Front Country
Burned Area Emergency Response (BAER)
Hydrology Report

Christine Mai, Rob Tanner & Jim Laprevote USFS Hydrologists
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OBJECTIVES

The objective of this assessment is to evaluate the effects of several fires on watershed hydrologic processes and function including changes in runoff, sediment yield, and watershed response to precipitation events. This assessment focuses on fire-induced changes in hydrologic processes and function that pose a significant threat to human life and property, and critical natural and cultural resources. Values at risk are identified and a determination as to whether or not an emergency condition exists is made for each value. Treatment recommendations are identified for resources where emergency conditions exist.

RECONNAISSANCE

Reconnaissance of the burn areas was conducted using a rapid approach described as a burned area emergency assessment. The burned area emergency assessment is an immediate and rapid assessment of the burned area that is conducted in order to identify post-fire threats, critical values at risk, and need for emergency stabilization measures. The burned area emergency assessment is not a comprehensive evaluation of all fire damages or long-term rehabilitation or restoration needs (FSM 2500, 2004).

Reconnaissance of the burned area was conducted by helicopter overviews, driving roads, and hiking on trails and cross-country through the burn. Specialists that the hydrologists worked with and/or consulted during the field assessments included soil scientists, fisheries biologists, geologists, botanists, archaeologists, and road engineers. The Forest Service team also worked in conjunction with the Bureau of Land Management, Natural Resource Conservation Service, the Central Valley regional Water Quality Control Board, Department of Water Resources and others.

AFFECTED ENVIRONMENT

The fires assessed within the Lime/SHU Complex Fire burned approximately 110,000 acres. Table 1 displays the acres of burn severity by 6th-Field Hydrologic Unit Codes (HUC). All 6th-fields have less than 21% burned in high and moderate severities.

Table 1. Approximate fire severity by subwatersheds and fires (these values include other fires that have not been assessed at this time).

6th-Field Subwatershed	Fire_Name	Acres Burned	Percent of HUC 6 Burned			
			% High	% Moderate	% Low	%High & Moderate
Grass Valley Creek	Lower	798				
	Moon	87				
Grass Valley Creek Total		885	0.1%	0.3%	3.3%	0.4%
Indian Creek	Moon	9				
Indian Creek Total		9	0.0%	0.0%	0.0%	0.0%
East Fork Browns Creek	Deadshot	579				
	Deerlick	73				
East Fork Browns Creek Total		652	0.1%	0.9%	1.6%	0.9%
Big Creek	Ironside	671				
Big Creek Total		671	0.0%	0.6%	4.8%	0.6%
Lower New River	Ironside	1,036				
	Ziegler	474				
Lower New River Total		1,510	0.0%	1.4%	5.6%	1.4%
Don Juan Creek	Ironside	3,522				
Don Juan Creek Total		3,522	0.1%	3.2%	13.2%	3.3%
Mcdonald River	Hell's Half	10				
	Ironside	1,416				
Mcdonald River Total		1,426	0.8%	2.3%	4.1%	3.1%
Hawkins-Sharber	Ziegler	734				
Hawkins-Sharber Total		734	0.0%	0.9%	2.8%	0.9%
Dubakella Creek	South Fork	56				
	Telephone	1,050				
Dubakella Creek Total		1,106	0.1%	0.8%	2.5%	0.9%
Salt Creek-Hayfork Creek	Telephone	4,474				
Salt Creek-Hayfork Creek Total		4,474	0.3%	3.6%	8.2%	4.0%
Hyampom	Hell's Half	750				
	Slide	766				
Hyampom Total		1,516	0.0%	1.0%	3.1%	1.0%
Grouse Creek	Hell's Half	756				
Grouse Creek Total		756	0.2%	1.0%	0.9%	1.2%
Lower South Fork Trinity River	Hell's Half	7,545				
Lower South Fork Trinity River Total		7,545	0.5%	6.4%	19.2%	7.0%
Squaw Creek-Dry Creek	Motion	5,370				
Squaw Creek-Dry Creek Total		5,370	3.5%	17.4%	18.6%	20.9%
Digger Bay	Motion	53				
Digger Bay Total		53	0.0%	0.4%	0.2%	0.4%
East Fork-Clear Creek	Motion	8				
East Fork-Clear Creek Total		8	0.0%	0.0%	0.0%	0.0%
French Gulch-Clear Creek	Motion	3				
French Gulch-Clear Creek Total		3	0.0%	0.0%	0.0%	0.0%
Willow-Crystal-Clear Creek	Moon	561				
Willow-Crystal-Clear Creek Total		561	0.4%	0.9%	1.3%	1.3%
Whiskeytown Lake	Moon	2,892				
	Motion	4,769				
Whiskeytown Lake Total		7,661	0.7%	8.8%	6.2%	9.5%
Lower Clear Creek	Moon	2,939				
Lower Clear Creek Total		2,939	0.5%	5.0%	3.8%	5.5%
Spring-Sacramento River	Motion	9,758				
Spring-Sacramento River Total		9,758	1.4%	11.1%	10.8%	12.5%
Upper North Fork Cottonwood Creek	Moon	12,106				
Upper North Fork Cottonwood Creek Total		12,106	6.5%	14.4%	17.2%	20.8%
Lower North Fork Cottonwood Creek	Deck	204				
	Moon	7,632				
Lower North Fork Cottonwood Creek Total		7,837	1.3%	15.5%	10.0%	16.9%
South Fork Beegum Creek	Noble	510				
South Fork Beegum Creek Total		510	0.0%	1.0%	1.3%	1.0%
Middle Fork Beegum Creek	Noble	3,732				
Middle Fork Beegum Creek Total		3,732	0.7%	8.6%	10.3%	9.3%
Beegum Gorge	Noble	3,848				
Beegum Gorge Total		3,848	0.7%	13.1%	10.0%	13.8%
Harrison Gulch	Noble	309				
Harrison Gulch Total		309	0.0%	0.1%	1.2%	0.1%
Duncan Creek	Deerlick	3,996				
	Moon	48				
Duncan Creek Total		4,044	2.6%	9.7%	9.2%	12.3%
Knob Gulch-Arbuckle Creek	Deerlick	5,224				
Knob Gulch-Arbuckle Creek Total		5,224	1.3%	13.2%	7.0%	14.5%
Big Salt-Fiddler-Cottonwood Creek	Noble	14				
Big Salt-Fiddler-Cottonwood Creek Total		14	0.0%	0.0%	0.0%	0.0%
Upper Dry Creek	Noble	1,613				
Upper Dry Creek Total		1,613	0.1%	3.9%	6.3%	4.0%
Lower Dry Creek	Noble	0				
Lower Dry Creek Total		0	0.0%	0.0%	0.0%	0.0%

Watershed Numbers for these watersheds as reported in the 2500-8 follow:

Lime Complex	SHU Complex
Lower Sacramento	**Lower Sacramento**
180201530201	180200050406
180201530202	180200050407
180201530203	180201510104
180201530204	180201510105
	180201510106
	180201510201
	180201530101
	180201530102
	180201530202
	180201530203
	180201530205
	180201530206
	180201530207
	180201530301
Klamath/Trinity	**Klamath/Trinity**
180102110701	180102110603
180102120301	180102110604
180102120303	180102110701
180102120401	

WATERSHED CONDITIONS

Precipitation in the fire area ranges from approximately 15 in/yr to 70 in/yr, with most of it occurring as rain. Elevations in the fire area range from 3400 ft to 6500 ft. Hydrologic features found with the fire areas include perennial, intermittent and ephemeral streams as well as a number of reservoirs and smaller private ponds. Water systems of the City of Redding and Bella Vista Water District as well as Happy Valley Irrigation District are all going to be impaired. Significant Damage occurred to the

Permeability rates, the rate of water movement through the soil profile, for the majority of soils in the analysis area, range from 4-14 inches per hour. This range exceeds the 2-yr 6 hour event (2.6 inches) as well as the 25-year 6 hour event (3.6 inches) for the same area.

Peak flows within the fire area are predicted to increase as a result of the fire. However, due to limited hydrophobic soils (approximately 5% of total fire area with moderate hydrophobicity of 1-2 cm depth), increases in runoff are assumed to be strictly due to the loss of vegetation and ground cover (i.e. interception, evapotranspiration, ground cover storage). Elevated streamflows can be expected to occur in the burned watersheds, with greater flow increases in those drainages having higher percentages of high burn severity.

Present management direction states that culverts should be designed to accommodate the 100-yr stream flow event. Prefire and post-fire flow estimates were derived using Waananen and Crippen (1977) regional streamflow equations modified using the gage verses ungaged relationship for neighboring stream gages.

Convective events, which are of short duration and high intensity, occur regularly in this area during the summer months and are also known to result in erosion and flooding. The convective storm is the type modeled within the burn area since it best represents the effects from the most erosive storms in the area.

An 80% chance of being able to mitigate a convective storm with proposed culvert upgrades required an estimate of vegetative recovery period (hydrologic recovery) which for this area 5 years for the majority of the fire area covered with chaparral; forested areas may not fully recover for at least 20 years. Therefore the equivalent design recurrence interval period is 50 years for chaparral areas and 100 year for forested areas using the Streams System Technology Center October 1998 publication on Calculated risks , using Figure 2.56 from the BAER handbook. The USFS requires that all stream crossings be designed to pass a 100 year storm so this bodes well for a design life of 20 years within the forested fire areas.

A 25 year storm even was used to represent the rainfall amount. This storm frequency represents a 4% chance it will occur in any one year and an 18% chance it will occur in the next 5 years.

Within the fire areas evaluated the following streams were affected as shown in the table below. The most significant impacts to stream occurred in the SHU Complex which had 13 miles of perennial stream adjacent areas burned at moderate or high severities. Within the 2 complexes 54 miles of ephemeral stream adjacent areas were burned at moderate or high severities.

Streams Burned		**Flow_type**			
Complex	**severity**	**Ephemeral**	**Intermittent**	**Perennial**	**Grand Total**
Lime Complex	High	1.6	0.3	0.0	**1.9**
	Low	39.6	21.7	9.0	**70.3**
	Moderate	21.8	7.9	2.1	**31.8**
Lime Complex Total		**63.1**	**29.8**	**11.1**	**104.1**
SHU Complex	High	2.0	7.5	0.9	**10.5**
	Low	28.2	82.5	33.8	**144.6**
	Moderate	28.9	70.9	12.1	**111.9**
SHU Complex Total		**59.1**	**161.0**	**46.8**	**266.9**
Grand Total		**122.2**	**190.8**	**58.0**	**370.9**

HYDROLOGY AREAS OF CONCERN

Dry Fork Creek Road –

There is about ¾ of a mile of road that is at risk of failure. Failure would be in the form of culverts that cannot handle expected increased flows and debris. There are 3 culverts along the road that are undersized and not aligned correctly. The drainages upslope of the road in this area have relatively large areas of moderate to high severity burn (Photos 1 and 2). Upslope material potentially contains contaminated material from past mining that could threaten water quality in Lake Shasta and the Sacramento River.

