2009 Addendum to
2007 Angora Wildfire Hydrophobicity Field Monitoring Report
Lake Tahoe Basin Management Unit

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Introduction

This addendum presents the third year of data collection for hydrophobicity in the Angora Burn area. In the first year (USFS, 2007), six transects were measured for hydrophobicity in the Angora Burn, to characterize impacts throughout various slopes within the burn area (see Figure 1). Of these six transects, three were characterized as hydrophobic and three were not hydrophobic, as described below.

Hydrophobic
- Angora Ridge Upper: high intensity burn – SE aspect – upper slope
- Angora Ridge Lower: high intensity burn – SE aspect – lower slope
- Boulder Mtn. Lower: moderate intensity burn – SE aspect – lower slope

Not hydrophobic
- Tahoe Mtn. Upper: moderate intensity burn – NE aspect – upper slope
- Tahoe Mtn. Lower: high intensity burn – NE aspect – lower slope
- High School Site: high intensity burn - NE aspect- lower slope

As was noted in the original report, the variable that seemed to affect level of hydrophobicity the most was aspect, with the hydrophobic slopes all characterized by a southeast facing aspect. The 2007 data report can be obtained by visiting http://fs.usda.gov/ltbmu and using the left side menu, navigating to Maps & Publications. Follow the link to Publications and scroll down until you see Lake Tahoe Basin Management Unit Monitoring Reports for 2007.

Results

Only the three sites that were hydrophobic in 2007 were measured again in July 2008, and since they remained hydrophobic in 2008, they were measured again in July 2009. These sites were 1) Angora Ridge – Upper, 2) Angora Ridge – Lower, and 3) Boulder Mountain. A comparison of the 2007 through 2009 summary results is displayed in Table 1.

The results of the 2009 hydrophobic monitoring indicate a slight decrease in the percentage of "high" water repellency samples compared to 2008 (Table 1). However it is likely that the changes observed between all three years, reflect the inherent variability in data collection for this parameter, rather than physical changes in soil conditions between 2007 and 2009. The percent of sites exhibiting high water repellency at the 3

transects range from 82 to 90%. Conditions of naturally high hydrophobicity are common in the Tahoe Basin and the high values collected for this monitoring effort may reflect naturally high hydrophobic conditions at the sites. Hydrophobicity measurements at these three transects, along with samples from a nearby reference site will be collected in 2010. Soil moisture conditions at the time of sampling have been similar in all three years.

Visual observations following a transect that traverses the entire burn area note that vegetation continues to rebound vigorously. In areas of high severity burn, vegetative cover of young shrubs, forbs, and brush is approximately 50 percent. Vegetation includes manzanita, tobacco brush, white thorn, mahala mat, grasses and forbs. The aerial application of hydromulch in 2007 is still present, although now only providing approximately 20 percent of soil coverage. Where present, the hydromulch remains intact.

In moderate severity burn areas, soil is almost 100 percent covered with needle castings, and vegetation covers approximately 25 percent. Vegetation includes snowberry, willows, gayophytum, ribes, manzanita, white thorn, prickly lettuce, phacelia, and grasses and forbs. Seedlings approximately 1 inch tall are growing (25/100 sq ft). The duff layer is approximately ½ to 1 inch thick. Where soil is exposed, very little soil pedestalling appears.

The spring of 2009 produced more precipitation events resulting in surface runoff, than the spring of 2008. This runoff produced rilling that was observed in an area of high burn severity west of Lookout Point Circle during the 2009 visual survey (Figure 2). These rills come together to form a small gully approximately ½ foot deep, 1 foot wide, and 350 feet long (Photos 1 through 4). The gully dissipates onto an area of gentler slope and does not reach any stream, water body, or wetland. This area has only 5-20 percent vegetative cover and practically no needle castings. Further north, approximately 500 feet into the hydromulched area, rills and gullies do not occur. Rills and gullies are also not present further south where vegetation increases to about 75 percent.

On October 13, 2009 a significant storm event produced rainfall amounts of up to 4 inches in the Angora Burn area. A repeat visual survey was subsequently conducted from the end of Forest Mountain Road (the Tahoe Mountain Hydrophobicity monitoring site) along the side of Angora Ridge to below Angora Lakes and down to the Seneca Pond.

The most extensive rilling occurred in the same region as described above. The rills observed were mostly in the range of 1-2 inches deep, 3-6 inches wide, and of variable lengths (many extended for greater than 150 ft). The spacing ranged from a few feet to a few hundred feet. For example, it was common for rills to be spaced an average of perhaps 10 feet for a few hundred feet, then no rills for a few hundred feet.

