The Establishment of Step-Pool Sequences in the Ephemeral Tributary of Dry Canyon Creek, Calabasas, California

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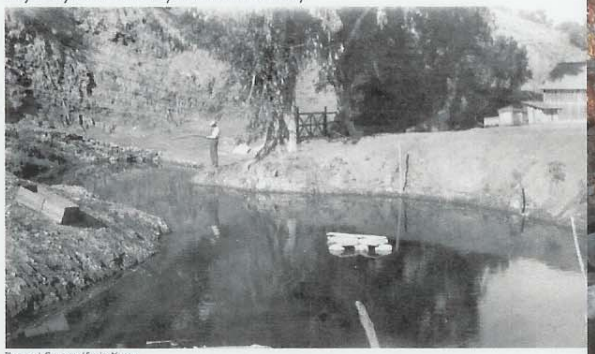
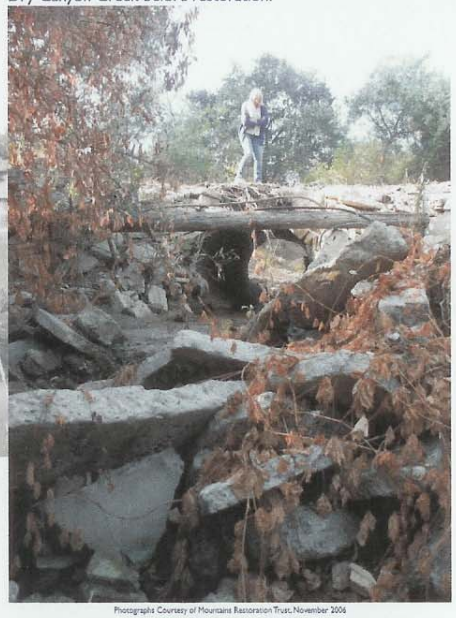
RESTORING A STREAM

Dry Canyon Creek early in the last Century.



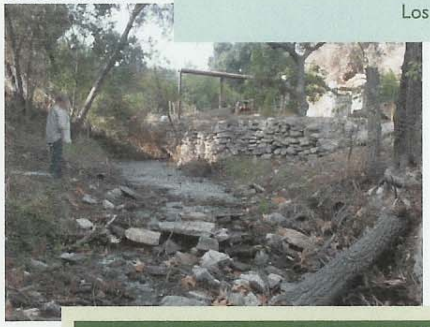
Photograph Courtesy of Stanley Masson

Dry Canyon Creek before restoration.



Photographs Courtesy of Mountains Restoration Trust, November 2006

Dry Canyon Creek before restoration.



VOICES

"A limpid little stream with willows hanging over its banks."

—William R. Mulholland describing the Los Angeles River

A LITTLE STREAM'S BIGGER PICTURE

Like many headwater streams, Dry Canyon Creek is far more significant than it first appears. Not just a "limpid little stream," it is actually the workhorse of the local ecology.

The water that flows through Dry Canyon Creek also permeates the soil and joins groundwater reserves. It nourishes hundreds of plant and animal species, and its health influences the entire downstream network of surface water, groundwater, and coastal beaches.

WHAT IS A HEADWATER STREAM?

Like delicate stems on a huge tree, tiny trickles of water run down hillside creases and connect — above and below ground — to create bigger rivulets. These eventually form what scientists call *headwater* streams.

HEADWATERS CORNER AT CALABASAS

WHY RESTORE A STREAM?

Healthy streams provide many "ecosystem services" that contribute to the overall well-being of plants, animals and humans!