Photo 1 – One small drainage above Dry Fork Creek Road with moderate to high burn severity.

Photo 1 – One of the undersized culverts along the Dry Fork Creek Road.

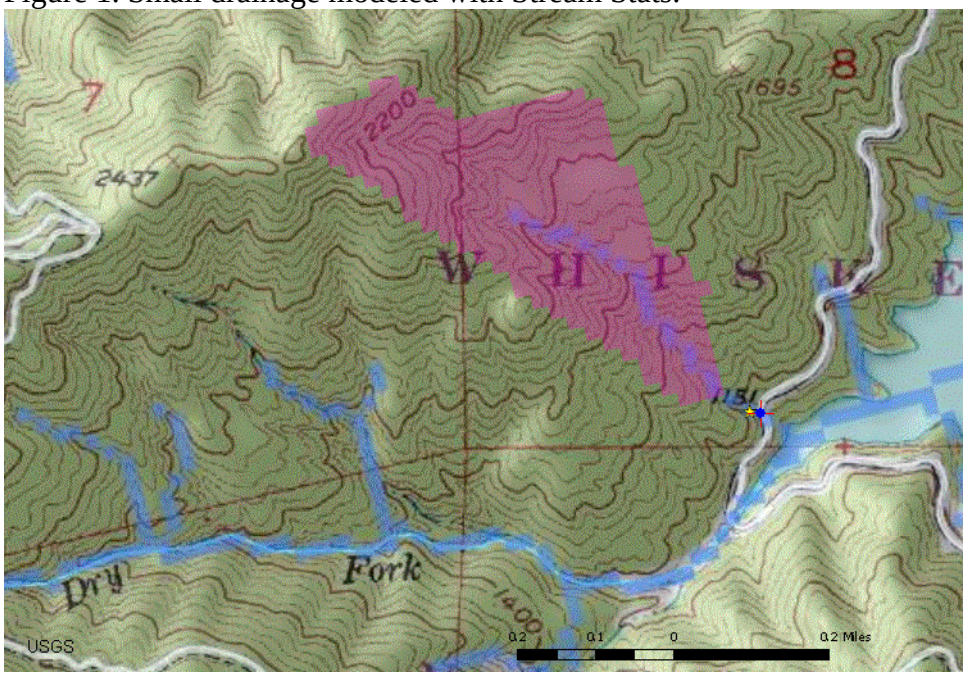
Photo 2

Recommendations/Treatments for this area include the following:

1. Outslope the road and fill inboard ditch
2. Replace existing culverts with larger ones (48 to 60-inch) to accommodate 100-year flood event
3. Build critical dips to minimize road failure
4. Re-gravel road

One drainage within this area (Figure 1) was modeled using Stream Stats. The 100-yr flood event for this drainage (pre-fire) was modeled to be 73 cubic feet per second (cfs). Post-fire flow magnitudes are estimated to increase by approximately 2-3 times in this area with high to moderate severity burns.

Figure 1. Small drainage modeled with Stream Stats.



Return Interval	Flow (cfs)
Q_2	**14**
Q_5	**27**
Q_{10}	**35**
Q_{25}	**48**
Q_{50}	**62**
Q_{100}	**73**

Shasta-Chappie OHV Area –

This area has a moderate to high burn severity through much of the area (Photos 3 and 4). Past debris flows and active erosion are evident throughout the area. The risk of debris flow (post-fire) is relatively high. Water quality will be compromised in this drainage, but most of the sediment load would be deposited behind Keswick Dam. Snags in the area pose a hazard to human safety. Three OHV bridges have been completely burned up, while another bridge is partially burned (photos 5 and 6).

Recommendations/Treatments for this area include the following:

1. Temporarily close the area for one year or until human safety is not compromised. This would include posting closure/warning signs in the area. Closure would also allow time for reestablishment of vegetation which would help keep OHVs on designated trails.
2. Look at the possibility for mulching areas where slopes permit it and values at risk justify so.

3. Storm Patrol the area and trails. This would include falling hazard trees and maintaining trails on an annual basis.
4. Rebuild three OHV bridges and patch the bridge in Photo 6.

Photo 3 – Erosion in the upper part of the watershed upstream of the OHV staging area.

Photo 4 – Moderate to high burn severity upstream of the Shasta-Chappie OHV area

Photo 5 – Burned OHV bridge above the Shasta Chappie OHV Staging Area.

Photo 6 – Burned bridge near the Shasta-Chappie OHV Staging Area.

Beegum Creek, 29N06 Road –

This area has a mix of burn severity through much of the area. Past debris flows and active erosion are evident throughout the area (Photo 7). The risk of debris flows (post-fire) is relatively high (approximately 80%) in some of the drainages. Water quality within Beegum Creek is expected to be compromised with more sediment input to the stream. Some of the higher intensity/severity burn areas are adjacent to Beegum Creek near the campground (Photo 8). In addition there are several culverts along the 29N06 Road that are undersized and the risk for post-fire failure is relatively high (Photo 9).

Recommendations/Treatments for this area include the following:

1. Look at the possibility for mulching areas where slopes permit it (Photo 10).
2. Treat the 29N06 road or close it. Closure could include pulling culverts, removing outside berms, installing dips and drainage.
3. Storm Patrol the area if not closed.

Photo 7 - Unstable drainage that is burned along the Beegum Cr Road (29N06)

Photo 8 – Burned hillslope adjacent to Beegum Creek along the 29N06 Road.

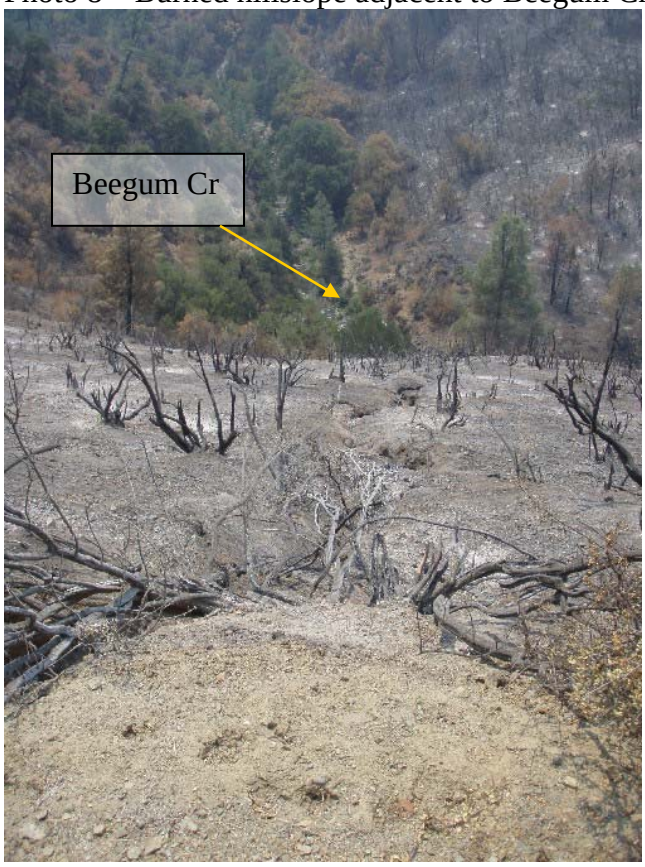


Photo 9 – Typical scenario along the Beegum Gorge 29N06 Road

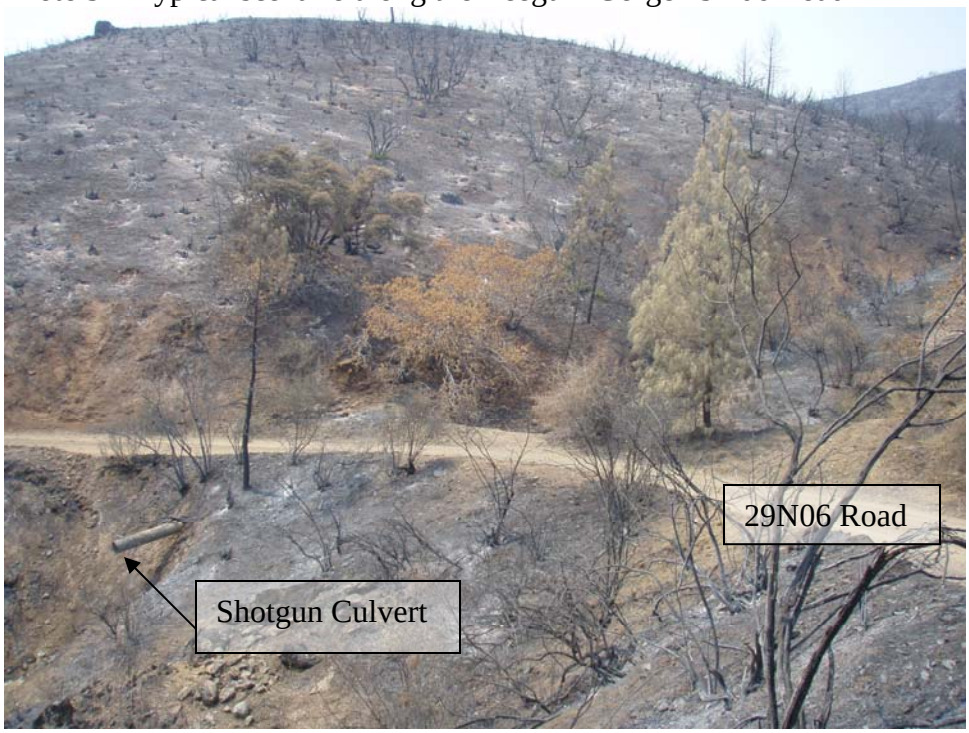


Photo 10 – Potential Treatment area along Beegum Road.

