River Complex BAER Hydrology Report

Hydrology

26 September 2015

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River Complex Setting

This report presents the results from a hydrologic assessment of the River Complex in Northern California that was prepared for the Burned Area Emergency Response program (BAER). The River Complex was initiated by a dry lightning event on July 30th, 2015. The event caused over 60 new fires in the New River and adjacent watersheds which eventually burned together to form the complex (InciWeb). The River Complex initially consisted of 5 large fires ranging in size from about 4,000 to 15,000 acres. Much of the acreage that was burned in the River Complex has burned in earlier fires over the past 30 years. As of September 23rd the River Complex had burned 77,805 acres (120 mi^2). The area burned was almost entirely comprised of public lands on the Shasta-Trinity and Six Rivers National Forests. Only 805 acres of private lands were burned within the 77,805 acres fire perimeter.

Affected Watersheds

The River Complex burned within a total of 13 HUC 6 watersheds (Table 1). Three of these watersheds had so little acreage burned that the impacts are considered negligible. The watersheds with more than 75% of their area burned included Devils Canyon, Quinby Creek-New River, Big Creek, and Bell Creek-New River. All of the aforementioned watersheds are tributary to the New River.

HUC 6 #	Watershed	Watershed Acres	Acres Within Burn	% Within Burn
180102110903	Middle North Fork Trinity River *	13,646	1	0%
180102111001	Virgin Creek	24,088	1501	6%
180102111003	East Fork New River	26,352	1582	6%
180102111004	Devils Canyon	17,649	16398	93%
180102111005	Quinby Creek-New River	21,387	16810	79%
180102111006	Big Creek	12,282	11457	93%
180102111007	Bell Creek-New River	21,722	17768	82%
180102111103	Big French Creek	24,686	2998	12%
180102111105	Don Juan Creek-Trinity River	21,351	2668	12%
180102111106	McDonald Creek-Trinity River *	19,838	7	0%
180102111107	Sharber Creek-Trinity River *	19,590	55	0%
180102111202	Cedar Creek	16,752	2110	13%
180102111203	Horse Linto Creek	25,301	4450	18%

Table 1: HUC 6 Watersheds - * Indicates <1% watershed area within fire perimeter.

Climate

The River Complex Fire area has a Mediterranean climate characterized by hot and dry summers with temperatures occasionally above 100°F, and cold and wet winters with temperatures often below freezing. Snow frequently accumulates above 4,000 feet elevation during the winter months. Elevations between 3,000 feet to 4,000 feet are frequently subjected to rain on snow events. Mean annual precipitation varies between 70 inches in the upper portions of the watershed to nearly 40 inches at the lower end. About 90 percent of the precipitation falls between October and April, with snow usually remaining at higher elevations through May or June (USDA Forest Service, New River Watershed Analysis, 2000).

The 2013-14 and 2014-15 winters have been very dry and there has been virtually no snow accumulation in the burn area for the past 2 years. These dry winters set the stage for River Complex and other large fires on the west side of the Shasta-Trinity National Forest.

Potential Values at Risk – Water Resources Focus

Values at risk associated with the River Complex were identified by the BAER team through field reconnaissance, interviews with local FS personnel and literature (e.g. Forest Plans, Watershed Analyses). Values at risk that are directly related to water resources are summarized in Table 2. Refer to the 2500-8 and Resource Reports for a complete description of all values at risk for the River Complex Fire including fisheries values associated with the New River Wild and Scenic River corridor.

Value at Risk For Hydrology	Post Fire Threats
Infrastructure	
Water diversion and conveyance infrastructure	Water systems within the fire area have the potential to be impacted by flooding and debris flows.
Water Quality – Domestic Water Users	
Domestic water users (Scotts Gulch, Rancheria Creek and un-named springs)	Potential sedimentation at system intake locations. Increased turbidity and fine sediment.
Natural Resource – Water Quality and Aquatic/Riparian Habitats	
Potential for impacts to water quality and aquatic and riparian habitats. Primary areas of interest include Big Creek, Quinby Creek, Panther Creek, Barron Creek, Devils Canyon Creek, Fawn Creek, Swede Creek and East Fork Horse Linto Creek.	Potential for flooding and debris flow impacts to aquatic and riparian habitats. Potential for impaired water quality due to increased turbidity and sedimentation of aquatic habitats. Potential for erosion causing turbidity and sedimentation into New River – Wild and Scenic River.
Wild and Scenic River Corridor	
New River Wild and Scenic River Corridor	Potential impacts to Wild and Scenic River corridor ORVs and ecological functioning condition.

Table 2: Values at risk as they relate to water resources. See Fisheries Report for Values at Risk pertaining to Aquatics.

Burn Severity Assessment for HUC 6 and Smaller Watersheds

A Burned Area Reflectance Classification (BARC) image was acquired from the Forest Service Remote Sensing Applications Center. Based on comparisons with archived images, this image classifies the extent of the burned area into unburned, low severity burn, moderate severity burn, and high severity burn. The BARC map was field verified by BAER team members and edited based on ground observations to produce a soil burn severity map (Figure 1).

The burn severity for the River Complex Fire was assessed within the context of the 13 HUC 6 watersheds that were affected by the fire (Table 3, Table 5 and Figure 6).

Watershed	Watershed Acres	Acres Within Burn	% Within Burn	Unburned/ Low	Low	Moderate	High
Middle North Fork Trinity River *	13,646	1	0%	1	0	0	0
Virgin Creek	24,088	1501	6%	556	555	323	67
East Fork New River	26,352	1582	6%	613	660	303	6
Devils Canyon	17,649	16398	93%	5,967	6,863	2,498	1,071
Quinby Creek-New River	21,387	16810	79%	5,873	7,863	2,837	236
Big Creek	12,282	11457	93%	5,050	5,014	1,237	156
Bell Creek-New River	21,722	17768	82%	6,343	8,742	2,460	223
Big French Creek	24,686	2998	12%	1,385	1,033	541	39
Don Juan Creek-Trinity River	21,351	2668	12%	957	1,408	195	107
McDonald Creek-Trinity River *	19,838	7	0%	4	3	0	0
Sharber Creek-Trinity River *	19,590	55	0%	26	27	2	0
Cedar Creek	16,752	2110	13%	772	765	508	65
Horse Linto Creek	25,301	4450	18%	1,725	1,310	1,012	404

Table 3: Burn Severity Acres by HUC 6 Watershed.

The Devils Canyon, Quinby Creek-New River, Big Creek and Bell Creek-New River watersheds had over 75% of their total area burned in the River Complex Fire (Figure 5). Of these the Devils Canyon Creek Watershed experienced the greatest fire activity with 93% of the watershed area burned. Devils Canyon Creek Watershed also had the most acres burned at high and moderate severities (6% and 14%, respectively). It is noteworthy that high severity fire was not clustered in any single HUC 6 watershed and was relatively scarce over the rest of the fire area. The Horse Linto Creek Watershed had the second greatest area of high severity acres at 2% and the Quinby Creek-New River, Big Creek, and Bell Creek-New River each had approximately 1% of their watershed areas burned at a high severity. In this overall context the Devils Canyon Creek HUC6 watershed clearly stands out as being the most affected by high severity fire.

While the HUC 6 numbers suggest limited impacts at the HUC 6 watershed scale, smaller watershed areas that have proportionately more area burned at high and moderate severities may experience locally greater impacts associated with fall and winter runoff events. For example the East Fork Horse Linto Creek drainage had 9% of its watershed area affected by high severity fire. Similarly the Swede Creek drainage above the 05N04 Road had 8% of its watershed area burned at high severity. Many of these smaller watersheds have been identified as ‘pour point’ watersheds for this analysis and are analyzed for runoff effects in Table 8 and Table 9.

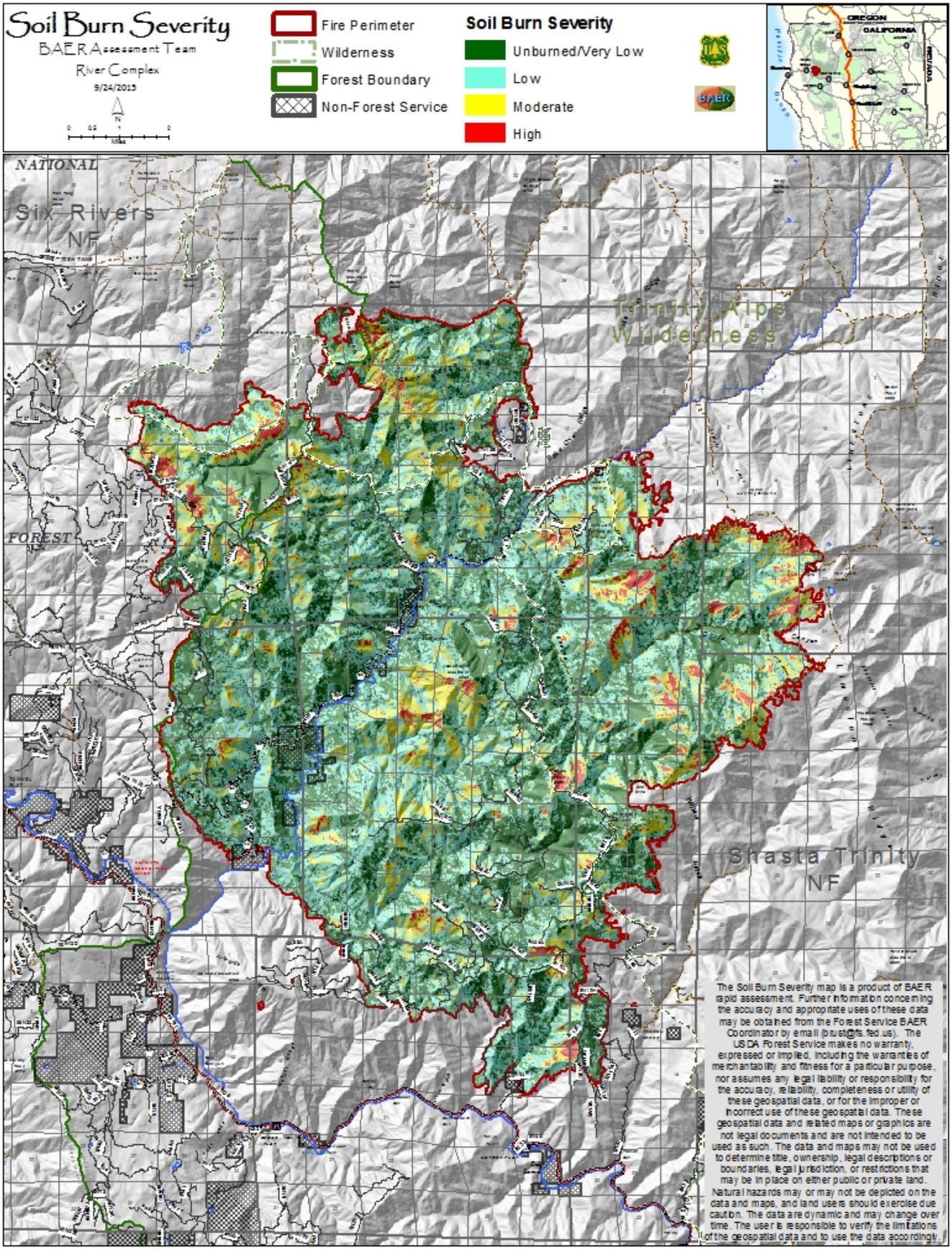

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Figure 1: Burn Severity for River Complex Fire.

Figure 2: A mosaic of burn severities on steep slopes located above the New River as viewed from Denny Road (402 County Road).

Figure 3: Factors influencing erosion and runoff potential in headwater swales. Course rock in swale bottoms will reduce erosion potential (left – Swede Creek headwaters). Needle cast from moderate severity burns will also provide some soil cover and reduce erosion potential (right – Jim Jam Ridge).

Fire History and Burn Severity Assessment for HUC 6 and Smaller Watersheds

The River Complex Fire area has experienced multiple large wildfires over the past 30 years. Almost all of the past burn area was burned in 1999 during the Onion and Megram Fires. Smaller amounts of the River Complex burn area were burned in the Ironsides Fire (2008), Bake Oven Fire (2006), Buckhorn Fire (2008), Flat Fire (2012), Ziegler Fire (2008), Corral Fire (2013). In all 64% (49,763 acres) of the area burned in the River Complex has burned within the past 30 years. The River Complex burned through the 1999 fire areas but the more recent fires occurring from 2006 to present appear to have slowed the spread of the River Complex (Figure 5).

HUC 6 Watershed	Watershed Acres in River Complex Fire Perimeter	Watershed Area Burned in Historic Fires from 1985-Present	Percent of Watershed Area within River Complex Perimeter Burned in Historic Fires 1985-Present
Bell Creek-New River	17,768	14,515	82%
Big Creek	11,457	7,372	64%
Big French Creek	2,998	2,516	84%
Cedar Creek	2,110	2,110	100%
Devils Canyon	16,398	486	3%
Don Juan Creek-Trinity River	2,668	194	7%
East Fork New River	1,582	1,557	98%
Horse Linto Creek	4,451	4,450	100%
McDonald Creek-Trinity River	7	7	100%
Quinby Creek-New River	16,810	143,939	83%
Sharber Creek-Trinity River	55	55	100%
Virgin Creek	1,501	1,501	100%
Total Acres	77,804	48,702	63%

Table 4: Fire History Information for HUC 6 Watershed within River Complex Fire Perimeter.

Figure 4: Headwaters of East Fork Horse Linto Creek drainage as viewed from 7N10 Road. Many areas in the River Complex have burned in the past 25 years which presents a challenge to mapping burn severity and determining the cumulative effects of past burns on soil and water resources.

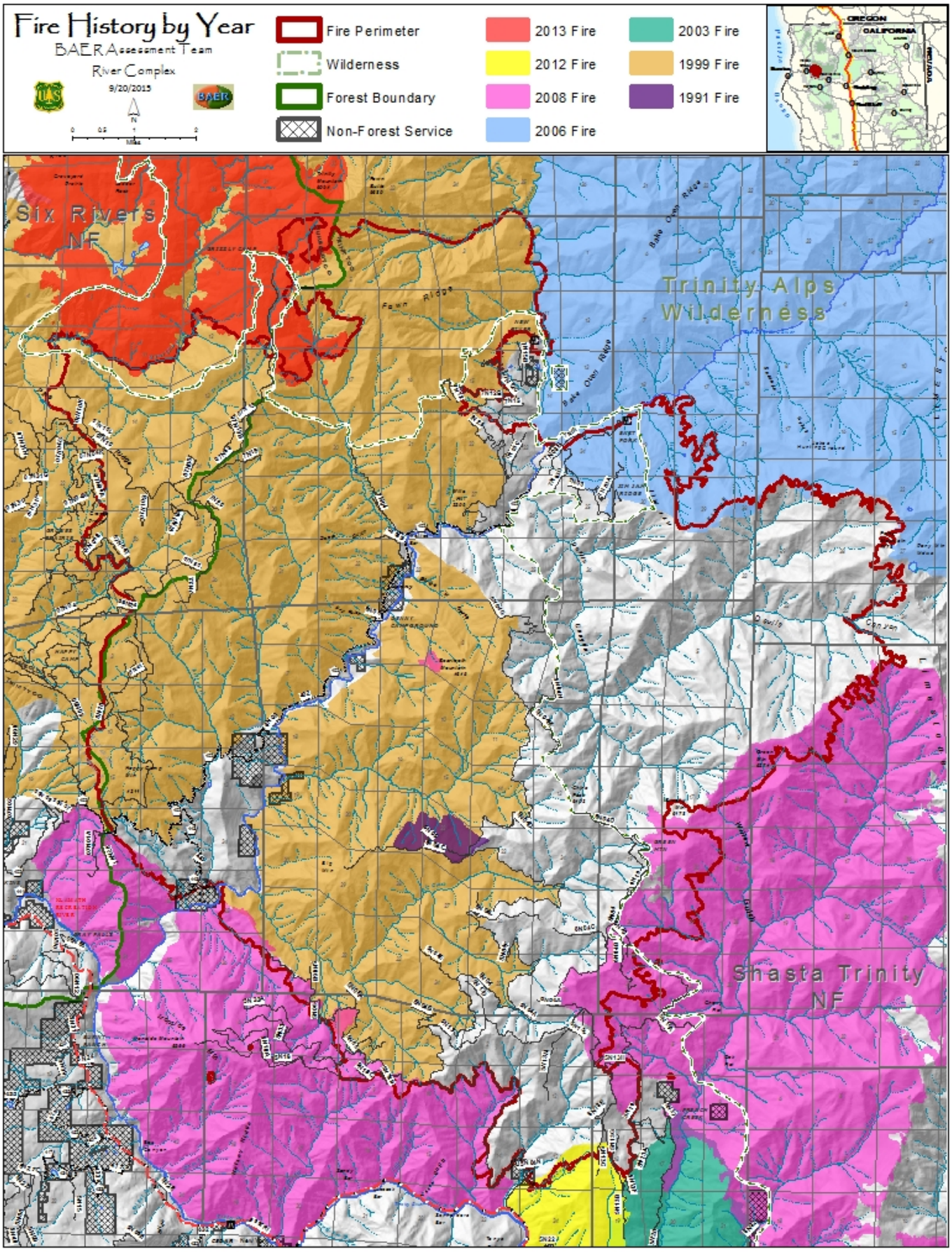

Figure 5: Fire History Map for River Complex Fire Area.

