
- ☐ Sand – up to 0.1 inch in diameter (visible as particles, feels gritty)
- ☐ Gravel – 0.1 inch to 2 inches in diameter (ladybug to tennis ball size)
- ☐ Cobble– 2 to 10 inches in diameter (tennis ball to basketball size)
- ☐ Boulder – 10 inches in diameter (basketball to car size)
- ☐ Bedrock – solid rock (or bigger than car)
- ☐ Cement - or other constructed surface



>76% SHADE COVER

SHADE COVER:

Standing in the middle of the stream, look straight up.
Estimate the percentage of canopy cover.

- ☐ 0%
- ☐ 1 - 10%
- ☐ 11 - 50%
- ☐ 51 - 75%
- ☐ >76%

LEFT BANK SLOPE:

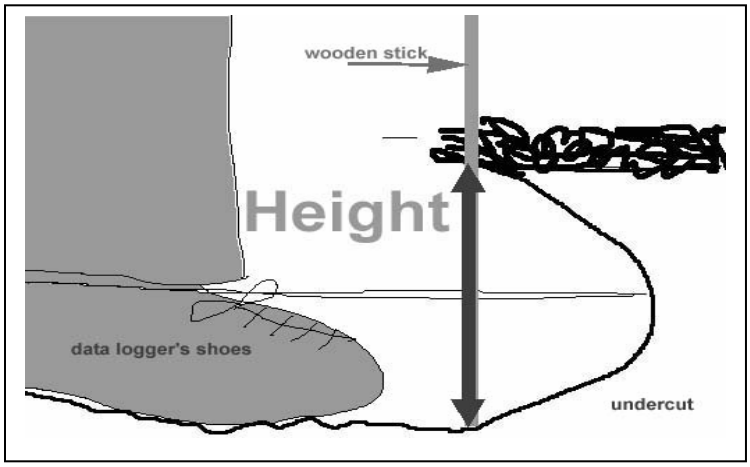
Estimate the slope from the toe of the bank to the top of the bank. Remember that left bank is determined by looking downstream.

- ☐ < 30 degrees
- ☐ 31 - 60 degrees
- ☐ 61 - 90 degrees
- ☐ > 91 degrees

LEFT BANK UNDERCUT HEIGHT (Vertical Measurement)

Use provided wooden stick. Red lines are drawn in 6-inch (1/2 ft) increments. Hold the stick vertically in front of you when you are facing an undercut. Measure from the bottom of the undercut to the top of the undercut. In the picture on the right, height is from the shoe bottom to where plants are located. If there is no undercut, answer "No".

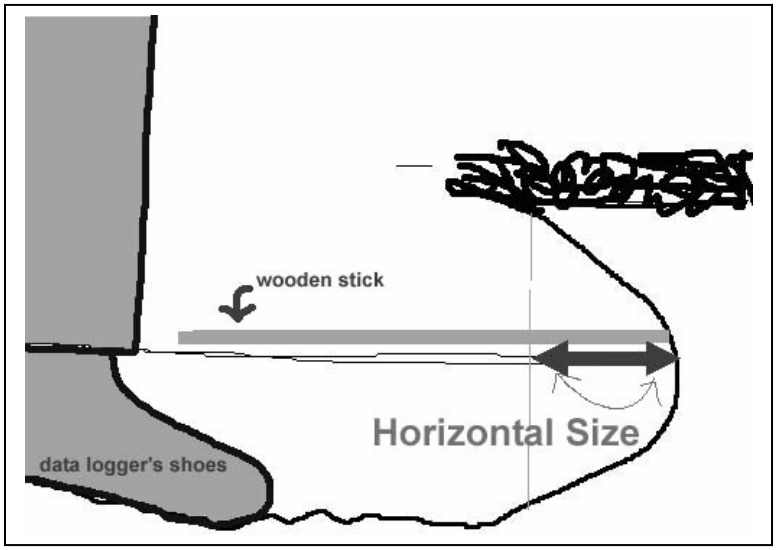
- ☐ No
- ☐ Yes: height < ½ ft
- ☐ Yes: height > ½ ft
- ☐ Do not know



LEFT BANK UNDERCUT HORIZONTAL SIZE (H-SIZE)

Use provided wooden stick. Red lines are drawn in 6-inch (1/2 ft) increments. Hold the stick horizontally in front of you when you are facing an undercut. Measure the length from the deepest part of the undercut to the vertical edge of the undercut. No undercut, answer "0 ft".

- ☐ 0 ft
- ☐ 0.1 to 6 inches
- ☐ 6.1 inches to 1 ft
- ☐ 1.1 ft to 2 ft
- ☐ 2.1 ft to 3 ft
- ☐ 3.1 ft to 4 ft
- ☐ >4.1 ft
- ☐ Do not know



RIGHT BANK SLOPE:

Estimate the slope from the toe of the bank to the top of the bank. Remember that right bank is determined by looking downstream.

- ☐ < 30 degrees
- ☐ 31 - 60 degrees
- ☐ 61 - 90 degrees
- ☐ > 91 degrees

RIGHT BANK UNDERCUT HEIGHT (Vertical Measurement)

Use provided wooden stick. Follow the procedures given for measuring the Left Bank Undercut Height. If there is no undercut, answer "No".

- ☐ No
- ☐ Yes: height < ½ ft
- ☐ Yes: height > ½ ft
- ☐ Do not know

RIGHT BANK UNDERCUT HORIZONTAL SIZE (H-SIZE)

Use provided wooden stick. Follow the procedures given for measuring the Left Bank Undercut Horizontal Size. If there is no undercut, answer "0 ft".

- ☐ 0 ft
- ☐ 0.1 to 6 inches
- ☐ 6.1 inches to 1 ft
- ☐ 1.1 ft to 2 ft
- ☐ 2.1 ft to 3 ft
- ☐ 3.1 ft to 4 ft
- ☐ >4.1 ft
- ☐ Do not know

PHOTO DOCUMENTATION:

Stand in the middle of the creek use the compass to record the photo direction in degrees for upstream and downstream location. Enter the interval number and degrees into the data logger.