2500-8 PART IV –HYDROLOGIC DESIGN FACTORS

Both Complexes

	Chaparral	Mixed Conifer Forest
Item A – Vegetative Recovery	5 years	20 years
Design Chance of Success	90	80
Equivalent Design Recurrence Interval	50	100
All stream crossings must be designed to pass 100 year storm however as directed by Northwest Forest Plan		
Design Storm Duration	25 year 6 hour	25 year 6 hour
Design Storm Magnitude	3.6 inches	3.6 inches
Design Flow csm	121	299
Reduction in infiltration	5	5
Adjusted Design Flow	185	380

Peak Flow and Sedimentation Analyses

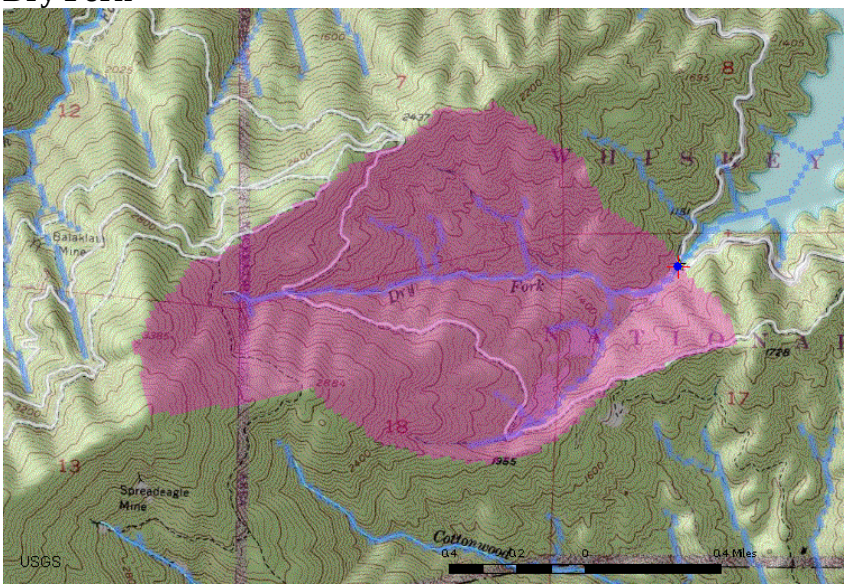
Watersheds HUC 4-7	Wshed Area (ac)	% High	% Mod	% Low	Stream Gage for calcs	Prefire 2-yr Qp (cfs)	Prefire 5-yr Q Qp (cfs)	Prefire 10-yr Qp (cfs)	Prefire 25-yr Qp (cfs)	Prefire 50-yr Qp (cfs)	Prefire 100-yr Qp (cfs)	Prefire 2-yr Sediment Yield (ktons)	Post Fire 2-yr Qp (cfs)	Post Fire 10-yr Qp (cfs)	Post Fire 2-yr Sediment Yield (ktons)	2-yr Peak Increase x normal
South Fork Trinity River	596,164	0%	1%	1%	147	25151	42416	54,949	71,877	85,498	99,747		26,063	56,563		1.0
Upper South Fork Trinity River	100,558	0%	0%	0%	147	5069	8702	11,475	15,280	18,176	21,205		5,078	11,493		1.0
Middle South Fork Trinity River	118,626	0%	0%	0%	147	5882	10080	13,271	17,642	20,986	24,483		5,892	13,292		1.0
Upper Hayfork Creek	105,766	0%	0%	1%	147	5304	9102	11,997	15,966	18,992	22,157		5,387	12,165		1.0
Lower South Fork Trinity River	129,183	0%	5%	2%	147	6351	10875	14,305	19,001	22,601	26,368		7,312	16,043		1.2
Lower South Fork Trinity River	28,780	1%	6%	19%	147	1644	2858	3,816	5,145	6,121	7,141		2,262	5,106		1.4
Sacramento Headwaters	381,062	0%	1%	1%	357	48680	77888	98,238	126,702	151,068	178,219	1,296	49,937	100,357	6,788	1.0
Squaw Creek-Dry Creek	13,592	4%	18%	19%	357	2423	4009	5,228	6,971	8,311	9,805	47	4,178	8,390	245	1.7
Sacramento/Clear	313,389	0%	3%	3%	3	15141	25273	32,331	42,002	49,585	57,558	1,624	16,999	35,623	5,769	1.1
Clear Creek	159,195	0%	4%	3%	3	8230	13831	17,814	23,300	27,507	31,929	881	9,315	19,752	2,753	1.1
Whiskeytown Lake	30,389	2%	14%	10%	3	1854	3168	4,148	5,516	6,512	7,559	168	2,738	5,778	526	1.5
Sacramento River/Stillwater	154,193	0%	3%	3%	3	7997	13444	17,321	22,662	26,753	31,055	744	8,904	18,961	2,963	1.1
Spring-Sacramento River	41,966	1%	11%	11%	3	2479	4222	5,511	7,305	8,624	10,010	203	3,512	7,428	807	1.4
Shasta Dam-Motion Creek	6,577	0%	20%	23%	3	468	811	1,079	1,457	1,720	1,996	32	800	1,730	126	1.7
Spring Creek	10,512	5%	29%	26%	3	713	1232	1,630	2,190	2,586	3,002	51	1,513	3,143	202	2.1
Cottonwood	603,609	1%	3%	3%	8	22344	37979	49,344	64,765	76,845	89,331	2,802	25,054	54,302	10,615	1.1
North Fork Cottonwood Creek	87,015	3%	10%	10%	4	3660	5836	7,398	9,451	10,987	12,523	272	5,256	10,061	1,280	1.4
Upper North Fork Cottonwood Creek	31,851	6%	14%	17%	4	1482	2386	3,055	3,942	4,583	5,224	99	2,558	4,896	515	1.7
Lower North Fork Cottonwood Creek	29,168	1%	16%	10%	4	1369	2206	2,827	3,652	4,245	4,839	92	2,063	4,003	388	1.5
Middle Fork Cottonwood Creek	159,275	1%	6%	5%	4	6307	9995	12,594	15,993	18,591	21,190	726	7,591	14,719	2,082	1.2
Middle Fork Beegum Creek	19,023	1%	9%	10%	6	1097	1668	2,017	2,466	2,857	5,525	87	1,461	2,585	328	1.3
Upper Beegum Gorge	8,489	0%	16%	11%	6	531	814	992	1,222	1,416	2,738	39	792	1,395	146	1.5
Beegum Gorge	16,198	1%	13%	10%	6	949	1446	1,751	2,144	2,484	4,804	88	1,358	2,376	241	1.4
Lower Middle Fork Beegum Creek	16,651	1%	9%	9%	6	973	1482	1,794	2,196	2,544	4,920	91	1,283	2,275	248	1.3
Duncan Creek	18,818	3%	10%	9%	6	1087	1652	1,998	2,443	2,830	5,473	99	1,530	2,673	237	1.4
Knob Gulch-Arbuckle Creek	24,382	1%	13%	7%	4	1165	1881	2,415	3,125	3,632	4,140	117	1,653	3,237	301	1.4
Dry Creek	79,760	0%	1%	1%	4	3384	5401	6,852	8,762	10,186	11,610	370	3,492	7,042	1,403	1.0
South Fork Cottonwood Creek	157,853	0%	0%	0%	4	6256	9916	12,495	15,868	18,447	21,025	733	6,268	12,514	2,776	1.0
Lower Cottonwood Creek	119,707	0%	0%	0%	4	4877	7752	9,795	12,474	14,501	16,528	556	4,878	9,796	2,105	1.0

FIRE	HUC6	Area of Concern	Wshed Area (ac)	% High	% Mod	% Low	Stream Gage for calcs	Prefire 2-yr Qp (cfs)	Prefire 5-yr Q Qp (cfs)	Prefire 10-yr Qp (cfs)	Prefire 25-yr Qp (cfs)	Prefire 50-yr Qp (cfs)	Prefire 100-yr Qp (cfs)	Prefire 2-yr Sediment Yield (ktons)	Post Fire 2-yr Qp (cfs)	Post Fire 10-yr Qp (cfs)	Post Fire 2-yr Sediment Yield (tons)	2-yr Peak Increase x normal
Motion	Squaw/Dry	Dry Fork Near Lake	719	0%	29%	45%	357	172	293	393	540	644	760	2,474	371	789	12,959	2.2
		DryFork Unnamed Trib	65	11%	86%	3%	357	20	35	48	67	80	94	225	66	134	1,177	3.3
	Spring/Sac	Cottonwood Cr nr Coram	957	1%	44%	36%	2	108	177	234	311	360	410	4,593	260	509	18,372	2.4
		Trib nr Coram	169	0%	38%	39%	2	23	38	51	69	80	91	813	52	107	3,251	2.3
		11938 Benson Dr culvert	869	14%	46%	22%	3	76	134	182	250	296	343	4,171	208	436	16,684	2.7
		inner gorge	208	1%	40%	23%	2	27	45	61	82	95	109	997	60	121	3,988	2.2
		intermittent channel fill removal	64	0%	8%	3%	2	9	16	21	29	34	39	305	11	25	1,220	1.2
		Ohv staging drainage	444	1%	42%	33%	2	54	89	119	159	185	210	2,131	126	250	8,526	2.3
		Reinsvold property	114	0%	37%	40%	2	16	27	36	49	57	65	549	37	76	2,197	2.3
	Whiskey	Whiskey Cr Bridge	3,822	2%	37%	20%	2	375	606	790	1,037	1,201	1,367	21,134	799	1,519	65,515	2.1
Moon	LNF Cottonwood	Doby Cr @ Rainbow Rd	1,535	0%	40%	20%	3	126	222	300	411	485	563	4,818	272	582	20,237	2.2
		Eagle Cr @ diversion	3,406	7%	39%	34%	3	259	452	605	822	970	1,126	10,695	647	1,355	44,920	2.5
		Eagle Cr @ Ono	4,623	7%	46%	31%	3	340	593	791	1,072	1,265	1,469	14,515	886	1,828	60,963	2.6
		Huling Cr @ Platina Rd	2,622	2%	34%	18%	3	204	358	480	654	773	897	8,233	413	880	34,578	2.0
		Rector Cr @ Rainbow Lake Rd	1,470	3%	55%	28%	3	121	214	289	395	467	542	4,615	322	675	19,381	2.7
Noble	3 Beegums	Beegum Cr abv gorge	45,336	0%	8%	7%	6	2397	3613	4,332	5,250	6,081	11,761	225,322	3,024	5,281	657,939	1.3

APPENDIX :

Characteristics of Specific Watersheds of Interest
And
Pre-Fire Flood Calculations

Dry Fork

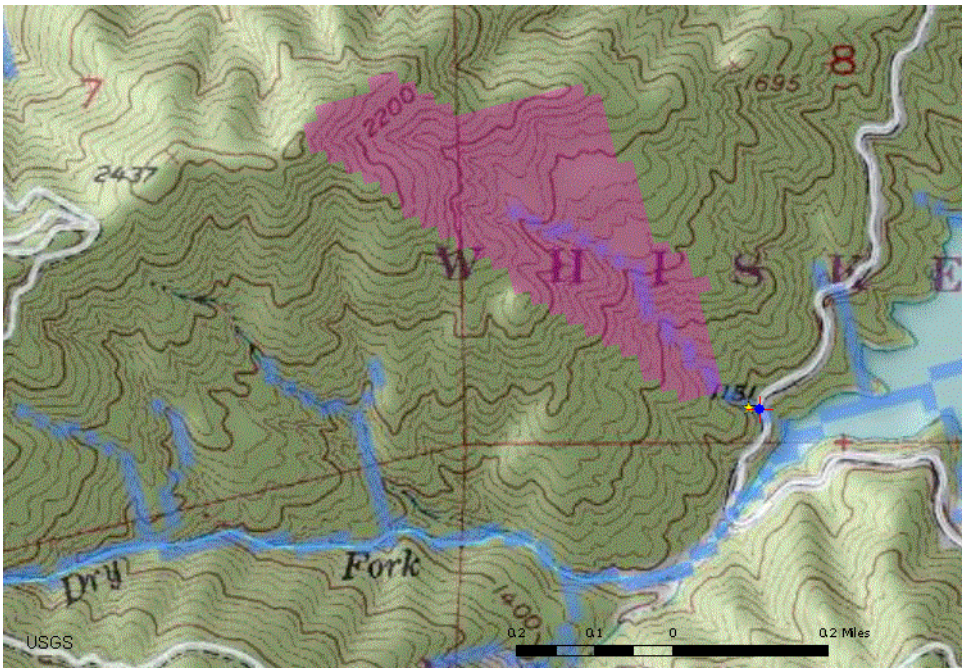


Date: Fri Aug 1 2008 16:10:09 NAD83 Latitude: 40.7250 (40 43 29) NAD83 Longitude: -122.4591 (-122 27 32) NAD27 Latitude: 40.7251 (40 43 30) NAD27 Longitude: -122.4579 (-122 27 28)	Value
Average basin slope, in percent	43.6
Average basin elevation, in feet	2090
Minimum elevation, in feet	1080
Perimeter, in miles	5.67
Relief, in feet	2530
Maximum elevation, in feet	3610
Average minimum January temperature, in Fahrenheit	32.3
Percentage of basin covered by forest	39
Area, in square miles	1.11
Percentage of basin covered by impervious surface	0.25
Distance in miles from basin centroid to the coast	84.1
Relative relief, in feet per mile	446
Percent of area covered by lakes and ponds	0
Average maximum January temperature, in Fahrenheit	48.8
Mean annual precipitation, in inches	71.6
High Elevation Index - Percent of area with elevation > 6000 feet	0

