Appendix D: Past Fire Cumulative Effects within the 6th Field Watersheds

Station Fire, Angeles National Forest
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Tim Biddinger, Mary Moore, Chris Stewart, John Thornton, Kyle Wright

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Wildfires result in increased runoff and sediment yield commensurate with burn severity. Burn Area Emergency Rehabilitation (BAER) teams use burn severity to estimate runoff and sediment increases resulting from fires. These increases are calculated as adjusted design flow and sediment potential. Adjusted design flow is the flow increase expected to occur as a result of decreased infiltration and interception following a wildfire. Sediment potential is the estimated potential sediment delivered to channels. Together these values are utilized to evaluate the need to increase capacity for flow or drainage structures such as culverts and bridges. Values also provide an estimate of flooding and sedimentation potential to downstream communities.

Cumulative Effects of Watershed Response

Before an adjusted design flow can be determined, pre-fire design flow and sediment must be calculated. This is the flow and sediment yield expected to occur prior to the fire. This is the flow responsible for forming present day channel conditions and flows used to estimate proper performance of culverts and other drainage structures. Design flow estimates have been based on existing gage station information and streams surveyed within or adjacent to the immediate fire area. These estimates assume pre-fire ground infiltration and ground cover conditions.

Sediment and Discharge Rates for the fire were estimated using values from Rowe, Countryman and Storey, 1949. These authors estimated sedimentation rates from measurement of sediment accumulation in reservoirs. In their study, sedimentation records included periods associated with a wide variety of discharges. Relationships between computed sedimentation rates and individual peak discharges were established for specific watersheds. Curves representing average relationship between peak discharge and sedimentation rate were developed by these authors and used to determine normal annual sedimentation rates. Adjustments to normal annual erosion rates were made for watersheds affected by fires. These adjustments were made through comparison of burned watersheds to similar unburned watersheds and recovered over a ten year period. These relationships were utilized to predict sediment potential for the Station Fire.

Three of the 6th field watersheds affected by the 2009 Station Fire were also affected by the past fires. Figure 1 displays a fire history map for the burned area. These three watersheds are:

1. Big Tujunga Canyon was affected by the 2008 Marek Fire. In Lower Big Tujunga Canyon while field investigations suggest these areas have hydrologically recovered with respect to increases in water yield, sediment is still a concern. Drainages currently contain large amounts of stored sediment that could mobilize during rain events. The combination of the Station and Marek Fires has resulted in a cumulative sediment potential effect. Sediment rates of past events vary by watershed as defined in Rowe, Countryman and Storey, 1949. Table 1 displays the specific sedimentation rates for the Lower Big Tujunga Canyon watershed used to analyze the cumulative sediment effects of the Station and Marek Fires.
2. Pacoima Wash was affected by the 2008 Marek and Sayre Fires. In Pacoima Wash while field investigations suggest these areas are hydrologically recovered with respect to increases in water yield, sediment is still a concern. Drainages currently contain large amounts of stored sediment that could mobilize during rain events. The combination of the Station, Marek, and Sayre Fires

has resulted in a cumulative sediment potential effect. Sediment rates of past events vary by watershed as defined in Rowe, Countryman and Storey, 1949. Table 2 displays the specific sedimentation rates for the Pacoima Wash watershed used to analyze the cumulative sediment effects of the Station, Marek, and Sayre Fires.

3. Lower Soledad Canyon was affected by the 2007 North Fire. In Lower Soledad Canyon while field investigations suggest these areas are hydrologically recovered with respect to increases in water yield, sediment is still a concern. Drainages currently contain large amounts of stored sediment that could mobilize during rain events. The combination of the Station and North Fires has resulted in a cumulative sediment potential effect. Sediment rates of past events vary by watershed as defined in Rowe, Countryman and Storey, 1949. Table 3 displays the specific sedimentation rates for the Lower Soledad Canyon watershed used to analyze the cumulative sediment effects of the Station and North Fires.

