

Aspen Fire

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Abstract

The spread of fire is important in understanding wildland fire behavior. With the ongoing drought occurring in the west, fire behavior has become increasingly complex and difficult to predict. Over the last decade there has been a notable increase in fire severity, size, and spatial continuity. The more land managers can learn about how fires spread in the current environmental conditions, the more equipped they will be to manage for future conditions and fire behavior.

Introduction

The aspen fire was discovered on Monday July 22, 2013, on the Sierra National Forest in the High Sierra Ranger District. The fire was started in the San Joaquin River canyon just below Mammoth Pools Reservoir. Ignited by lightning the fire quickly spread up canyon and management of the fire was transferred to the South Central Sierra Interagency Incident Management Team on July 24th. Command of the fire was returned to local resources on August 11th when ninety percent containment had been reached (USFS 2013). Our group was particularly interested in analyzing spread for this fire because one of our members actually worked on a Forest Service fire crew that responded to it. We thought it would be interesting to look at rates of spread and how the fire moved up the canyon after seeing the fire behavior on the ground.

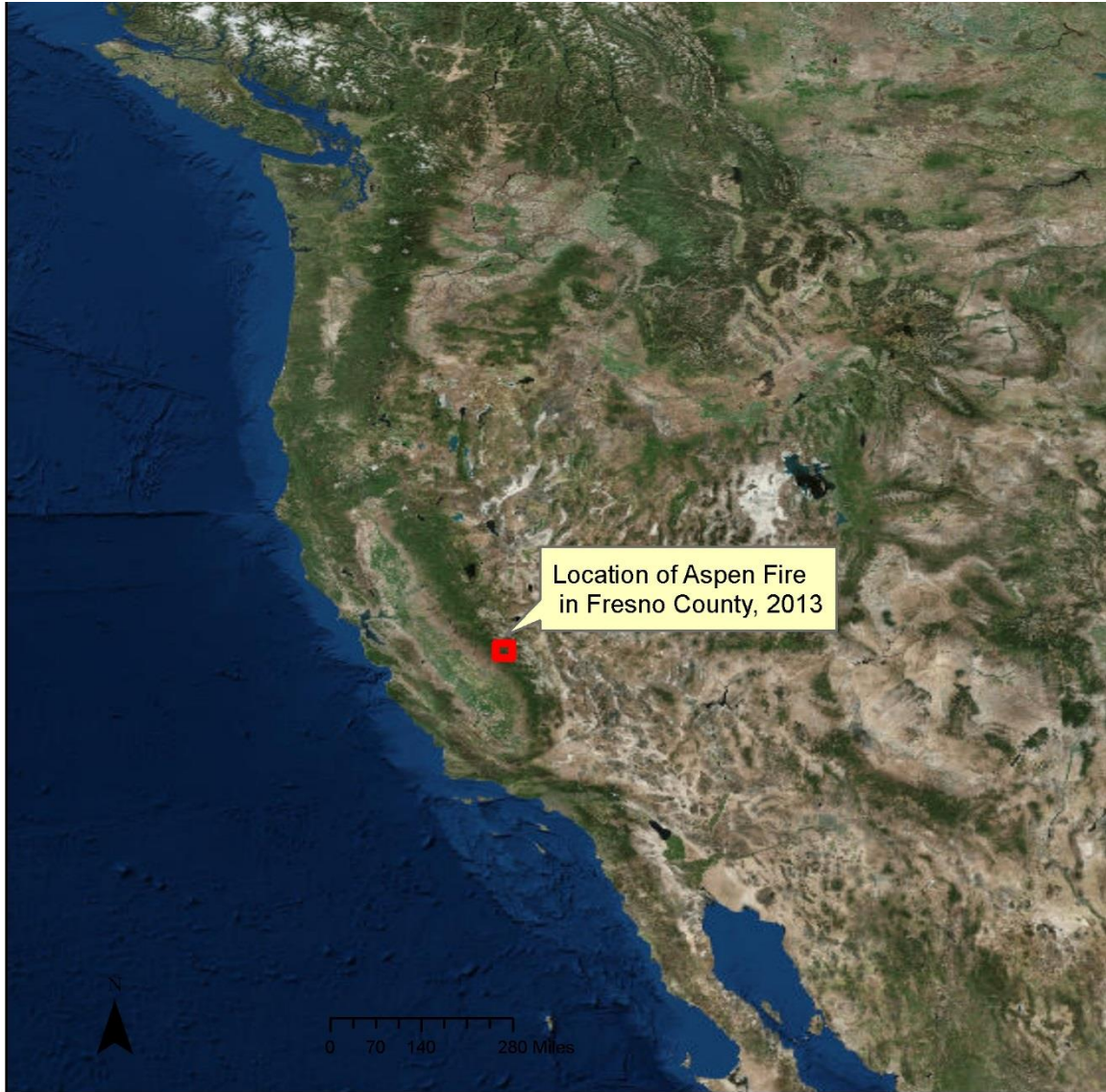


Figure 1. Map showing the location of the Aspen fire in Fresno County

Methods

Our group located and downloaded our data through the USGS Geosciences and Environmental Change Science Center. Once we created a folder structure for our data, we organized it all by date created. We then loaded the data into Arc Map 10.1 and analyzed area of spread by creating a column for area in the attributes table of each layer. Next we used the Calculate Geometry tool to find the area of spread in acres. We used our different fire spread layers to create maps based on area of spread for each day.