Watershed	Watershed Acres	% Outside Burn	% Unburned/Low	% Low	% Moderate	% High
Middle North Fork Trinity River *	13,646	100%	0%	0%	0%	0%
Virgin Creek	24,088	94%	2%	2%	1%	0%
East Fork New River	26,352	94%	2%	3%	1%	0%
Devils Canyon	17,649	7%	34%	39%	14%	6%
Quinby Creek-New River	21,387	21%	27%	37%	13%	1%
Big Creek	12,282	7%	41%	41%	10%	1%
Bell Creek-New River	21,722	18%	29%	40%	11%	1%
Big French Creek	24,686	88%	6%	4%	2%	0%
Don Juan Creek-Trinity River	21,351	88%	4%	7%	1%	0%
McDonald Creek-Trinity River *	19,838	100%	0%	0%	0%	0%
Sharber Creek-Trinity River *	19,590	100%	0%	0%	0%	0%
Cedar Creek	16,752	87%	5%	5%	3%	0%
Horse Linto Creek	25,301	82%	7%	5%	4%	2%

Table 5: Burn Severity Expressed as a Percent of HUC6 Watershed Area Burned Within The Fire Perimeter.

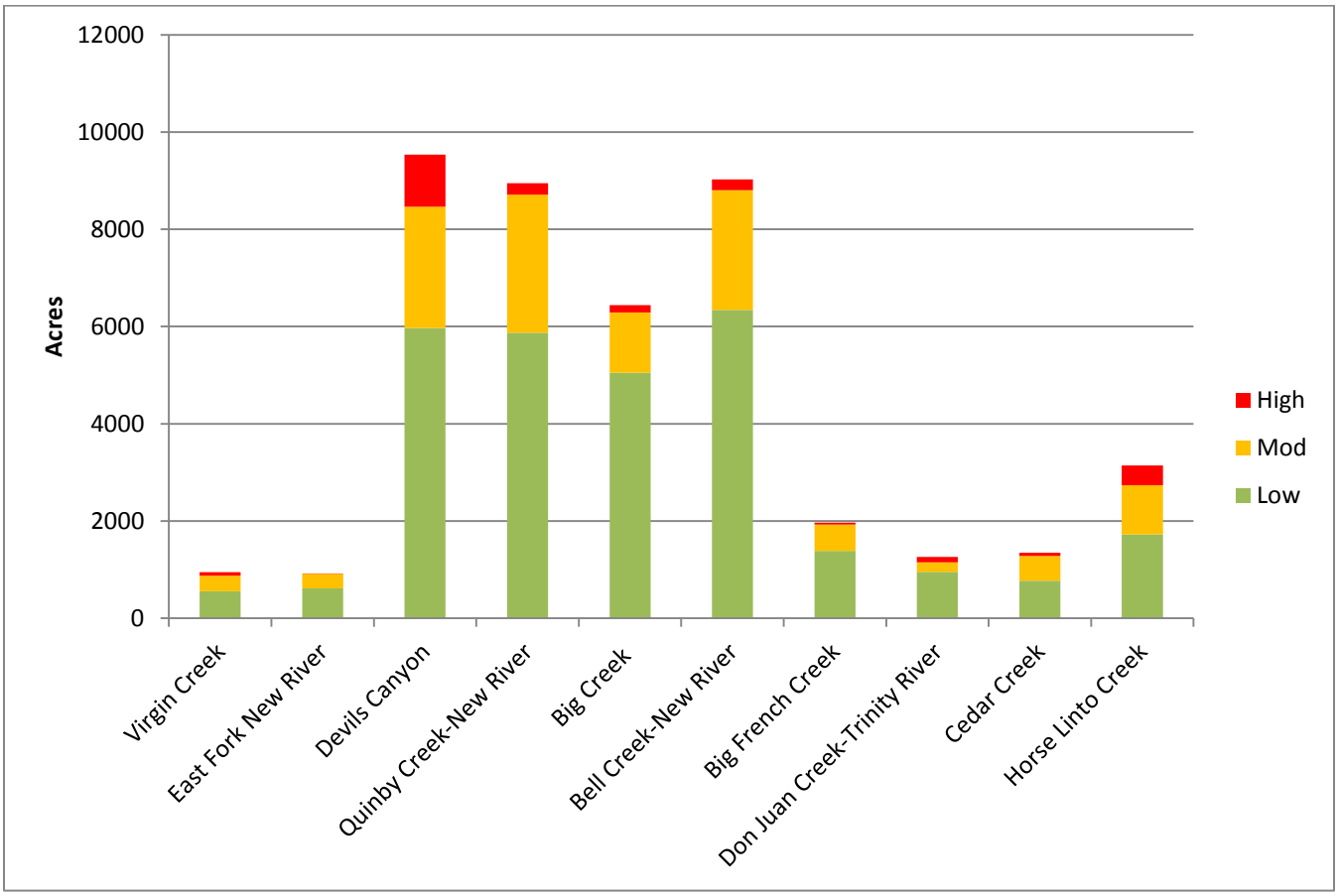

Figure 6: Burn Severity Acres in HUC 6 Watershed with River Complex Fire Perimeter (watershed with less than 100 acres within fire perimeter excluded).

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Watershed Runoff Response

HUC 6 and Pour Point watersheds were analyzed to determine how the River Complex Fire could affect runoff processes as a result of reduced infiltration, fire-induced water repellency and loss of ground cover. Increases in runoff and increased debris transport in burned watersheds can cause downstream flooding and pose a risk to life and property. Increased hillslope runoff also introduces more sediment to the channel network which is transported through high gradient reaches and often deposited in response reaches with channel gradients less than 2 percent.

For this fire, the model developed by Gotvald, et al., 2012 was used to forecast runoff from areas that were burned in the River Complex. This model is a regional regression analysis that utilizes stream gages on gaged streams in California to estimate water discharge from ungaged streams. The equations for the North Coast region utilize the parameters of drainage area and mean annual precipitation to determine the peak discharge for each watershed. The average annual precipitation for the model was derived using PRISM data from the PRISM climate group based at Oregon State University (Figure 7). Peak flows at 2, 5, 10, 25, 50 and 100-yr recurrence intervals were modelled and the results are shown in Table 6. The burn severity data were used to predict increases in flows that would result in watersheds that were burned in the River Complex. The 2 and 10 year peak flows were modelled for this assessment and are presented in Table 7.

In order to assess potential impacts to values at risk (e.g. road infrastructure) within the fire, pour point basins were identified and mapped. These basins are various sizes and are determined by the desired outlet or pour point above a value at risk or area of concern. These sites may be within or downstream of the burned area. StreamStats was used to model pre-fire runoff from each pour point basin. Soil burn severity information was used to model post-fire runoff response for each pour point watershed. Pour point basin pre and post-fire runoff estimates are shown in Table 8 and Table 9.

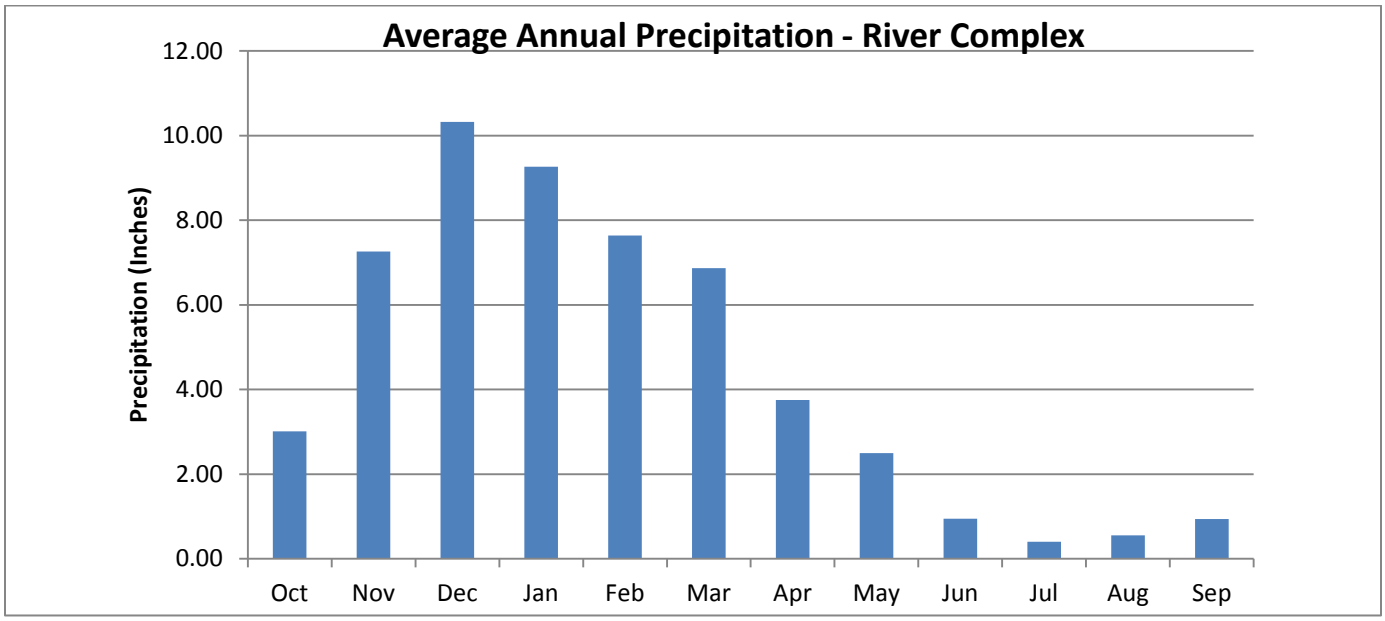


Figure 7: Average monthly precipitation for the river complex burn area, 30 year normals, 1981-2010 (derived from PRISM data, Northwest Alliance for Computational Science and Engineering, Oregon State University).

6th Field HUC Subwatershed	Watershed Area (mi^2)	Average Annual Precipitation (inches) (PRISM)	Pre '2-yr Qp (cfs)	Pre '5-yr Qp (cfs)	Pre '10-yr Qp (cfs)	Pre '25-yr Qp (cfs)	Pre '50-yr Qp (cfs)	Pre '100-yr Qp (cfs)
Middle North Fork Trinity River	21.3	61.40	1656	2939	3839	5004	5878	6772
Virgin Creek	37.6	62.46	2815	4930	6405	8312	9734	11184
East Fork New River	41.2	48.37	2375	4382	5802	7657	9054	10487
Devils Canyon	27.6	48.67	1663	3086	4095	5415	6412	7436
Quinby Creek-New River	33.4	52.29	2123	3867	5098	6700	7905	9140
Big Creek	19.2	57.13	1403	2532	3328	4362	5140	5939
Bell Creek-New River	33.9	53.94	2220	4016	5281	6926	8161	9425
Big French Creek	38.6	46.86	2170	4035	5359	7090	8396	9737
Don Juan Creek-Trinity River	33.4	46.86	1903	3548	4716	6245	7400	8587
McDonald Creek-Trinity River	31.0	52.00	1973	3602	4753	6252	7380	8537
Sharber Creek-Trinity River	30.6	57.15	2140	3832	5020	6562	7718	8900
Cedar Creek	26.2	53.94	1755	3189	4202	5519	6510	7526
Horse Linto Creek	39.5	62.46	2943	5149	6688	8677	10159	11670

Table 6: Pre-Fire Modelled Runoff for 2, 5, 10, 25, 50 and 100-Yr Events for HUC 6 Watersheds in River Complex Area.

6th Field HUC Subwatershed	Watershed Area Sq mi	Pre '2-yr Qp (cfs)	Post '2-yr Qp (cfs)	Pre '10-yr Qp (cfs)	Post '10-yr Qp (cfs)	Post '2-yr Peak Increase x normal	Post '10-yr Peak Increase x normal
Middle North Fork Trinity River	21.3	1656	1656	3839	3839	1.00	1.00
Virgin Creek	37.6	2815	2998	6405	6763	1.06	1.06
East Fork New River	41.2	2375	2504	5802	6082	1.05	1.05
Devils Canyon	27.6	1663	3238	4095	7482	1.95	1.83
Quinby Creek-New River	33.4	2123	3699	5098	8484	1.74	1.66
Big Creek	19.2	1403	2412	3328	5514	1.72	1.66
Bell Creek-New River	33.9	2220	3848	5281	8801	1.73	1.67
Big French Creek	38.6	2170	2389	5359	5832	1.10	1.09
Don Juan Creek-Trinity River	33.4	1903	2112	4716	5193	1.11	1.10
McDonald Creek-Trinity River	31.0	1973	1973	4753	4754	1.00	1.00
Sharber Creek-Trinity River	30.6	2140	2144	5020	5028	1.00	1.00
Cedar Creek	26.2	1755	1986	4202	4676	1.13	1.11
Horse Linto Creek	39.5	2943	3531	6688	7804	1.20	1.17

Table 7: Comparison of Pre/Post Fire Runoff for 2 and 10 Year Events for HUC 6 Watershed.

Pour Point Location	Total Acres	Burn Severity			
		Low - Low/Unburned	Moderate	High	Outside Fire Perimeter
07N04T Spur Road Crossing Trib. to Cedar Creek	339	258	75	6	0
07N26 Road Crossing Trib. to Bell Creek	163	153	10	0	0
05N04 Road Crossing #1 - Trib. to Big Creek	1083	969	96	18	0
05N04 Road Crossing #2 - Trib. to Big Creek	132	118	12	2	0
05N04 Road Crossing #3 - Trib. to Big Creek	106	106	0	0	0
05N04 Road Crossing #4 - Trib. to Big Creek	601	443	148	10	0
05N04 Road Crossing #5 - Trib. to Big Creek	447	302	89	56	0
05N04 Road Crossing - Trib. to Italian Creek	248	225	21	2	0
05N04 Swede Creek Crossing	1319	1060	155	103	0
402 County Road Quinby Creek Crossing	5612	3774	1051	117	670
Devils Canyon Creek Watershed	17648	12832	2502	1071	1243
East Fork Horse Linto Creek Watershed	4123	2253	813	363	694
07N04 Crossing - Cedar Creek Headwaters	1095	745	304	44	1

Table 8: Pour Point Basins – Burn Severity.