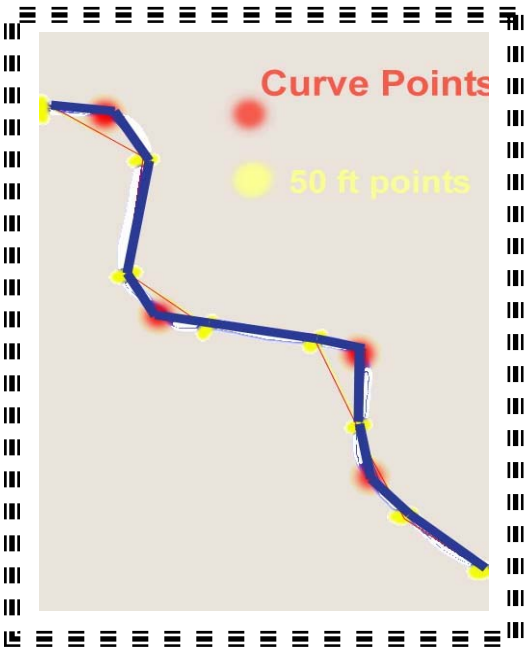
- __ Upstream direction in degrees
- __ Downstream direction in degrees

CURVE POINTS

GPS Survey: Curve Points

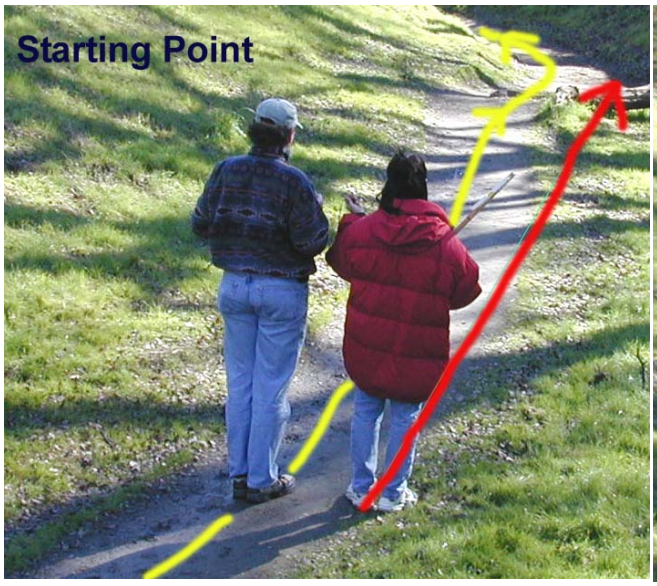
WHAT IS CURVE POINT MEASUREMENT?

CURVE POINT MEASUREMENT will provide supplemental information on the meander and shape of a creek. When shapes of creeks are drawn only based on 50 ft interval points, some twists and turns may be missed. Curve points measurements are taken when a creek curves substantially between 50 ft intervals.



HOW DO WE COLLECT DATA ON THESE FEATURES?

Work in a team of two, with each person holding an end of a 5 ft rope. The data logger stands in a thalweg of a creek and his/her partner stands adjacent to the data logger, looking downstream. The data logger walks on the thalweg of a creek while his/her partner walks straight from the beginning location. When the distance between the partners is at 5 ft the rope will be taught and curve point measurement needs to be taken. Collect a minimum of 90 counts of satellite communication (90 seconds).



SURVEY QUESTIONS

LEFT BANK UNDERCUT HEIGHT (Vertical Measurement)

LEFT BANK UNDERCUT HORIZONTAL SIZE (H-SIZE)

RIGHT BANK UNDERCUT HEIGHT (Vertical Measurement)

RIGHT BANK UNDERCUT HORIZONTAL SIZE (H-SIZE)

Same as 50 ft Interval measurements (See previous page)

GENERAL VEGETATION CHARACTERISTICS

GPS Survey: Vegetation

WHAT IS VEGETATION?

Plants present in the stream and on its banks are described as **VEGETATION**.

HOW DO WE COLLECT DATA ON VEGETATION?

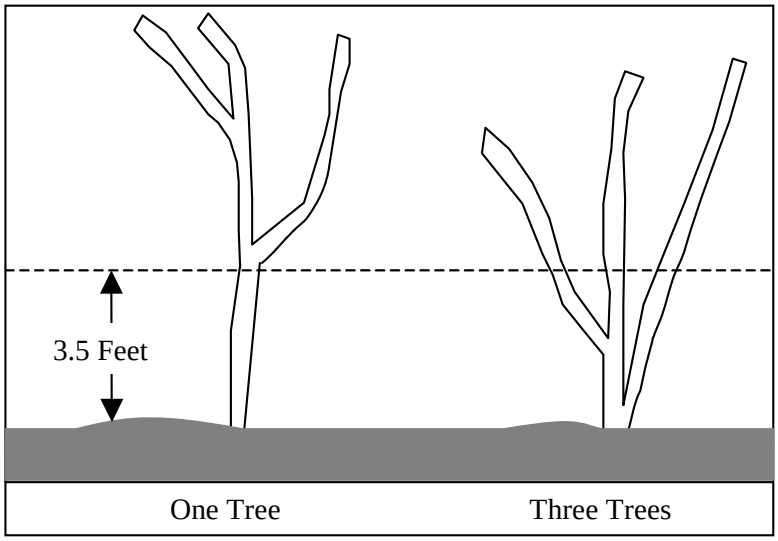
Answer the survey questions about vegetation before moving on to the next data collection segment.

Indicate a new segment each time the ratio of vegetation in-stream **or** on the left **or** right bank changes. See glossary for definitions of each vegetation classification (shrub, herbaceous, and bare.)

WHY SHOULD WE COLLECT DATA ON VEGETATION?

It is important to describe the vegetated cover of stream banks to identify areas subject to erosion, sources of sediment loading, and key habitat.

TREES need to be counted on each bank and the number entered into the data logger. For the purposes of this data collection effort, **a tree is defined as any woody vegetation over 10 feet tall with a diameter of 2 inches or more at 3.5 feet**. For trees with multiple trunks, each trunk is considered a separate tree as long as it is at least 2 inches in diameter and branches from another trunk at or within 3.5 feet of the base (Fischer *et al.* 1996). See illustration below.



Fischer, Christina, et. al. (1996). *Vegetation Survey Protocol*, Coyote Creek Riparian Station in Volunteer Monitoring Protocols: A reference guide for monitoring California's rivers, streams and watersheds. San Francisco Estuary Institute, CA. Page 4.

SURVEY QUESTIONS:

The drop-down menu on the data logger will prompt different ranges of percent cover. This is an example of how the drop down menu on the GPS unit will look:

- ☐ 0 %
- ☐ 1-25 %
- ☐ 26-50 %
- ☐ 51-75 %
- ☐ 76-99 %
- ☐ 100 %

Select the appropriate range for each of the vegetation cover questions.

