

APPENDIX A: Predicted West Fork Complex Wildfire Flood Response for Individual Drainages

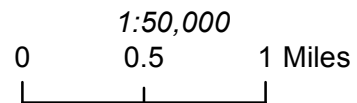
- South Fork Rio Grande
- Leopard (Lower Goose) and Elk Creeks
- Upper Goose Creek
- Trout Creek
- Upper Rio Grande

West Fork Complex Fire Area Estimated Flood Magnification South Fork Rio Grande 12/12/2013



United States Department of Agriculture
Natural Resources Conservation Service

aerial imagery collected 8/2011



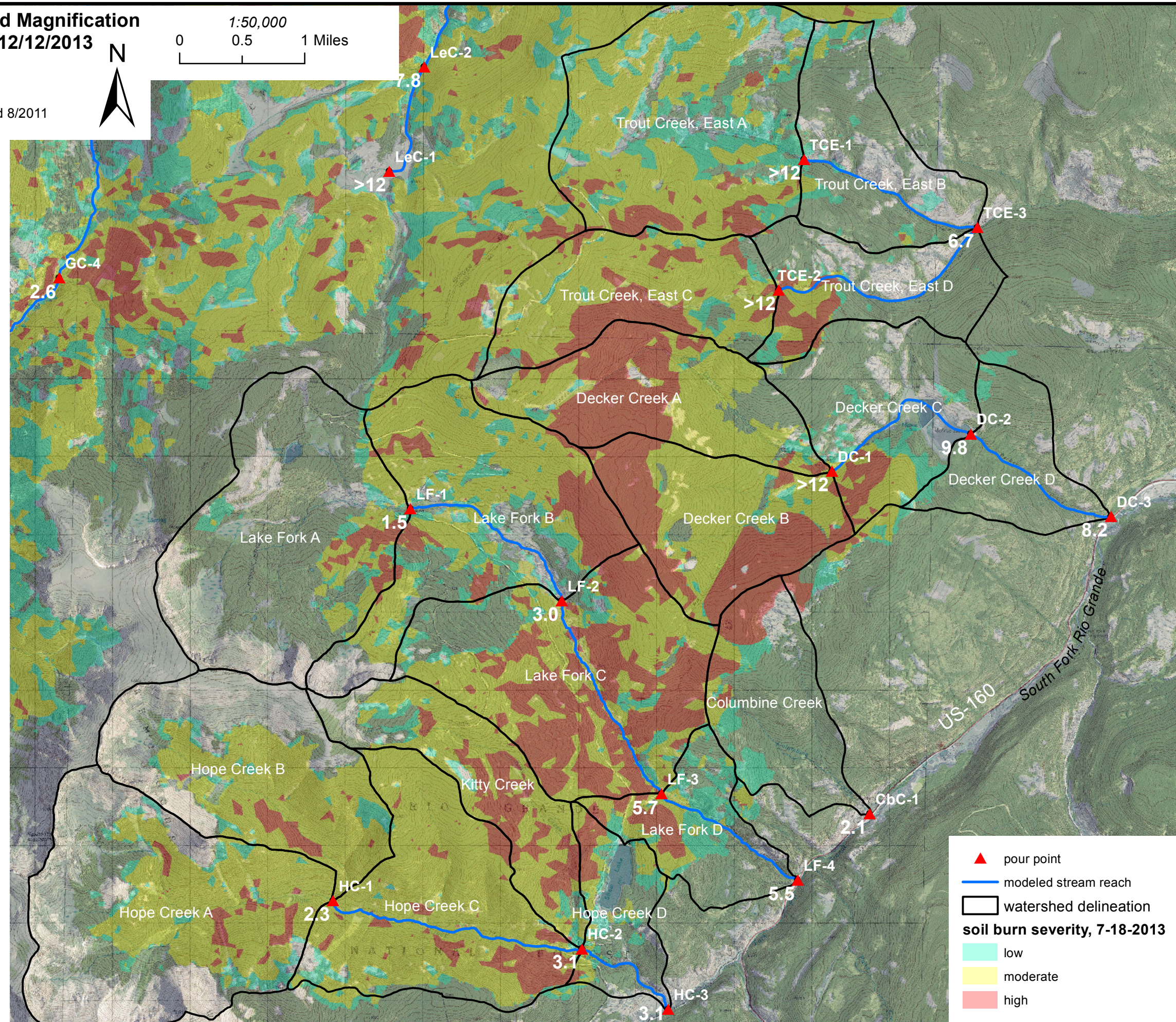
Peak flow predictions and flood magnification ratios are provided for the 6-hour, 25-year rain event. The magnification ratios (larger bold, white numbers) are computed as (post fire peak flow) / (pre fire peak flow). Predicted peak flows are also provided in the table below.

Methods:

- * Post and pre fire flows predicted using the NRCS Curve Number (CN) methodology, using a 6-hour rainfall event over the entire stream catchment.
- * Simulation modeled in HEC-HMS (3.5).
- * CN development accounted for hydrologic soil group, vegetation type and soil burn severity.
- * Streamflow routing performed using Muskingum-Cunge methodology.
- * Sediment bulking factor included in separate prediction values, using a simple multiplication factor that is dependent upon the catchment percent moderate and high soil burn severity.
- * Aerial precipitation reduction factors applied for catchments > 11 mi².

Questions? Contact Steven Yochum, NRCS Hydrologist
(970-295-5657, steven.yochum@co.usda.gov)

Pour Point	Drainage Area (mi ²)	25-Year Rain Event			Post/Pre Peak Flow
		Predicted Flow (cfs) Pre Fire	Predicted Flow (cfs) Post Fire	Bulking	
HC-A	3.58	370	780	850	2.1
HC-B	2.51	270	670	840	2.5
HC-1	6.09	630	1400	1800	2.3
KC	1.53	100	650	820	6.3
HC-2	10.20	860	2700	3300	3.1
HC-3	11.04	910	2800	3500	3.1
LF-1	3.34	140	210	210	1.5
LF-2	6.27	170	510	630	3.0
LF-3	9.50	240	1400	1700	5.7
LF-4	10.59	270	1500	1800	5
CbC-1	1.42	94	200	220	2
DC-A	1.90	44	610	760	>12
DC-B	1.85	77	1000	1200	>12
DC-1	3.75	110	1500	1900	>12
DC-2	5.56	170	1600	2100	10
DC-3	6.63	210	1700	2200	8.2
TCE-1	3.28	47	610	760	>12
TCE-2	1.79	26	510	640	>12
TCE-3	8.06	200	1300	1700	6.7