Figure: 1 Fire History Map

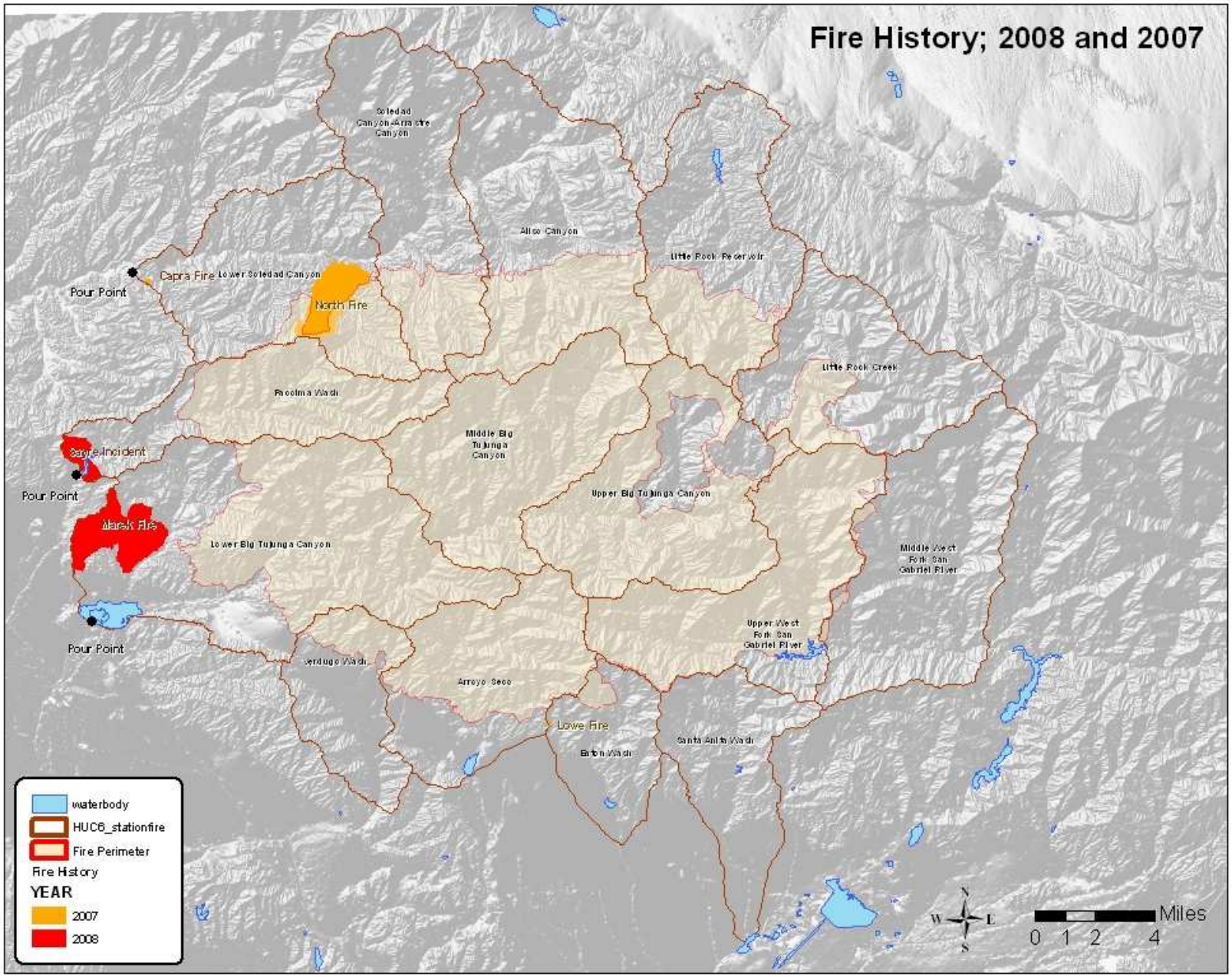

Table 1: Cumulative Effects for Lower Big Tujunga Canyon

events per year	Storm Event	1 - year	2 - year	3 - year	7 - year	15 - year	30 - year	70 - year (normal)
0.461	**2.2**	491	358	317	280	266	258	256
0.1968	**5.1**	945	798	742	678	654	637	629
0.0965	**10.4**	1,296	1,126	1,061	980	950	928	916
0.0414	**24.2**	2,389	2,182	2,095	1,976	1,924	1,886	1,861
0.0192	**52.1**	3,141	2,915	2,807	2,668	2,605	2,553	2,517
0.01	**100.0**	6,346	6,024	5,861	5,655	5,532	5,448	5,365
years after								
annual								
	increase %	1187%	506%	330%	224%	151%	96%	53%

Station Fire	
severity	**acres**
unburned	6,698
low	3,967
moderate	2,535
high	6
total	13,206
	0%

Table 2: Cumulative Effects for the Pacoima Wash

events per year	Storm Event	1 - year	2 - year	3 - year	7 - year	15 - year	30 - year	70 - year (normal)
0.461	**2.2**	647	392	314	240	215	200	195
0.1968	**5.1**	1,417	1,037	895	727	650	622	604
0.0965	**10.4**	2,012	1,563	1,376	1,143	1,056	998	964
0.0414	**24.2**	4,036	3,351	3,042	2,666	2,486	2,361	2,279
0.0192	**52.1**							

Station Fire	
severity	**acres**
unburned	4,830
low	2,347
moderate	9,531
high	

		5,378	4,573	4,230	3,733	3,494	3,322	3,202			1,430
0.01	**100.0**	11,181	9,965	9,332	8,561	8,116	7,790	7,482		total	18,138
years after											
annual											
	increase %	1785%	589%	275%	241%	159%	97%	45%	7%	0%	

Table 3: Cumulative Effects for Lower Soledad Canyon

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events per year	**Storm Events**	**1 - year**	**2 - year**	**3 - year**	**7 - year**	**15 - year**	**30 - year**	**70 - year (normal)**		**Station Fire**	
0.461	**2.2**	606	470	427	388	375	366	364		**severity**	**acres**
0.1968	**5.1**	1,390	1,217	1,153	1,078	1,047	1,029	1,020		unburned	18,929
0.0965	**10.4**	2,003	1,809	1,729	1,630	1,594	1,567	1,553		low	2,690
0.0414	**24.2**	4,113	3,838	3,720	3,564	3,489	3,441	3,409		moderate	3,474
0.0192	**52.1**	5,576	5,258	5,121	4,928	4,834	4,766	4,722		high	517
0.01	**100.0**	12,054	11,592	11,355	11,062	10,875	10,763	10,644		total	25,610
years after											
annual											
	increase %	553%	205%	130%	87%	58%	35%	21%	1%	0%	

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