

Trail Maintenance Report for the Western States Trail One Locality at a Step-Down Rock Bench North of Kaput Springs in El Dorado Canyon American River Ranger District, Tahoe National Forest *between Deadwood and Michigan Bluff, Placer County, California*

by **Greg Kimler**, Western States Trail Foundation, Board of Governors; AERC Trail Master; *Chief*, Tevis Trail Committee;
Michael Shackelford, Western States Trail Foundation, Board of Governors; AERC Trail Master; Tevis Trail Crew Boss
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May 17, 2013

Introduction

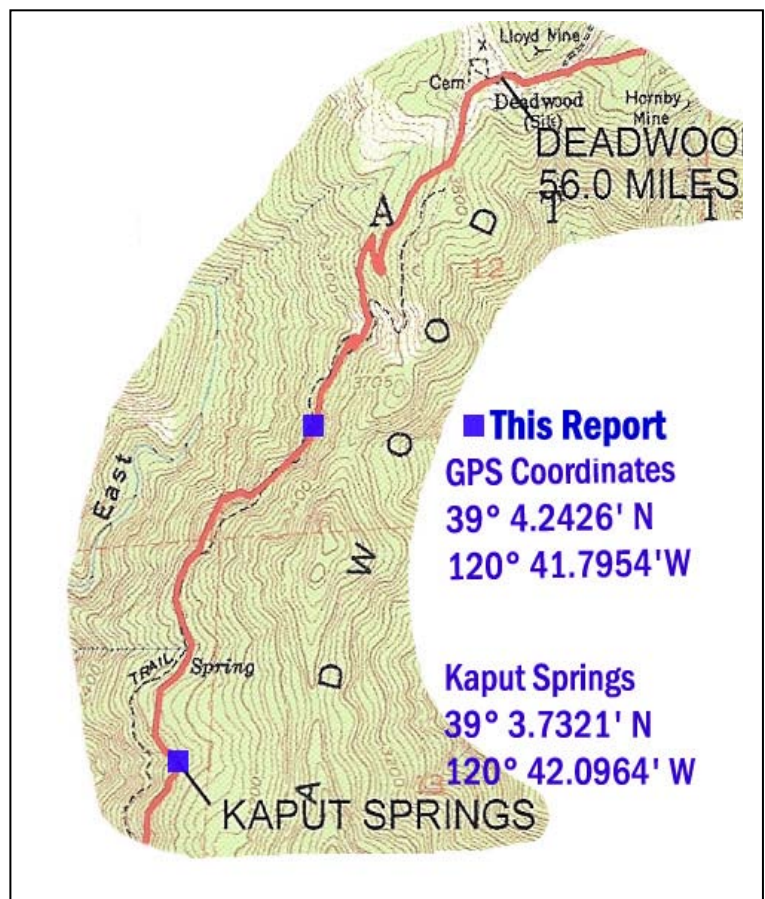
This is a fieldwork report about one day of trail maintenance at one specific location along the Western States Trail through El Dorado Canyon, about one-third mile north of Kaput Springs. This report is about a rock-bench that has an unsafe step-down for horses on slick metamorphic rock. It is also difficult for hikers or runners to step-down or step-up at this hazardous location. In addition, the side-slopes are unusually steep (typically 47 degrees), so there is no lateral escape for a horse in case of a fall. The repair work performed on May 17, 2013, greatly improved public safety.

Location Map of Safety Hazard within El Dorado Canyon

This map shows the Western States Trail within El Dorado Canyon for the segment between Deadwood (at Tevis Milepost 56.0) and Kaput Springs. The red line indicates the precise location of the modern Western States Trail; *not* the dashed black line which is the historic 1850 trail shown on the U.S. Geological Survey topographic map. The 1850 Last Chance Trail has been modified and improved in the 1970's and 1980's, with some changes in alignment for safety reasons. Several new switchbacks at a safer gradient were graded by a trail machine in 1989; and subsequently several steep switchbacks have been abandoned and are now overgrown and eroded.

The trail maintenance work of Friday, May 17, 2013, as described in this report, is one specific locality marked with a blue square. It is about one-third mile north of Kaput Springs. Seventeen safety-hazard locations along this trail were described in a report dated March 18, 2013 by Kimler and Sydnor.

This particular locality is the northernmost and probably the most problematical in all of El Dorado Canyon. So we worked on it first, as the highest priority for safety.