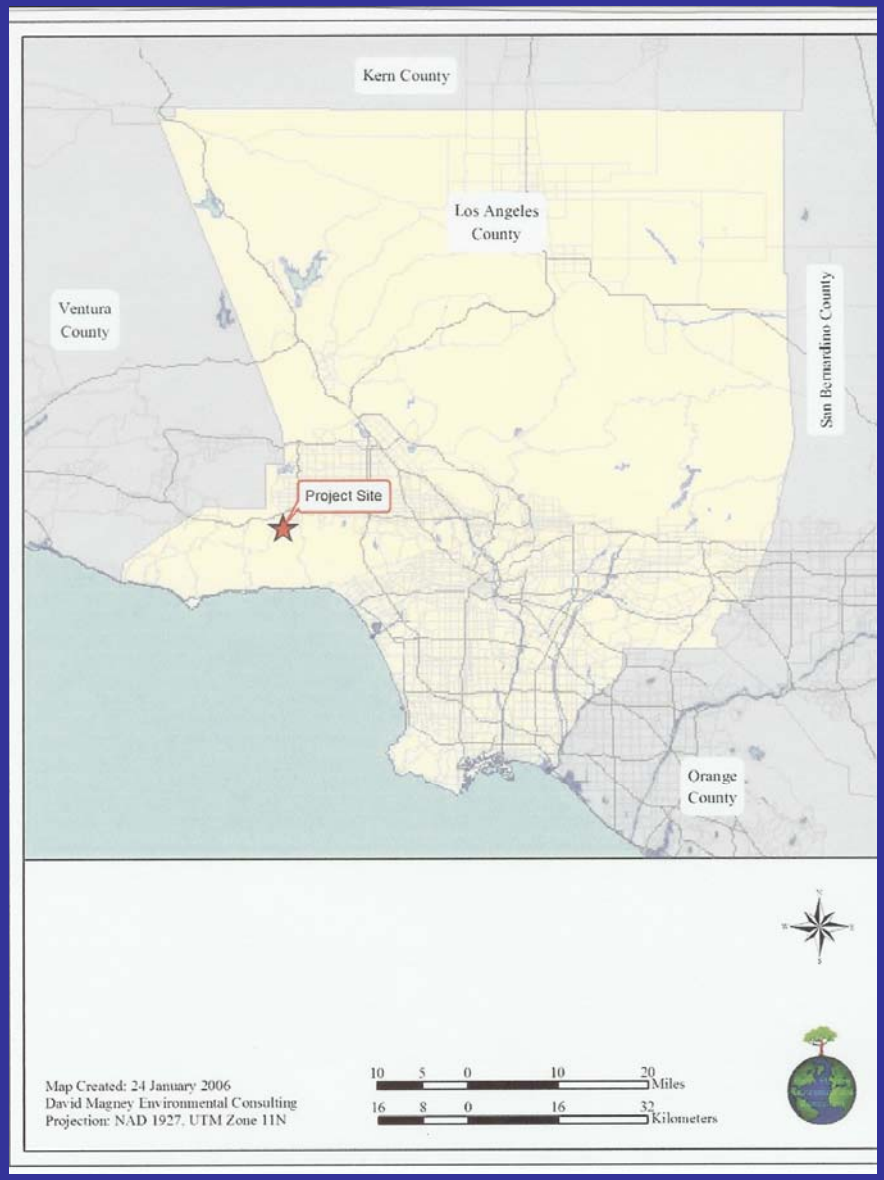
By making streambanks slope more gently, and by removing debris, concrete blocks and non-native plants, the ecosystem services are restored.

In time, this area will offer:

- improved air and water quality
- a respite from urbanization
- improved stream and riparian habitats
- reduced erosion from high winter flows.

See nature at work, with a little assistance from its friends, as Dry Canyon Creek continues to restore its watershed functions.