Return Interval	Flow (cfs)
Q_2	**121**
Q_5	**239**
Q_{10}	**294**
Q_{25}	**406**
Q_{50}	**530**
Q_{100}	**632**

Burn Severity	Percent of Area
Low	**45**
Moderate	**29**
High	**0**

Unnamed Trib - North of Dry Fork

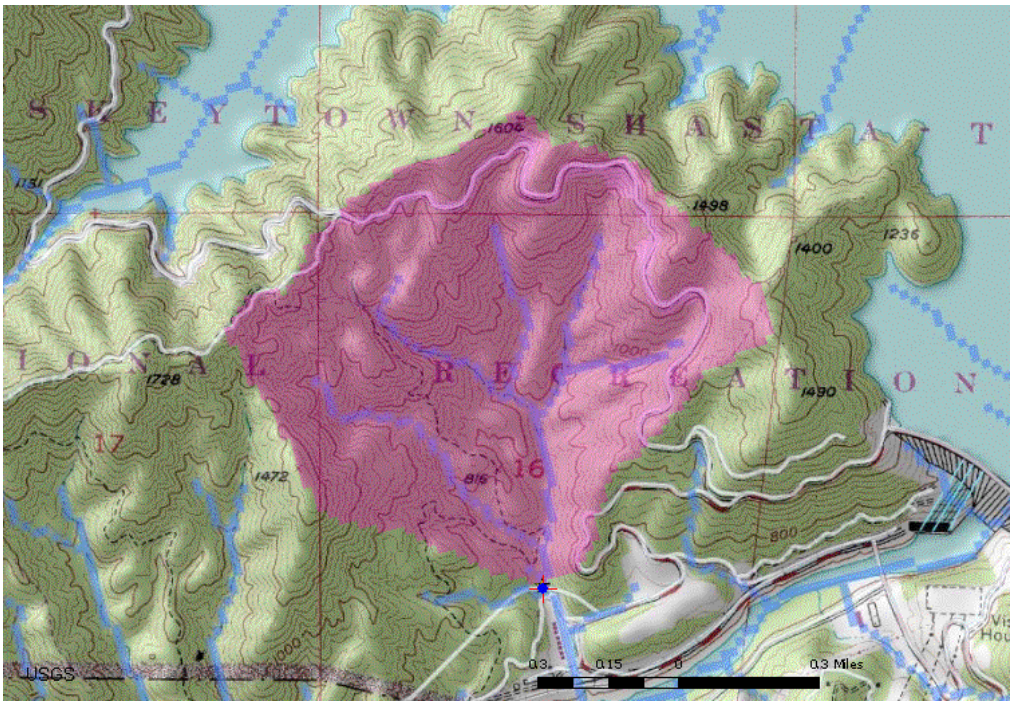


Date: Fri Aug 1 2008 16:38:41 NAD83 Latitude: 40.7270 (40 43 37) NAD83 Longitude: -122.4587 (-122 27 31) NAD27 Latitude: 40.7271 (40 43 37) NAD27 Longitude: -122.4576 (-122 27 27)	**Value**
Average basin slope, in percent	38.4
Average basin elevation, in feet	1840
Minimum elevation, in feet	1250
Perimeter, in miles	1.9
Relief, in feet	1130
Maximum elevation, in feet	2380
Average minimum January temperature, in Fahrenheit	33.6
Percentage of basin covered by forest	32.6
Area, in square miles	0.098
Percentage of basin covered by impervious surface	0
Relative relief, in feet per mile	593
Percent of area covered by lakes and ponds	0
Average maximum January temperature, in Fahrenheit	50.3
Mean annual precipitation, in inches	68.1
High Elevation Index - Percent of area with elevation > 6000 feet	0

Return Interval	**Flow (cfs)**
Q_2	**14**
Q_5	**27**
Q_{10}	**35**
Q_{25}	**48**
Q_{50}	**62**
Q_{100}	**73**

Burn Severity	**Percent of Area**
Low	**3**
Moderate	**86**
High	**11**

OHV Staging Drainage

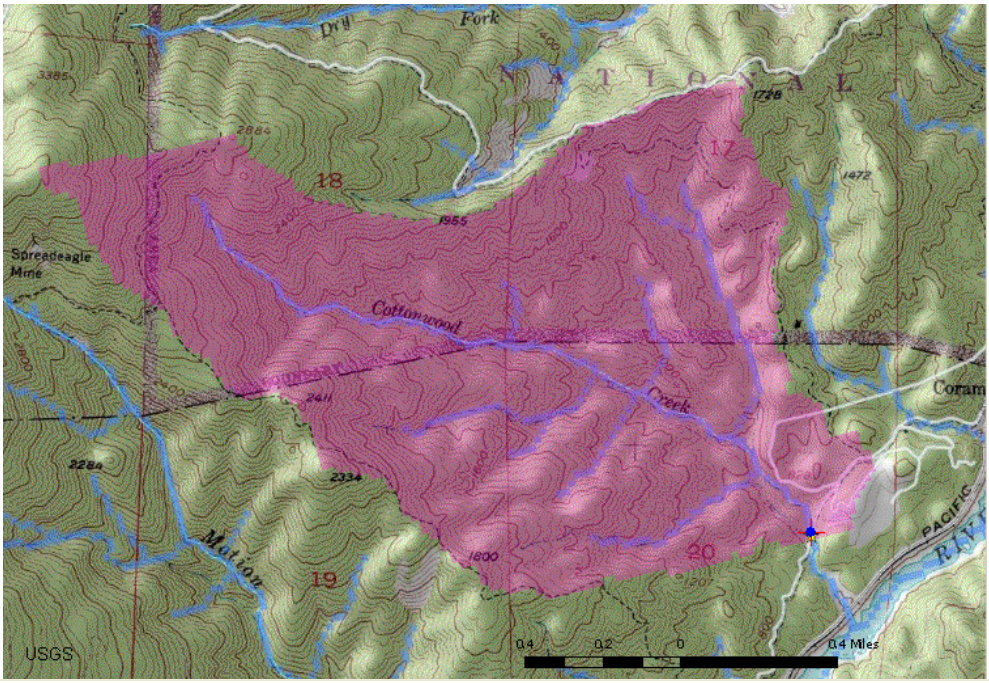


Date: Fri Aug 1 2008 17:04:47 NAD83 Latitude: 40.7153 (40 42 55) NAD83 Longitude: -122.4379 (-122 26 16) NAD27 Latitude: 40.7154 (40 42 55) NAD27 Longitude: -122.4367 (-122 26 12)	**Value**	**Return Interval**	**Flow (cfs)**
Average basin slope, in percent	35.5	Q_2	**92**
Average basin elevation, in feet	1130	Q_5	**160**
Minimum elevation, in feet	641	Q_{10}	**198**
Perimeter, in miles	4.29	Q_{25}	**258**
Relief, in feet	950	Q_{50}	**318**
Maximum elevation, in feet	1590	Q_{100}	**360**
Average minimum January temperature, in Fahrenheit	35.5		
Percentage of basin covered by forest	30.9	**Burn Severity**	**Percent of Area**
Area, in square miles	0.7	Low	
Percentage of basin covered by impervious surface	1	Moderate	
Relative relief, in feet per mile	222	High	
Percent of area covered by lakes and ponds	0		
Average maximum January temperature, in Fahrenheit	52.2		
Mean annual precipitation, in inches	60.2		

Near Coram

Date: Fri Aug 1 2008 17:15:11 **NAD83 Latitude: 40.7105 (40 42 37)** **NAD83 Longitude: -122.4472 (-122 26 49)** **NAD27 Latitude: 40.7106 (40 42 38)** **NAD27 Longitude: -122.4461 (-122 26 45)**	**Value**	**Return Interval**	**Flow (cfs)**
Average basin slope, in percent	37.1	Q_2	**38**
Average basin elevation, in feet	1120	Q_5	**66**
Minimum elevation, in feet	715	Q_{10}	**83**
Perimeter, in miles	3.06	Q_{25}	**109**
Relief, in feet	1000	Q_{50}	**134**
Maximum elevation, in feet	1710	Q_{100}	**151**
Average minimum January temperature, in Fahrenheit	35.7		
Percentage of basin covered by forest	32.9	**Burn Severity**	**Percent of Area**
Area, in square miles	0.26	Low	
Percentage of basin covered by impervious surface	0.009	Moderate	
Distance in miles from basin centroid to the coast		High	
Relative relief, in feet per mile	327		
Percent of area covered by lakes and ponds	0		
Average maximum January temperature, in Fahrenheit	52.6		
Mean annual precipitation, in inches	59.9		
High Elevation Index - Percent of area with elevation > 6000 feet	0		