LEFT BANK COVER:

Remember that left bank is determined by looking downstream. Bank covered by woody brush, grasses, bare ground, or manicured landscaping (lawn) should be estimated and recorded.

__ # of Trees

__ % Brush (woody)

__ % Herbaceous (grass, vines and all non-woody plants)

__ % Bare (unvegetated)

RIGHT BANK COVER:

Remember that right bank is determined by looking downstream.

__ # of Trees

__ % Brush (woody)

__ % Herbaceous (grass, vines and all non-woody plants)

__ % Bare (unvegetated)

IN-STREAM COVER:

__ % None (open water or bare dry bed)

__ % Emergent (coming out of the water: cattails, etc)

__ % Submergent (underwater)

__ % Floating (on surface of water)

INVASIVE PLANTS

GPS Survey: Invasive Plants

WHAT IS AN INVASIVE PLANT?

INVASIVES are plants that take over and crowd out other vegetation. Common riparian invasives in Contra Costa County include Arundo, Ivy, Thistle, and Vinca.

HOW DO WE COLLECT DATA ON INVASIVE PLANTS?

More than one invasive can be documented with one point. The GPS unit will log your location every second. To ensure location accuracy you must have a minimum of 90 counts of satellite communication (90 seconds). Be sure to answer all the questions and check the count before moving on to the next data collection point.

WHY SHOULD WE COLLECT DATA ON INVASIVE PLANTS?

Invasives can quickly alter an ecosystem. By identifying where the invasive plants are located and the extent to which they are prevalent, we can plan removal, eradication and restoration efforts.

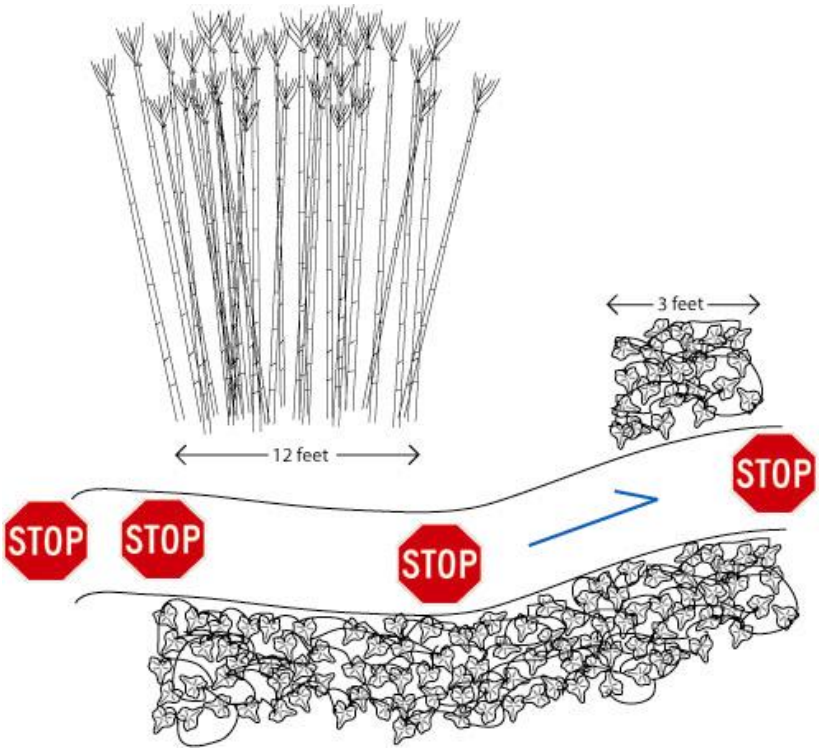
SURVEY QUESTIONS:

TYPE:

The types of invasive plants are included in the GPS unit. If more than one type is present at a data point, indicate which is most predominant by selecting it as "main type" and the others as types 2 or 3. At the upstream end of a stand, "None" should be selected.

SIZE:

The size of the stand of invasive plants should be documented on both the upstream and downstream ends if the extent of the stand is longer than 5 feet along either bank. If the stand is less than 5 feet, it should be documented on the downstream end only and marked as size "< 5 feet". See illustration at right.



LEFT BANK INVASIVES

Remember that left bank is determined by looking downstream.

- ☐ None
- ☐ Arundo (*Arundo Donax*)
- ☐ Broom (*Genista monspessulana and Cytisus scoparius*)
- ☐ Ivy (*Delairea odorata, Hedera sp.*)
- ☐ Pampas Grass (*Cortaderia sp.*)
- ☐ Invasive Blackberry (*Rubus discolor*)
- ☐ Giant Thistle (*Cynara cardunculus*)
- ☐ Star Thistle (*Centaurea solstitialis*)
- ☐ Tree of Heaven (*Ailanthus altissima*)
- ☐ Vinca (periwinkle or *Vinca sp.*)
- ☐ Other/Unsure_____ (please describe on data sheet)

RIGHT BANK INVASIVES

Remember that right bank is determined by looking downstream.

- ☐ None
- ☐ Arundo (*Arundo Donax*)
- ☐ Broom (*Genista monspessulana and Cytisus scoparius*)
- ☐ Ivy (*Delairea odorata, Hedera sp.*)
- ☐ Pampas Grass (*Cortaderia sp.*)
- ☐ Invasive Blackberry (*Rubus discolor*)
- ☐ Giant Thistle (*Cynara cardunculus*)
- ☐ Star Thistle (*Centaurea solstitialis*)
- ☐ Tree of Heaven (*Ailanthus altissima*)
- ☐ Vinca (periwinkle or *Vinca sp.*)
- ☐ Other/Unsure_____ (please describe on data sheet)

IN-STREAM INVASIVES

- ☐ None
- ☐ Arundo (*Arundo Donax*)
- ☐ Pampas Grass (*Cortaderia sp.*)
- ☐ Tree of Heaven (*Ailanthus altissima*)
- ☐ Vinca (periwinkle or *Vinca sp.*)
- ☐ Other/Unsure_____ (please describe on data sheet)

CHANNEL AND BANK COMPOSITION

GPS Survey: Bank Composition

WHAT ARE BANK CHANNEL LOCATION AND BANK COMPOSITION?

CHANNEL is used to describe the physical path of the stream.
BANK COMPOSTION describes the actual material that supports the banks.

HOW DO WE COLLECT DATA ON BANK AND CHANNEL LOCATION?