Pour Point	Location Identifier	Pre '2-yr Qp (cfs)	Post '2-yr Qp (cfs)	Pre '10-yr Qp (cfs)	Post '10-yr Qp (cfs)	Post '2-yr Peak Increase x normal	Post '10-yr Peak Increase x normal
1	07N04T Spur Road Crossing Trib. to Cedar Creek	76	151	176	329	2.0	1.9
2	07N26 Road Crossing Trib. to Bell Creek	44	67	105	156	1.5	1.5
3	05N04 Road Crossing #1 - Trib. to Big Creek	194	304	459	692	1.6	1.5
4	05N04 Road Crossing #2 - Trib. to Big Creek	28	41	69	99	1.5	1.4
5	05N04 Road Crossing #3 - Trib. to Big Creek	27	35	68	89	1.3	1.3
6	05N04 Road Crossing #4 - Trib. to Big Creek	106	227	256	512	2.1	2.0
7	05N04 Road Crossing #5 - Trib. to Big Creek	79	179	196	404	2.3	2.1
8	05N04 Road Crossing - Trib. to Italian Creek	45	79	115	197	1.8	1.7
9	05N04 Swede Creek Crossing	187	384	470	908	2.1	1.9
10	402 County Road Quinby Creek Crossing	850	1649	1940	3543	1.9	1.8
11	Devils Canyon Creek Watershed	2360	4595	5240	9573	1.9	1.8
12	East Fork Horse Linto Creek Watershed	793	1563	1710	3082	2.0	1.8
13	07N04 Crossing - Cedar Creek Headwaters	226	497	510	1031	2.2	2.0

Table 9: Pour Point Basins – Peak Flow Estimates for 2 and 10-Year Recurrence Intervals.

Table 10 shows the hydrologic parameters that were selected for the 2500-8 Report. See Appendix A for more information on how these values were chosen.

A. Estimated Vegetative Recovery Period	3-5 years
B. Design Chance of Success	80 %
C. Equivalent Design Recurrence Interval	2 years
D. Design Storm Duration	6 hours
E. Design Storm Magnitude	1.95-2.55 inches
F. Design Flow	65 cfs / mi^2
G. Estimated Reduction in Infiltration	10%
H. Adjusted Design Flow	85 cfs / mi^2

Table 10: Hydrologic Design Factors for 2500-8. See appendix A for additional information.

Risk Assessment Process

The risk matrix below, Exhibit 2 of Interim Directive No.: 2520-2010-1 was used to evaluate the Risk Level for each value identified during Assessment. The values at risk (VAR) matrix displayed summarizes values at risk, post wildfire threats and risk ratings. Values with high or very high risk ratings are addressed, where possible, with BAER response actions (treatments). Generally, response actions are not recommended for values with low and intermediate risk ratings.

Probability of Damage or Loss	Magnitude of Consequences		
	Major	Moderate	Minor
	RISK		
Very Likely	Very High	Very High	Low
Likely	Very High	High	Low
Possible	High	Intermediate	Low
Unlikely	Intermediate	Low	Very Low

Property Value at Risk: Water Diversion and Conveyance Infrastructure:

The BAER Team identified several permitted water diversions from field reviews and information from local Forest personnel. The BAER team did not complete an extensive inventory of all water diversions in the burned area. It is likely these diversions and associated water conveyance and/or storage infrastructure could be impacted by sediment and/or debris.

- Magnitude of Consequences: Moderate
- Probability of Damage or Loss: Likely
- Risk: High

Treatments: In most cases, adaptive responses such as shutting down diversions when sediment laden flows occur could be an effective mitigation strategy. Information sharing and outreach efforts with the USFS permit administrator, NRCS, and potentially affected parties are recommended to increase awareness of burned area conditions and potential impacts to water infrastructure. Also see recommendations for domestic water users.

Water Quality – Human Use Value At Risk: Impacts to Domestic water users (Scotts Gulch, Rancheria Creek creeks and Un-named Springs)

Numerous small water systems are scattered throughout the River Complex fire area. The majority of these water systems are associated with private property and are located on mid to lower slopes of the New River and other drainages. Burn severity mapping indicates that these systems were not directly impacted by high severity fire, however many of the systems are located below hillslopes that burned in the River Complex. Systems that take water from streams in burned watershed will likely experience issues with turbidity and potential damage to system infrastructure during fall and winter storms. Systems that take water from springs will have a lower potential for impacts.

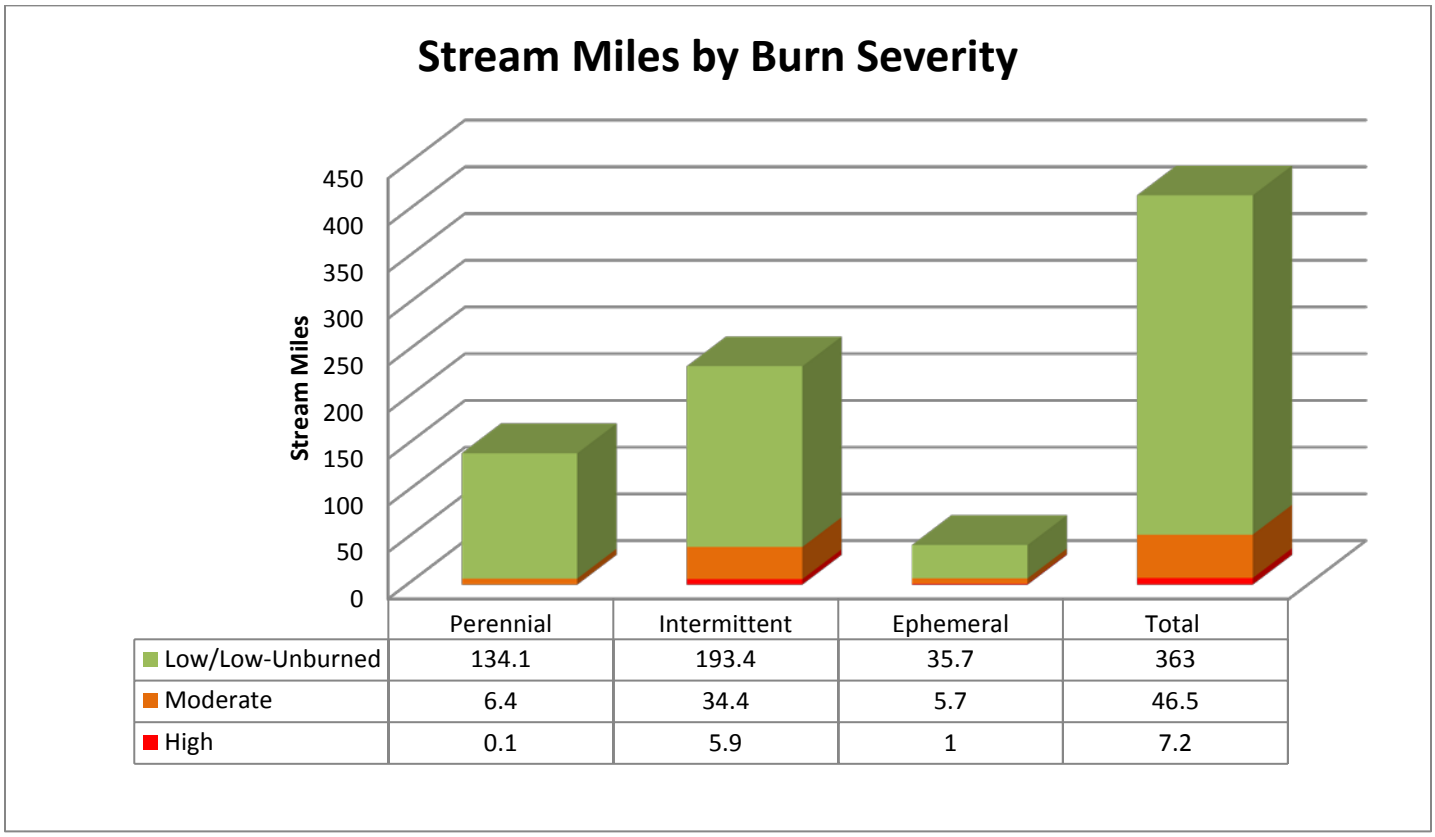
- Magnitude of Consequences: Major
- Probability of Damage or Loss: Possible
- Risk: High

Treatments: Share assessment information with water users and NRCS. Increase maintenance at water intake facilities. Monitor systems during storm events. Consider adding storage to ensure a clean water source during high turbidity events. Also see recommended treatments for water diversion and conveyance infrastructure.

Natural Resource Value at Risk – Water Quality and Aquatic/Riparian Habitats

The River Complex burned a total of 417 miles of perennial, intermittent and ephemeral streams in 10 HUC 6 watersheds. There are about 141 miles of perennial streams, 234 miles of intermittent streams and 42 miles of ephemeral streams within the fire perimeter (NHD GIS Data, 2015). Figure 8 shows the miles of channel located within each burn severity type. Many of these channels have burned previously in the numerous fires that have occurred over the past 16 years. Field reviews suggest that stream channels that were located in previous burn areas did not burn as hot as those that located in areas that had not burned within the past 30 years (though this was not always the case – e.g. East Fork Horse Linto Creek).

Figure 8: On left, Road 5N04 inside ditch. Suppression repair efforts have improved road drainage conditions in some areas but there are many miles of roads within the burn that should be maintained prior to the onset of winter precipitation. Small headwater drainage burned at low/moderate intensity. Small culverts may be at risk of plugging if they are not maintained.



	Perennial	Intermittent	Ephemeral	Total
Low/Low-Unburned	134.1	193.4	35.7	363
Moderate	6.4	34.4	5.7	46.5
High	0.1	5.9	1	7.2

Figure 9: Stream Miles by Burn Severity.

Based on burn severity mapping the River Complex has had similar effects to the previous fires. High and moderate severity burn areas have mostly occurred in headwater drainages and burned though dry ephemeral and intermittent draws. Field observations by BAER personnel indicate that perennial channels in the River Complex generally experienced low severity burns that affected understory vegetation but left most overstory vegetation intact. The field observations agree with a GIS analysis that looked at channel types and burn severity within the River Complex (Figure 9). The analysis indicates that the vast majority of the stream miles that were affected by the burn were located within low to low-unburned severity areas and less and only 6.4 and 0.1 miles of channel were burned at moderate or high severities, respectively.

The probability of damage to some aquatic and riparian habitats is likely, particularly for aquatic/riparian channel networks that are located within and downstream of high and moderate severity burn areas, but the overall risk to the entire channel network is low. The potential for impacts is greatest in the headwater channel network where ephemeral and intermittent channels burned at higher severities. These channels will likely see an influx of fine and course sediments that will be routed to downstream perennial channels. Water temperature could also be affected in areas where the majority of the channel canopy (understory and/or overstory) has been removed. Recovery of channel canopy cover will be variable and take years to decades depending on the vegetation types that were lost in the fire.

- Magnitude of Consequences: Minor
- Probability of Damage or Loss: Likely
- Risk: Low

Treatment: No channel treatments are recommended. Treatments associated with road stream crossings will effective in reducing the probability of damage or loss of aquatic and riparian habitats located downstream of the treatment areas.

Natural Resource Value at Risk Description – New River Wild and Scenic River Corridor

The New River Wild and Scenic River Corridor was analyzed for burn severity effects. The New River Wild and Scenic River corridor occupies 4,397 acres within the River Complex Fire Perimeter (0.25 miles on either side of River). The New River mostly burned at low to low/unburned severities (Table 11). The New River has 7.3 miles of Wild, 5.0 miles of Scenic and 8.7 miles of Recreation Wild and Scenic River designations (Shasta-Trinity National Forest FEIS, 1994).

Wild and Scenic Corridor	Low / Low-Unburned	Moderate	High
Acres and (%)	4260 (97%)	136 (3%)	<1 (0%)

Table 11: New River Wild and Scenic River Corridor Burn Severity Acres – River Complex Fire.

- Magnitude of Consequences: Minor
- Probability of Damage or Loss: Unlikely
- Risk: Very Low

Treatment: No treatments recommended for Wild and Scenic River Corridor specific to this value at risk. See Fisheries and Water Quality and Aquatic/Riparian habitat treatments for additional information of protection of water and fisheries resources.

Figure 10: New River near wilderness boundary.

Summary

The River Complex Fire burned 77,805 acres centered in the New River and adjacent watersheds from late-July through September 2015. The BAER team assessed the fire in late-September and identified and determined potential impacts to values at risk. Water resources values at risk included water conveyance systems, domestic water infrastructure and associated water quality, water quality and aquatic/riparian habitats and the New River Wild and Scenic River corridor. Overall burn severity was low with isolated pockets of high severity occurring in the Devils Canyon Creek HUC 6 watershed and small catchments. There is a potential for impacts to water conveyance systems and domestic water sources as well as portions of streams located within and below areas that burned at high to moderate severity. No direct channel treatments were recommended based on the low probability of success and slope steepness. Potential concerns with water quality and aquatic/riparian habitat are best addressed through implementation of treatment recommendations for roads and other resources (e.g fisheries, geology, soils, botany, recreation).

References

Gotvald, A.J., Barth, N.A., Veilleux, A.G., and Parrett, Charles, 2012, Methods for determining magnitude and frequency of floods in California, based on data through water year 2006: U.S. Geological Survey Scientific Investigations Report 2012–5113, 38 p., 1 pl.

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PRISM Climate Group, Northwest Alliance for Computational Science and Engineering, Oregon State University (precipitation data, 30 year normals).

USDA Forest Service, Final Environmental Impact Statement, Shasta-Trinity National Forests, 1994.

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USDI, Geological Survey, Stream Stats, Available online at http://water.usgs.gov/osw/streamstats/california.html.

Appendix A: Hydrologic Design Factors for Form 2500-8 for River Complex

A. Estimated Vegetative Recovery Period: A recovery period of approximately **3-5 years** was selected for areas burned at high and moderate intensity. This value represents the number of years of vegetative recovery that is necessary before early seral stage plant communities become effective in reducing hillslope erosion in areas that burned at moderate and high intensity. Areas that burned at low intensities are expected to develop vegetative ground cover over a period of 1-2 years.

B. Design Chance of Success: The design chance of success is estimated at **80%**. Factors influencing this determination include confidence in treatments based on experiences addressing impacts from past fires in the same fire perimeter. The chance of success is based on the design storm (6-hour, 2-year RI). Countering past experience is the uncertainty of changing climate and the potential influence of a strong El Nino may result in large precipitation events in the coming winter.

C. Equivalent Design Recurrence Interval: **2-year** recurrence interval.

D. Design Storm Duration: A design storm duration of **6 hours** was chosen for watersheds affected by the River Complex fires. The past several years have been very dry and with infrequent but intense frontal precipitation events. El Nino conditions this coming winter could set the stage for large and more frequent storms. Events on the order of 6 hours and greater will have the potential to produce a watershed response from the burned areas.

E. Design Storm Magnitude: The 2-year, 6-hour rainfall event was determined to be **2.22 inches** (confidence interval of 1.95" to 2.55"). The value was derived by the National Weather Service Precipitation Frequency Tool (http://hdsc.nws.noaa.gov/hdsc/pfds/).

F. Design Flow: The pre-event design flow was calculated for each watershed according to methodology developed by Gotveld et al, 2012 using regression equations and variables of watershed area and mean annual rainfall. Estimated runoff for 2, 5, 10, 25 50 and 100-year recurrence interval storms for the affected HUC 6 watershed is shown in Table 5. The total pre-fire yield from a 2-year recurrence interval storm was estimated at approximately **65 cfs/mile^2**. Runoff estimates ranged from 56 cfs/mi^2 to 78 cfs/mi^2 in the affected watersheds.

G. Estimated Reduction in Infiltration: The reduction in infiltration was estimated to be **10 percent** across the entire fire area (based on discussion with the BAER team soil scientists).

H. Adjusted Design Flow: The total post-fire runoff response to a 2-year recurrence interval storm was calculated to be approximately **85 cfs/mile^2**. Runoff estimates ranged from 61 cfs/mi^2 to 126 cfs/mi^2 in the affected watersheds.