Slippery Rock Surfaces, Steep Step-Down, Drop-off Cliff on Downslope

This set of four photographs (taken March 2, 2013 during a trail reconnaissance) showcases the safety hazard at the step-down rock-bench. One-foot ruler for scale. If a horse were to lose traction here on a steep step-down (= steel horseshoes on smooth metamorphic rock), the horse could collapse and buckle both front feet, with lacerations and severe injuries to the front knees. The drop-off cliff at left is about 70 degrees for the first 30 feet, then the over-all slope angle is about 47 degrees.



These photographs are different views of the same location. Hard metamorphic rock (Paleozoic slate) with vertical foliation is exposed on the tread-surface. One-foot rulers are for scale. The softer rock in the foreground contrasts with the harder rock above, so there is a differential erosion situation.

Motorcycles trying to surmount the steep smooth knob have gunned their rear knobby tires here, which causes mechanical abrasion in the softer rock below.

Horses headed steeply downhill need to lunge forward here, so there is "impact deflation" of the trail-bed from the front hooves. Over many decades of no trail maintenance, a bowl is formed on the trail-bed.

Tevis Trail Crew members

On this particular day, the following Tevis Trail crewmen worked here: **Greg Kimler** (Trail Chief and WSTF Governor), **Mike Shackelford** (Trail Boss and WSTF Governor), **Steve Hallmark** (AERC Trail Master), **Bridget Bergin** (Geologist), and **Robert Sydnor** (Engineering Geologist and AERC Trail Master).

The trail restoration work was performed under USFS written permit from **Matt Brownlee** (Trail Manager, USFS Tahoe National Forest) who supervised this work in the field. His leadership is greatly appreciated.

Boulder Carrying Slings (one medium and one large)

For this complicated trail repair, it was necessary to carry three large boulders, so webbed slings were devised by the Tevis Trail Crew and prepared at home.

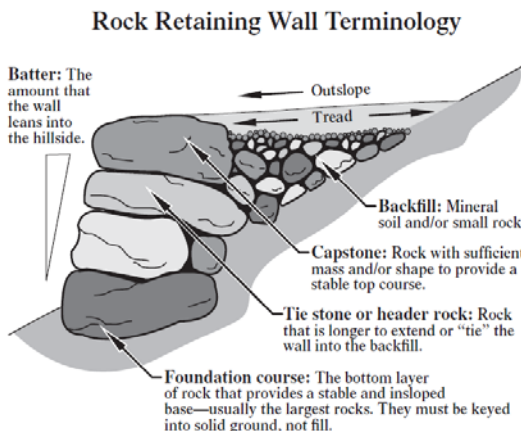
At left, a medium-sized sling (4-foot) that is meant to be carried with hand-grips by crewmen, depending on the width of the narrow trail. It has a flat surface, so additional nylon ties (not shown) are used so that the boulder will not fall-out during transport on a rough trail.

At right, a pole-supported carrying sling was constructed by the Tevis Trail Crew for carrying larger boulders on a narrow trail. It is mathematically designed with **double parabolic surface**, analogous to a canoe-shape, so that a boulder is self-contained by its own dead-weight, and will not fall-out while the trail crew staggers along an uneven narrow trail.



Trail Repair and Restoration Strategy

(from USFS, 2007, Trail Construction & Maintenance Notebook, Figure 75)



The strategy was to create a battered rock wall on the outside edge that leans inward to support the trail-bed. The elevation of the trail-bed was then raised by creating a gravel pad. Several flat boulders were selected from locations away from the trail corridor (upslope and downslope). The 150 and 200-pound boulders were then carried laterally for several hundred feet along the steep trail using the webbed slings shown above.

Three Boulders Located Away from Trail Corridor



Locating loose boulders on 47-degree slope above the trail.