Indicate a new segment each time bank composition changes. It is a priority to map constructed/altered areas. If the bank is part constructed and part natural, it should be documented as having a constructed (concrete, riprap, etc.) bank composition and its location (upper, middle, lower) on the bank.

SURVEY QUESTIONS:

WHY SHOULD WE COLLECT DATA ON BANK COMPOSITION?

The data that is collected will represent the channel of the creek. Channel location data will provide a 'ground-truthing' of the location of creeks. The data will be used to create accurate creek maps by combining the data with recently flown aerial photos.

We want to identify natural and unnatural banks along creeks. Bank composition (in combination with other parameters) provides useful information about bank stability and helps determine restoration potential.

LEFT BANK COMPOSITION:

Remember that left bank is determined by looking downstream. Bank composition may not be obvious. Vegetation can be thick and hide alterations to the bank.
It is important to look carefully at the entire bank.

It is a priority to map constructed/altered banks. If a bank is part constructed and part natural, document it as a constructed (concrete, riprap, etc.) bank composition.

- ☐ Natural
- ☐ Concrete
- ☐ Crib Wall
- ☐ Gabion
- ☐ Riprap
- ☐ Other _____

LEFT BANK PLACEMENT:

Indicate the area of bank that is covered by the chosen bank composition.

- ☐ All
- ☐ Lower bank
- ☐ Middle bank
- ☐ Upper bank

RIGHT BANK COMPOSITION:

Remember that right bank is determined by looking down stream.

- ☐ Natural
- ☐ Concrete
- ☐ Crib Wall
- ☐ Gabion
- ☐ Riprap
- ☐ Other _____ (describe on a data sheet)

RIGHT BANK PLACEMENT:

Indicate the area of bank that is covered by the chosen bank composition.

- ☐ All
- ☐ Lower bank
- ☐ Middle bank
- ☐ Upper bank

BRIDGES

GPS Survey: Bridges

WHAT IS A BRIDGE?

A **BRIDGE** is defined as any constructed crossing of the stream. Types of bridges include road, rail and pedestrian.

HOW DO WE COLLECT DATA ON BRIDGES?

The GPS unit will log your location every second. To ensure location accuracy you must have a minimum of 90 counts of satellite communication (90 seconds). Be sure to answer all the questions and check the count before moving on to the next data collection point.

Location should be documented by standing on the **downstream** side of the bridge/overpass over the middle of the creek. If you do not have access to the overpass, stand as close to the structure as possible on the downstream side and take the reading and record the offset (how far you are from the middle of the creek).

SURVEY QUESTIONS:

BRIDGE PRIMARY USE:

In some cases our creeks flow underground for significant distances. In such cases, check "under urban area" icon. Under Lanes, also check "under urban area".

- ☐ Auto
- ☐ Train
- ☐ Pedestrian
- ☐ Under urban area

LANES:

- ☐ 1
- ☐ 2
- ☐ 3
- ☐ >4
- ☐ Under urban area

HEIGHT OF BRIDGE:

Height should be measured from bottom of stream to bottom of bridge.

- ☐ < 5 feet
- ☐ 5.1 to10 feet
- ☐ 10.1 to15 feet
- ☐ > 15.1 feet

WHY SHOULD WE COLLECT DATA ON BRIDGES?

It is important to collect data on bridges to evaluate their impacts to our creeks. Bridges can interrupt habitat, alter water flow, cause changes to the substrate and contribute to surface runoff pollution. Bridge construction and use often cause significant changes to the substrate of streams, for this reason, data on substrate should be collected at bridges as well as at the "50 Ft Interval."

TYPE OF CROSSING:

- ☐ Arch
- ☐ Box Culvert
- ☐ Multiple-Box Culvert
- ☐ Concrete Pipe (Reinforced)
- ☐ Metal Pipe (Corrugated)
- ☐ Multiple Pipe Culvert
- ☐ Pier
- ☐ Other _____

SUBSTRATE COMPOSITION:

Substrate describes the material that makes up the bed of a creek. Evaluate the nature of the particles in the creek in a 5-foot wide transect between channel banks. You will often find that the substrate is composed of a variety of sizes of material. Record the type of substrate in the percentage classes (see below) for the 5-foot wide transect. Percentages should add up to 100%.

☐ 0% ☐ 1 – 25% ☐ 26 – 50% ☐ 51 – 75% ☐ 76-100%

- ☐ Silt/Clay/Mud – substrate has a sticky cohesive feeling. Smallest size, unable to distinguish particles (not gritty between fingers)
- ☐ Sand – up to 0.1 inch in diameter (visible as particles, feels gritty)
- ☐ Gravel – 0.1 inch to 2 inches in diameter (ladybug to tennis ball size)
- ☐ Cobble– 2 to 10 inches in diameter (tennis ball to basketball size)
- ☐ Boulder – 10 inches in diameter (basketball to car size)
- ☐ Bedrock – solid rock (or bigger than car)
- ☐ Cement - or other constructed surface

OUTFALLS

GPS Survey: Outfalls

WHAT IS AN OUTFALL?

For our purposes, an **OUTFALL** is any tributary into or potential source of water for the creek. In addition to natural tributaries, storm-water drains, irrigation ditches, and pipes that discharge into a channel are considered outfalls. There also may be in-stream outfalls, such as combined sewer overflows or pipes located in the bed of the creek, or pipes carrying water out of the creek.

HOW DO WE INCLUDE OUTFALLS IN OUR DATA COLLECTION EFFORTS?

The GPS unit will log your location every second. To ensure location accuracy you must have a minimum of 90 counts of satellite communication (90 seconds). Be sure to answer all the questions and check the count before moving on to the next data collection point.

Where multiple outfalls are located at the same place, record a cluster. Take one full reading for one point. For each additional outfall answer all the survey questions and gather at least 20 satellite counts. See "How to Collect a Point: Clusters" for more detailed information.

SURVEY QUESTIONS:

OUTFALL LOCATION:

Remember that bank side is determined by looking downstream. These points may be taken at the outfall (off-set), rather than in the thalweg of the channel.

- ☐ LB (Left Bank)
- ☐ RB (Right Bank)
- ☐ In-Stream

TYPE:

- ☐ Constructed (culverts, drains, etc.)
- ☐ Natural (natural tributaries)
- ☐ Unsure _____(describe structure on data sheet.)

WHY SHOULD WE COLLECT DATA ON OUTFALLS?