Appendix B: Pour Point Data From StreamStats

Pour Point 1: 07N04T Spur Road Crossing Delineation (Tributary to Cedar Creek)

Date: Thurs Sept 24, 2015 7:39:34 PM GMT-7
Site Location: California
NAD 1983 Latitude: 40.9468 (40 56 48)
NAD 1983 Longitude: -123.4726 (-123 28 22)
Drainage Area: 0.5 mi2

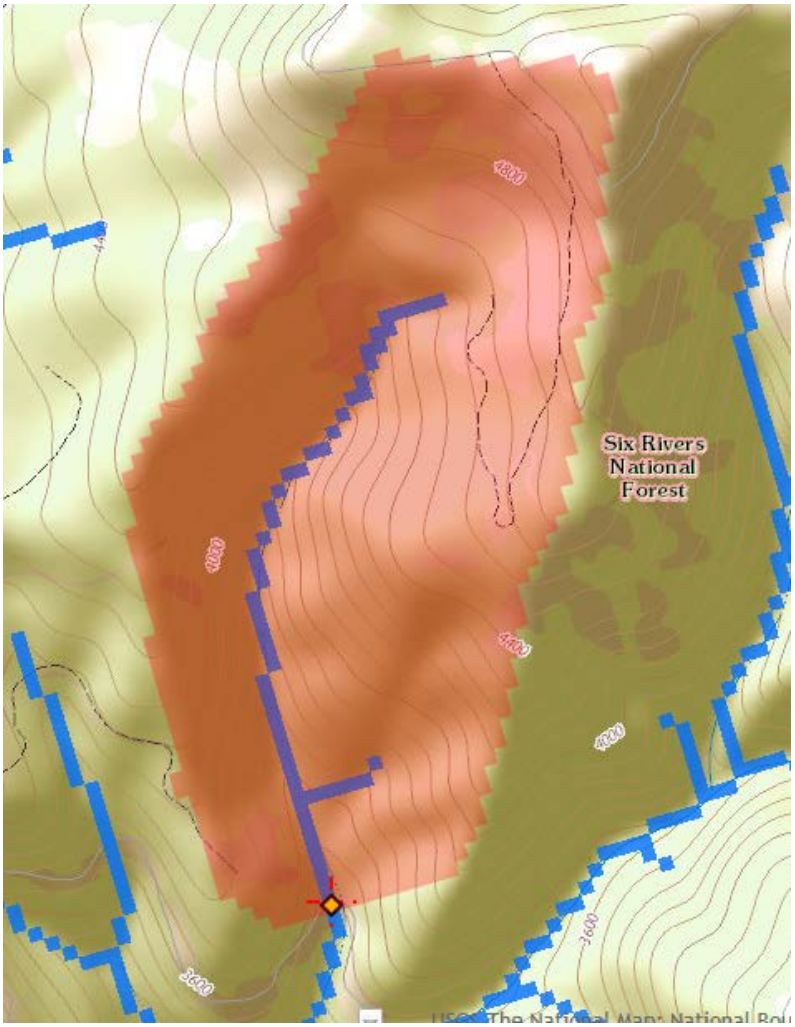
Peak-Flow Basin Characteristics			
100% 2012 5113 Region 1 North Coast (0.5 mi2)			
Parameter	**Value**	**Regression Equation Valid Range**	
		Min	**Max**
Drainage Area (square miles)	0.5	0.04	3200
Mean Annual Precipitation (inches)	84	20	125

Peak-Flow Statistics						
Statistic	**Value**	**Unit**	**Prediction Error (percent)**	**Equivalent years of record**	**90-Percent Prediction Interval**	
					Min	**Max**
PK2	75.8	ft3/s	59		30.6	188
PK5	134	ft3/s	47		63.2	285
PK10	176	ft3/s	44		85.9	359
PK25	229	ft3/s	43		116	454
PK50	270	ft3/s	43		136	537
PK100	313	ft3/s	44		153	637
PK200	353	ft3/s	44		172	721
PK500	406	ft3/s	46		194	851

#http://pubs.usgs.gov/sir/2012/5113/#
Gotvald_ A.J._ Barth_ N.A._ Veilleux_ A.G._ and Parrett_ Charles_ 2012_ Methods for determining magnitude and frequency of floods in California_ based on data through water year 2006: U.S. Geological Survey Scientific Investigations Report 2012-5113_ 38 p._ 1 pl.

Label	Value	Units	Definition
DRNAREA	0.5	square miles	Area that drains to a point on a stream
RELIEF	1701	feet	Maximum - minimum elevation
ELEVMAX	5158	feet	Maximum basin elevation
MINBELEV	3458	feet	Minimum basin elevation
LAKEAREA	0	percent	Percentage of Lakes and Ponds
EL6000	0	percent	Percent of area above 6000 ft
OUTLETELEV	3458	feet	Elevation of the stream outlet in thousands of feet above NAVD88.
BASINPERIM	3.88	miles	Perimeter of the drainage basin as defined in SIR 2004-5262
RELRELF	439	feet per mi	Basin relief divided by basin perimeter
ELEV	4324	feet	Mean Basin Elevation
BSLDEM30M	42.9	percent	Mean basin slope computed from 30 m DEM
FOREST	48.4	percent	Percentage of area covered by forest

LC11IMP	0	percent	Percentage of impervious area determined from NLCD 2011 impervious dataset
PRECIP	84	inches	Mean Annual Precipitation
JANMAXTMP	45.88	degrees F	Mean Maximum January Temperature
JANMINTMP	29.71	degrees F	Mean Minimum January Temperature
ALTIND	3.59	thousand feet	Altitude Index
LC11DEV	0.9	percent	Percentage of land-use from NLCD 2011 classes 21-24
LFPLENGTH	1	miles	Length of longest flow path



Pour Point 2: 07N26 Road Crossing Delineation (Tributary to Bell Creek)

Date: Fri Sept 25, 2015 7:50:55 AM GMT-7
Site Location: California
NAD 1983 Latitude: 40.9179 (40 55 05)
NAD 1983 Longitude: -123.4678 (-123 28 04)
Drainage Area: 0.3 mi2

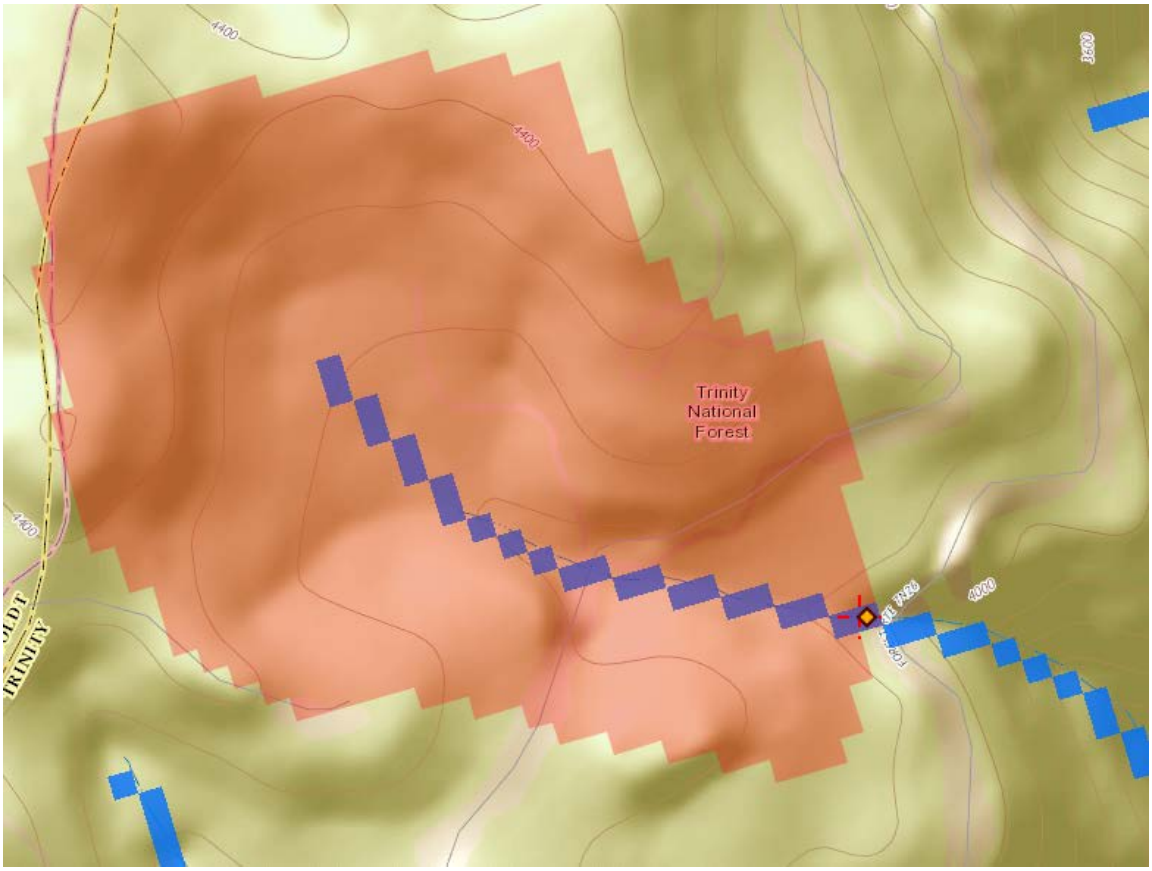
Peak-Flow Basin Characteristics			
100% 2012 5113 Region 1 North Coast (0.3 mi2)			
Parameter	**Value**	**Regression Equation Valid Range**	
		Min	**Max**
Drainage Area (square miles)	0.3	0.04	3200
Mean Annual Precipitation (inches)	76.9	20	125

Peak-Flow Statistics						
Statistic	**Value**	**Unit**	**Prediction Error (percent)**	**Equivalent years of record**	**90-Percent Prediction Interval**	
					Min	**Max**
PK2	43.8	ft3/s	59		17.6	109
PK5	79.6	ft3/s	47		37.4	169
PK10	105	ft3/s	44		51.4	216
PK25	139	ft3/s	43		69.8	276
PK50	164	ft3/s	43		82.4	328
PK100	191	ft3/s	44		93.5	391
PK200	217	ft3/s	44		106	444
PK500	250	ft3/s	46		119	526

#http://pubs.usgs.gov/sir/2012/5113/#
Gotvald_ A.J._ Barth_ N.A._ Veilleux_ A.G._ and Parrett_ Charles_ 2012_ Methods for determining magnitude and frequency of floods in California_ based on data through water year 2006: U.S. Geological Survey Scientific Investigations Report 2012-5113_ 38 p._ 1 pl.

Label	Value	Units	Definition
DRNAREA	0.3	square miles	Area that drains to a point on a stream
RELIEF	0	feet	Maximum - minimum elevation
ELEVMAX	4202	feet	Maximum basin elevation
MINBELEV	4202	feet	Minimum basin elevation
LAKEAREA	0	percent	Percentage of Lakes and Ponds
EL6000	0	percent	Percent of area above 6000 ft
OUTLETELEV	4045	feet	Elevation of the stream outlet in thousands of feet above NAVD88.
BASINPERIM	2.42	miles	Perimeter of the drainage basin as defined in SIR 2004-5262
RELRELF	0	feet per mi	Basin relief divided by basin perimeter
ELEV	4278	feet	Mean Basin Elevation
BSLDEM30M	18.6	percent	Mean basin slope computed from 30 m DEM
FOREST	62	percent	Percentage of area covered by forest
LC11IMP	0	percent	Percentage of impervious area determined from NLCD 2011 impervious dataset

PRECIP	76.9	inches	Mean Annual Precipitation
JANMAXTMP	45.92	degrees F	Mean Maximum January Temperature
JANMINTMP	29.97	degrees F	Mean Minimum January Temperature
ALTIND	3.55	thousand feet	Altitude Index
LC11DEV	0	percent	Percentage of land-use from NLCD 2011 classes 21-24
LFPLENGTH	0	miles	Length of longest flow path



Pour Point 3: 05N04 Road Crossing Delineation #1 (Tributary to Big Creek)

Date: Fri Sept 25, 2015 8:08:04 AM GMT-7
Site Location: California
NAD 1983 Latitude: 40.8705 (40 52 14)
NAD 1983 Longitude: -123.3374 (-123 20 15)
Drainage Area: 1.7 mi2

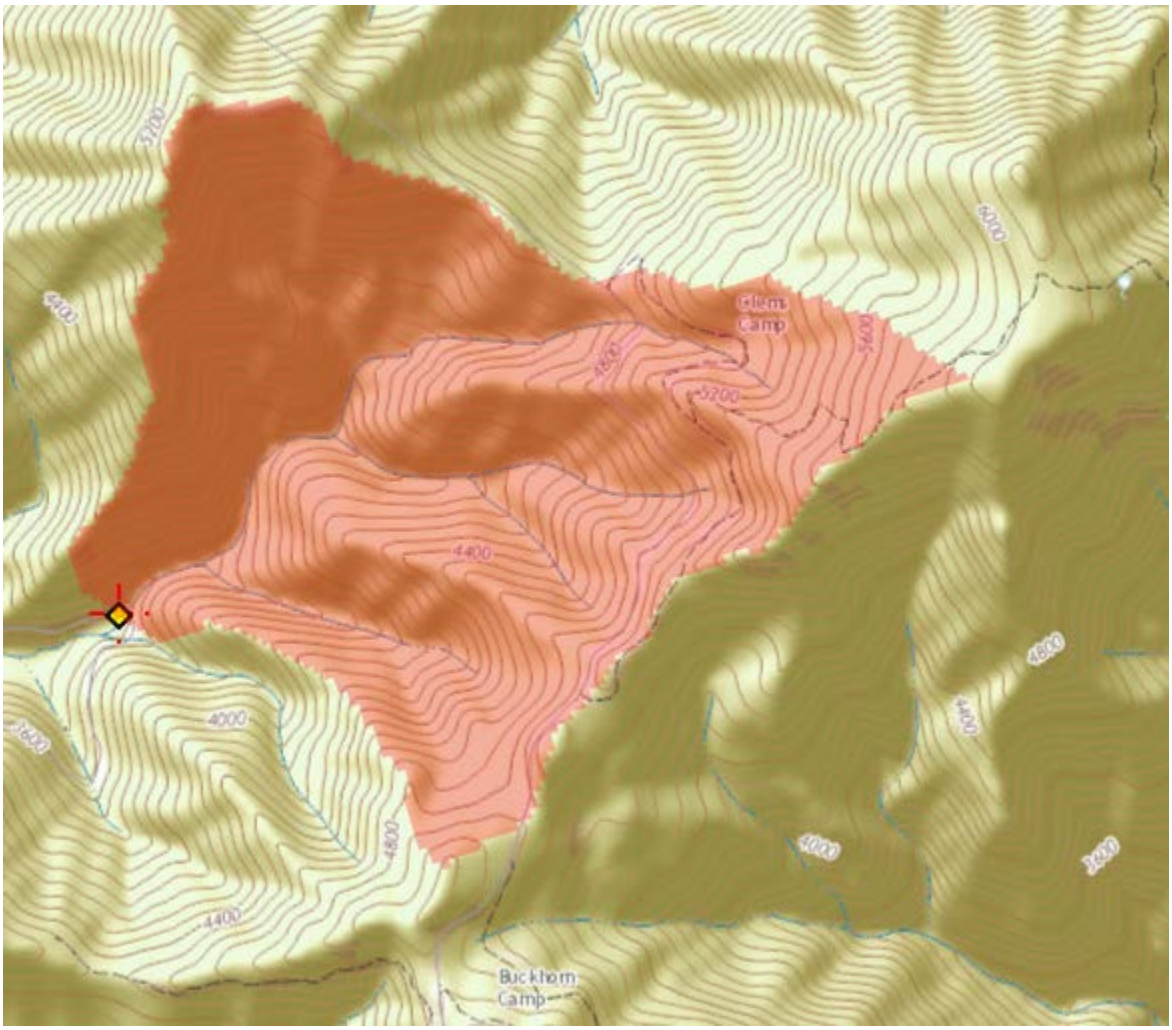
Peak-Flow Basin Characteristics			
100% 2012 5113 Region 1 North Coast (1.7 mi2)			
Parameter	**Value**	**Regression Equation Valid Range**	
		Min	**Max**
Drainage Area (square miles)	1.7	0.04	3200
Mean Annual Precipitation (inches)	71.1	20	125

Peak-Flow Statistics						
Statistic	**Value**	**Unit**	**Prediction Error (percent)**	**Equivalent years of record**	**90-Percent Prediction Interval**	
					Min	**Max**
PK2	194	ft3/s	59		79.3	477
PK5	349	ft3/s	47		166	734
PK10	459	ft3/s	44		227	930
PK25	602	ft3/s	43		307	1180
PK50	710	ft3/s	43		361	1400
PK100	822	ft3/s	44		408	1660
PK200	928	ft3/s	44		459	1880
PK500	1070	ft3/s	46		516	2210

#http://pubs.usgs.gov/sir/2012/5113/#
Gotvald_ A.J._ Barth_ N.A._ Veilleux_ A.G._ and Parrett_ Charles_ 2012_ Methods for determining magnitude and frequency of floods in California_ based on data through water year 2006: U.S. Geological Survey Scientific Investigations Report 2012-5113_ 38 p._ 1 pl.