Several rills that were noticeably larger than the rest were observed (Photo 5). These were approximately 4 inches deep, 12 inches wide, and at least 300 feet in length. In

addition, there were short stretches of transect (approximately 10-30 feet) with a high density rills of modest width and depth (approximately 2-3" deep and 2-6" wide). Deposition occurred behind logs, in vegetation, in depressions, and where the slope significantly decreased. Very few rills were observed along the transect further south than the region described above. The slope was comparable (40 percent), but along the slope below the lookout tower, the rock cover consisted of larger material (several inches in diameter). Areas of moderate severity burn generally had almost 100% covering, primarily of pine needle cast, and very little if any signs of erosion were observed in these areas. Some small and discontinuous rilling and sheet flow has occurred on the steeper, less covered areas between Angora Lakes and Seneca Pond.

Overall, erosion as a result of the fire has thus far not manifested as a serious problem in the study area, and as ground cover continues to increase it is likely that these surface erosion features will not continue to grow. However hydrophobicity measurements and visual monitoring will continue to be conducted on an annual basis. In addition the LTBMU in partnership with the USFS Remote Sensing Lab, will be producing an analysis in the spring of 2010, comparing high resolution aerial photography between 2007 and 2009, to further describe observed changes and recovery within the Angora burn area.

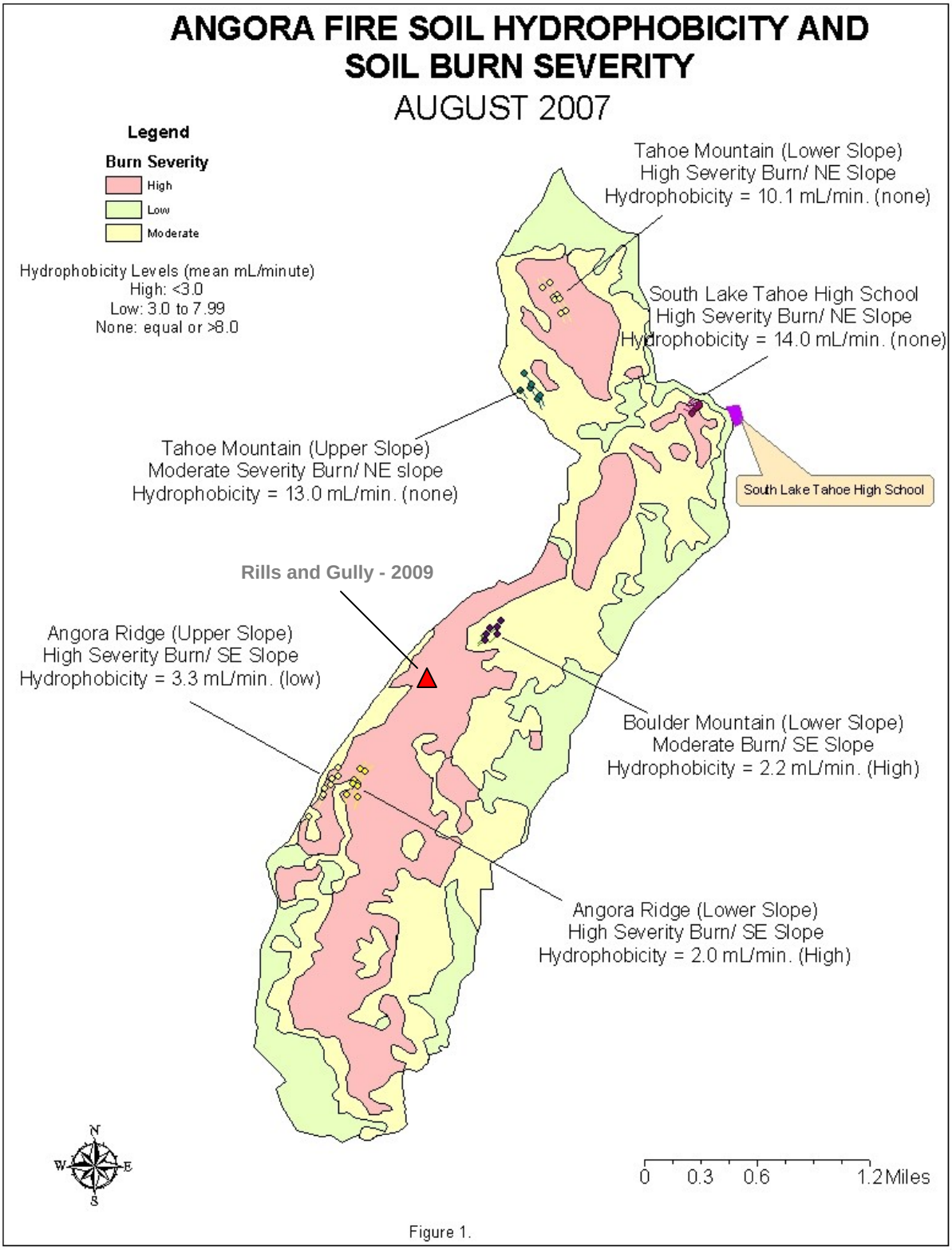

Figure 1 (modified from Weaver, Biddinger and Rust, 2007)