It is important to identify outfalls to our creeks. Knowing where water enters a creek helps us anticipate water quality and flow levels. Many of the outfalls on out creeks are not currently mapped. These factors impact the overall health of our ecosystem, erosion rates and flooding possibilities. Specifically, outfall locations and their attributes will help us understand our creek's water sources, identify possible pollutant sources, record areas that need maintenance.

FLOWING:

- ☐ Yes
- ☐ No

WIDTH AT ENTRANCE TO CREEK: (pipe or natural)

For pipes and culverts, size should be based on its diameter. For drains and natural tributaries, size should be based on width of the outfall at its confluence with the stream or channel.

- ☐ < 6-inch wide
- ☐ 6.1 inches to 2 ft wide
- ☐ > 2.1 ft wide

HEIGHT:

Measure from bottom of channel to bottom of outfall.

- ☐ <1 ft
- ☐ 1.1 to 3 ft
- ☐ 3.1 to 6 ft
- ☐ 6.1 to 9 ft
- ☐ >9 .1 ft

DEBRIS JAMS

GPS Survey: Debris Jam

WHAT IS A DERBIS JAM?

For our purposes, a **DEBRIS JAM** is any non-permanent blockage of stream flow. Debris jams can be made of natural materials or trash. They can block flow across the entire channel or only part of the channel.

HOW DO WE INCLUDE DEBRIS JAMS IN OUR DATA COLLECTION EFFORTS?

The GPS unit will log your location every second. To ensure location accuracy you must have a minimum of 90 counts of satellite communication (90 seconds). Be sure to answer all the questions and check the count before moving on to the next data collection point.

WHY SHOULD WE COLLECT DATA ON DEBRIS JAM?

Debris jams can be amenities to our creeks. They can provide important habitat for fish and other creatures. However, debris jams can also have detrimental impacts. They can divert or block stream flow causing erosion, or collect garbage creating a hazardous environment for in-stream organisms and local wildlife.

SURVEY QUESTIONS:

LOCATION:

Remember that bank side is determined by looking downstream.

- ☐ LB (Left Bank)
- ☐ RB (Right Bank)
- ☐ Center (not attached to either bank)
- ☐ Across Stream (entire length)

COMPOSITION:

- ☐ 76-100% natural (debris)
- ☐ 51-75% natural (debris)
- ☐ 26-50% natural (debris)
- ☐ 0-25% natural (debris)

DAMS

GPS Survey: Dams

WHAT IS A DAM?

A **DAM** is a manmade structure that blocks water flow along a stream channel, creating an upstream reservoir. Dams vary greatly in purpose, size, and impact to ecosystems.

HOW DO WE COLLECT INFORMATION ON DAMS?

The GPS unit will log your location every second. To ensure location accuracy you must have a minimum of 90 counts of satellite communication (90 seconds). Be sure to answer all the questions and check the count before moving on to the next data collection point.

WHY SHOULD WE COLLECT DATA ON DAMS?

Dams impact the hydrology, habitat, and water quality of streams. Specifically, dams can be barriers to fish movement, trap sediment, and reduce water flow. By knowing the size and location of dams, we can better understand the significance of these impacts in our watersheds.

SURVEY QUESTIONS:

FISH LADDER:

A fish ladder is a series of shallow pools that provide a route for fish to travel upstream. This passage can be man-made or natural.

- ☐ Yes
- ☐ No

HEIGHT OF DAM:

You will need to measure the height on the downstream side of the structure (from bottom of pool to top of structure). Ranges are provided in the drop-down menus.

- ☐ < 1 foot
- ☐ 1 - 3 ft
- ☐ 3.1 - 6 ft
- ☐ 6.1 - 9 ft
- ☐ 9.1 - 12 ft
- ☐ >12.1 ft

DROP STRUCTURES

GPS Survey: Drop Structure US, Drop Structure DS

WHAT IS A DROP STURCTURE?

A **DROP STRUCTURE** is a constructed feature that slows water flow often resulting in a drop in the channel depth. They can take the form of a long slough ending with a drop in elevation, or they can be short in length. For the purposes of this data collection effort, we are documenting vertical waterfalls as natural drop structures.

WHY SHOULD WE COLLECT DATA ON DROP STRUCTURES?

Drop structures alter the natural flow of the creek. They can impact erosion rates, habitat quality, stream passage, and substrate condition.

HOW DO WE INCLUDE DROP STRUCTURES IN OUR DATA COLLECTION EFFORTS?

Drop structures will be documented as up to THREE POINTS. One point will be at the upstream origin and a second point at the 'drop', and the third point will document the downstream terminus of the structure. This will give us the position and length along the channel of the structure.

The GPS unit will log your location every second. To ensure location accuracy you must have a minimum of 90counts of satellite communication (90 seconds). Be sure to answer all the questions and check the count before moving on to the next data collection point.

SURVEY QUESTIONS:

Drop:

TYPE: The drop may be natural (a waterfall) or constructed.

- ☐ Constructed
- ☐ Natural

FISH LADDER:

A fish ladder is a series of shallow pools that provide a route for fish to travel upstream. This passage can be man-made or natural.

- ☐ Yes
- ☐ No

HEIGHT OF STRUCTURE:

You will need to measure the height on the downstream side of the structure (from bottom of pool to top of structure). Select the range in which your measurement falls.

- ☐ < 1 foot
- ☐ 1 - 3 ft
- ☐ 3.1 - 6 ft
- ☐ 6 .1 - 9 ft
- ☐ 9.1 - 12 ft
- ☐ > 12.1 ft

STRUCTURES

GPS Survey: Structures

WHAT IS A STRUCTURE?

Buildings, decks, power boxes, etc. are considered STRUCTURES.

HOW DO WE COLLECT DATA ON STRUCTURES?

The GPS unit will log your location every second. To ensure location accuracy you must have a minimum of 90 counts of satellite communication (90 seconds). Be sure to answer all the questions and check the count before moving on to the next data collection point.

SURVEY QUESTIONS:

LOCATION:

Remember that bank side is determined by looking downstream.