Cottonwood Creek

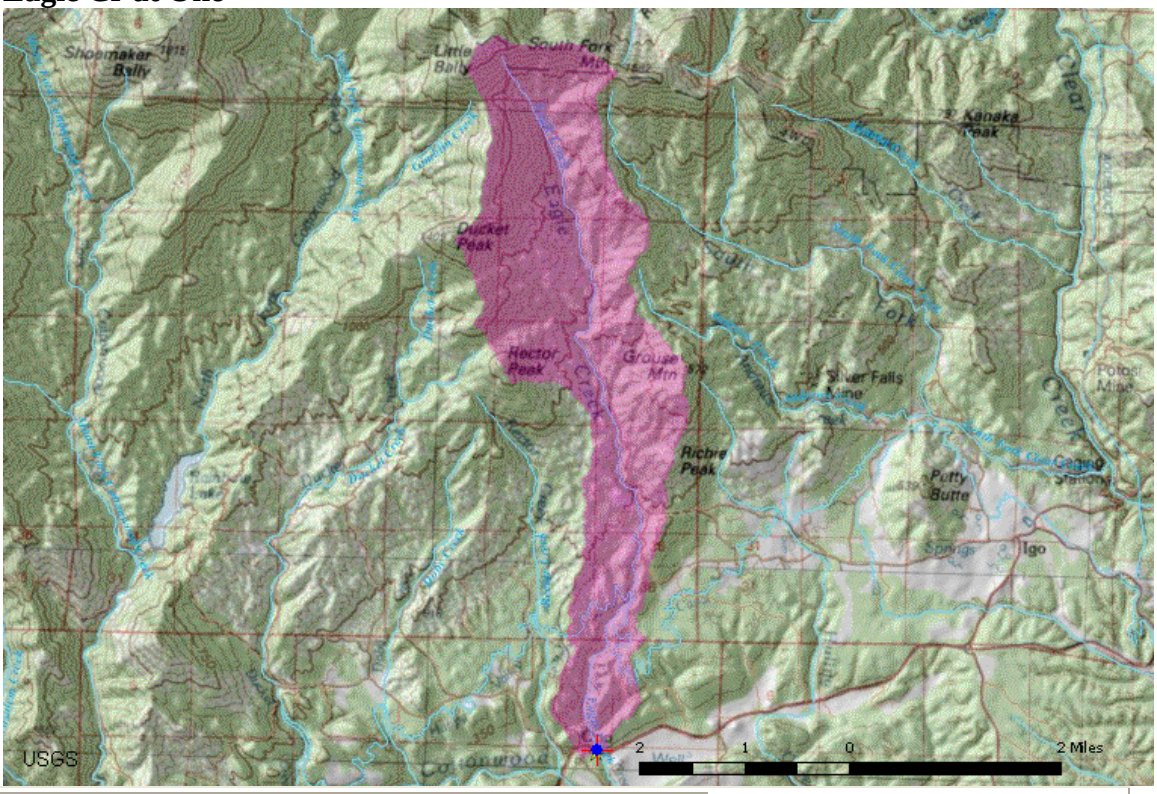


Date: Fri Aug 1 2008 17:21:00 NAD83 Latitude: 40.7050 (40 42 18) NAD83 Longitude: -122.4507 (-122 27 02) NAD27 Latitude: 40.7051 (40 42 18) NAD27 Longitude: -122.4496 (-122 26 58)	**Value**
Average basin slope, in percent	40.3
Average basin elevation, in feet	1590
Minimum elevation, in feet	672
Perimeter, in miles	7.46
Relief, in feet	2940
Maximum elevation, in feet	3610
Average minimum January temperature, in Fahrenheit	33.8
Percentage of basin covered by forest	34.8
Area, in square miles	1.54
Percentage of basin covered by impervious surface	0.15
Relative relief, in feet per mile	395
Percent of area covered by lakes and ponds	0
Average maximum January temperature, in Fahrenheit	50.6
Mean annual precipitation, in inches	66.2
High Elevation Index - Percent of area with elevation > 6000 feet	0

Return Interval	**Flow (cfs)**
Q_2	**174**
Q_5	**322**
Q_{10}	**395**
Q_{25}	**529**
Q_{50}	**673**
Q_{100}	**784**

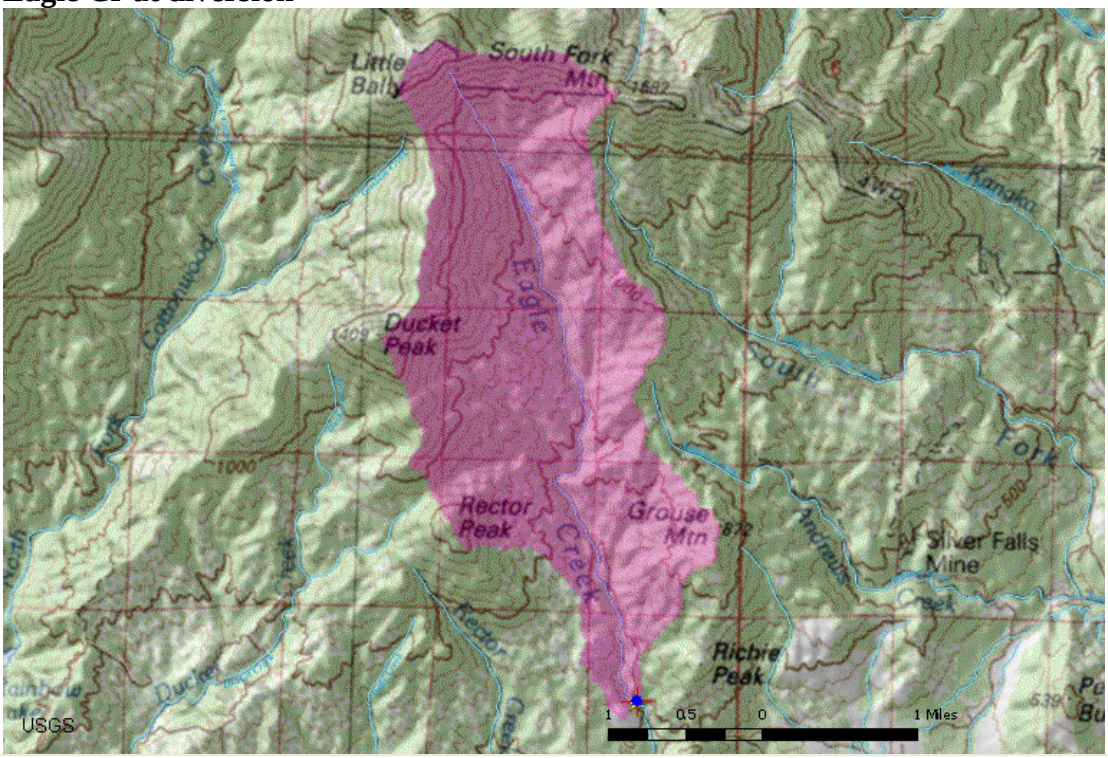
Burn Severity	**Percent of Area**
Low	
Moderate	
High	

Eagle Cr at Ono



Date: Fri Aug 1 2008 19:52:12 NAD83 Latitude: 40.4744 (40 28 27) NAD83 Longitude: -122.6164 (-122 36 59) NAD27 Latitude: 40.4745 (40 28 28) NAD27 Longitude: -122.6153 (-122 36 55)	**Value**	**Return Interval**	**Flow (cfs)**
Average basin slope, in percent	29.9	Q_2	**428**
Average basin elevation, in feet	2690	Q_5	**858**
Minimum elevation, in feet	923	Q_{10}	**1036**
Perimeter, in miles	22.1	Q_{25}	**1436**
Relief, in feet	4470	Q_{50}	**1906**
Maximum elevation, in feet	5400	Q_{100}	**2311**
Average minimum January temperature, in Fahrenheit	31.3		
Percentage of basin covered by forest	42.5	**Burn Severity**	**Percent of Area**
Area, in square miles	6.98	Low	
Percentage of basin covered by impervious surface	0.065	Moderate	
Relative relief, in feet per mile	203	High	
Percent of area covered by lakes and ponds	0		
Average maximum January temperature, in Fahrenheit	46.5		
Mean annual precipitation, in inches	52		

Eagle Cr at diversion

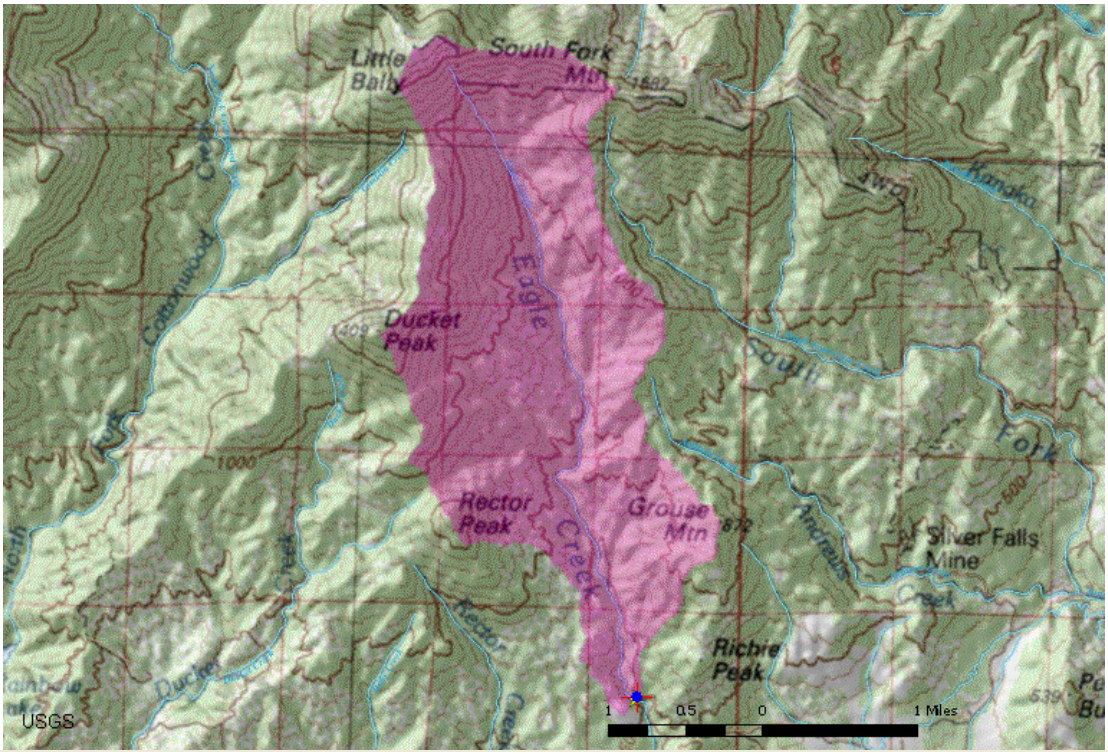


Date: Fri Aug 1 2008 19:56:55 NAD83 Latitude: 40.5107 (40 30 38) NAD83 Longitude: -122.6121 (-122 36 43) NAD27 Latitude: 40.5108 (40 30 38) NAD27 Longitude: -122.6110 (-122 36 39)	**Value**
Average basin slope, in percent	34
Average basin elevation, in feet	3160
Minimum elevation, in feet	1660
Perimeter, in miles	15
Relief, in feet	3730
Maximum elevation, in feet	5400
Average minimum January temperature, in Fahrenheit	30.8
Percentage of basin covered by forest	45.8
Area, in square miles	5.05
Percentage of basin covered by impervious surface	0.01
Relative relief, in feet per mile	249
Percent of area covered by lakes and ponds	0
Average maximum January temperature, in Fahrenheit	45.1
Mean annual precipitation, in inches	55.9

Return Interval	**Flow (cfs)**
Q_2	**316**
Q_5	**658**
Q_{10}	**798**
Q_{25}	**1129**
Q_{50}	**1522**
Q_{100}	**1871**