- ▲ pour point
- modeled stream reach
- ▭ watershed delineation

soil burn severity, 7-18-2013

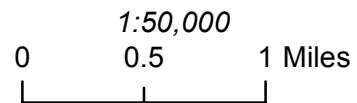
- low
- moderate
- high

West Fork Complex Fire Area Estimated Flood Magnification Leopard (Lower Goose) and Elk Creeks 12/12/2013



United States Department of Agriculture
Natural Resources Conservation Service

aerial imagery collected 8/2011



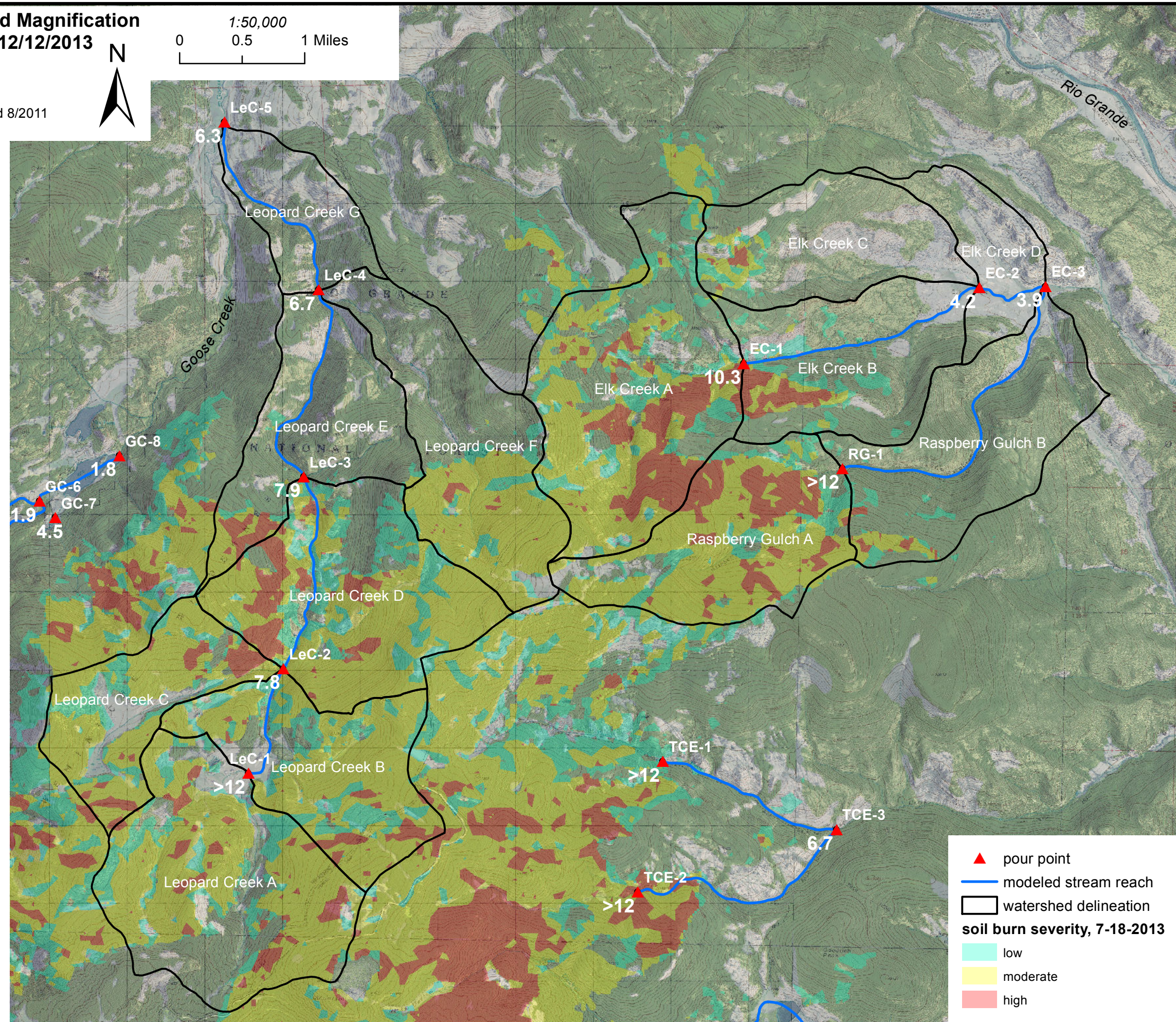
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Pour Point	Drainage Area (mi ²)	25-Year Rain Event			Post/Pre Peak Flow
		Pre Fire	Post Fire	Bulking	
EC-1	3.19	66	680	850	10
EC-C	1.71	89	120	120	1.4
EC-2	6.85	220	930	1200	4.2
RG-1	2.18	32	450	570	>12
EC-3	12.22	390	1500	1900	3.9
LeC-1	2.99	35	560	700	>12
LeC-C	1.48	160	660	830	4.3
LeC-2	6.45	200	1500	1900	7.8
LeC-3	9.16	270	2100	2600	7.9
LeC-F	2.31	25	86	95	3.4
LeC-4	13.29	330	2200	2800	6.7
LeC-5	14.26	360	2300	2900	6.3



▲ pour point
 — modeled stream reach
 □ watershed delineation
soil burn severity, 7-18-2013
 low
 moderate
 high

West Fork Complex Fire Area Estimated Flood Magnification Upper Goose Creek 12/12/2013