Label	Value	Units	Definition
DRNAREA	1.7	square miles	Area that drains to a point on a stream
RELIEF	0	feet	Maximum - minimum elevation
ELEVMAX	4207	feet	Maximum basin elevation
MINBELEV	4207	feet	Minimum basin elevation
LAKEAREA	0	percent	Percentage of Lakes and Ponds
EL6000	0	percent	Percent of area above 6000 ft
OUTLETELEV	3348	feet	Elevation of the stream outlet in thousands of feet above NAVD88.
BASINPERIM	7.83	miles	Perimeter of the drainage basin as defined in SIR 2004-5262
RELRELF	0	feet per mi	Basin relief divided by basin perimeter
ELEV	4552	feet	Mean Basin Elevation
BSLDEM30M	46.1	percent	Mean basin slope computed from 30 m DEM
FOREST	75.8	percent	Percentage of area covered by forest
LC11IMP	0	percent	Percentage of impervious area determined from NLCD 2011 impervious dataset
PRECIP	71.1	inches	Mean Annual Precipitation

JANMAXTMP	45.18	degrees F	Mean Maximum January Temperature
JANMINTMP	27.96	degrees F	Mean Minimum January Temperature
ALTIND	3.78	thousand feet	Altitude Index
LC11DEV	0	percent	Percentage of land-use from NLCD 2011 classes 21-24
LFPLENGTH	0	miles	Length of longest flow path



Pour Point 4: 05N04 Road Crossing Delineation #2 (Tributary to Big Creek).

Date: Fri Sept 25, 2015 8:20:39 AM GMT-7
Site Location: California
NAD 1983 Latitude: 40.8647 (40 51 53)
NAD 1983 Longitude: -123.3384 (-123 20 19)
Drainage Area: 0.2 mi2

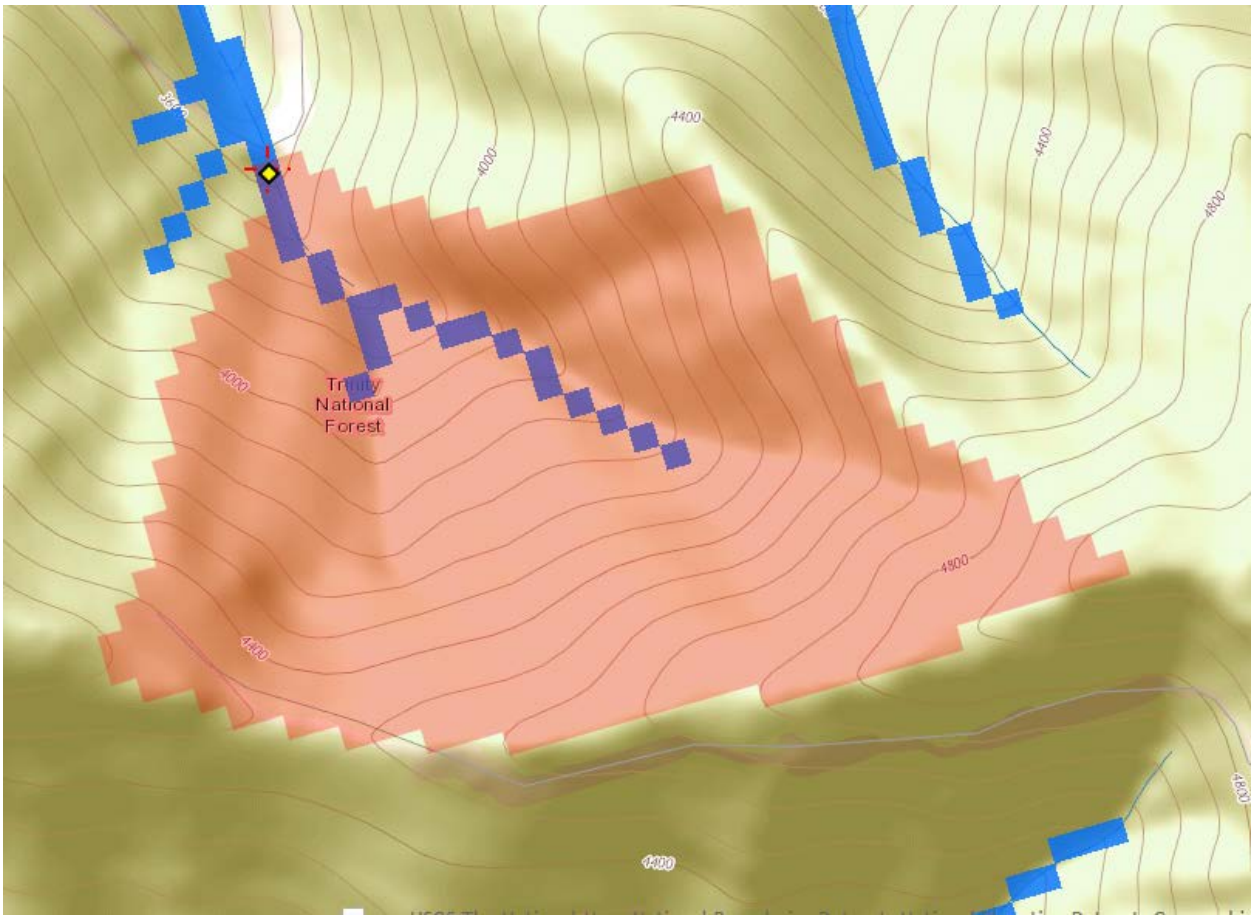
Peak-Flow Basin Characteristics			
100% 2012 5113 Region 1 North Coast (0.2 mi2)			
Parameter	**Value**	**Regression Equation Valid Range**	
		Min	**Max**
Drainage Area (square miles)	0.2	0.04	3200
Mean Annual Precipitation (inches)	69.9	20	125

Peak-Flow Statistics						
Statistic	**Value**	**Unit**	**Prediction Error (percent)**	**Equivalent years of record**	**90-Percent Prediction Interval**	
					Min	**Max**
PK2	27.6	ft3/s	59		11.1	68.8
PK5	51.6	ft3/s	47		24.2	110
PK10	69	ft3/s	44		33.6	142
PK25	91.7	ft3/s	43		46	183
PK50	109	ft3/s	43		54.6	218
PK100	128	ft3/s	44		62.3	262
PK200	145	ft3/s	44		70.5	298
PK500	168	ft3/s	46		79.8	355

#http://pubs.usgs.gov/sir/2012/5113/#
Gotvald_ A.J._ Barth_ N.A._ Veilleux_ A.G._ and Parrett_ Charles_ 2012_ Methods for determining magnitude and frequency of floods in California_ based on data through water year 2006: U.S. Geological Survey Scientific Investigations Report 2012-5113_ 38 p._ 1 pl.

Label	Value	Units	Definition
DRNAREA	0.2	square miles	Area that drains to a point on a stream
RELIEF	1435	feet	Maximum - minimum elevation
ELEVMAX	5004	feet	Maximum basin elevation
MINBELEV	3569	feet	Minimum basin elevation
LAKEAREA	0	percent	Percentage of Lakes and Ponds
EL6000	0	percent	Percent of area above 6000 ft
OUTLETELEV	3569	feet	Elevation of the stream outlet in thousands of feet above NAVD88.
BASINPERIM	2.42	miles	Perimeter of the drainage basin as defined in SIR 2004-5262
RELRELF	592	feet per mi	Basin relief divided by basin perimeter
ELEV	4299	feet	Mean Basin Elevation
BSLDEM30M	49.5	percent	Mean basin slope computed from 30 m DEM
FOREST	84	percent	Percentage of area covered by forest
LC11IMP	0	percent	Percentage of impervious area determined from NLCD 2011 impervious dataset
PRECIP	69.9	inches	Mean Annual Precipitation

JANMAXTMP	45.63	degrees F	Mean Maximum January Temperature
JANMINTMP	28.59	degrees F	Mean Minimum January Temperature
ALTIND	3.57	thousand feet	Altitude Index
LC11DEV	1.3	percent	Percentage of land-use from NLCD 2011 classes 21-24
LFPLENGTH	1	miles	Length of longest flow path



Pour Point 5: 05N04 Road Crossing Delineation #3 (Tributary to Big Creek).

Date: Fri Sept 25, 2015 8:29:00 AM GMT-7
Site Location: California
NAD 1983 Latitude: 40.8576 (40 51 27)
NAD 1983 Longitude: -123.3517 (-123 21 06)
Drainage Area: 0.2 mi2

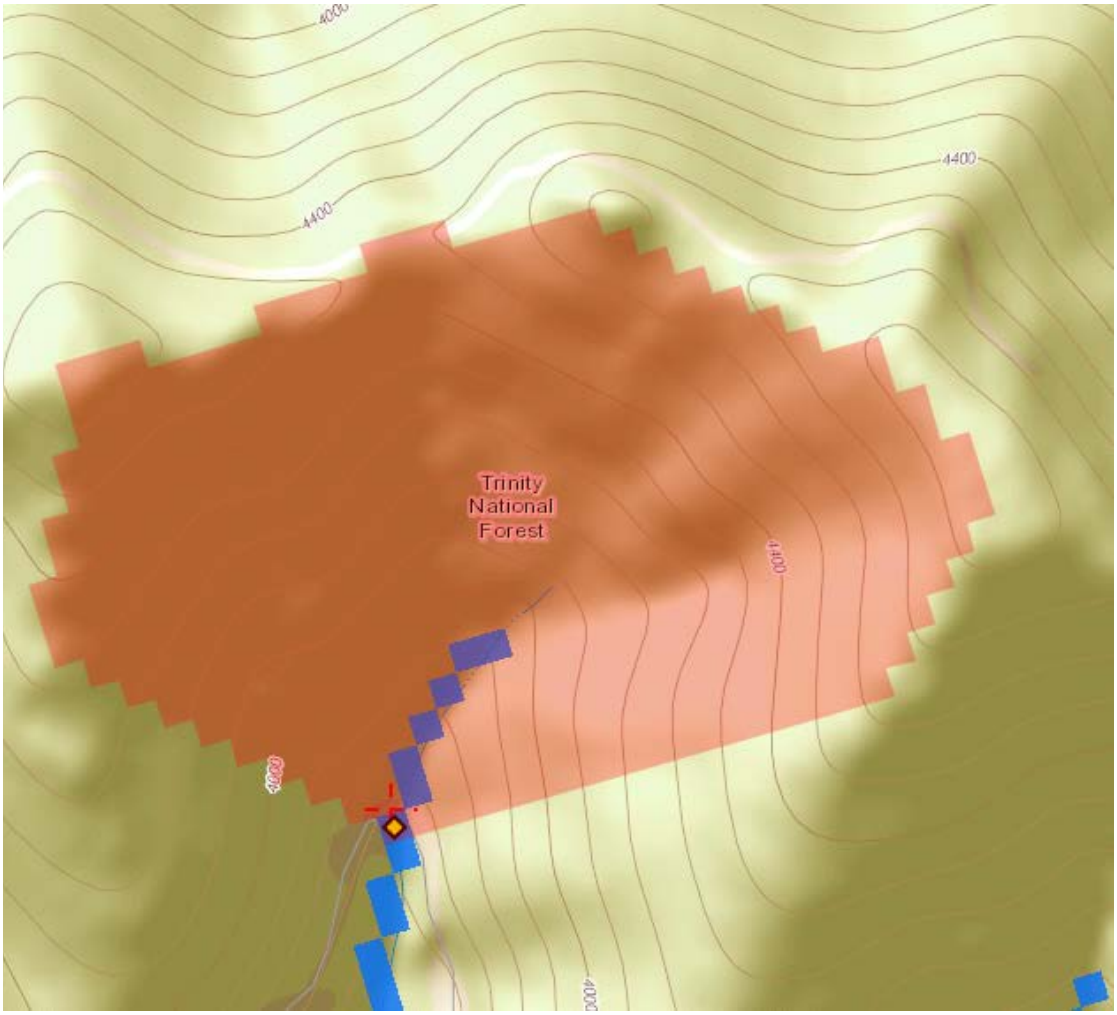
Peak-Flow Basin Characteristics			
100% 2012 5113 Region 1 North Coast (0.2 mi2)			
Parameter	**Value**	**Regression Equation Valid Range**	
		Min	**Max**
Drainage Area (square miles)	0.2	0.04	3200
Mean Annual Precipitation (inches)	68.9	20	125

Peak-Flow Statistics						
Statistic	**Value**	**Unit**	**Prediction Error (percent)**	**Equivalent years of record**	**90-Percent Prediction Interval**	
					Min	**Max**
PK2	27.2	ft3/s	59		10.9	67.8
PK5	51.1	ft3/s	47		24	109
PK10	68.3	ft3/s	44		33.3	140
PK25	90.9	ft3/s	43		45.6	181
PK50	108	ft3/s	43		54.2	216
PK100	127	ft3/s	44		61.8	260
PK200	144	ft3/s	44		70	296
PK500	167	ft3/s	46		79.2	352

#http://pubs.usgs.gov/sir/2012/5113/#
Gotvald_ A.J._ Barth_ N.A._ Veilleux_ A.G._ and Parrett_ Charles_ 2012_ Methods for determining magnitude and frequency of floods in California_ based on data through water year 2006: U.S. Geological Survey Scientific Investigations Report 2012-5113_ 38 p._ 1 pl.

Label	Value	Units	Definition
DRNAREA	0.2	square miles	Area that drains to a point on a stream
RELIEF	1026	feet	Maximum - minimum elevation
ELEVMAX	4750	feet	Maximum basin elevation
MINBELEV	3723	feet	Minimum basin elevation
LAKEAREA	0	percent	Percentage of Lakes and Ponds
EL6000	0	percent	Percent of area above 6000 ft
OUTLETELEV	3723	feet	Elevation of the stream outlet in thousands of feet above NAVD88.
BASINPERIM	1.98	miles	Perimeter of the drainage basin as defined in SIR 2004-5262
RELRELF	519	feet per mi	Basin relief divided by basin perimeter
ELEV	4315	feet	Mean Basin Elevation
BSLDEM30M	46.9	percent	Mean basin slope computed from 30 m DEM
FOREST	71.5	percent	Percentage of area covered by forest
LC11IMP	0	percent	Percentage of impervious area determined from NLCD 2011 impervious dataset

PRECIP	68.9	inches	Mean Annual Precipitation
JANMAXTMP	46.09	degrees F	Mean Maximum January Temperature
JANMINTMP	29.26	degrees F	Mean Minimum January Temperature
ALTIND	3.58	thousand feet	Altitude Index
LC11DEV	0.2	percent	Percentage of land-use from NLCD 2011 classes 21-24
LFPLENGTH	0	miles	Length of longest flow path



Pour Point 6: 05N04 Road Crossing Delineation #4 (Tributary to Big Creek).