Burn Severity	**Percent of Area**
Low	
Moderate	
High	

Rector Cr at Rainbow Lake Rd

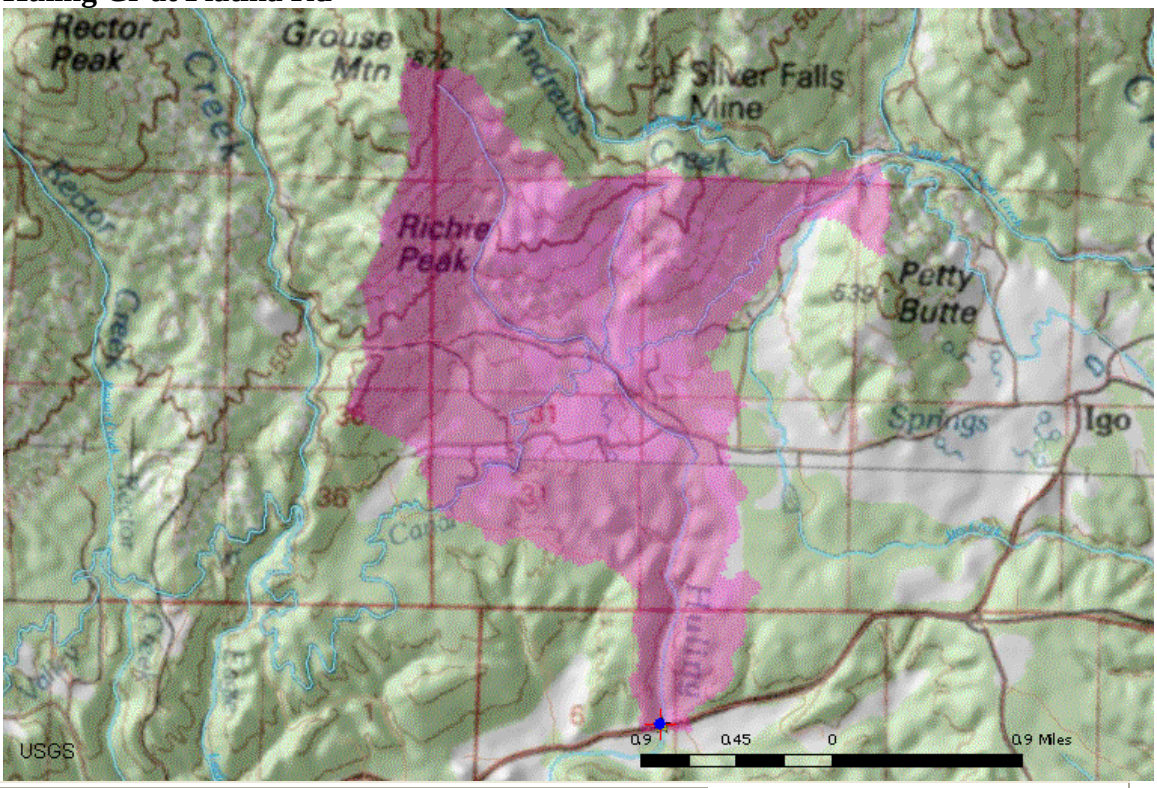


Date: Fri Aug 1 2008 20:06:05 NAD83 Latitude: 40.4768 (40 28 36) NAD83 Longitude: -122.6259 (-122 37 33) NAD27 Latitude: 40.4769 (40 28 36) NAD27 Longitude: -122.6248 (-122 37 29)	**Value**
Average basin slope, in percent	20.3
Average basin elevation, in feet	1850
Minimum elevation, in feet	991
Perimeter, in miles	10.8
Relief, in feet	2520
Maximum elevation, in feet	3510
Average minimum January temperature, in Fahrenheit	31.2
Percentage of basin covered by forest	21.3
Area, in square miles	2.56
Percentage of basin covered by impervious surface	0.093
Relative relief, in feet per mile	233
Percent of area covered by lakes and ponds	0
Average maximum January temperature, in Fahrenheit	48.8
Mean annual precipitation, in inches	43.7

Return Interval	**Flow (cfs)**
Q_2	**177**
Q_5	**331**
Q_{10}	**404**
Q_{25}	**543**
Q_{50}	**694**
Q_{100}	**816**

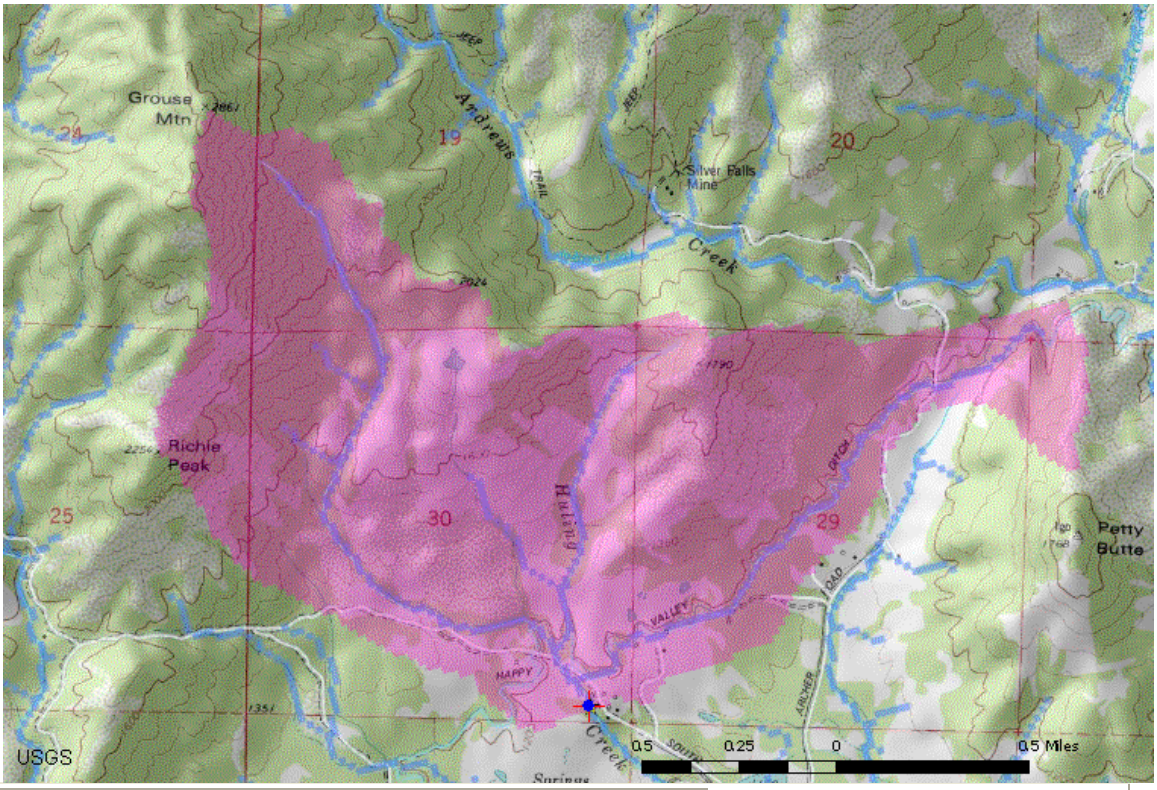
Burn Severity	**Percent of Area**
Low	
Moderate	
High	

Huling Cr at Platina Rd



Date: Fri Aug 1 2008 20:14:42 NAD83 Latitude: 40.4822 (40 28 55) NAD83 Longitude: -122.5778 (-122 34 40) NAD27 Latitude: 40.4823 (40 28 56) NAD27 Longitude: -122.5767 (-122 34 36)	**Value**	**Return Interval**	**Flow (cfs)**
Average basin slope, in percent	15.3	Q_2	**277**
Average basin elevation, in feet	1380	Q_5	**485**
Minimum elevation, in feet	887	Q_{10}	**590**
Perimeter, in miles	14.4	Q_{25}	**768**
Relief, in feet	1940	Q_{50}	**956**
Maximum elevation, in feet	2820	Q_{100}	**1097**
Average minimum January temperature, in Fahrenheit	32.9		
Percentage of basin covered by forest	22.2	**Burn Severity**	**Percent of Area**
Area, in square miles	3.71	Low	
Percentage of basin covered by impervious surface	0.12	Moderate	
Relative relief, in feet per mile	135	High	
Percent of area covered by lakes and ponds	0.25		
Average maximum January temperature, in Fahrenheit	50.7		
Mean annual precipitation, in inches	42.5		

Huling Cr

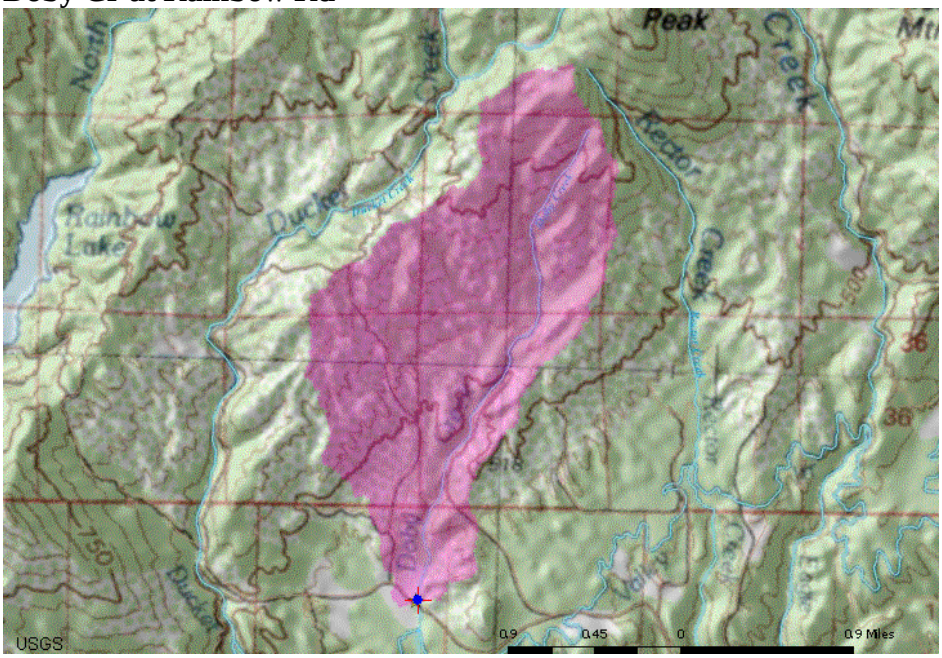


Date: Fri Aug 1 2008 20:42:21 **NAD83 Latitude: 40.5054 (40 30 19)** **NAD83 Longitude: -122.5826 (-122 34 57)** **NAD27 Latitude: 40.5055 (40 30 19)** **NAD27 Longitude: -122.5815 (-122 34 53)**	**Value**
Average basin slope, in percent	20.9
Average basin elevation, in feet	1570
Minimum elevation, in feet	1140
Perimeter, in miles	9.06
Relief, in feet	1680
Maximum elevation, in feet	2820
Average minimum January temperature, in Fahrenheit	32.3
Percentage of basin covered by forest	26.7
Area, in square miles	1.83
Percentage of basin covered by impervious surface	0.039
Relative relief, in feet per mile	186
Percent of area covered by lakes and ponds	0
Average maximum January temperature, in Fahrenheit	50.1
Mean annual precipitation, in inches	44.4