United States Department of Agriculture
Natural Resources Conservation Service

aerial imagery collected 8/2011

1:60,000
0 0.5 1 Miles



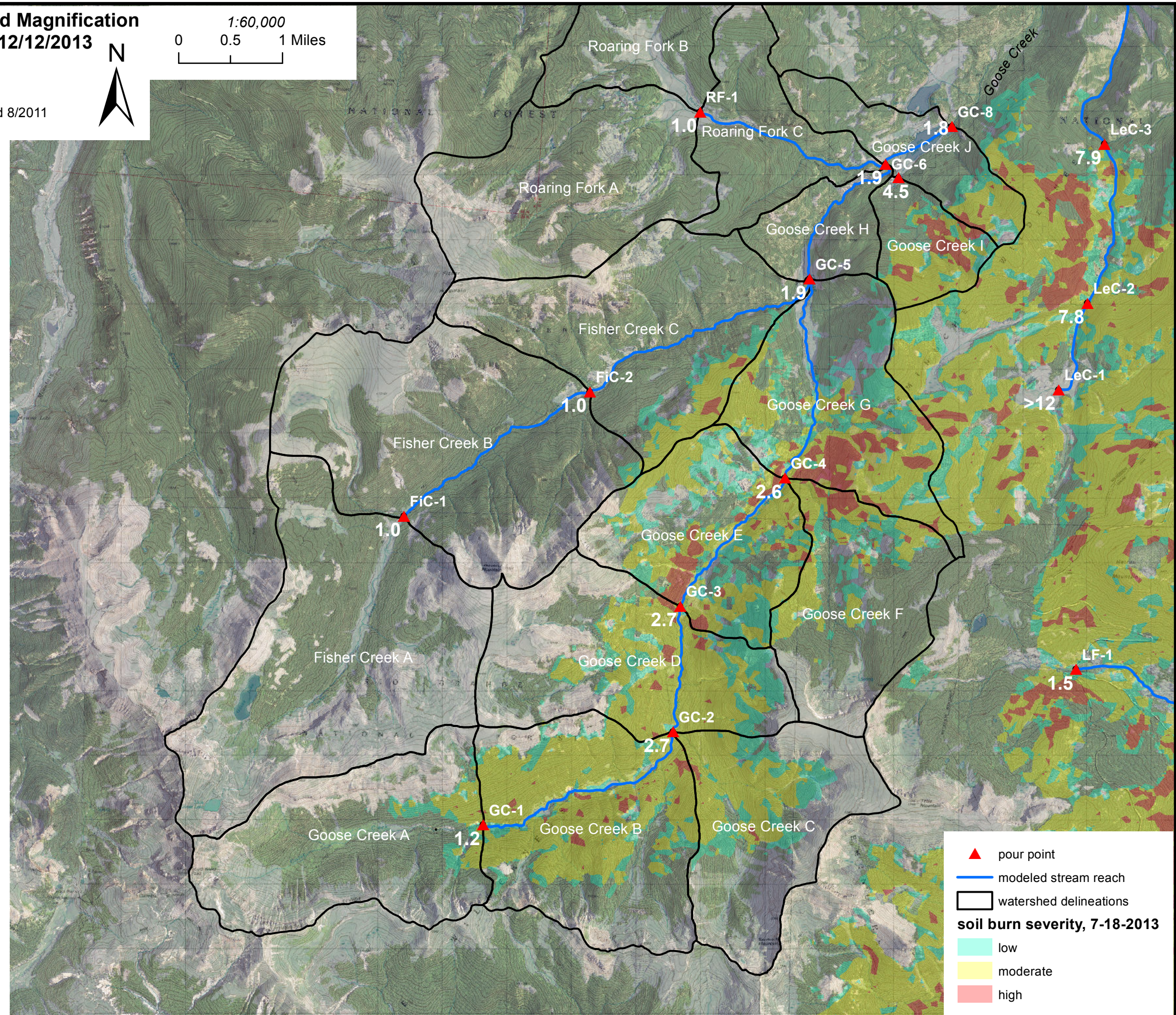
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Pour Point	Drainage Area (mi ²)	25-Year Rain Event			Post/Pre Peak Flow
		Predicted Flow (cfs) Pre Fire	Predicted Flow (cfs) Post Fire	Bulking	
GC-1	3.83	280	330	330	1.2
GC-C	2.94	82	190	210	2.3
GC-2	10.83	450	1200	1400	2.7
GC-3	14.49	580	1600	1700	2.7
GC-F	2.69	290	430	480	1.5
GC-4	20.07	830	2100	2300	2.6
FiC-1	6.05	190	190	190	1.0
FiC-2	11.91	390	390	390	1.0
GC-5	39.33	1400	2800	3100	1.9
RF-1	6.15	84	84	84	1.0
GC-6	48.43	1600	2900	3200	1.9
GC-7	0.96	120	550	690	4.5
GC-8	50.81	1600	2900	3200	1.8



West Fork Complex Fire Area Estimated Flood Magnification Trout Creek 12/13/2013



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Natural Resources Conservation Service

