

**PRELIMINARY ASSESSMENT**

**OF**

**THE COLD STREAM WATERSHED**

**A tributary of the Little Truckee River**

**Sierra County, California**

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For

The Sagebrush Chapter of Trout Unlimited  
And  
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## INTRODUCTON

This document summarizes the findings of a “preliminary assessment” of the Cold Stream watershed, a tributary of the Little Truckee River. The Sagebrush Chapter and Feather River Chapter of Trout Unlimited commissioned this effort. As the title implies, this effort was limited in scope, designed to provide a current snapshot of watershed conditions in the basin. This assessment is a distillation of known information; a limited amount of new quantitative data, and qualitative observations based on field surveys of stream and hillslope conditions. Its purpose is to serve as a starting point for more extensive assessments of the upper portion of the Little Truckee. Of special interest are conditions affecting the fishery resource in the area.

## SOILS AND GEOLOGY

Volcanism and glaciation are the processes that have shaped the dominant characteristics of the watershed. Pyroclastic rocks and lava flows form the basement rocks that are overlain by coarse glacial drift. The glacial material is a coarse textured mix of rocks of different sizes and compositions that is moderately consolidated. At an elevation around 7200', the main channel cuts across glacial moraine deposits. At this location, channel gradient increases and streamside landslides line both sides of the channel. Large boulders and bedrock chutes typify this section.

**Resistance to Erosion.** The net result is a surface soil that is extremely rocky and porous. This leads to a surface that is fairly resistant to erosion. Erosion pavements form quickly on disturbed ground and they retard soil movement once formed. The few areas along the main road where drainage had collected showed little serious erosion below the road where it drained.

Hillsides that were logged in the mid 1990s were walked and examined for evidence of erosion related to the logging. The few areas of erosion that were found were mostly related to temporary haul roads. Problems were small and few had resulted in any serious soil loss.

**Landslides.** Rockfalls constitute the most common form mass movement. Boulder covered talus slopes are common in the upper watershed.

Along the channel, there is a distinct section approximately 1000 ft in length that is dominated by debris slides and slumps on both sides. This is discussed in detail in a subsequent section.

**Soil Hydrology.** The underlying volcanic rocks appear to act as a restriction to downward percolation, especially in the upper half of the drainage. These areas are visible on air photos as numerous large spring areas that contribute year around base flow to the main stream.

**Stream Channel.** Channel reaches are described in detail in a subsequent section. The surrounding landscape has supplied a lot of cobble- and boulder-size material within the channel's active flood zone. Much of this material accumulates behind debris jams during most flows. Periodically, debris jams give way, mobilizing this material and scouring the channel. It produces a channel that is well armored but subject to periodic scour as debris jams come and go

## PHYSIOGRAPHY

The Cold Stream basin is relatively small at 2321 acres (3.62 mi<sup>2</sup>) and elongate in shape with no major perennial tributaries. Elevation ranges from 6480 at the confluence with the Little Truckee River to 9150 at the summit of Mt. Lola.

Volcanic rock outcrops dominate the upper ridgelines with steep talus slopes immediately below them. Lower down, glacial drift partially fills the valley bottom producing a somewhat broader and more gently sloping valley bottom. Cold Stream Meadow is a unique feature in the watershed. It appears to be a remnant of a small glacial outflow lake that has since filled with alluvium.

As previously mentioned, the channel encounters the remnants of terminal moraine below 7200'. Below 6800', the stream begins to exit its canyon and starts to form an alluvial fan.

With a few exceptions, hillside slope gradients are mostly between 30%-55% and are highly variable. The steepest areas are limited to areas near ridgetop outcrops and along the main channel through the highest gradient reach between 6800' and 7200'.

## HYDROLOGY

**Precipitation.** Precipitation estimates were derived from climatological summaries for three nearby stations (Sierraville RS, Truckee RS, and Squaw Valley Lodge). All stations are located at elevations representative of the lowest elevations in the Cold Stream basin. Orographic effects are presumed to deliver significantly higher amounts of precipitation to the upper portion of the basin (where elevations approach 9000 feet) than is indicated from station data.

Sierraville	Elevation 4975	Annual Precip 26.34 inches
Truckee	Elevation 6020	Annual Precip 30.85 inches
Squaw Valley	Elevation 6230	Annual Precip 51.02 inches

Without extended analysis, it would be reasonable to expect an overall basin precipitation of 60 inches or more.

Mean snow accumulation for the Jan-Mar period is estimated at 2-3 feet in the lowest portion of the basin and probably in excess of 6-10 feet at the highest elevations. Maximum accumulations are possible well in excess of these estimates.