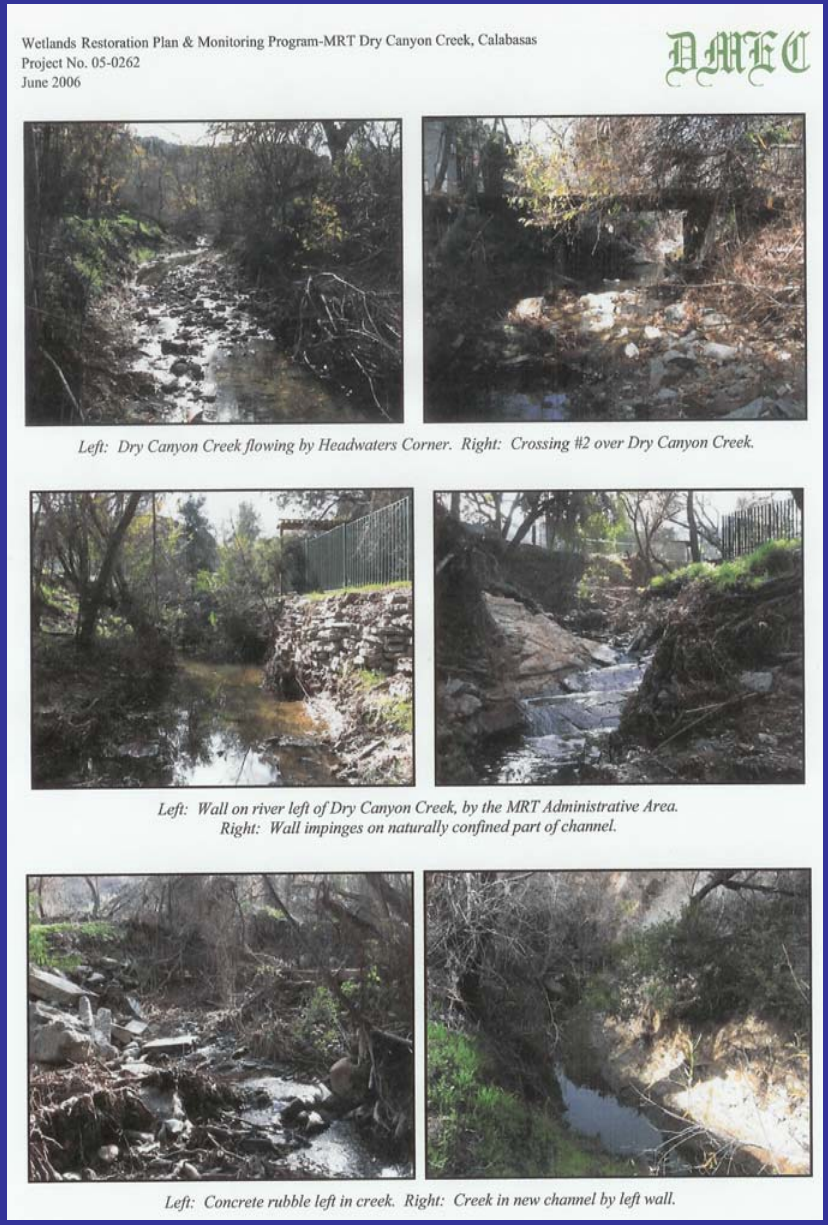
Dry Canyon Creek, Calabasas, California



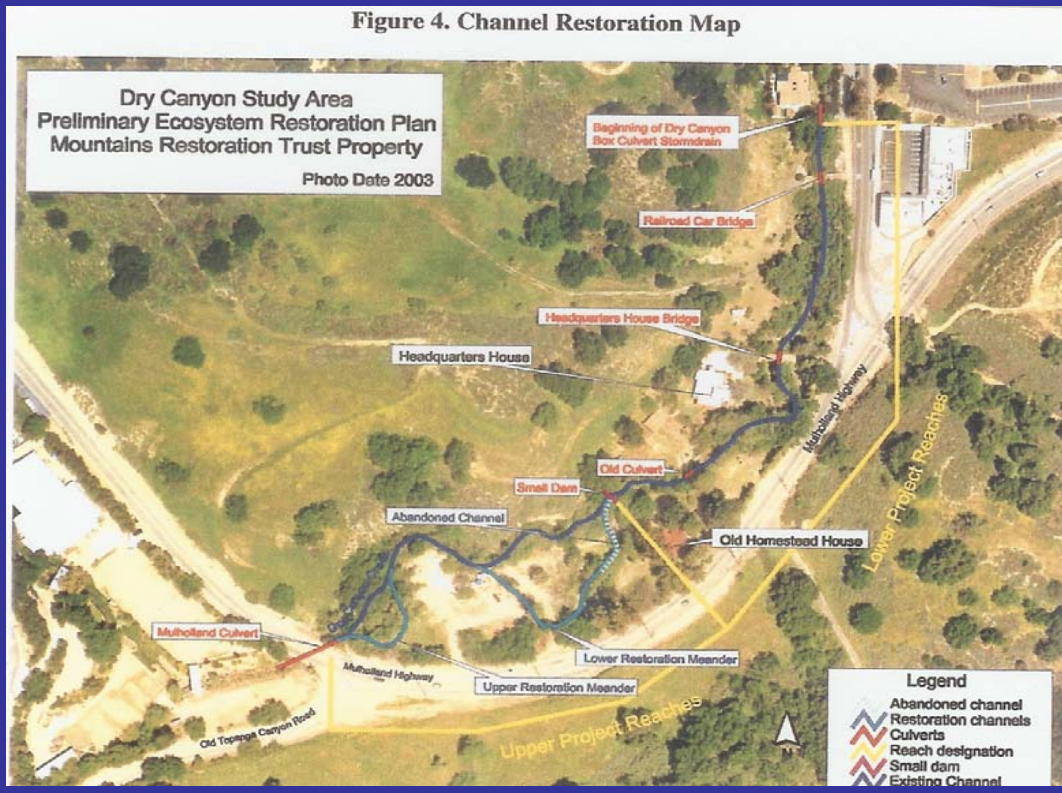
Stream Restoration

Objectives

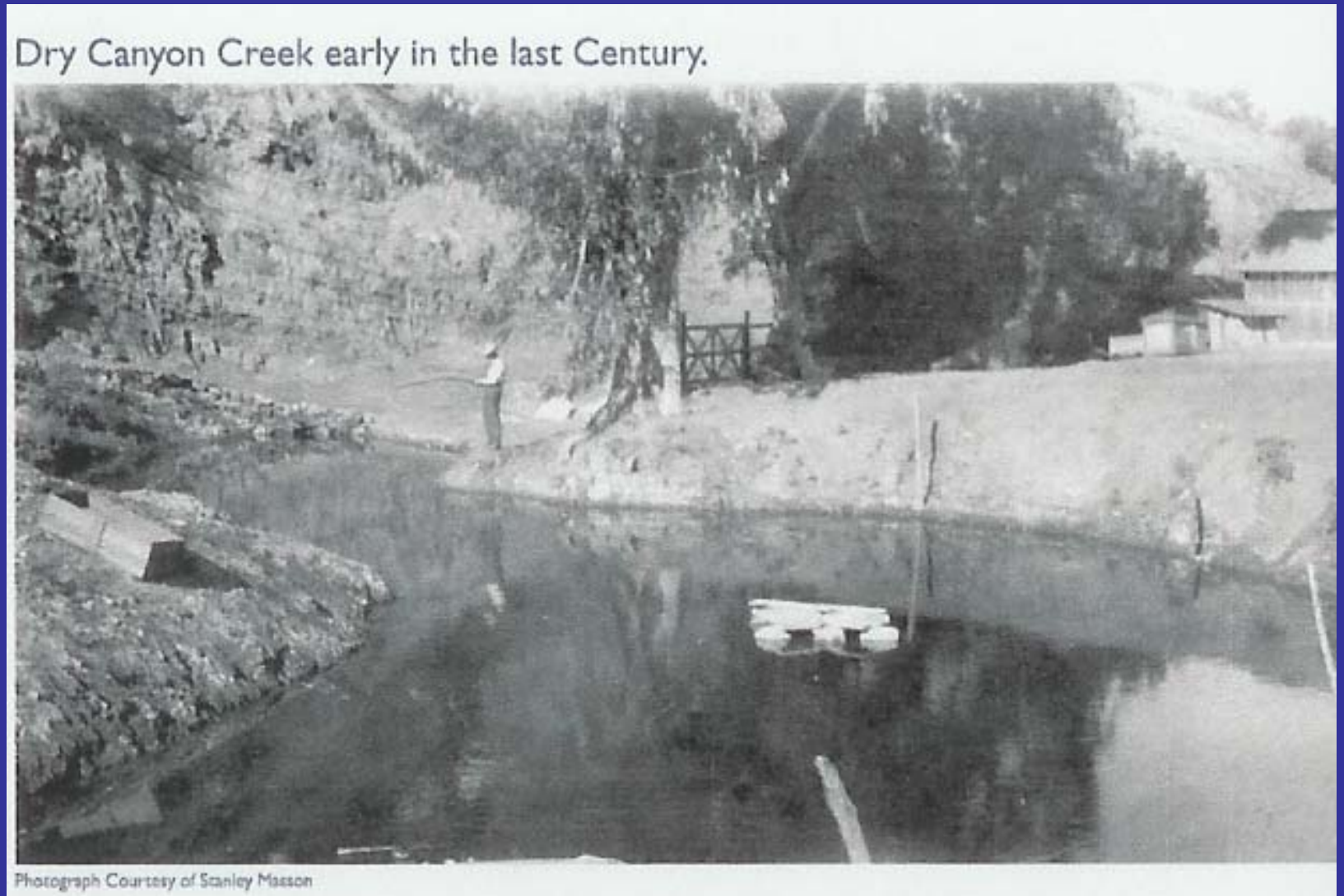
- To provide alternative methods for flood control and property protection.
- Physical restoration of channel system.
- Remove remnants of standard methods such as stream-lining and stream straightening using concrete or rock, rip rap bank stabilization and inappropriate instream structures including walls within the channel and undersized culverts.
- Replace undersized bridges.
- Floodplain and habitat restoration, enhancement or creation, improve functionality.
- Improve water quality.
- Develop environmentally-oriented recreation opportunities.
- Develop and implement educational programs that enhance knowledge of the resources and promote stewardship of the water and the land.