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0 0.5 1 Miles



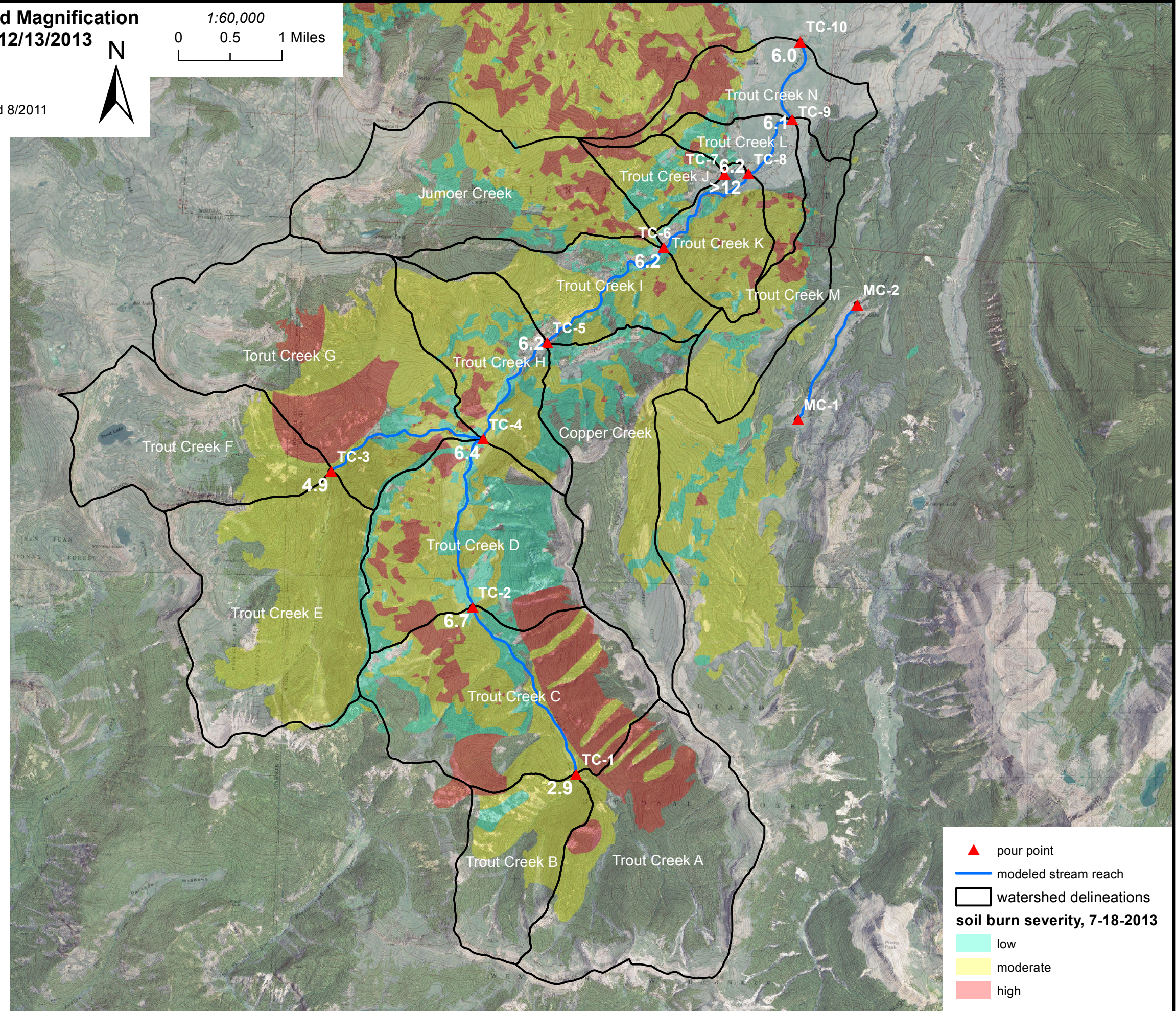
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Pour Point	Drainage Area (mi ²)	25-Year Rain Event			Post/Pre Peak Flow
		Pre Fire	Post Fire	Bulking	
TC-A	3.99	85	220	240	2.6
TC-B	1.60	49	170	190	3.5
TC-1	5.59	130	370	410	2.9
TC-2	9.30	170	1100	1400	6.7
TC-E	3.86	38	620	770	>12
TC-F	2.55	180	310	350	1.7
TC-3	6.41	190	930	1200	4.9
TC-4	23.34	440	2800	3500	6.4
CC	3.01	31	75	83	2.4
TC-5	28.19	500	3100	3800	6.2
TC-6	33.23	530	3300	4100	6.2
TC-J	0.65	7.1	200	240	>12
TC-8	34.91	540	3300	4200	6.2
TC-9	37.22	550	3300	4200	6.1
TC-10	38.60	550	3300	4100	6.0



▲ pour point
 — modeled stream reach
 □ watershed delineations
soil burn severity, 7-18-2013
 low
 moderate
 high

West Fork Complex Fire Area Estimated Flood Magnification Upper Rio Grande 12/13/2013



United States Department of Agriculture
Natural Resources Conservation Service

1:60,000
0 0.5 1 Miles



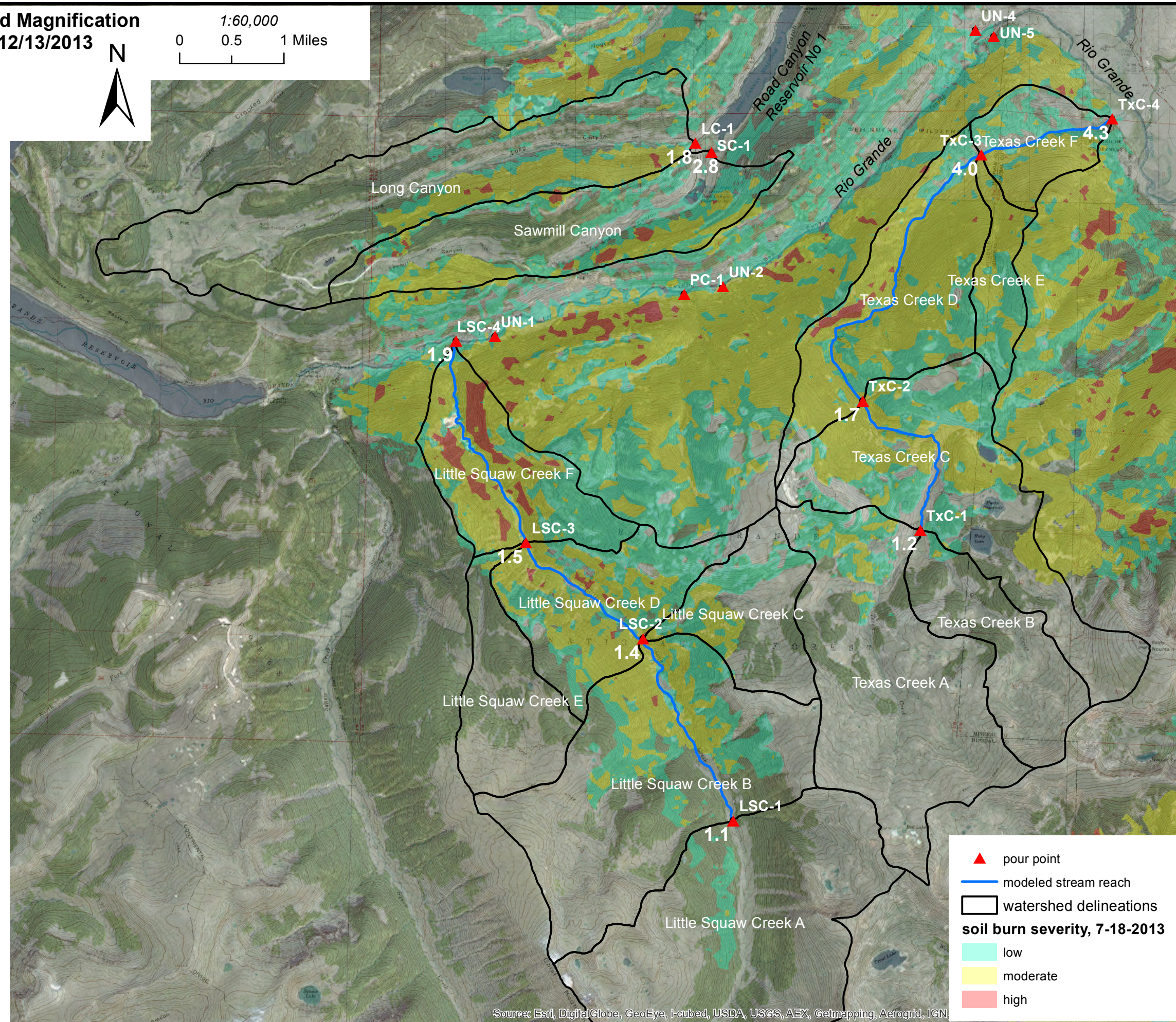
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Pour Point	Drainage Area (mi ²)	25-Year Rain Event			Post/Pre Peak Flow
		Pre Fire	Post Fire	Bulking	
TxC-1	6.09	61	73	73	1.2
TxC-2	9.89	120	210	230	1.7
TxC-3	13.41	150	580	720	4.0
TxC-4	14.40	150	660	820	4.3
LSC-1	5.55	200	210	210	1.1
LSC-C	1.50	26	52	52	2.0
LSC-2	12.02	360	490	540	1.4
LSC-3	15.76	450	650	720	1.5
LSC-4	17.73	510	980	1100	1.9
LC-1	4.80	83	150	160	1.8
SC-1	2.89	62	170	190	2.8