- ☐ LB (Left Bank)
- ☐ RB (Right Bank)
- ☐ Center (not attached to either bank)
- ☐ Across Stream (entire length)

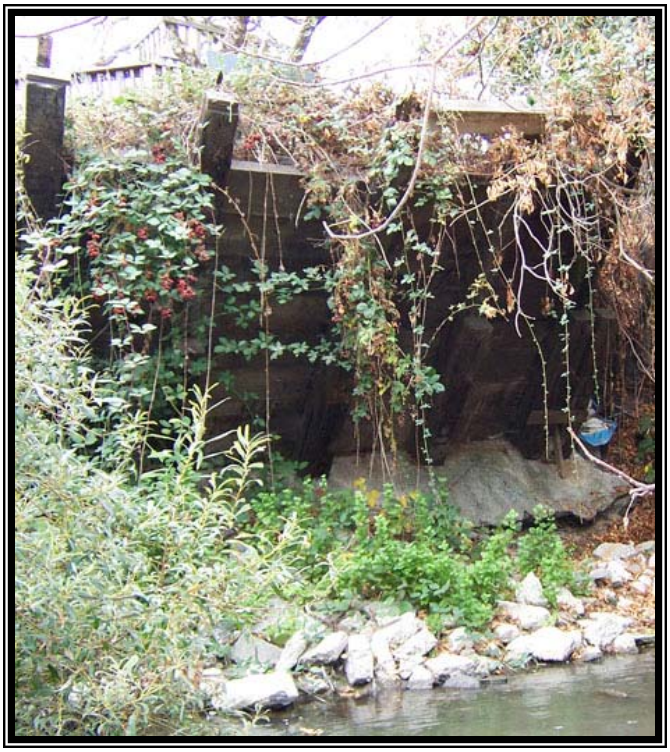
TYPE:

- ☐ Solid (building)
- ☐ Overhanging (deck on stilts)
- ☐ Floating (dock)
- ☐ Other _____

(describe structure on data sheet)

WHY SHOULD WE COLLECT DATA ON STRUCTURES?

STRUCTURES can impact wildlife habitat and access to the stream. Some structures may be at risk due to bank failure and are potential safety hazards. Some structures such as viewing decks can be amenities to our creeks.



SPECIAL AREAS

GPS Survey: Special Areas

WHAT IS A SPECIAL AREA?

As you walk your creeks you may come across things that are important that don't fall neatly into another category. These points will be captured as **SPECIAL AREAS**.

HOW DO WE INCLUDE SPECIAL AREAS IN OUR DATA COLLECTION?

The GPS unit will log your location every second. To ensure location accuracy you must have a minimum of 90 counts of satellite communication (90 seconds). Be sure to answer all the questions and check the count before moving on to the next data collection point.

WHY SHOULD WE COLLECT DATA ON SPECIAL AREAS?

The drop down menu lists situations that community groups and technical experts mentioned as other areas of special interest. They relate directly to creek health, water quality, safety, and infrastructure.

SURVEY QUESTIONS:

LOCATION:

Remember that bank side is determined by looking downstream.

- ☐ LB (Left Bank)
- ☐ RB (Right Bank)
- ☐ LB & RB (Left Bank and Right Bank)
- ☐ In Stream
- ☐ All

TYPE:

- ☐ Severe Erosion (document at the downstream end of the eroded section)
- ☐ Dumping Area (document at the downstream end of the dumping area)
- ☐ Broken Pipe
- ☐ Pipe Crossing Stream
- ☐ Other _____ (please describe on data sheet.)

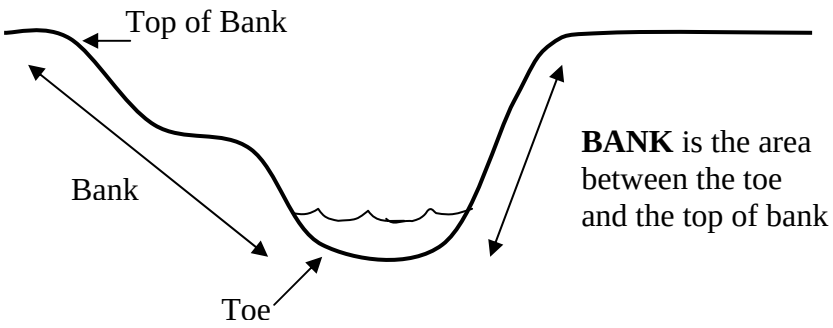
- **Severe Erosion:** Describes areas where there is obvious slope failure and erosion. Identifies areas of significant sediment deposition.
- **Dumping Area:** Describes areas regularly used to dump large amounts of garbage and other waste such as tires, cars, mattresses etc.
- **Broken Pipe:** Describes utility, sewage and other pipes that are contributing pollution to streams because they are broken.
- **Pipe Crossing Stream:** Describes pipes that completely cross streams. Identifies exposed pipes and potential for failure.

WATERSHED ATLAS GLOSSARY

These terms and phrases are defined for use with the protocols used for data collection by the Contra Costa Watershed Forum.

Arch: For the purposes of the CCWF data collection effort, arch refers to the shape and design structure of a bridge. The important characteristic of an arched bridge is that does not have piers that are in the streambed.

Bank:



Bank Side: The sides of the channel around the creek. **Left Bank** and **Right Bank** are determined by facing downstream. The label 'left' or 'right' refers to the left or right side of the flowing water.

Bare: Unvegetated.

Boulder: Rocks from 10 inches in diameter to car sized. (Substrate classification system adapted from: US Environmental Protection Agency Office of Water. *Volunteer Stream Monitoring: A Methods Manual* (1997) [online]. www.epa.gov/owow/monitoring/volunteer/stream (May 16, 2001). Section 4.2)

Box Culvert: A box shaped culvert is typically used when a road passes over a creek. Two or more of these boxes can be placed side by side to create a multiple box culvert.

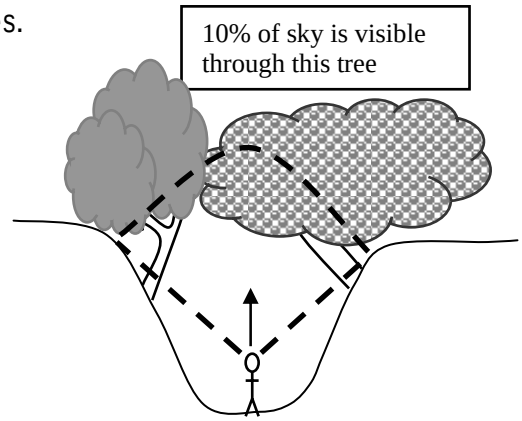
Single box culvert on Strawberry Creek at Shattuck Avenue in Berkeley, CA.

Broken Pipe: Describes utility, sewage and other pipes that are contributing pollution to streams because they are broken.