Date: Fri Sept 25, 2015 8:38:05 AM GMT-7
Site Location: California
NAD 1983 Latitude: 40.8528 (40 51 10)
NAD 1983 Longitude: -123.3442 (-123 20 39)
Drainage Area: 0.9 mi2

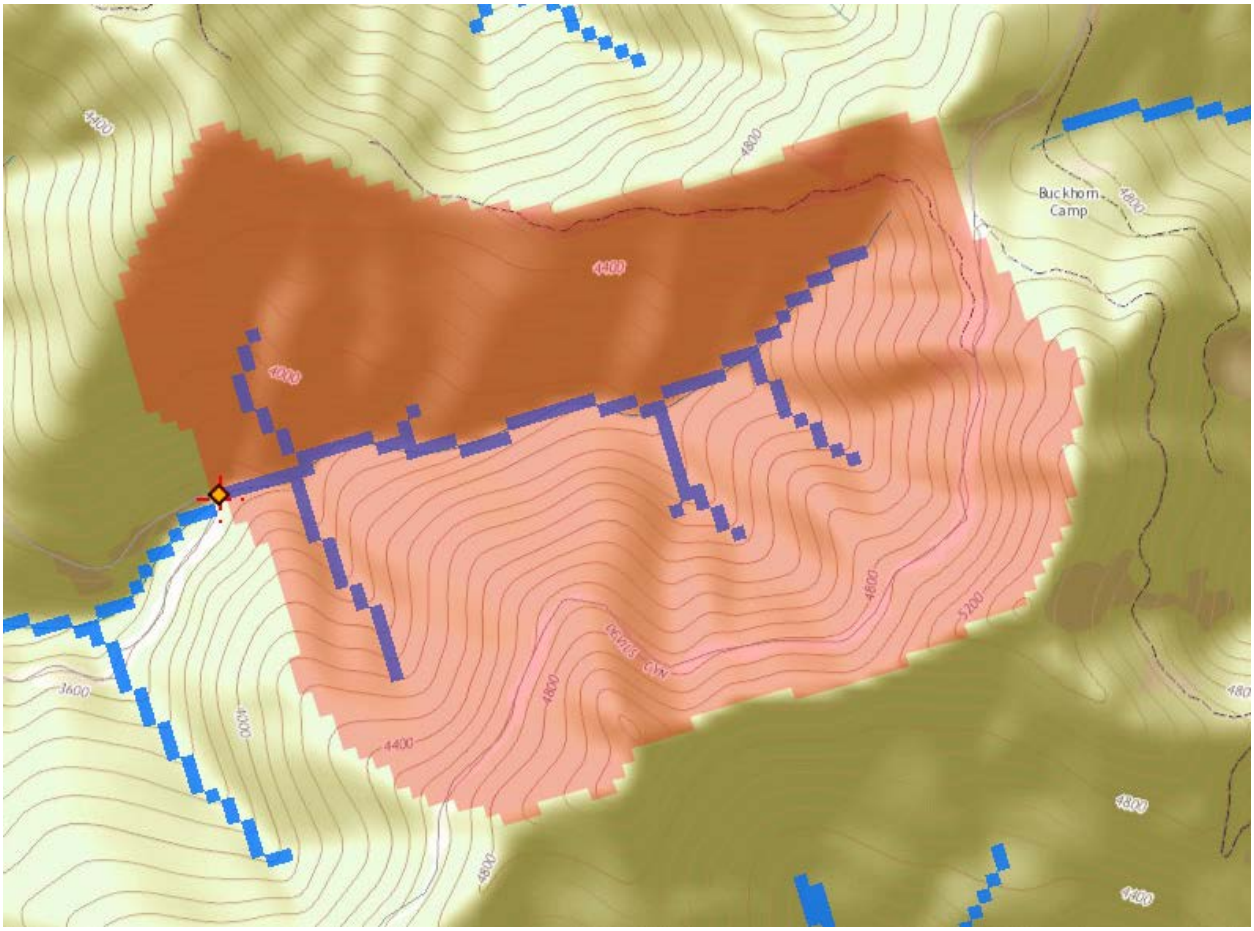
Peak-Flow Basin Characteristics			
100% 2012 5113 Region 1 North Coast (0.9 mi2)			
Parameter	**Value**	**Regression Equation Valid Range**	
		Min	**Max**
Drainage Area (square miles)	0.9	0.04	3200
Mean Annual Precipitation (inches)	68.6	20	125

Peak-Flow Statistics						
Statistic	**Value**	**Unit**	**Prediction Error (percent)**	**Equivalent years of record**	**90-Percent Prediction Interval**	
					Min	**Max**
PK2	106	ft3/s	59		42.9	260
PK5	193	ft3/s	47		91.6	407
PK10	256	ft3/s	44		126	520
PK25	337	ft3/s	43		171	664
PK50	400	ft3/s	43		202	789
PK100	465	ft3/s	44		230	940
PK200	526	ft3/s	44		259	1070
PK500	608	ft3/s	46		292	1260

#http://pubs.usgs.gov/sir/2012/5113/#
Gotvald_ A.J._ Barth_ N.A._ Veilleux_ A.G._ and Parrett_ Charles_ 2012_ Methods for determining magnitude and frequency of floods in California_ based on data through water year 2006: U.S. Geological Survey Scientific Investigations Report 2012-5113_ 38 p._ 1 pl.

Label	Value	Units	Definition
DRNAREA	0.9	square miles	Area that drains to a point on a stream
RELIEF	1871	feet	Maximum - minimum elevation
ELEVMAX	5399	feet	Maximum basin elevation
MINBELEV	3528	feet	Minimum basin elevation
LAKEAREA	0	percent	Percentage of Lakes and Ponds
EL6000	0	percent	Percent of area above 6000 ft
OUTLETELEV	3528	feet	Elevation of the stream outlet in thousands of feet above NAVD88.
BASINPERIM	4.88	miles	Perimeter of the drainage basin as defined in SIR 2004-5262
RELRELF	383	feet per mi	Basin relief divided by basin perimeter
ELEV	4442	feet	Mean Basin Elevation
BSLDEM30M	49.4	percent	Mean basin slope computed from 30 m DEM
FOREST	76.1	percent	Percentage of area covered by forest
LC11IMP	0.1	percent	Percentage of impervious area determined from NLCD 2011 impervious dataset

PRECIP	68.6	inches	Mean Annual Precipitation
JANMAXTMP	45.34	degrees F	Mean Maximum January Temperature
JANMINTMP	28.21	degrees F	Mean Minimum January Temperature
ALTIND	3.69	thousand feet	Altitude Index
LC11DEV	4.4	percent	Percentage of land-use from NLCD 2011 classes 21-24
LFPLENGTH	1	miles	Length of longest flow path



Pour Point 7: 05N04 Road Crossing Delineation #5 (Tributary to Big Creek).

Date: Fri Sept 25, 2015 8:42:56 AM GMT-7
Site Location: California
NAD 1983 Latitude: 40.8409 (40 50 27)
NAD 1983 Longitude: -123.3514 (-123 21 06)
Drainage Area: 0.7 mi2

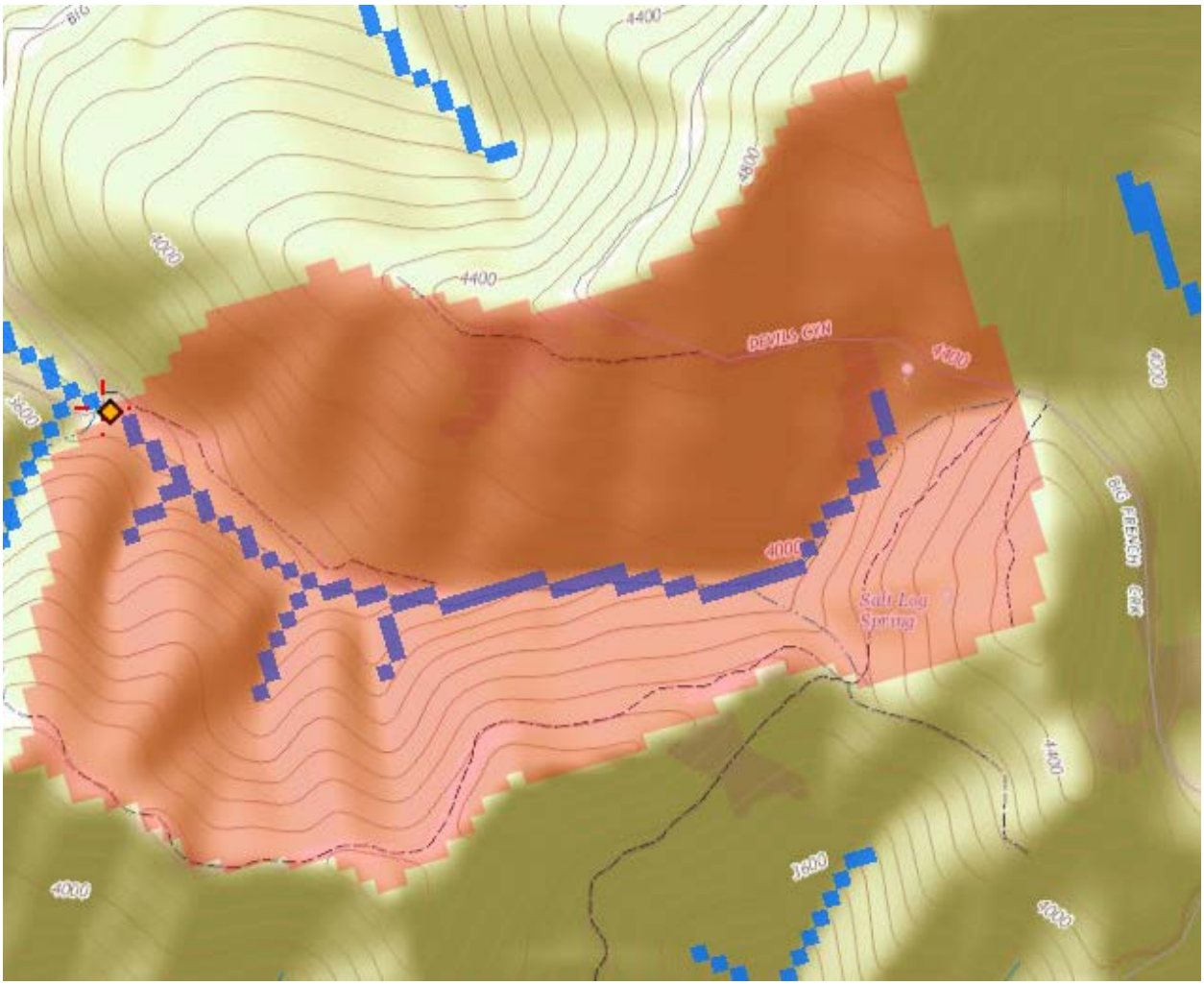
Peak-Flow Basin Characteristics			
100% 2012 5113 Region 1 North Coast (0.7 mi2)			
Parameter	**Value**	**Regression Equation Valid Range**	
		Min	**Max**
Drainage Area (square miles)	0.7	0.04	3200
Mean Annual Precipitation (inches)	64.4	20	125

Peak-Flow Statistics						
Statistic	**Value**	**Unit**	**Prediction Error (percent)**	**Equivalent years of record**	**90-Percent Prediction Interval**	
					Min	**Max**
PK2	79.1	ft3/s	59		32.1	195
PK5	147	ft3/s	47		69.8	311
PK10	196	ft3/s	44		96.5	399
PK25	260	ft3/s	43		132	513
PK50	309	ft3/s	43		156	612
PK100	361	ft3/s	44		178	731
PK200	409	ft3/s	44		201	832
PK500	474	ft3/s	46		228	988

#http://pubs.usgs.gov/sir/2012/5113/#
Gotvald_ A.J._ Barth_ N.A._ Veilleux_ A.G._ and Parrett_ Charles_ 2012_ Methods for determining magnitude and frequency of floods in California_ based on data through water year 2006: U.S. Geological Survey Scientific Investigations Report 2012-5113_ 38 p._ 1 pl.

Label	Value	Units	Definition
DRNAREA	0.7	square miles	Area that drains to a point on a stream
RELIEF	1600	feet	Maximum - minimum elevation
ELEVMAX	5067	feet	Maximum basin elevation
MINBELEV	3467	feet	Minimum basin elevation
LAKEAREA	0	percent	Percentage of Lakes and Ponds
EL6000	0	percent	Percent of area above 6000 ft
OUTLETELEV	3467	feet	Elevation of the stream outlet in thousands of feet above NAVD88.
BASINPERIM	4.55	miles	Perimeter of the drainage basin as defined in SIR 2004-5262
RELRELF	352	feet per mi	Basin relief divided by basin perimeter
ELEV	4141	feet	Mean Basin Elevation
BSLDEM30M	42.9	percent	Mean basin slope computed from 30 m DEM
FOREST	66.8	percent	Percentage of area covered by forest
LC11IMP	0.1	percent	Percentage of impervious area determined from NLCD 2011 impervious dataset
PRECIP	64.4	inches	Mean Annual Precipitation
JANMAXTMP	46.11	degrees F	Mean Maximum January Temperature
JANMINTMP	29.55	degrees F	Mean Minimum January Temperature

ALTIND	3.44	thousand feet	Altitude Index
LC11DEV	5.4	percent	Percentage of land-use from NLCD 2011 classes 21-24
LFPLENGTH	2	miles	Length of longest flow path



Pour Point 8: 05N04 Road Crossing Delineation #5 (Tributary to Italian Creek).