Abandoned and Filled Meander



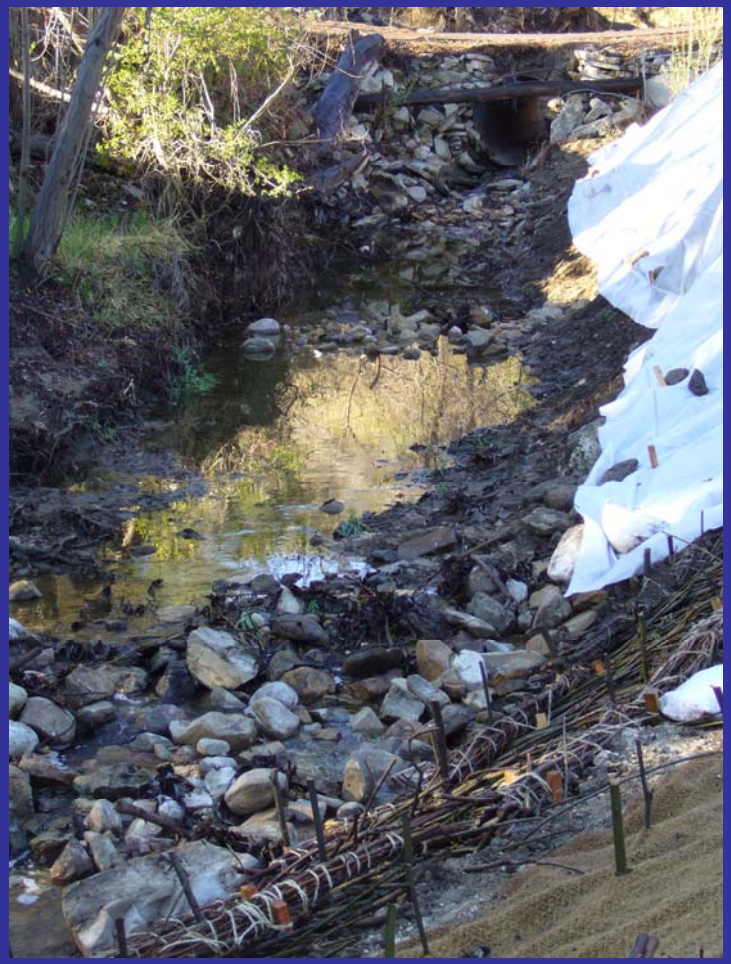
Dry Canyon Creek
Historic Meander



Dry Canyon Creek early in the last Century.