Return Interval	**Flow (cfs)**
Q_2	**143**
Q_5	**260**
Q_{10}	**319**
Q_{25}	**423**
Q_{50}	**533**
Q_{100}	**619**

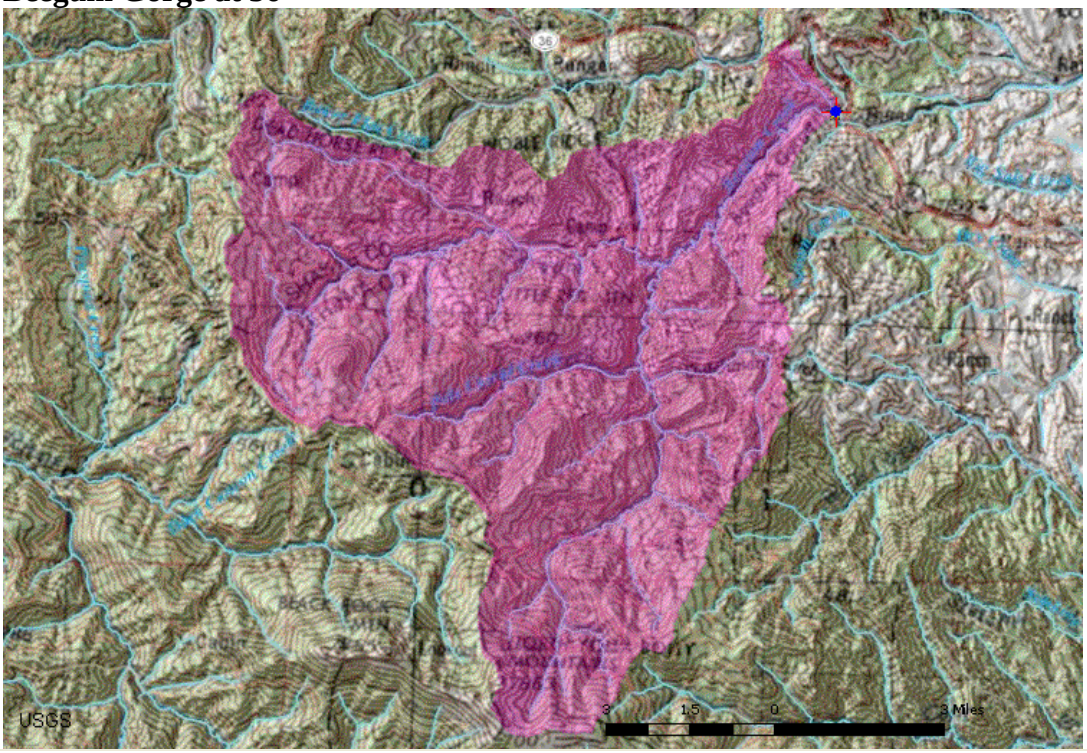
Burn Severity	**Percent of Area**
Low	
Moderate	
High	

Doby Cr at Rainbow Rd



Date: Sat Aug 2 2008 16:02:52 NAD83 Latitude: 40.4822 (40 28 55) NAD83 Longitude: -122.6551 (-122 39 18) NAD27 Latitude: 40.4823 (40 28 56) NAD27 Longitude: -122.6540 (-122 39 14)	Value	Return Interval	Flow (cfs)
Average basin slope, in percent	19.3	Q_2	**161**
Average basin elevation, in feet	2000	Q_5	**305**
Minimum elevation, in feet	1400	Q_{10}	**373**
Perimeter, in miles	9.66	Q_{25}	**506**
Relief, in feet	1580	Q_{50}	**652**
Maximum elevation, in feet	2980	Q_{100}	**770**
Average minimum January temperature, in Fahrenheit	30.4		
Percentage of basin covered by forest	13.1	**Burn Severity**	**Percent of Area**
Area, in square miles	2.39	Low	
Percentage of basin covered by impervious surface	0.13	Moderate	
Relative relief, in feet per mile	164	High	
Percent of area covered by lakes and ponds	0		
Average maximum January temperature, in Fahrenheit	48		
Mean annual precipitation, in inches	43.8		

Beegum Gorge at 36

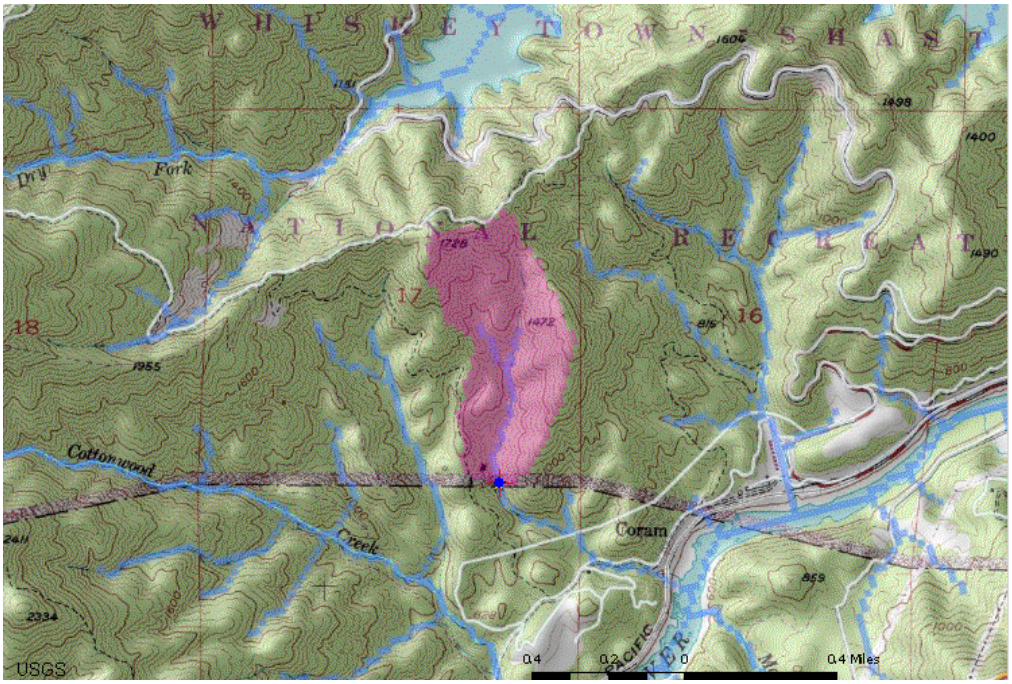


Date: Fri Aug 1 2008 21:11:57 NAD83 Latitude: 40.3477 (40 20 51) NAD83 Longitude: -122.8646 (-122 51 52) NAD27 Latitude: 40.3479 (40 20 52) NAD27 Longitude: -122.8635 (-122 51 48)	**Value**
Average basin slope, in percent	41.3
Average basin elevation, in feet	3980
Minimum elevation, in feet	1320
Perimeter, in miles	59
Relief, in feet	6510
Maximum elevation, in feet	7830
Average minimum January temperature, in Fahrenheit	30.1
Percentage of basin covered by forest	39.9
Area, in square miles	71
Percentage of basin covered by impervious surface	0.073
Relative relief, in feet per mile	110
Percent of area covered by lakes and ponds	0
Average maximum January temperature, in Fahrenheit	46
Mean annual precipitation, in inches	43

Return Interval	**Flow (cfs)**
Q_2	**2424**
Q_5	**5096**
Q_{10}	**6017**
Q_{25}	**8456**
Q_{50}	**11580**
Q_{100}	**14463**

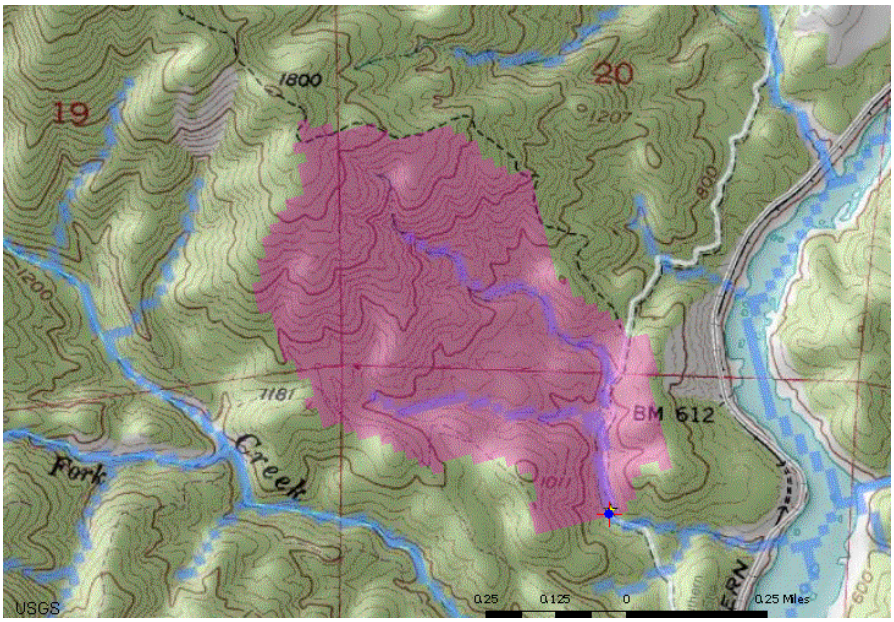
Burn Severity	**Percent of Area**
Low	
Moderate	
High	

Reinsvold Property



Date: Sat Aug 2 2008 14:51:19 NAD83 Latitude: 40.7122 (40 42 44) NAD83 Longitude: -122.4508 (-122 27 03) NAD27 Latitude: 40.7124 (40 42 44) NAD27 Longitude: -122.4497 (-122 26 59)	**Value**	**Return Interval**	**Flow (cfs)**
Average basin slope, in percent	38.4	Q_2	**25**
Average basin elevation, in feet	1220	Q_5	**45**
Minimum elevation, in feet	823	Q_{10}	**56**
Perimeter, in miles	2.35	Q_{25}	**75**
Relief, in feet	891	Q_{50}	**93**
Maximum elevation, in feet	1710	Q_{100}	**106**
Average minimum January temperature, in Fahrenheit	35.5		
Percentage of basin covered by forest	32.8	**Burn Severity**	**Percent of Area**
Area, in square miles	0.17	Low	
Percentage of basin covered by impervious surface	0.014	Moderate	
Relative relief, in feet per mile	379	High	
Percent of area covered by lakes and ponds	0		
Average maximum January temperature, in Fahrenheit	52.3		
Mean annual precipitation, in inches	60.5		
High Elevation Index - Percent of area with elevation > 6000 feet	0		