Source: Esri, DigitalGlobe, GeoEye, i-cubed, USDA, USGS, AEX, Getmapping, Aerogrid, IGN,

APPENDIX B: Predicted West Fork Complex Wildfire Sediment Yield Response for Individual Drainages

- South Fork Rio Grande
- Leopard (Lower Goose) and Elk Creeks
- Upper Goose Creek
- Trout Creek
- Upper Rio Grande

West Fork Complex Fire Area Estimated Sediment Yield Magnification

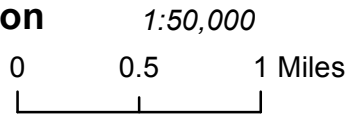
South Fork Rio Grande

12/18/2013



United States Department of Agriculture
Natural Resources Conservation Service

aerial imagery collected 8/2011



Sediment delivery ratios are provided for changes in 30 year average annual sediment yield at computation points. The ratios (larger bold, white numbers) are computed as (post fire average annual sediment yield) / (pre fire average annual sediment yield).

Sediment yields were estimated using the Revised Universal Soil Loss Equation (RUSLE, $A=R \cdot K \cdot (LS) \cdot C \cdot P$), which is the product of rain fall erosivity (R), soil erodibility (K), slope length (L), slope steepness (S), soil cover type (C), and soil/cover management (P).

Methods:

* Pre and post predicted erosion rates are based on the NRCS RUSLE equation executed within a Geographical Information System (GIS) using terrain analysis to calculate slope length (L) and steepness (S) factors, with simple map algebra statements to compute R, K and C factors derived from ancillary spatial datasets. The soil/cover management (P) factor was assumed to be equal to unity due to lack of spatial information on management activity in the area.

* The soil cover factor (C) was altered based on the Burned Area Reflectance Classification (BARC), with severe, moderate and low burned areas receiving inflated values from pre fire conditions.

* For each of the two burn scenarios (pre & post) the five RUSLE spatial factors are multiplied together then routed downslope and averaged to compute at-a-point estimated sediment yield.

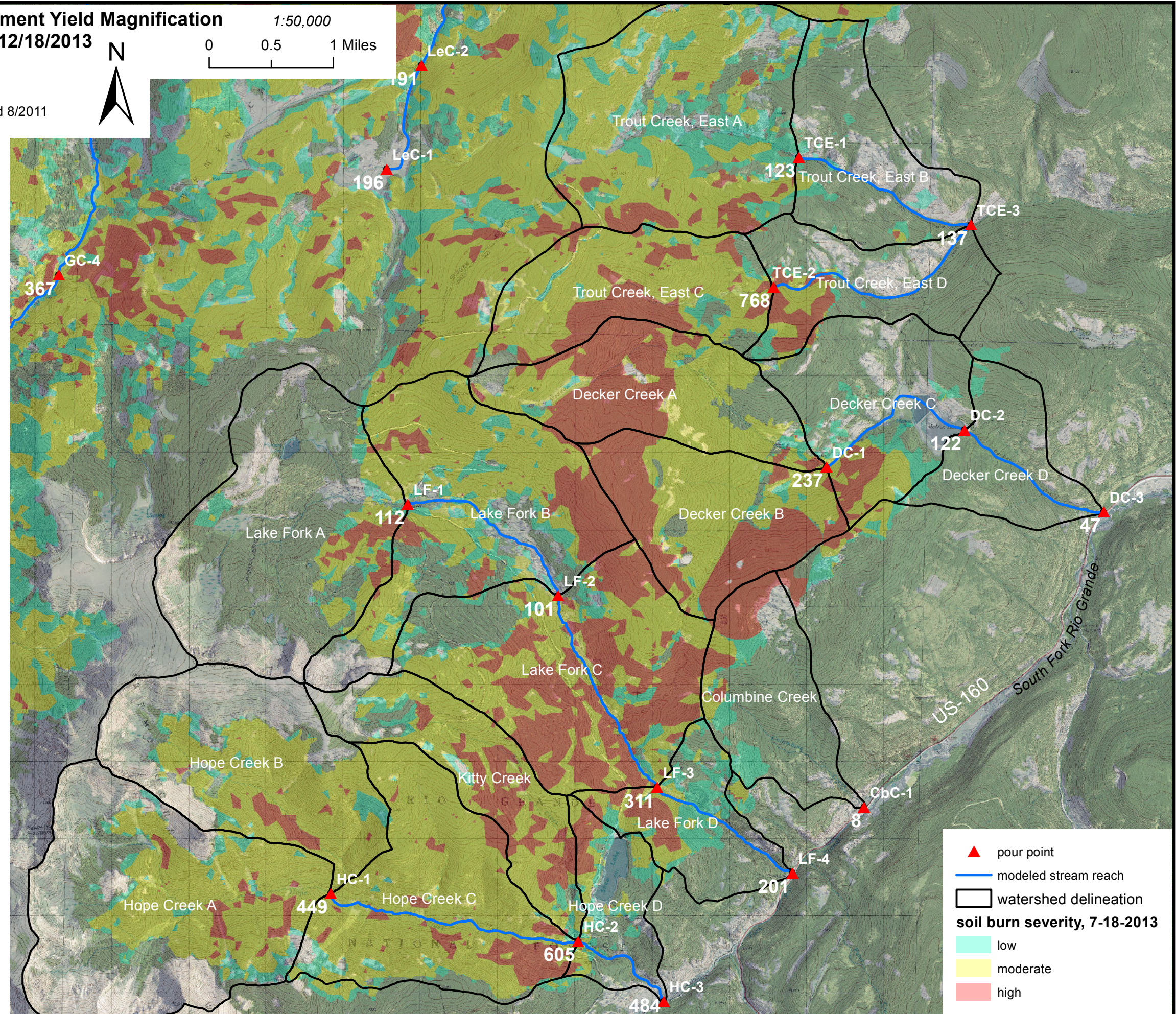
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* The hillslope steepness and length values were derived from the National Elevation Dataset (NED) 10 meter dataset and held constant between the two scenarios.