Photograph Courtesy of Stanley Masson

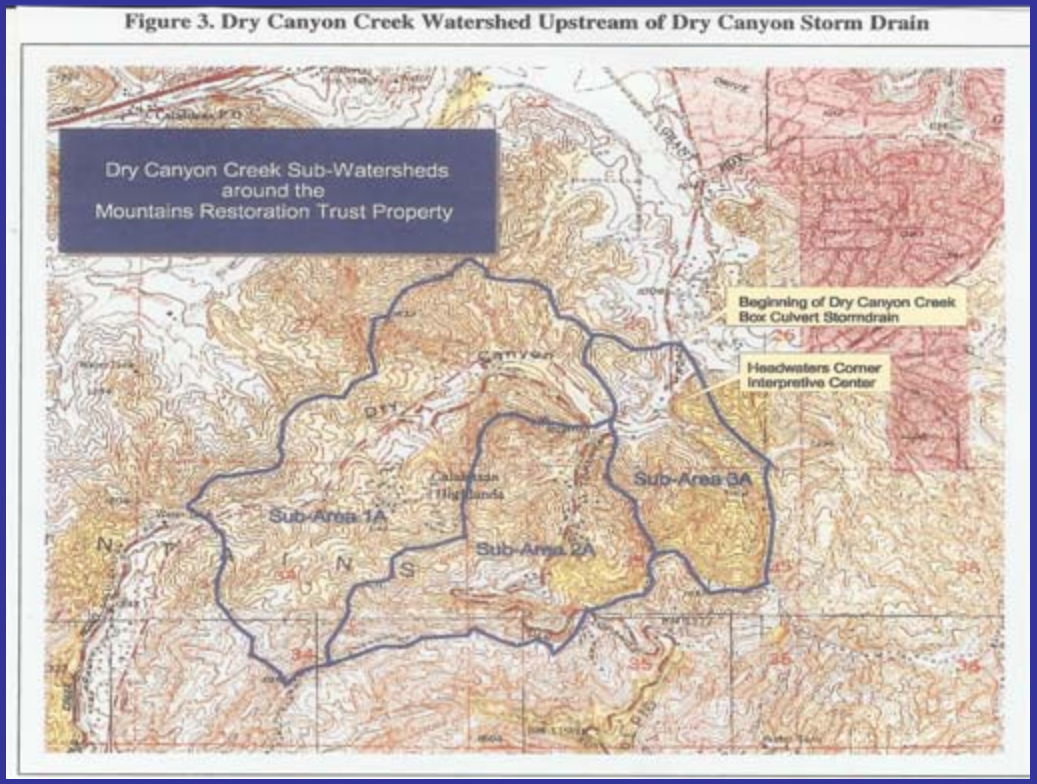
Stone Dam and Culvert



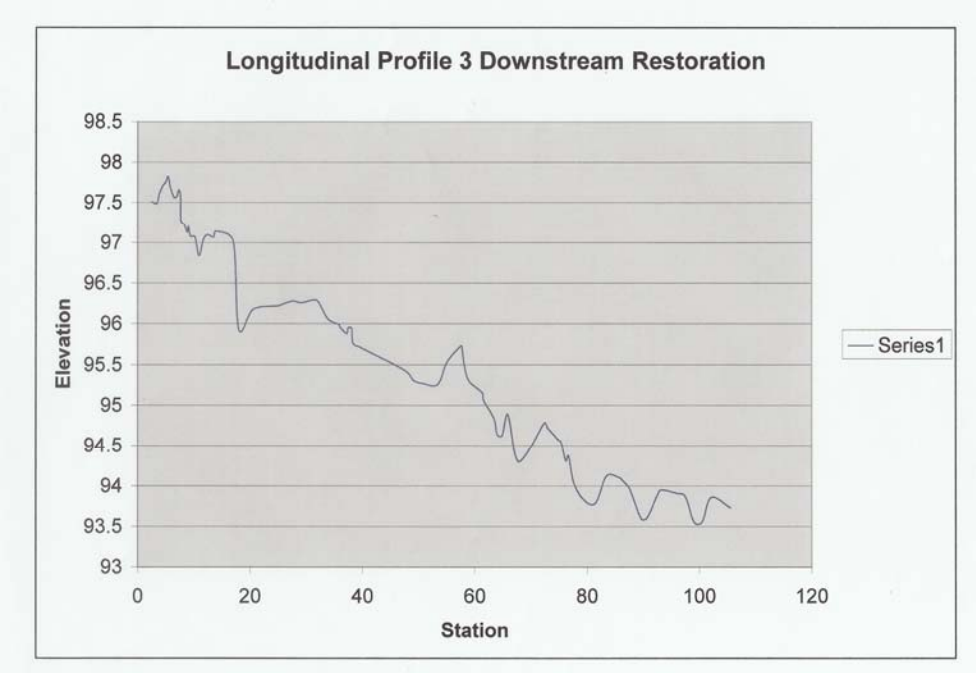
Dry Canyon Creek Drainage Basin

- Drainage areas

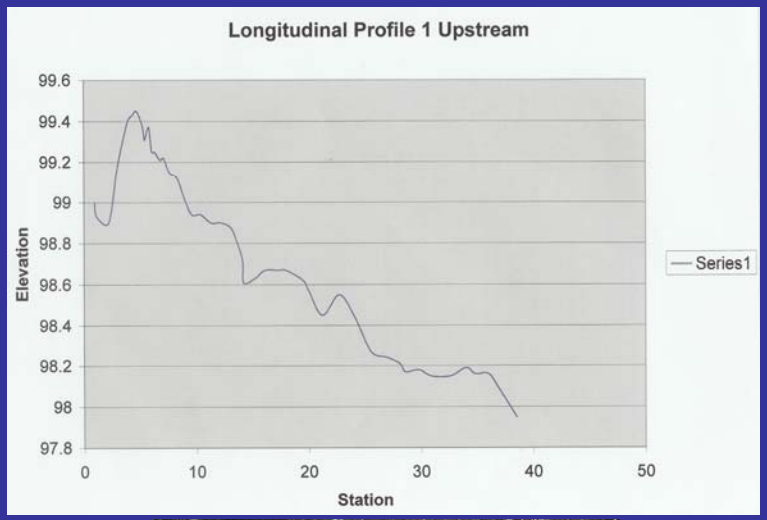
Sub-area 1A	0.76 sq. miles
Sub-area 2A	0.50 sq. miles
Sub-area 3A	0.30 sq. miles