Table 1: Angora Fire Hydrophobicity Results Summary

		Percentage of samples with:				
Site Name	Year	High Water Repellency (%)	Low Water Repellency (%)	No Water Repellency (%)	Class Mean (ml/min)[1]	Hydro-phobicity Rating
Angora Ridge - upper	2007	80	9	11	3.3	Low
	2008	95	2.5	2.5	1.1	High
	2009	90	6	4	1.3	High
Angora Ridge - lower	2007	85	9	6	2	High
	2008	85	6	9	2.3	High
	2009	82	9	9	3.0	Low
Boulder Mountain	2007	80	12	8	2.2	High
	2008	96.7	1.7	1.7	0.8	High
	2009	90	8	2	1.2	High

[1] Class Mean Rating: No hydrophobicity (≥ 8 ml/min)
Low hydrophobicity (3 to < 8 ml/min)
High hydrophobicity (< 3 ml/min)

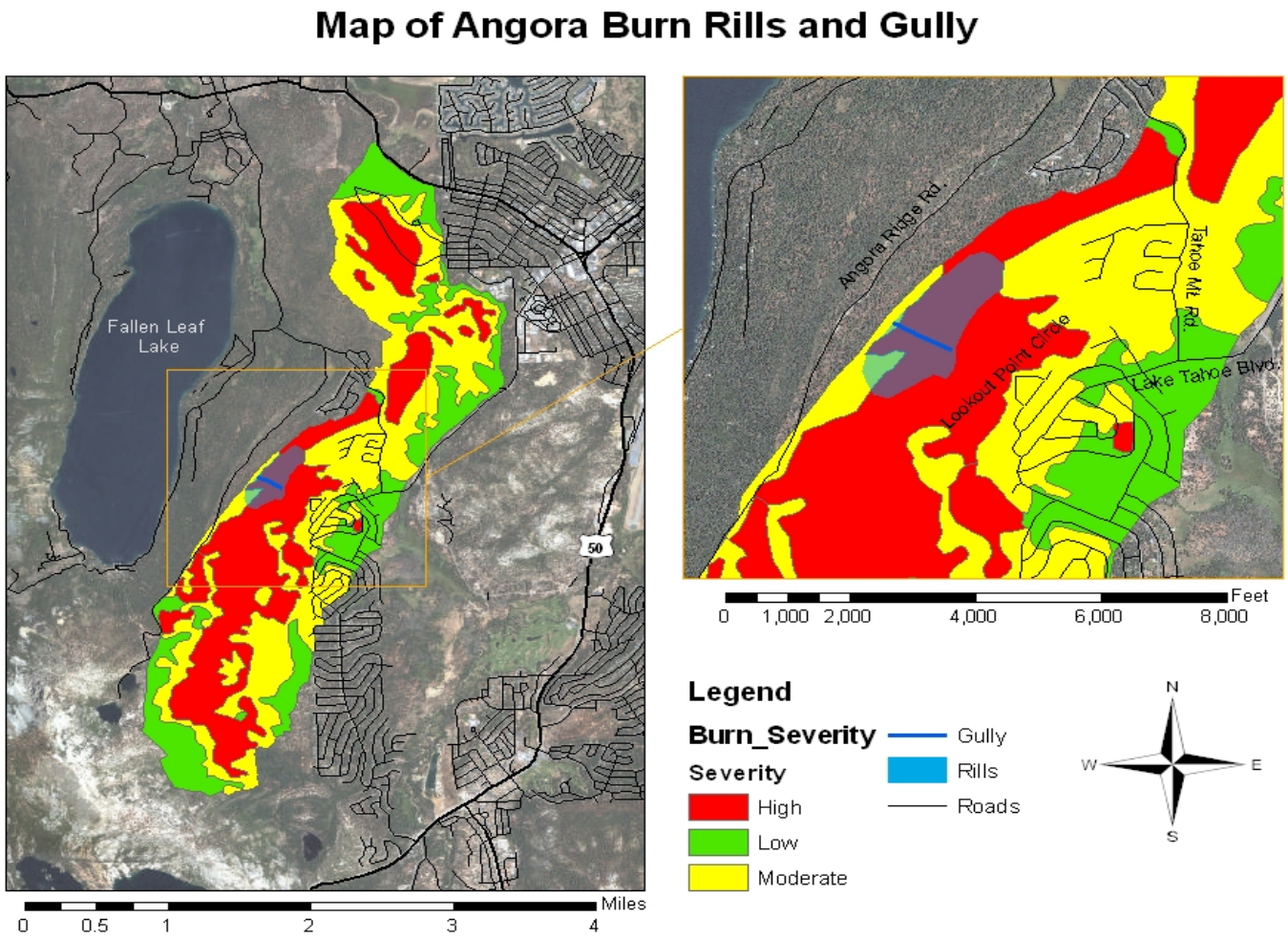

Figure 2. Area of Rill and Gully Formation in 2009

Photo 1. Rill formation

Photo 2. Rill formation

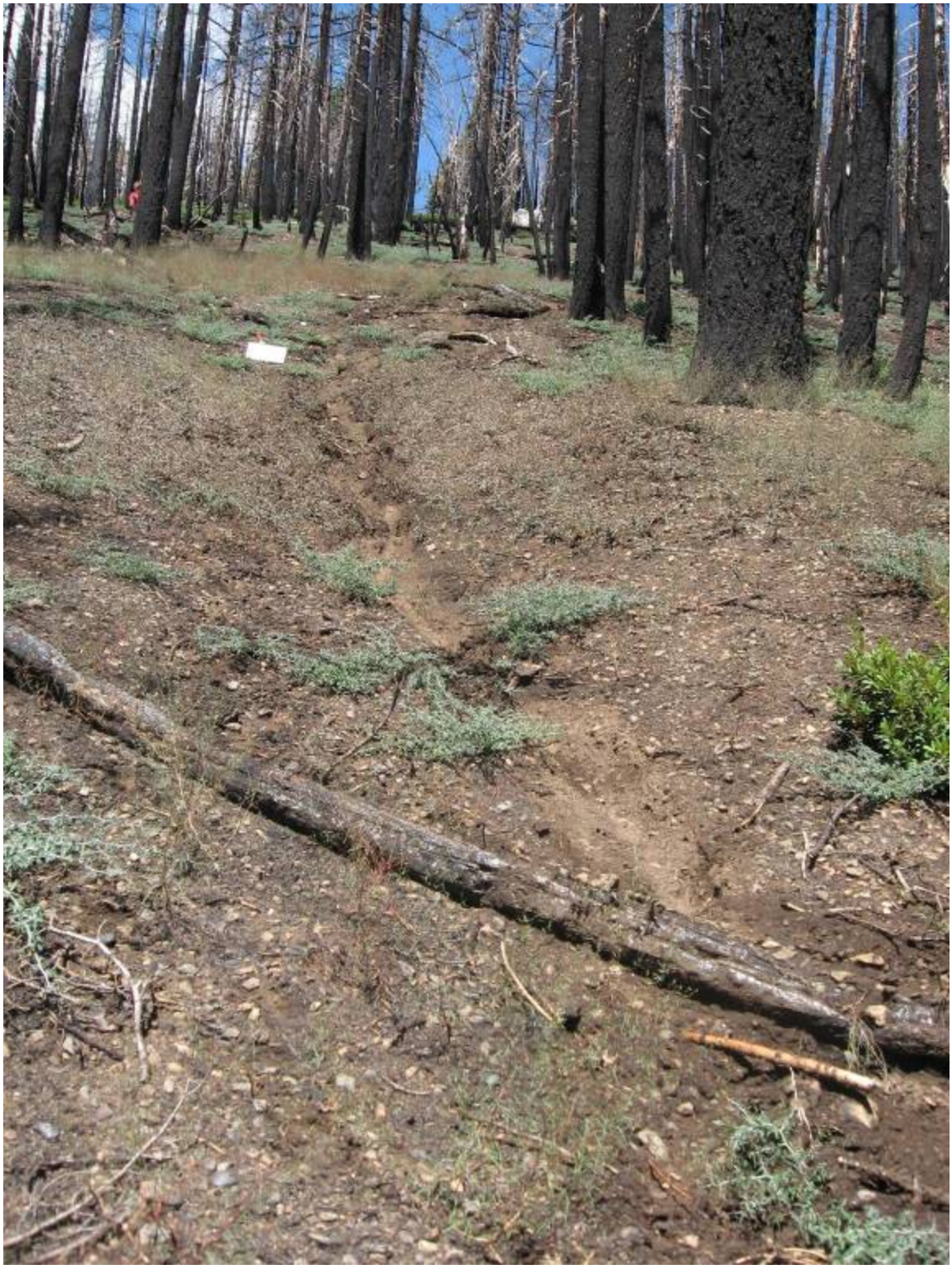
Photo 3. Gully in high burn severity area

Photo 4. Gully in high burn severity area

Photo 5: Post October 13, 2009 storm, rill formation.