Inner Gorge Erosion Potential

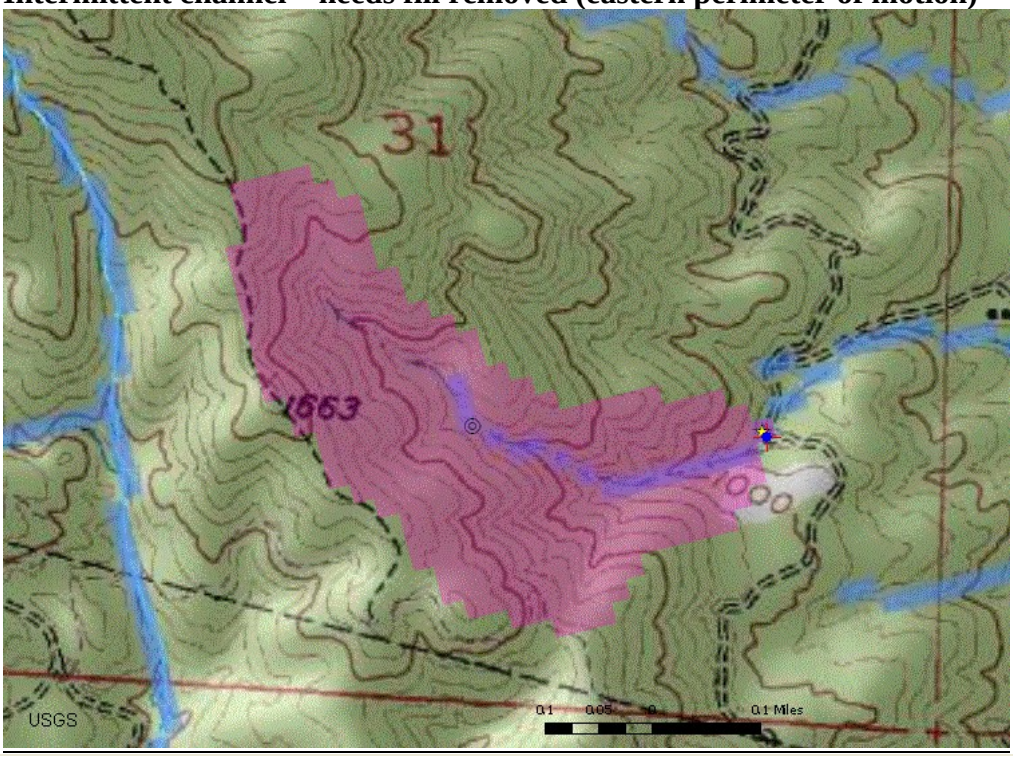


Date: Sat Aug 2 2008 15:02:20 NAD83 Latitude: 40.6931 (40 41 35) NAD83 Longitude: -122.4558 (-122 27 20) NAD27 Latitude: 40.6932 (40 41 35) NAD27 Longitude: -122.4547 (-122 27 16)	**Value**
Average basin slope, in percent	31.5
Average basin elevation, in feet	1120
Minimum elevation, in feet	714
Perimeter, in miles	3.13
Relief, in feet	1020
Maximum elevation, in feet	1730
Average minimum January temperature, in Fahrenheit	35.5
Percentage of basin covered by forest	32.4
Area, in square miles	0.32
Percentage of basin covered by impervious surface	0.2
Relative relief, in feet per mile	326
Percent of area covered by lakes and ponds	0
Average maximum January temperature, in Fahrenheit	52.6
Mean annual precipitation, in inches	59.8
High Elevation Index - Percent of area with elevation > 6000 feet	0

Return Interval	**Flow (cfs)**
Q_2	**46**
Q_5	**80**
Q_{10}	**99**
Q_{25}	**130**
Q_{50}	**160**
Q_{100}	**181**

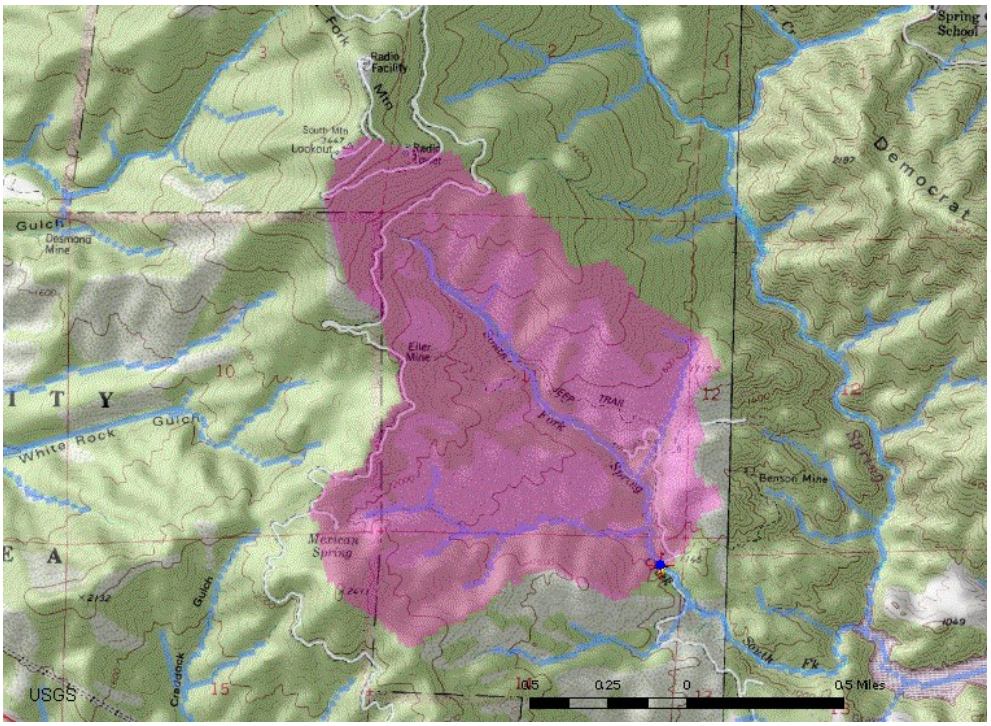
Burn Severity	**Percent of Area**
Low	
Moderate	
High	

Intermittent channel – needs fill removed (eastern perimeter of motion)



Date: Sat Aug 2 2008 13:21:01 NAD83 Latitude: 40.6693 (40 40 09) NAD83 Longitude: -122.4680 (-122 28 04) NAD27 Latitude: 40.6694 (40 40 09) NAD27 Longitude: -122.4668 (-122 28 00)	**Value**	**Return Interval**	**Flow (cfs)**
Average basin elevation, in feet	1360	Q_2	**15**
Minimum elevation, in feet	918	Q_5	**27**
X coordinate of the outlet, in map coordinates	-2190330.0	Q_{10}	**34**
Area, in square miles	0.099	Q_{25}	**46**
Percentage of basin covered by impervious surface	0	Q_{50}	**57**
Elevation at outlet, in feet	918	Q_{100}	**66**
Y coordinate of the centroid, in map coordinates	2269073.9		
X coordinate of the centroid, in map coordinates	-2190746.2	**Burn Severity**	**Percent of Area**
Mean annual precipitation, in inches	60.1	Low	
Y coordinate of the outlet, in map coordinates	2268960.0	Moderate	
		High	

11938 Benson Dr. potential for drainage/culvert failure (eastern perimeter motion fire)



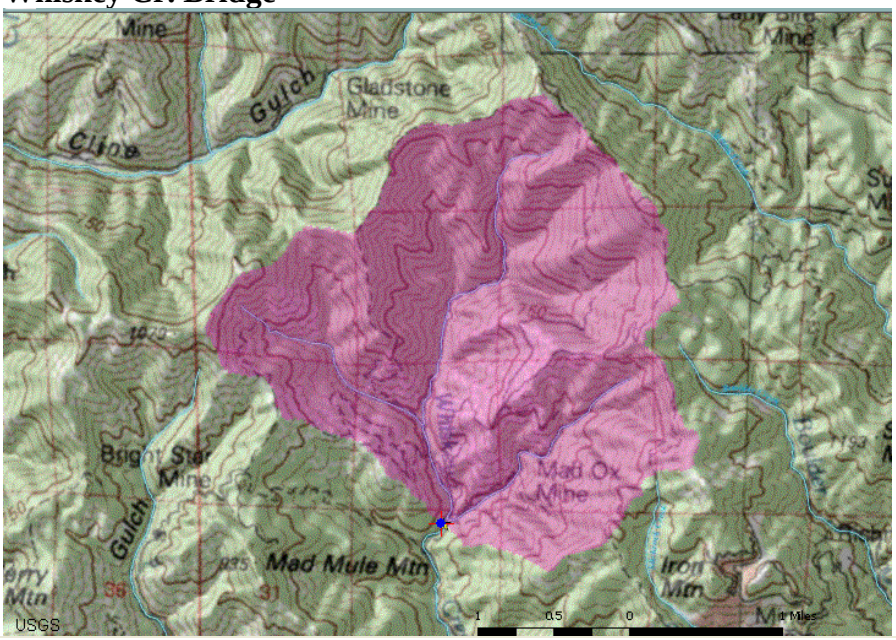
Date: Sat Aug 2 2008 13:39:15
NAD83 Latitude: 40.6351 (40 38 06)
NAD83 Longitude: -122.5051 (-122 30 18)
NAD27 Latitude: 40.6353 (40 38 06)
NAD27 Longitude: -122.5040 (-122 30 14)

Parameter	Value
Average basin elevation, in feet	1950
X coordinate of the outlet, in map coordinates	-2194380.0
Area, in square miles	1.35
Mean annual precipitation, in inches	70.5
Y coordinate of the outlet, in map coordinates	2266140.0

Return Interval	Flow (cfs)
Q_2	**149**
Q_5	**288**
Q_{10}	**353**
Q_{25}	**484**
Q_{50}	**627**
Q_{100}	**744**

Burn Severity	Percent of Area
Low	
Moderate	
High	

Whiskey Cr. Bridge



Date: Sat Aug 2 2008 14:33:05 NAD83 Latitude: 40.6791 (40 40 44) NAD83 Longitude: -122.5651 (-122 33 54) NAD27 Latitude: 40.6792 (40 40 45) NAD27 Longitude: -122.5640 (-122 33 50)	**Value**	**Return Interval**	**Flow (cfs)**
Average basin slope, in percent	50.2	Q_2	**465**
Average basin elevation, in feet	2630	Q_5	**937**
Minimum elevation, in feet	1440	Q_{10}	**1135**
Perimeter, in miles	13.3	Q_{25}	**1575**
Relief, in feet	2790	Q_{50}	**2095**
Maximum elevation, in feet	4230	Q_{100}	**2542**
Average minimum January temperature, in Fahrenheit	30.2		
Percentage of basin covered by forest	41.3	**Burn Severity**	**Percent of Area**
Area, in square miles	6	Low	
Percentage of basin covered by impervious surface	0.054	Moderate	
Relative relief, in feet per mile	209	High	
Percent of area covered by lakes and ponds	0		
Average maximum January temperature, in Fahrenheit	45.2		
Mean annual precipitation, in inches	65.7		
High Elevation Index - Percent of area with elevation > 6000 feet	0		