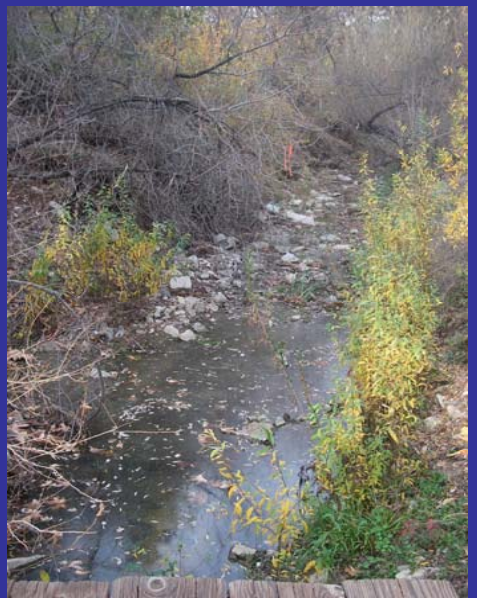


Dry Canyon Creek
Upstream Channel Profile

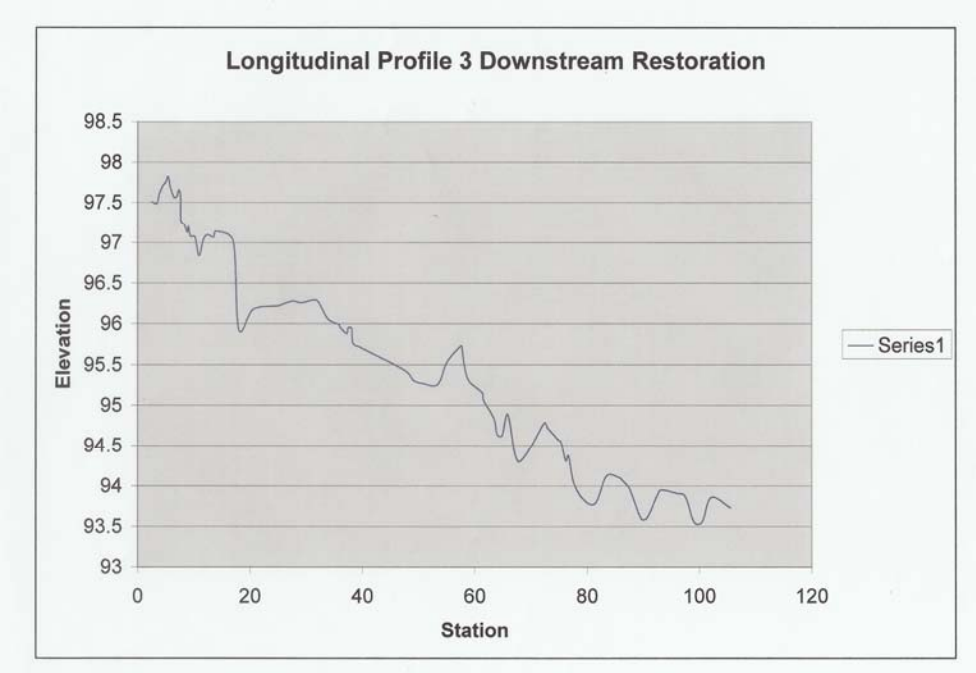


Dry Canyon Creek
Downstream Channel Profile

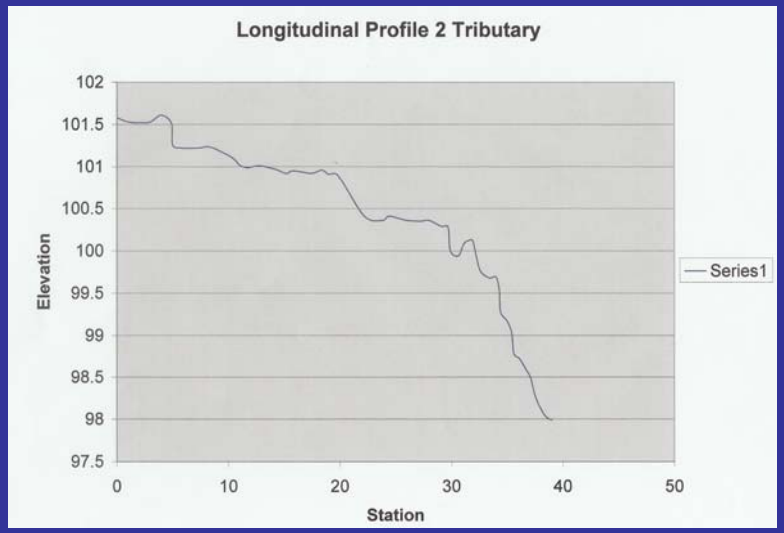


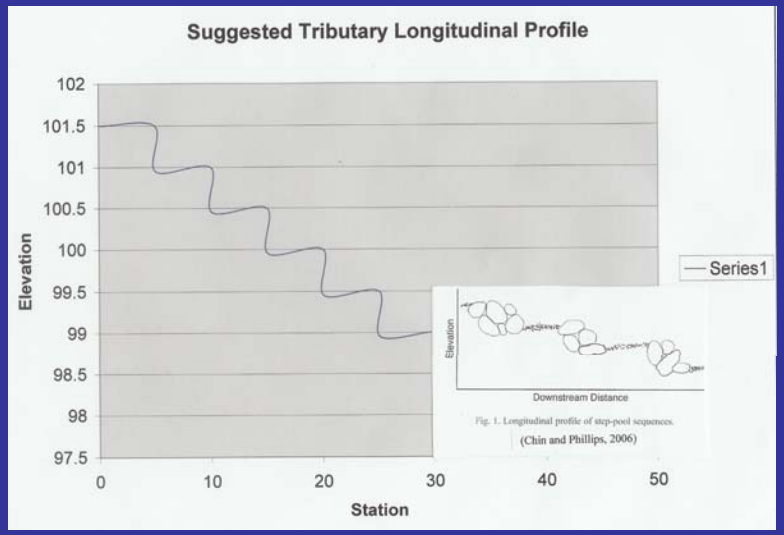


Dry Canyon Creek
Upstream Channel Profile



Dry Canyon Creek
Tributary Channel Profile





Restoration Objectives

Project Scope

- Revegetation and rehabilitation of channel and banks to more natural conditions.
- Restoration of historic channel form, reactivate abandoned and filled meander to reduce channel slope and erosion.
- Remove instream structures.
- Recontour steep bank gradients to create floodplain benches.
- Restoration and enhancement of aquatic and riparian habitats.
- Greening of structures and sites.
- Development of Masson House for historic and interpretive center.
- Monitor mitigation effectiveness and success.