Date: Fri Sept 25, 2015 8:50:17 AM GMT-7
Site Location: California
NAD 1983 Latitude: 40.8248 (40 49 29)
NAD 1983 Longitude: -123.3522 (-123 21 08)
Drainage Area: 0.4 mi2

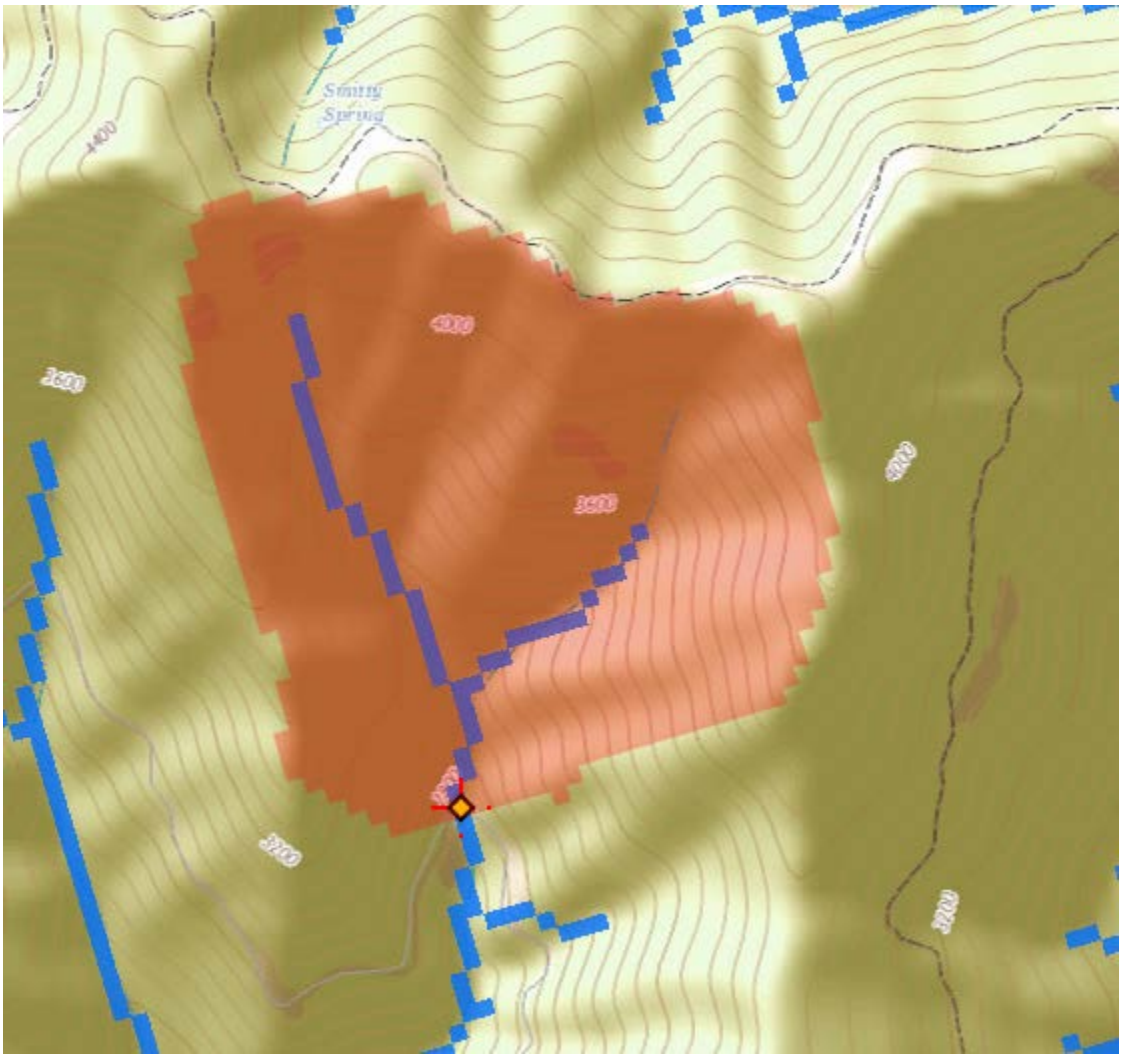
Peak-Flow Basin Characteristics			
100% 2012 5113 Region 1 North Coast (0.4 mi2)			
Parameter	**Value**	**Regression Equation Valid Range**	
		Min	**Max**
Drainage Area (square miles)	0.4	0.04	3200
Mean Annual Precipitation (inches)	60.4	20	125

Peak-Flow Statistics						
Statistic	**Value**	**Unit**	**Prediction Error (percent)**	**Equivalent years of record**	**90-Percent Prediction Interval**	
					Min	**Max**
PK2	44.8	ft3/s	59		18.1	111
PK5	85.3	ft3/s	47		40.3	181
PK10	115	ft3/s	44		56.2	234
PK25	153	ft3/s	43		77.5	304
PK50	183	ft3/s	43		92.2	364
PK100	214	ft3/s	44		105	437
PK200	244	ft3/s	44		120	499
PK500	284	ft3/s	46		136	594

#http://pubs.usgs.gov/sir/2012/5113/#
Gotvald_ A.J._ Barth_ N.A._ Veilleux_ A.G._ and Parrett_ Charles_ 2012_ Methods for determining magnitude and frequency of floods in California_ based on data through water year 2006: U.S. Geological Survey Scientific Investigations Report 2012-5113_ 38 p._ 1 pl.

Label	Value	Units	Definition
DRNAREA	0.4	square miles	Area that drains to a point on a stream
RELIEF	1686	feet	Maximum - minimum elevation
ELEVMAX	4397	feet	Maximum basin elevation
MINBELEV	2711	feet	Minimum basin elevation
LAKEAREA	0	percent	Percentage of Lakes and Ponds
EL6000	0	percent	Percent of area above 6000 ft
OUTLETELEV	2711	feet	Elevation of the stream outlet in thousands of feet above NAVD88.
BASINPERIM	2.95	miles	Perimeter of the drainage basin as defined in SIR 2004-5262
RELRELF	572	feet per mi	Basin relief divided by basin perimeter
ELEV	3684	feet	Mean Basin Elevation
BSLDEM30M	57.3	percent	Mean basin slope computed from 30 m DEM
FOREST	56	percent	Percentage of area covered by forest
LC11IMP	0	percent	Percentage of impervious area determined from NLCD 2011 impervious dataset
PRECIP	60.4	inches	Mean Annual Precipitation
JANMAXTMP	46.7	degrees F	Mean Maximum January Temperature
JANMINTMP	29.95	degrees F	Mean Minimum January Temperature

ALTIND	3.06	thousand feet	Altitude Index
LC11DEV	0.7	percent	Percentage of land-use from NLCD 2011 classes 21-24
LFPLENGTH	1	miles	Length of longest flow path



Pour Point 9: 05N04 Swede Creek Crossing

Date: Fri Sept 25, 2015 8:58:38 AM GMT-7
Site Location: California
NAD 1983 Latitude: 40.8085 (40 48 30)
NAD 1983 Longitude: -123.3476 (-123 20 52)
Drainage Area: 2.1 mi2

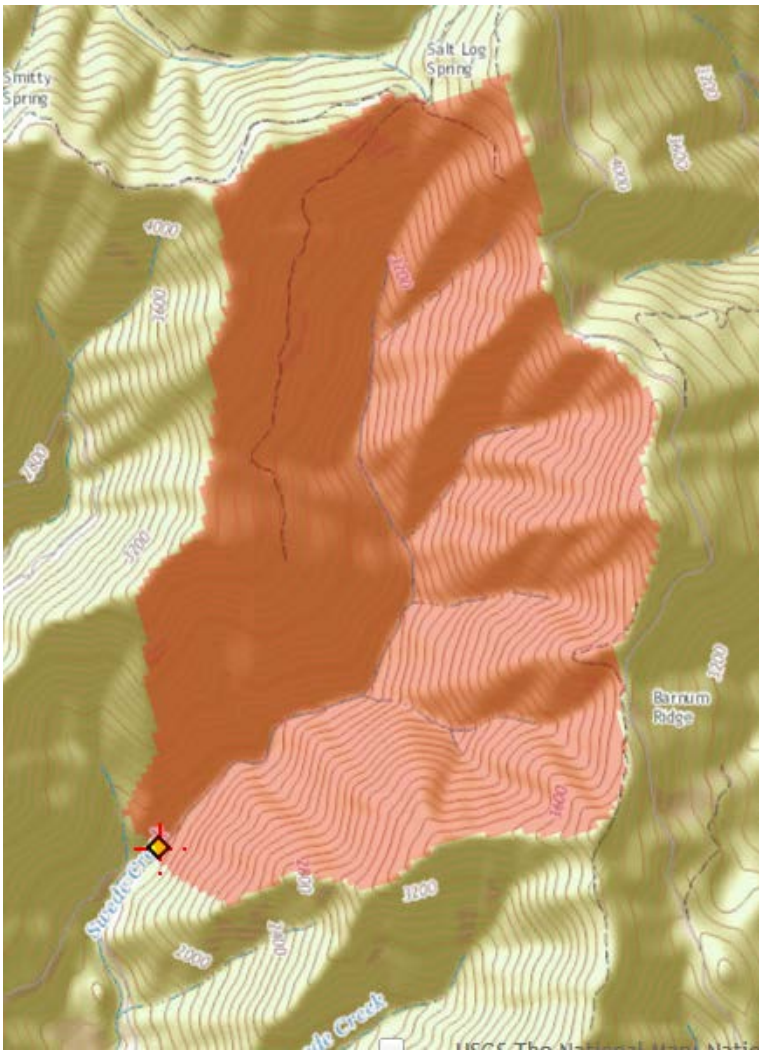
Peak-Flow Basin Characteristics			
100% 2012 5113 Region 1 North Coast (2.1 mi2)			
Parameter	**Value**	**Regression Equation Valid Range**	
		Min	**Max**
Drainage Area (square miles)	2.1	0.04	3200
Mean Annual Precipitation (inches)	56.3	20	125

Peak-Flow Statistics						
Statistic	**Value**	**Unit**	**Prediction Error (percent)**	**Equivalent years of record**	**90-Percent Prediction Interval**	
					Min	**Max**
PK2	187	ft3/s	59		76.5	458
PK5	352	ft3/s	47		168	738
PK10	470	ft3/s	44		233	950
PK25	625	ft3/s	43		319	1220
PK50	744	ft3/s	43		379	1460
PK100	867	ft3/s	44		431	1740
PK200	984	ft3/s	44		488	1980
PK500	1140	ft3/s	46		552	2360

#http://pubs.usgs.gov/sir/2012/5113/#
Gotvald_ A.J._ Barth_ N.A._ Veilleux_ A.G._ and Parrett_ Charles_ 2012_ Methods for determining magnitude and frequency of floods in California_ based on data through water year 2006: U.S. Geological Survey Scientific Investigations Report 2012-5113_ 38 p._ 1 pl.

Label	Value	Units	Definition
DRNAREA	2.1	square miles	Area that drains to a point on a stream
RELIEF	2807	feet	Maximum - minimum elevation
ELEVMAX	4523	feet	Maximum basin elevation
MINBELEV	1716	feet	Minimum basin elevation
LAKEAREA	0	percent	Percentage of Lakes and Ponds
EL6000	0	percent	Percent of area above 6000 ft
OUTLETELEV	1716	feet	Elevation of the stream outlet in thousands of feet above NAVD88.
BASINPERIM	7.64	miles	Perimeter of the drainage basin as defined in SIR 2004-5262
RELRELF	367	feet per mi	Basin relief divided by basin perimeter
ELEV	3171	feet	Mean Basin Elevation
BSLDEM30M	57.3	percent	Mean basin slope computed from 30 m DEM
FOREST	59.9	percent	Percentage of area covered by forest
LC11IMP	0	percent	Percentage of impervious area determined from NLCD 2011 impervious dataset
PRECIP	56.3	inches	Mean Annual Precipitation

JANMAXTMP	47.1	degrees F	Mean Maximum January Temperature
JANMINTMP	30.23	degrees F	Mean Minimum January Temperature
ALTIND	2.63	thousand feet	Altitude Index
LC11DEV	0.6	percent	Percentage of land-use from NLCD 2011 classes 21-24
LFPLENGTH	3	miles	Length of longest flow path



Pour Point 10: 402 County Road - Quinby Creek Crossing

Date: Fri Sept 25, 2015 9:06:17 AM GMT-7
Site Location: California
NAD 1983 Latitude: 40.9528 (40 57 10)
NAD 1983 Longitude: -123.3884 (-123 23 19)
Drainage Area: 8.8 mi2

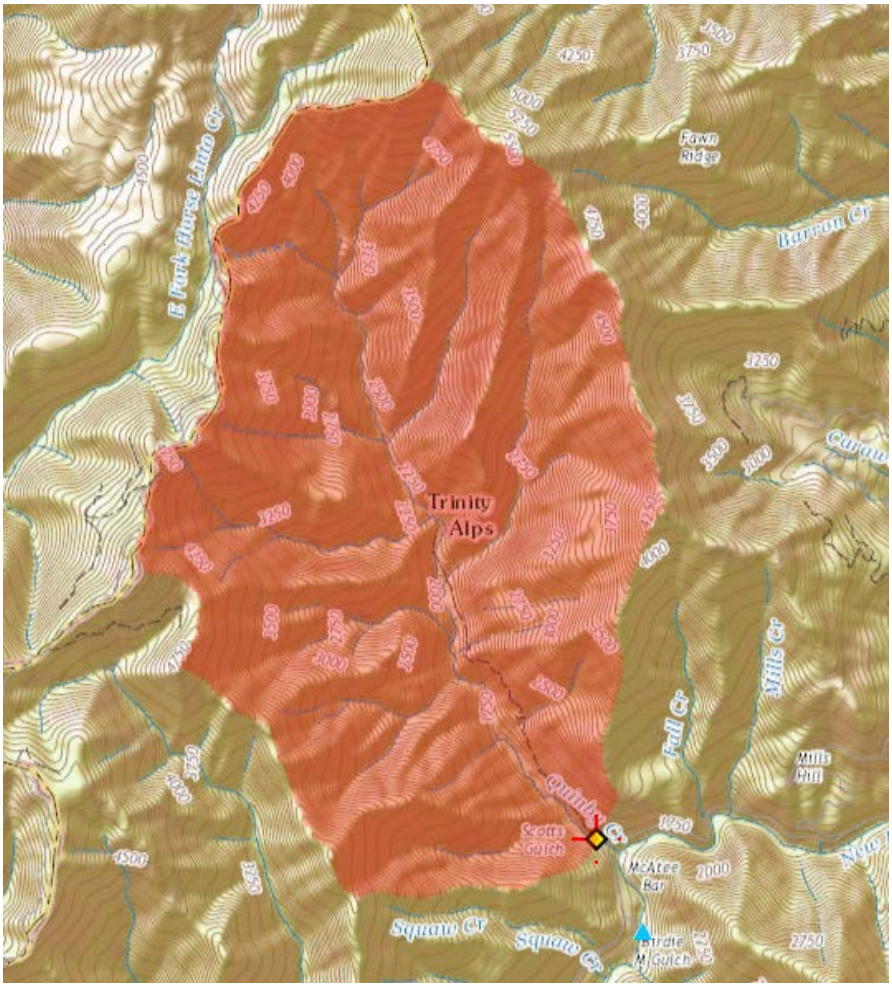
Peak-Flow Basin Characteristics			
100% 2012 5113 Region 1 North Coast (8.8 mi2)			
Parameter	**Value**	**Regression Equation Valid Range**	
		Min	**Max**
Drainage Area (square miles)	8.8	0.04	3200
Mean Annual Precipitation (inches)	70.3	20	125

Peak-Flow Statistics						
Statistic	**Value**	**Unit**	**Prediction Error (percent)**	**Equivalent years of record**	**90-Percent Prediction Interval**	
					Min	**Max**
PK2	850	ft3/s	59		349	2070
PK5	1490	ft3/s	47		713	3110
PK10	1940	ft3/s	44		962	3900
PK25	2510	ft3/s	43		1290	4890
PK50	2950	ft3/s	43		1510	5750
PK100	3390	ft3/s	44		1700	6780
PK200	3810	ft3/s	44		1900	7640
PK500	4370	ft3/s	46		2130	8960

#http://pubs.usgs.gov/sir/2012/5113/#
Gotvald_ A.J._ Barth_ N.A._ Veilleux_ A.G._ and Parrett_ Charles_ 2012_ Methods for determining magnitude and frequency of floods in California_ based on data through water year 2006: U.S. Geological Survey Scientific Investigations Report 2012-5113_ 38 p._ 1 pl.