**Runoff.** Estimates of surface runoff were derived from a combination of direct measurement and inference from nearby gauging stations. Neighboring Independence Creek has an extensive record of streamflow measurements between 1991 and 2009. The basin is larger than Cold Stream (5184 acres) and stream flow changes are undoubtedly buffered by changes in storage in Independence Lake. By adjusting for differences in basin sizes, a synthetic record of monthly streamflow for Cold Stream was generated.

**Summer Baseflow:** Typically 5-8 cfs. Consistently measured at 6 cfs during Jul-Aug 2010 field season.

Mean monthly flows in cfs (estimated from synthetic record):

January: 5.4	February: 5.2	March: 6.5
April: 9.5	May: 18.9	June: 20.2
July: 10.2	August: 7.2	September: 8.6
October: 7.4	November: 8.4	December: 6.0

**Annual Runoff.** Annual runoff totals approximately 35 inches equivalent depth, giving further support to precipitation estimates of 60 inches or greater.

**Peak flows.** Channel dimensions were measured using recent scour and other high water marks and used to estimate recent peak flow events. This estimate was then compared to maximum daily flows from the Independence Creek data (USGS Station ID 10343000) as a reality check. Flows in Independence Creek are regulated adding additional uncertainty to this analysis. Estimates should be considered rough approximations.

Based on this analysis, serious channel scour is probably associated with daily mean flows over 100 cfs which probably occur with an average frequency of 25 years or less. Instantaneous peak flows can be much higher.

Snow obviously dominates the basin's hydrologic response. This feature helps keep summer flows elevated for an extended time. It also can result in elevated peak flood events through the well-documented rain-on-snow mechanism.

The bottom line is that the Cold Stream basin produces more stream flow per inch of precipitation than would a comparably sized basin at lower elevations or with deeper, less rocky soils.

**Water Temperature.** A water temperature data logger was installed for the period 7/26 through 8/30/2010. The logger was located in the main channel below the Henness Pass road and above the confluence with the Little Truckee. Stream temperature was recorded every 20 minutes. A statistical summary of these data is shown below.

	<u>DEG C</u>
MAX FOR PERIOD	15.49
AVG FOR PERIOD	10.22
MIN FOR PERIOD	5.70
MEDIAN FOR PERIOD	10.03

These data show that temperatures are ideal for support of cold-water fish with no indication of stressful temperatures at any time during the period of deployment.

### **STREAM REACH DESCRIPTIONS**

**Stream Reach Delineation 2010.** Based on my field observations, I have broken the stream into the following reaches based on their dominant characteristics. These reaches are different than those established by USFS field crews during the 2000 survey. The differences between the two delineations will be discussed later in this section. Reach characteristics are summarized in Table 2 below.

Reaches 3 and 4 are the least accessible sections of the main channel owing to terrain and distance from the main road. On August 31, 2010, this section was traversed on foot while capturing video segments of representative sites along the way. These sites are referenced to GPS waypoints shown on the following map (Figure 1). Narration on the video clips identifies the waypoint identifier. The video is included on CD-R as a supplement to this report with the intent of giving the reader of this report a visual sense of this stream section. Reach 3 with its unstable hillsides and potential vertical and flow-velocity barriers to upstream fish migration is possibly the most critical reach from a fish habitat perspective.

A photo gallery of selected sites on the main channel is included as Appendix A.

Stream Reach Descriptions from 2000 USFS survey. The 2000 survey was implemented following the Region 6 (USFS) Stream Inventory Protocols as they existed at that time. The main channel was broken into three reaches as described in Table 3. The full data summary from that survey is included in Appendix B. The following table displays some of the more important channel characteristics as highlighted by the data from this survey.

Table 1: Highlights from 2000 USFS Stream Survey of main channel

INDICATOR	Reach delineations from 2000 Survey			COMMENT
	REACH 1	REACH 2	REACH 3	
BANK INSTABLILITY (ft <sup>2</sup> /mile)	21614	2831	1197	High values for reach 1 related to landslide zone between 6800-7100'
AVG % FINES (<6mm)	1%	14%	8%	Higher fines in reach 2 due to low gradient reach through Cold Stream Meadow
AVG % GRAVEL (6-64mm)	22%	55%	41%	Ample gravels present
WOODY DEBRIS (pcs/mile)	26.0	24.2	8.6	Ample woody debris
AVG GRADIENT	9%	4%	16%	Gradients within reaches are highly variable. Reach 1 has sections with channel gradients approaching 20%

Figure 1: Map of Stream Reaches with video waypoints (UTM).