Brush: Woody vegetation with trunks less than 2 inches in diameter or less than 10

feet tall. Also referred to as shrubs, scrub, and bushes.

(Fischer, Christina et. al. (1996). *Vegetation Survey Protocol*, Coyote Creek Riparian Station in Volunteer Monitoring Protocols: A reference guide for monitoring California's rivers, streams and watersheds. San Francisco Estuary Institute, CA. Page 4.)



76% - 100% SHADE COVER

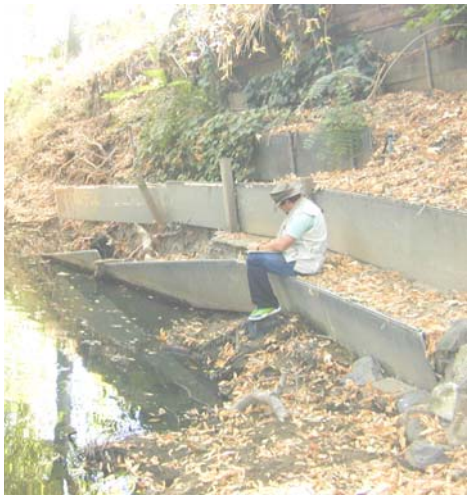
Canopy Cover: The percent of sky covered by vegetation. (Oregon Watershed Enhancement Board (1999). Addendum to *Oregon Water Quality Monitoring Technical Guide Book: Stream Shade and Canopy Cover Monitoring Methods* [online] www.oweb.state.or.us/pdfs/monitoring_guide/monguide2001_ch14.pdf. (March 16, 2002). Page 14-5).

Cobble: Rocks that are 2-10 inches in diameter. (Substrate classification system adapted from: US Environmental Protection Agency Office of Water. *Volunteer Stream Monitoring: A Methods Manual* (1997) [online]. www.epa.gov/owow/monitoring/volunteer/stream (May 16, 2001). Section 4.2)

Constructed: Unnatural. Alterations to the natural environment.

Corrugated Metal Pipe: Pipe commonly used to channel streams under roads or underground.

Crib Wall: A retaining wall made of interlocking concrete or timber sections with earth or gravel fill in between.



Crib Wall in Alhambra Creek, CA

Dam: Manmade structure that blocks water flow along a stream channel creating an upstream reservoir.

Data Logger: The person responsible for operating and entering data into the GPS unit.

Debris Jam: Any non-permanent blockage of stream flow. Debris jams can be made of natural or manmade materials.

Disconnected Pools: A series of pools of water not connected by surface flow.

Downstream: The direction water flows.

Dumping Area: Describes areas that are regularly used to dump large amounts of garbage and other waste such as tires, shopping carts, mattresses etc.

Drop Structure: A drop structure is a constructed feature that slows water flow. Drop structures can take the form of a long slough with a drop at the downstream end. It can also be a small drop as pictured to the right.

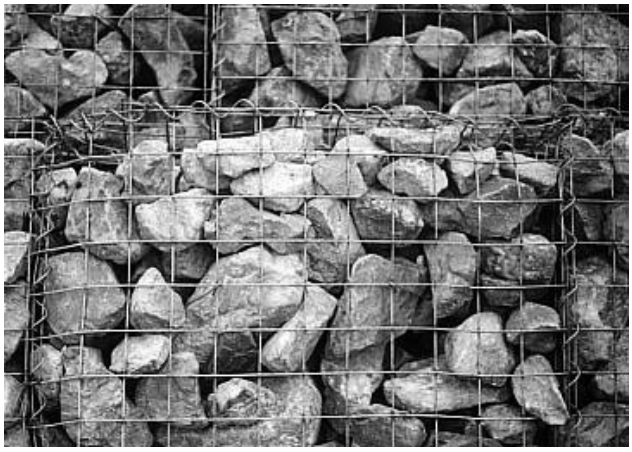
Drop Structures on Strawberry Creek downstream from Sather Gate, UC Berkeley, CA.

Fish Passage/ Fish Ladder: A route to enable fish to travel around a constructed barrier. This can be in the form of a series of pools moving up one side of the structure (a ladder) or a separate low flow channel around the obstruction.

Floating: Aquatic vegetation that has no roots connected to the creek bed.

Flowing: Moving water

Gabions:
Rocks bound in metal fencing (cages) often used to protect banks from erosion.



Gabion. Photo: Natural Building Resources [online] www.strawbalecentral.com/miscellaneous/misc3.html (July 11, 2001)

GIS: Geographic Information System is a general term used to describe a type database. GIS is used to store, manipulate and analyze geographic data. There are different types of programs that can be used. The most common way to view GIS data is in map form.

GPS: Global Positioning System is a term used to describe the network of satellites that orbit Earth and provide time and position information. There are 24 satellites operated by US Department of Defense that are available to communicate with GPS units (Trimble Pro XR Manual 1-1).

GPS unit: The GPS unit is a device that receives signals from satellites and can use the signals to determine its coordinates on the earth. GPS units need to receive signals from a minimum of four satellites to determine location.

Gravel: Rocks 0.1 – 2 inches in diameter. (Substrate classification system adapted from: US Environmental Protection Agency Office of Water. *Volunteer Stream Monitoring: A Methods Manual* (1997) [online]. www.epa.gov/owow/monitoring/volunteer/stream (May 16, 2001). Section 4.2)

Herbaceous: Grass, vines and all non-woody plants.

In-Stream Outfalls: Pipes that discharge into a channel are considered outfalls. Outfalls may be located "in-stream." For example, combined sewer overflows, which are not common (and are in fact illegal in CA), could be located in the bed of the creek.

Invasive plants: Plant species that crowd out other plant species. Invasive plants often spread rapidly and can dramatically change the ecosystem and habitat.

Line Feature: A series coordinates that represent the shape of a geographic feature, such as a river or road (ESRI Library Glossary [online]. http://www.esri.com/library/glossary/i_l.html#L (June 15, 2001))

Native/ Non-Native Plants: Native plants naturally occur in a specific region. Non-native plants are considered exotic plants and are usually introduced as ornamental vegetation (in landscaping), but are not naturally found in the region. Non-native plants may become invasive.

Natural debris: Organic debris from natural sources such as leaf litter, branches, bark, roots, vegetation, etc.

Outfall: Any contributing, or potentially contributing, source of water to a creek. Outfalls may be natural tributaries or constructed drainage pipes, culverts etc.