Ideal Step-Pool Geometry

- An ideal step-pool geometry maximizes the resistance of flow and is regularly spaced (Abrahams et al. 1995)

- The following formula, derived to produce an ideal staircase has been used to estimate step height and wavelength for the ephemeral tributary (Chin and Phillips 2006)

$$h/L=C\sin 0$$

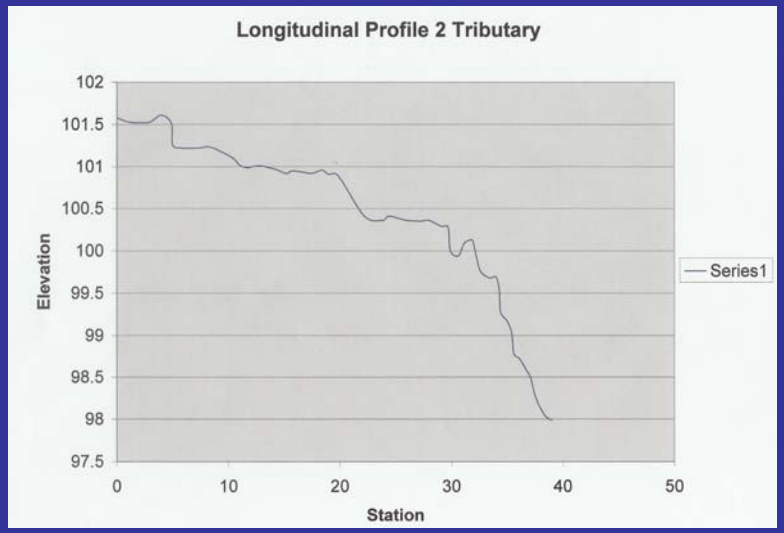
where h=step height L= length of tread (pool)

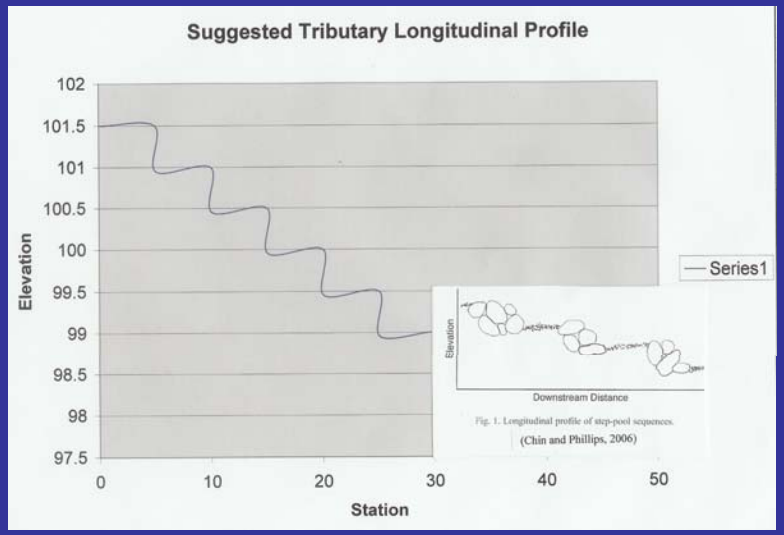
0=average bed slope

C=coefficient that accounts for reverse-shaped treads

Dr. Chin suggested the use of 1.3 for C

Dry Canyon Creek
Tributary Channel Profile





Step Length and Height Relations Relative to Slope

-
- $1.1 \leq (H/L)/S \leq 2.5$
  - Average (H/L)/S = 1.8
  - Value used was 1.3 to allow for scour

Tributary Under Construction

Dry Canyon Creek
Restored Tributary

Flow in the Ephemeral Tributary April 2007