These results are provided as an initial assessment of increased sediment yield potential to be expected from the West Fork Complex Wildfire area. The results should be used as a tool to evaluate the magnitude of change in sediment yield and not the absolute amount of sediment expected.

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- ▲ pour point
- modeled stream reach
- watershed delineation

soil burn severity, 7-18-2013

- low
- moderate
- high

West Fork Complex Fire Area Estimated Sediment Yield Magnification

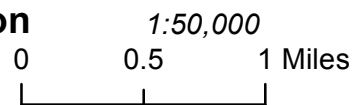
Leopard (Lower Goose) and Elk Creeks

1/23/2014



United States Department of Agriculture
Natural Resources Conservation Service

aerial imagery collected 8/2011



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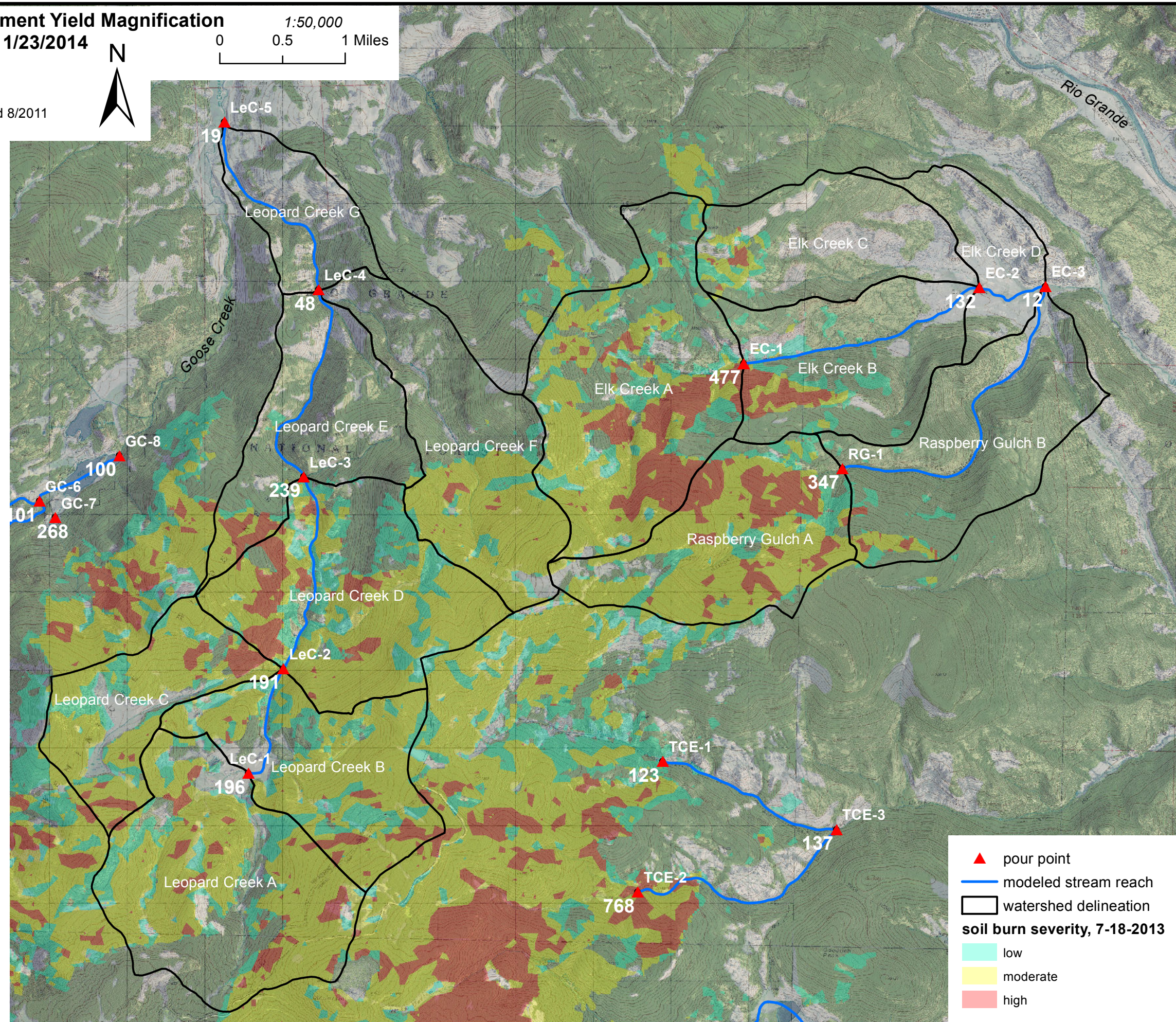
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- ▲ pour point
- modeled stream reach
- watershed delineation