Orthographic photo: An orthographic-photo (ortho-photo) is an aerial photograph that has been corrected to remove distortions resulting from the curvature of the earth. The photo has also been overlaid with a grid system and geographically referenced (given coordinates). The corrected photos can be imported and integrated as data in a GIS.

Pier: Refers to a bridge support that is located in the stream channel.

Outfalls on Strawberry Creek near Sather Gate, UC Berkeley.

Point Feature: A single (x,y) coordinate that represents a geographic feature such as an outfall or bridge (ESRI Library Glossary [online]. http://www.esri.com/library/glossary/i_l.html#L (June 15, 2001)).

Pool: A location in an active stream channel, usually located on the outside bends of a meander, where the water is the deepest and has reduced current velocities (Riley, Ann (1998). *Restoring Streams in Cities: a guide for planners, policy makers and citizens*. Island Press, Washington, D.C. Page 408).

QA/QC: Quality Assurance/Quality Control is a strategy to ensure data is of the highest quality possible. A good QAQC strategy will help ensure usable data.

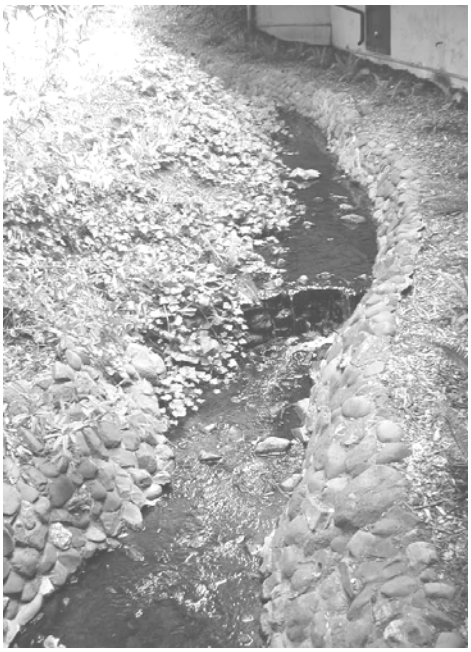
Reinforced Concrete Pipe: Large concrete pipe generally used to channel streams underground.

Riparian: Refers to the riverside or riverine environment next to the stream channel (Riley, Ann (1998). *Restoring Streams in Cities: a guide for planners, policy makers and citizens*. Island Press, Washington, D.C. p. 408). Riparian areas may have distinctly different vegetative species than adjacent areas, and/or, species similar to adjacent areas but exhibiting more vigorous or robust growth forms. These areas are transitional zones between wetland and upland. (Federal Interagency Stream Restoration Working Group (1998). *Stream Corridor Restoration: Principles, Processes and Practices*. p. 2-61).

Rip-rap: Heavy stones used to protect soil from the fast moving action of water **(**Riley, Ann (1998). *Restoring Streams in Cities: a guide for planners, policy makers and citizens*. Island Press, Washington, D.C., p.408).

Sand: Materials in a stream substrate up to .1 inch in diameter. Feels gritty to the touch. (Substrate classification system adapted from: US Environmental Protection Agency Office of Water. *Volunteer Stream Monitoring: A Methods Manual* (1997) [online]. www.epa.gov/owow/monitoring/volunteer/stream (May 16, 2001). Section 4.2.

Scribe: The person responsible for a data collection team's written materials. It is important that this person is meticulous in completing QAQC forms.



Rip-rap held in place by concrete along Strawberry Creek near the Men's Faculty Club, UC Berkeley, CA.

Severe Erosion: Describes areas where there is obvious slope failure and erosion. Identifies areas of significant loss deposition.

Shrub: Woody vegetation with trunks less than 2 inches in diameter or less than 10 feet tall. Also referred to as brush, scrub, and bushes (Fischer, Christina et. al. (1996). *Vegetation Survey Protocol*, Coyote Creek Riparian Station in Volunteer Monitoring Protocols: A reference guide for monitoring California's rivers, streams and watersheds. San Francisco Estuary Institute, CA. Page 4)

Silt/ Clay/ Mud: Substrate with fine particles. Feels sticky and cohesive, behaves like ooze. (Substrate classification system adapted from: US Environmental Protection Agency Office of Water. *Volunteer Stream Monitoring: A Methods Manual* (1997) [online]. www.epa.gov/owow/monitoring/volunteer/stream (May 16, 2001). Section 4.2)

Substrate: Describes the material that makes up the stream bed. (eg. Silt/clay/mud, sand, cobble, etc). (US Environmental Protection Agency, Office of Water. *Volunteer Stream Monitoring: A Methods Manual* (1997) [online]. www.epa.gov/owow/monitoring/volunteer/stream (May 16, 2001) Section 4.2).

Stagnant: Water that is not moving.

Terrace: A raised bank of earth having vertical or sloping sides and a flat top.

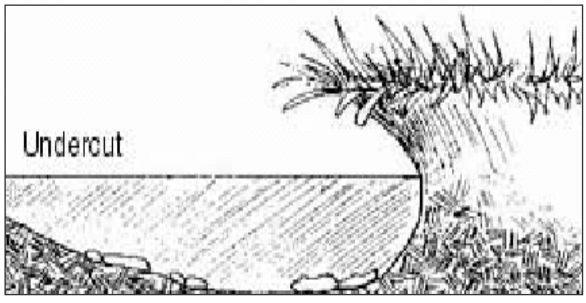
Thalweg: Deepest part of a creek

Toe: The break in slope at the foot of a stream bank where the bank meets the bed. (Riley, Ann (1998). *Restoring Streams in Cities: a guide for planners, policy makers and citizens*. Island Press, Washington, D.C. Page 410).

Top of Bank: Break in slope between the stream bank and the surrounding terrain (Riley, Ann and Mcdonald, Moira (1996). *Urban Waterways Restoration Training Manual for Youth Service and Conservation Corps*. Coalition to Restore Urban Waters Southwest Regional Office, Berkeley, CA. Gloss-169).

Tree: Any woody vegetation over 10 feet tall with a diameter of more than 2 inches (Fischer, Christina et. al. (1996). *Vegetation Survey Protocol*, Coyote Creek Riparian Station in Volunteer Monitoring Protocols: A reference guide for monitoring California's rivers, streams and watersheds. San Francisco Estuary Institute, CA. Page 4).

Undercut: A bank that rises vertically or overhangs the stream.



Undercut: from: EPA Volunteer Stream Monitoring: A Methods Manual

Upstream: The direction from which water flows.