Label	Value	Units	Definition
DRNAREA	8.8	square miles	Area that drains to a point on a stream
RELIEF	4385	feet	Maximum - minimum elevation
ELEVMAX	5856	feet	Maximum basin elevation
MINBELEV	1471	feet	Minimum basin elevation
LAKEAREA	0	percent	Percentage of Lakes and Ponds
EL6000	0	percent	Percent of area above 6000 ft
OUTLETELEV	1471	feet	Elevation of the stream outlet in thousands of feet above NAVD88.
BASINPERIM	15.5	miles	Perimeter of the drainage basin as defined in SIR 2004-5262
RELRELF	283	feet per mi	Basin relief divided by basin perimeter
ELEV	3332	feet	Mean Basin Elevation
BSLDEM30M	59.3	percent	Mean basin slope computed from 30 m DEM
FOREST	45.5	percent	Percentage of area covered by forest
LC11IMP	0	percent	Percentage of impervious area determined from NLCD 2011 impervious dataset

PRECIP	70.3	inches	Mean Annual Precipitation
JANMAXTMP	47.18	degrees F	Mean Maximum January Temperature
JANMINTMP	29.93	degrees F	Mean Minimum January Temperature
ALTIND	2.77	thousand feet	Altitude Index
LC11DEV	1	percent	Percentage of land-use from NLCD 2011 classes 21-24
LFPLENGTH	5	miles	Length of longest flow path



Pour Point 11: Devils Canyon Creek Watershed

Date: Fri Sept 25, 2015 9:15:34 AM GMT-7
Site Location: California
NAD 1983 Latitude: 40.9606 (40 57 38)
NAD 1983 Longitude: -123.348 (-123 20 53)
Drainage Area: 27.6 mi2

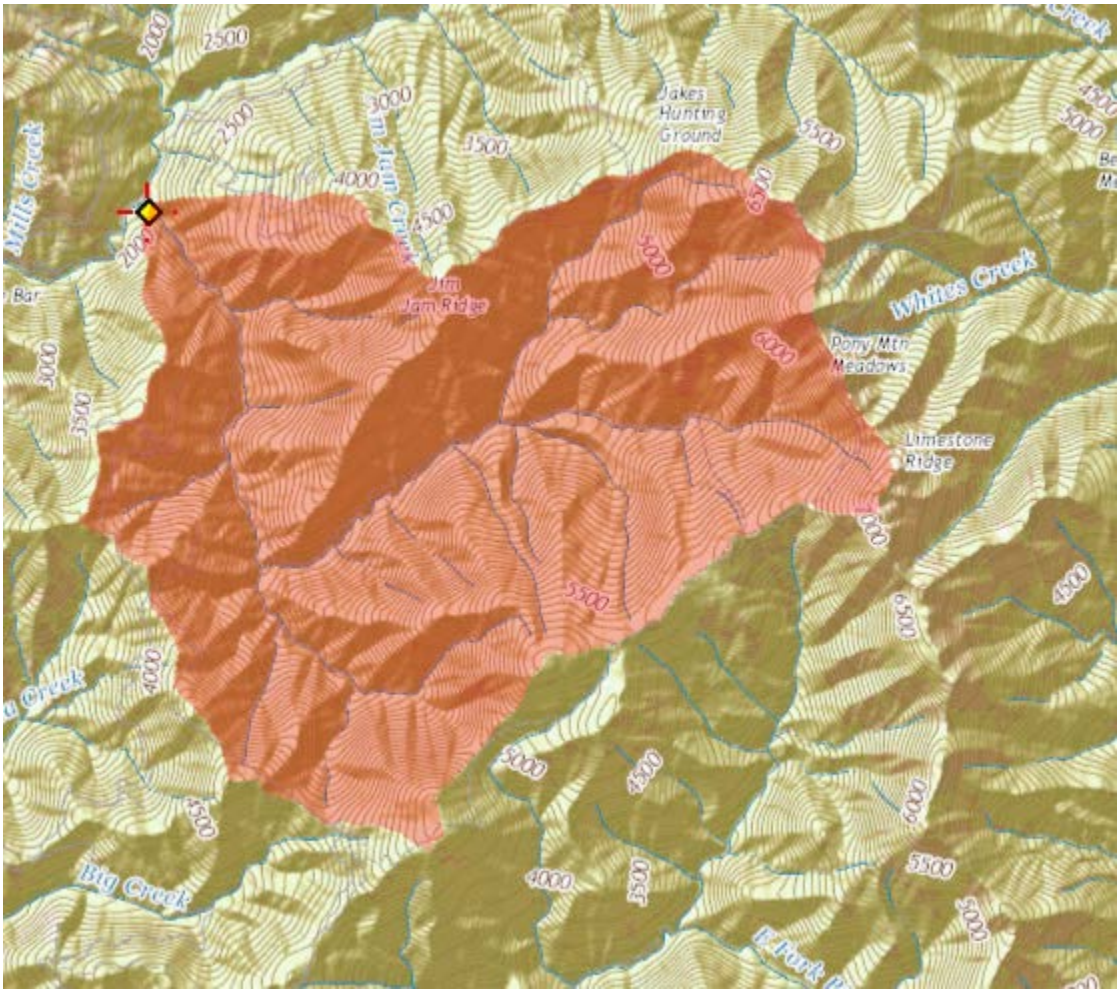
Peak-Flow Basin Characteristics			
100% 2012 5113 Region 1 North Coast (27.6 mi2)			
Parameter	**Value**	**Regression Equation Valid Range**	
		Min	**Max**
Drainage Area (square miles)	27.6	0.04	3200
Mean Annual Precipitation (inches)	69.3	20	125

Peak-Flow Statistics						
Statistic	**Value**	**Unit**	**Prediction Error (percent)**	**Equivalent years of record**	**90-Percent Prediction Interval**	
					Min	**Max**
PK2	2360	ft3/s	59		969	5720
PK5	4060	ft3/s	47		1950	8450
PK10	5240	ft3/s	44		2610	10500
PK25	6770	ft3/s	43		3490	13100
PK50	7900	ft3/s	43		4060	15400
PK100	9060	ft3/s	44		4550	18000
PK200	10100	ft3/s	44		5080	20300
PK500	11600	ft3/s	46		5680	23700

#http://pubs.usgs.gov/sir/2012/5113/#
Gotvald_ A.J._ Barth_ N.A._ Veilleux_ A.G._ and Parrett_ Charles_ 2012_ Methods for determining magnitude and frequency of floods in California_ based on data through water year 2006: U.S. Geological Survey Scientific Investigations Report 2012-5113_ 38 p._ 1 pl.

Label	Value	Units	Definition
DRNAREA	27.6	square miles	Area that drains to a point on a stream
RELIEF	5910	feet	Maximum - minimum elevation
ELEVMAX	7549	feet	Maximum basin elevation
MINBELEV	1639	feet	Minimum basin elevation
LAKEAREA	0	percent	Percentage of Lakes and Ponds
EL6000	7.69	percent	Percent of area above 6000 ft
OUTLETELEV	1639	feet	Elevation of the stream outlet in thousands of feet above NAVD88.
BASINPERIM	30.4	miles	Perimeter of the drainage basin as defined in SIR 2004-5262
RELRELF	194	feet per mi	Basin relief divided by basin perimeter
ELEV	4213	feet	Mean Basin Elevation
BSLDEM30M	52.3	percent	Mean basin slope computed from 30 m DEM
FOREST	73.5	percent	Percentage of area covered by forest
LC11IMP	0	percent	Percentage of impervious area determined from NLCD 2011 impervious dataset

PRECIP	69.3	inches	Mean Annual Precipitation
JANMAXTMP	44.65	degrees F	Mean Maximum January Temperature
JANMINTMP	27.68	degrees F	Mean Minimum January Temperature
ALTIND	3.5	thousand feet	Altitude Index
LC11DEV	0.6	percent	Percentage of land-use from NLCD 2011 classes 21-24
LFPLENGTH	11	miles	Length of longest flow path



Pour Point 12: East Fork Horse Linto Creek at Confluence with Horse Linto Creek.

Date: Fri Sept 25, 2015 9:21:34 AM GMT-7
Site Location: California
NAD 1983 Latitude: 40.9939 (40 59 38)
NAD 1983 Longitude: -123.4846 (-123 29 05)
Drainage Area: 6.4 mi2

Peak-Flow Basin Characteristics			
100% 2012 5113 Region 1 North Coast (6.4 mi2)			
Parameter	**Value**	**Regression Equation Valid Range**	
		Min	**Max**
Drainage Area (square miles)	6.4	0.04	3200
Mean Annual Precipitation (inches)	87.8	20	125

Peak-Flow Statistics						
Statistic	**Value**	**Unit**	**Prediction Error (percent)**	**Equivalent years of record**	**90-Percent Prediction Interval**	
					Min	**Max**
PK2	793	ft3/s	59		324	1940
PK5	1330	ft3/s	47		635	2790
PK10	1710	ft3/s	44		845	3450
PK25	2190	ft3/s	43		1120	4280
PK50	2550	ft3/s	43		1300	4990
PK100	2910	ft3/s	44		1450	5850
PK200	3260	ft3/s	44		1620	6560
PK500	3720	ft3/s	46		1800	7660

#http://pubs.usgs.gov/sir/2012/5113/#
Gotvald_ A.J._ Barth_ N.A._ Veilleux_ A.G._ and Parrett_ Charles_ 2012_ Methods for determining magnitude and frequency of floods in California_ based on data through water year 2006: U.S. Geological Survey Scientific Investigations Report 2012-5113_ 38 p._ 1 pl.

Label	Value	Units	Definition
DRNAREA	6.4	square miles	Area that drains to a point on a stream
RELIEF	3947	feet	Maximum - minimum elevation
ELEVMAX	6094	feet	Maximum basin elevation
MINBELEV	2147	feet	Minimum basin elevation
LAKEAREA	0	percent	Percentage of Lakes and Ponds
EL6000	0.0323	percent	Percent of area above 6000 ft
OUTLETELEV	2147	feet	Elevation of the stream outlet in thousands of feet above NAVD88.
BASINPERIM	21.9	miles	Perimeter of the drainage basin as defined in SIR 2004-5262
RELRELF	180	feet per mi	Basin relief divided by basin perimeter
ELEV	4319	feet	Mean Basin Elevation
BSLDEM30M	46.1	percent	Mean basin slope computed from 30 m DEM
FOREST	37.3	percent	Percentage of area covered by forest
LC11IMP	0	percent	Percentage of impervious area determined from NLCD 2011 impervious dataset
PRECIP	87.8	inches	Mean Annual Precipitation

JANMAXTMP	45.56	degrees F	Mean Maximum January Temperature
JANMINTMP	28.95	degrees F	Mean Minimum January Temperature
ALTIND	3.59	thousand feet	Altitude Index
LC11DEV	0.3	percent	Percentage of land-use from NLCD 2011 classes 21-24
LFPLENGTH	7	miles	Length of longest flow path

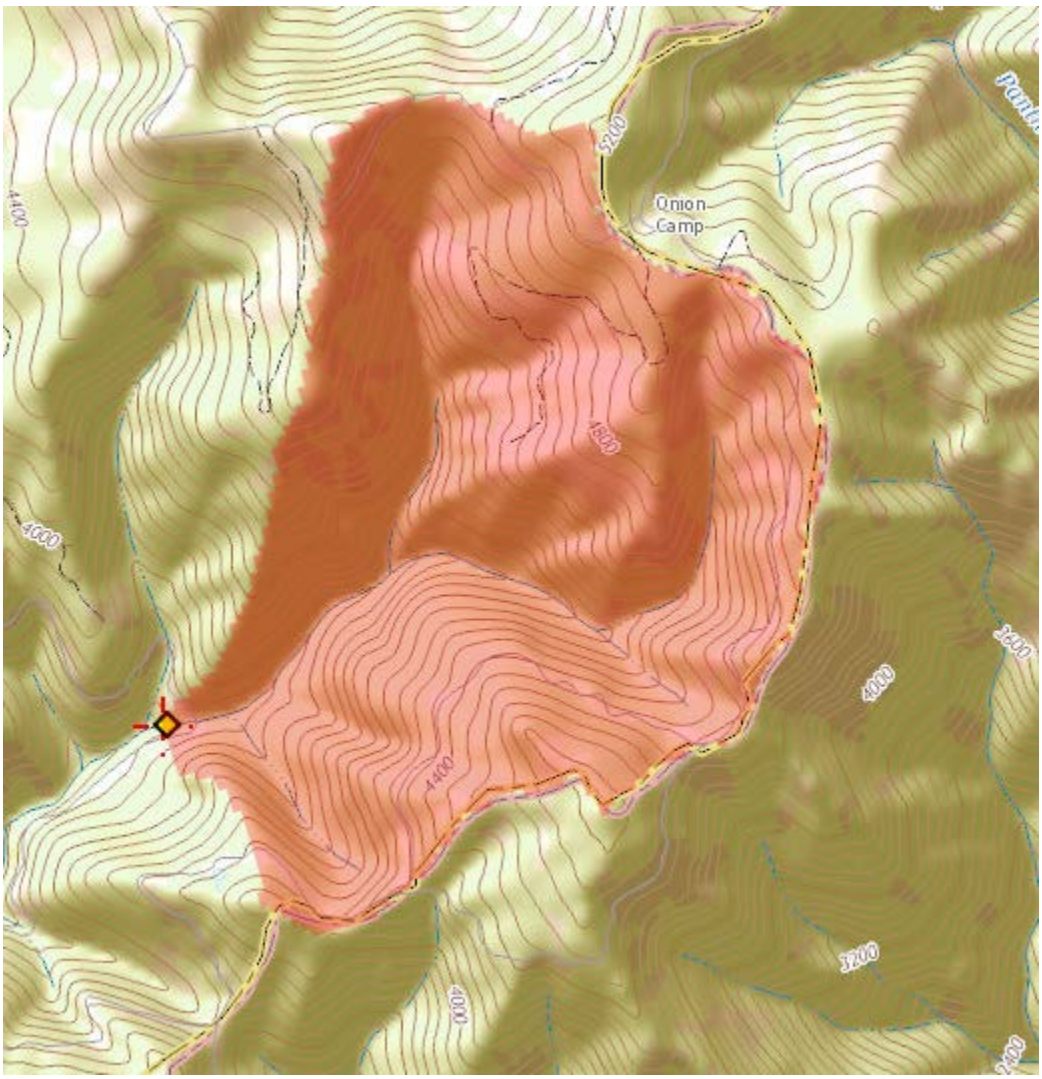
Pour Point 13: 07N04 Crossing - Cedar Creek Headwaters.

Date: Fri Sept 25, 2015 6:14:55 PM GMT-7
Site Location: California
NAD 1983 Latitude: 40.9441 (40 56 39)
NAD 1983 Longitude: -123.4722 (-123 28 20)
Drainage Area: 1.7 mi2

Peak-Flow Basin Characteristics			
100% 2012 5113 Region 1 North Coast (1.7 mi2)			
Parameter	**Value**	**Regression Equation Valid Range**	
		Min	**Max**
Drainage Area (square miles)	1.7	0.04	3200
Mean Annual Precipitation (inches)	82.7	20	125

Peak-Flow Statistics						
Statistic	**Value**	**Unit**	**Prediction Error (percent)**	**Equivalent years of record**	**90-Percent Prediction Interval**	
					Min	**Max**
PK2	226	ft3/s	59		91.7	555
PK5	392	ft3/s	47		186	827
PK10	510	ft3/s	44		251	1040
PK25	662	ft3/s	43		337	1300
PK50	776	ft3/s	43		394	1530
PK100	894	ft3/s	44		443	1810
PK200	1010	ft3/s	44		496	2040
PK500	1150	ft3/s	46		556	2390

#http://pubs.usgs.gov/sir/2012/5113/#
Gotvald_ A.J._ Barth_ N.A._ Veilleux_ A.G._ and Parrett_ Charles_ 2012_ Methods for determining magnitude and frequency of floods in California_ based on data through water year 2006: U.S. Geological Survey Scientific Investigations Report 2012-5113_ 38 p._ 1 pl.

Label	Value	Units	Definition
DRNAREA	1.7	square miles	Area that drains to a point on a stream
RELIEF	1856	feet	Maximum - minimum elevation
ELEVMAX	5204	feet	Maximum basin elevation
MINBELEV	3347	feet	Minimum basin elevation
LAKEAREA	0	percent	Percentage of Lakes and Ponds
EL6000	0	percent	Percent of area above 6000 ft
OUTLETELEV	3347	feet	Elevation of the stream outlet in thousands of feet above NAVD88.
BASINPERIM	7.23	miles	Perimeter of the drainage basin as defined in SIR 2004-5262
RELRELF	257	feet per mi	Basin relief divided by basin perimeter
ELEV	4410	feet	Mean Basin Elevation
BSLDEM30M	45.2	percent	Mean basin slope computed from 30 m DEM
FOREST	46.9	percent	Percentage of area covered by forest
LC11IMP	0.1	percent	Percentage of impervious area determined from NLCD 2011 impervious dataset

PRECIP	82.7	inches	Mean Annual Precipitation
JANMAXTMP	45.61	degrees F	Mean Maximum January Temperature
JANMINTMP	29.15	degrees F	Mean Minimum January Temperature
ALTIND	3.66	thousand feet	Altitude Index
LC11DEV	4	percent	Percentage of land-use from NLCD 2011 classes 21-24
LFPLENGTH	2	miles	Length of longest flow path