soil burn severity, 7-18-2013

- low
- moderate
- high

West Fork Complex Fire Area Estimated Sediment Yield Magnification

Upper Goose Creek



United States Department of Agriculture
Natural Resources Conservation Service

aerial imagery collected 8/2011

1/23/2014



1:60,000
0 0.5 1 Miles

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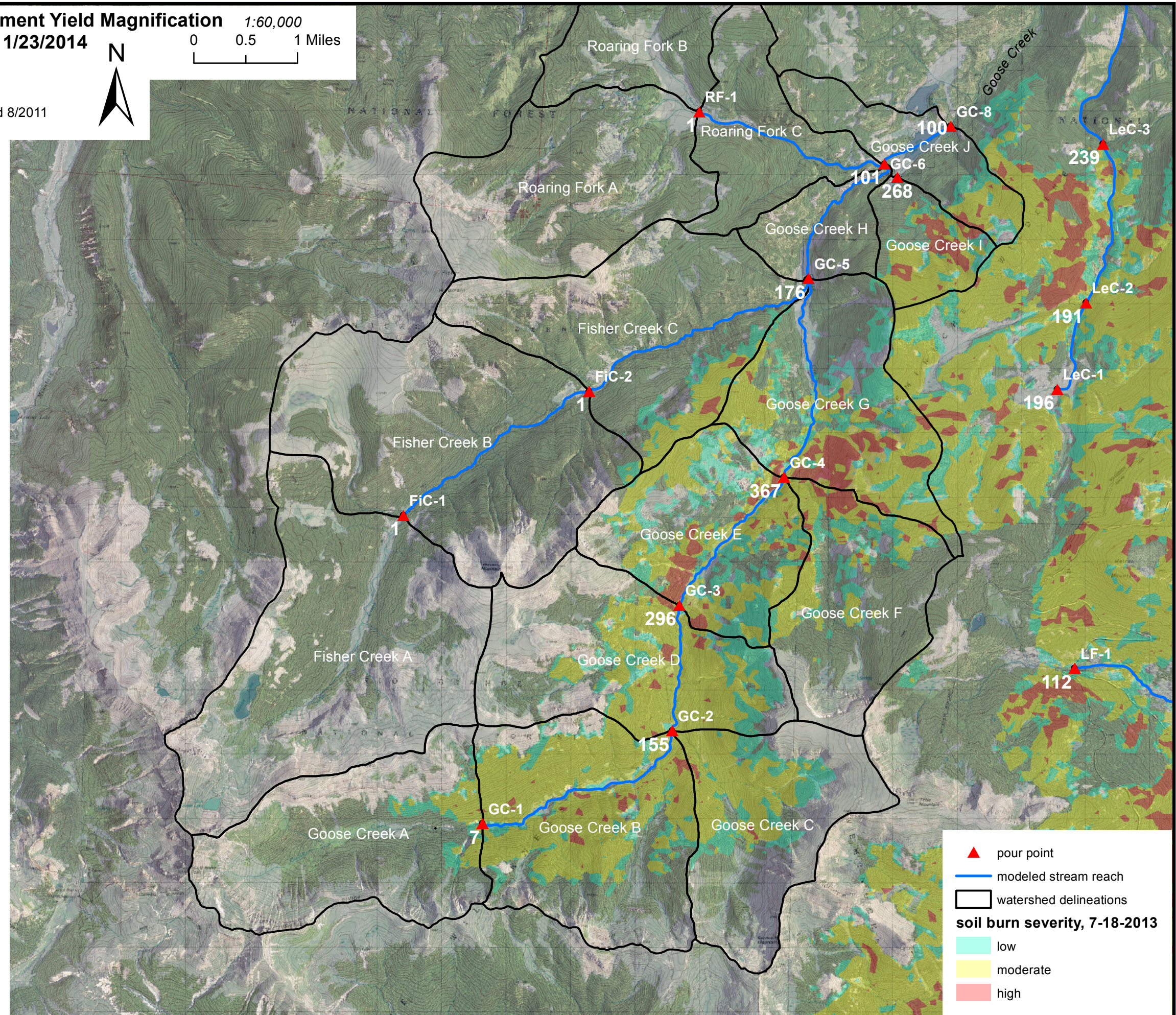
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▲ pour point
 — modeled stream reach
 □ watershed delineations
soil burn severity, 7-18-2013
 low
 moderate
 high