Greg Kimler
Trail Boss Mike Shackelford

Matt Brownlee
USFS

Belaying and lowering loose boulder in carry-sling



AERC Trail Master Steve Hallmark

Matt Brownlee
USFS Trail Manager

Belaying the boulder to the trail-bed



Greg Kimler, WSTF Governor, & AERC Trail Master

Matt Brownlee, USFS

Mike Shackelford, Tevis Trail Crew Boss

Steve Hallmark
AERC Trail Master



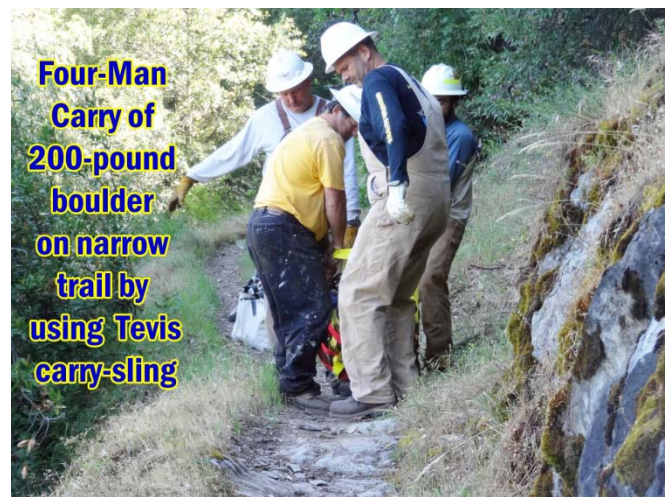
Geologist Bridget Bergin
Mike Shackelford
Tevis Trail Crew Boss

Matt Brownlee
USFS

Steve Hallmark,
AERC Trail Master

Greg Kimler
Western States Trail Governor

Carry-Pole with 200-pound Boulder on Very Narrow Trail



Four-Man Carry of 200-pound boulder on narrow trail by using Tevis carry-sling

Rock Work and Setting the Battered Capstone

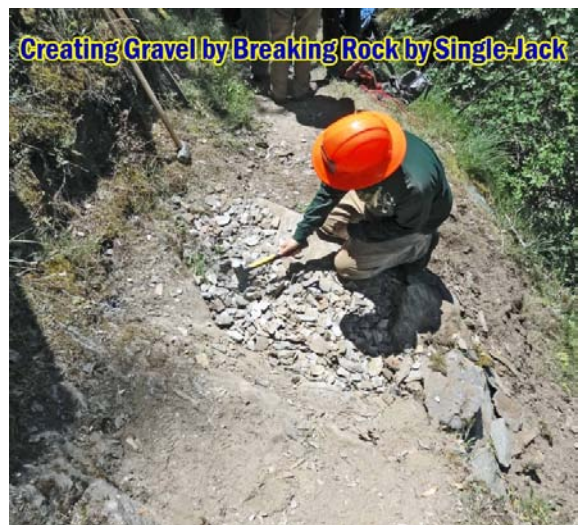
Lateral Carry of Boulder to Restoration Site.



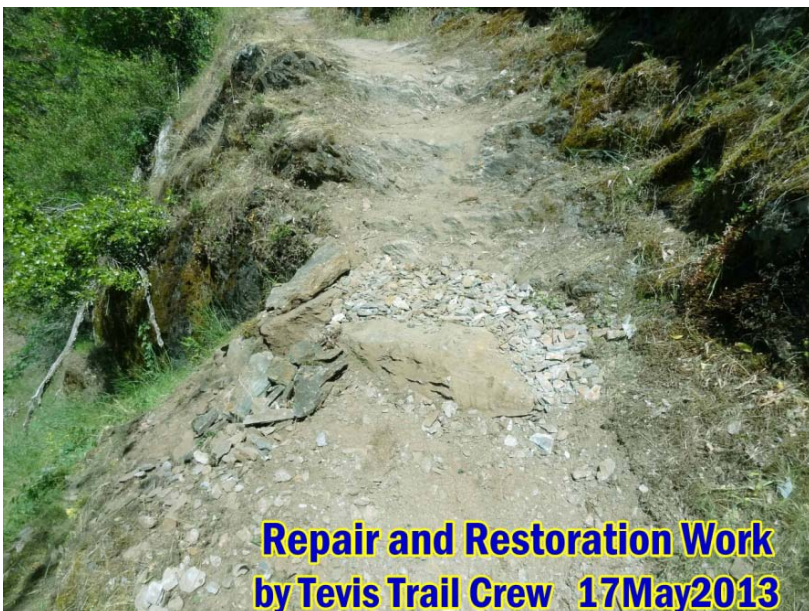
Custom-designed Tevis Carrying-Sling with 200-pound Boulder



Trail Master Greg Kimler creates in-sloping pad for large flat boulder



Creating Gravel by Breaking Rock by Single-Jack



Repair and Restoration Work by Tevis Trail Crew 17May2013

The large heavy boulders are sunk deeply into the subgrade and tipped inward to create a battered crib wall. Analogous to an iceberg, the large boulders are mostly out-of-sight.

Most horsemen and hikers will not comprehend what lies beneath, or the amount of difficult rock work that was expended here by the Tevis Trail Crew to repair, restore, and preserve the trailbed.