West Fork Complex Fire Area Estimated Sediment Yield Magnification

Trout Creek



United States Department of Agriculture
Natural Resources Conservation Service

1/23/2014



1:60,000
0 0.5 1 Miles

aerial imagery collected 8/2011

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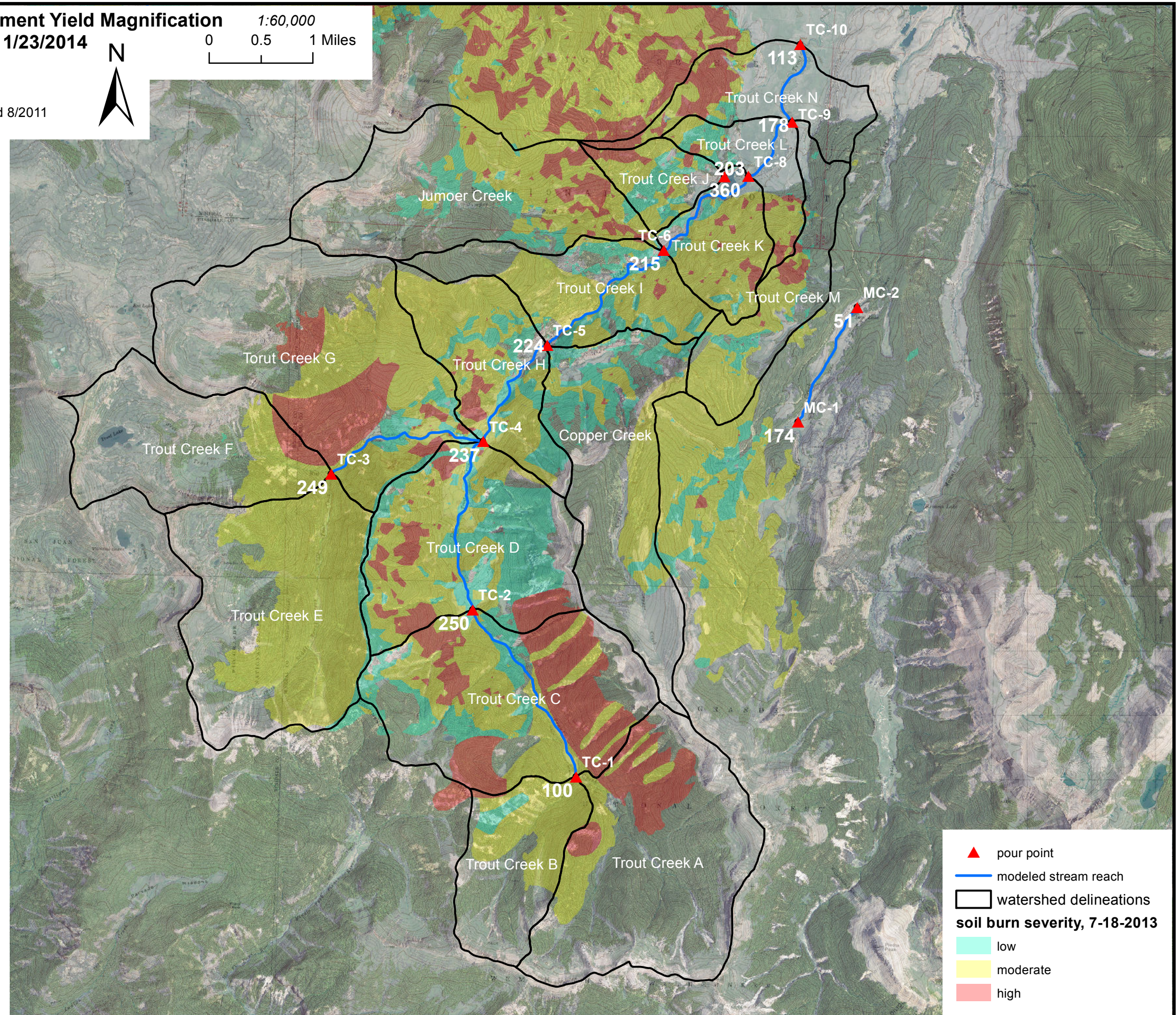
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- ▲ pour point
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West Fork Complex Fire Area Estimated Sediment Yield Magnification

Upper Rio Grande



United States Department of Agriculture
Natural Resources Conservation Service

1/23/2014



1:60,000
0 0.5 1 Miles

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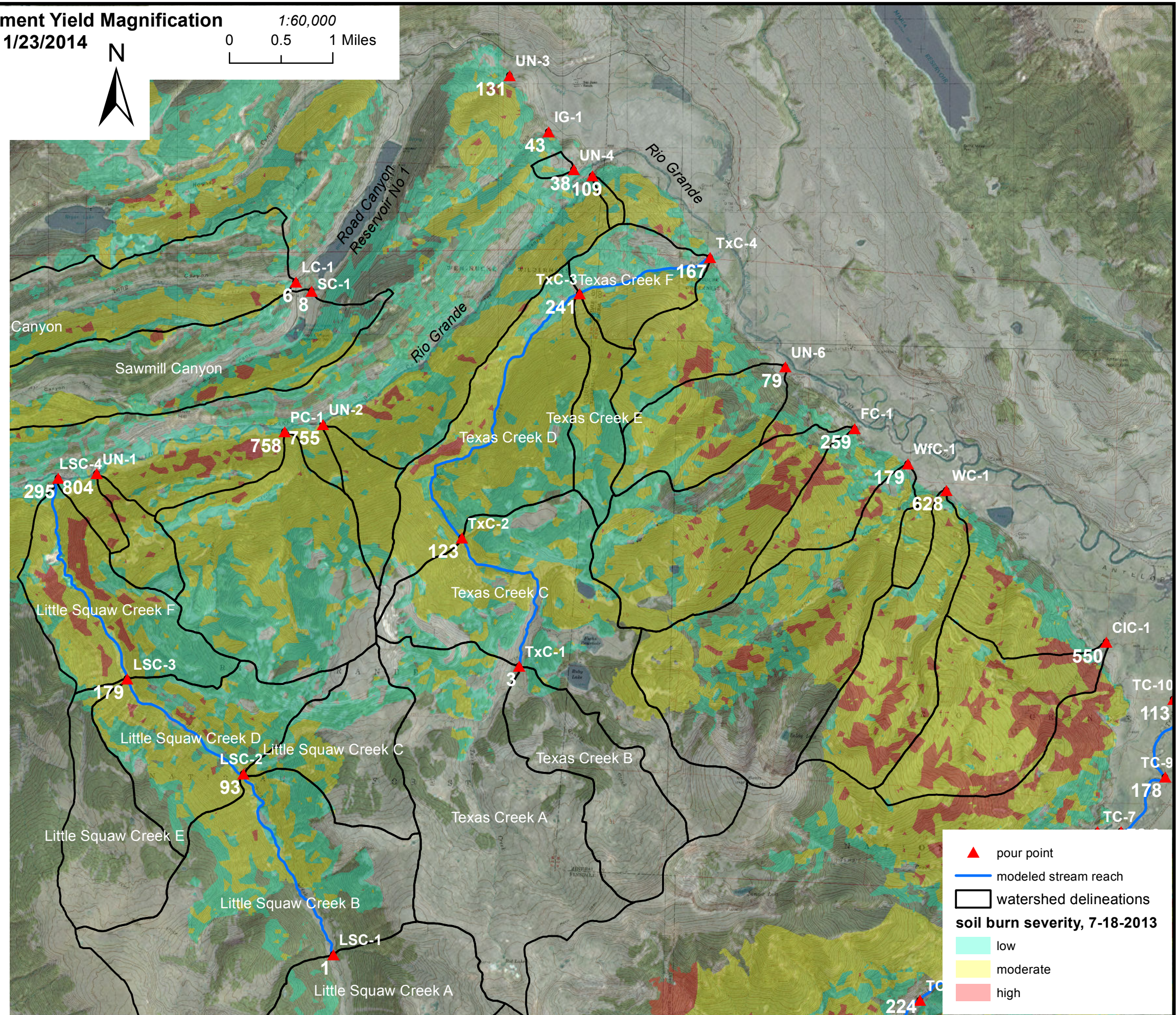
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