Results

Table 1. Summary of fire spread of the Aspen fire

Date	Size in Acres	Acres of Spread
24-Jul	2716.31	2716.31
26-Jul	6821.17	4104.86
28-Jul	11019.28	4198.11
29-Jul	11846.95	827.67
30-Jul	14332.38	2485.43
31-Jul	16203.92	1871.54
2-Aug	18105.74	1901.82
3-Aug	18985.49	879.75
4-Aug	19822.12	836.63
5-Aug	20797.16	975.04
6-Aug	21380.77	583.61
7-Aug	21930.98	550.21
8-Aug	22090.43	159.45
9-Aug	22171.87	81.44
10-Aug	22546.38	374.51
18-Aug	22747.62	201.24
9-Sep	22987.17	239.55

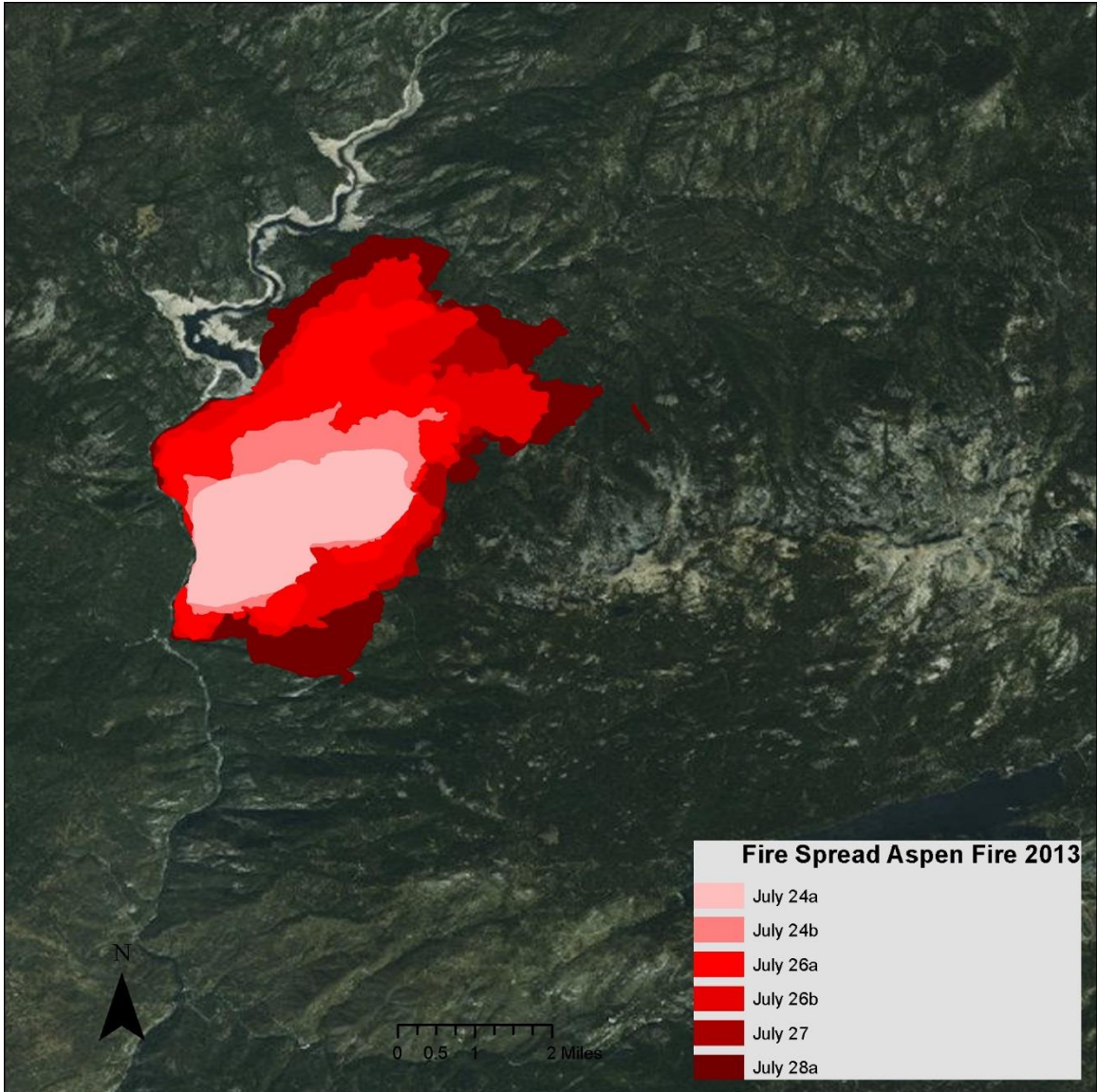


Figure 2. Spread of the Aspen fire between July 24, 2013 and July 28, 2013

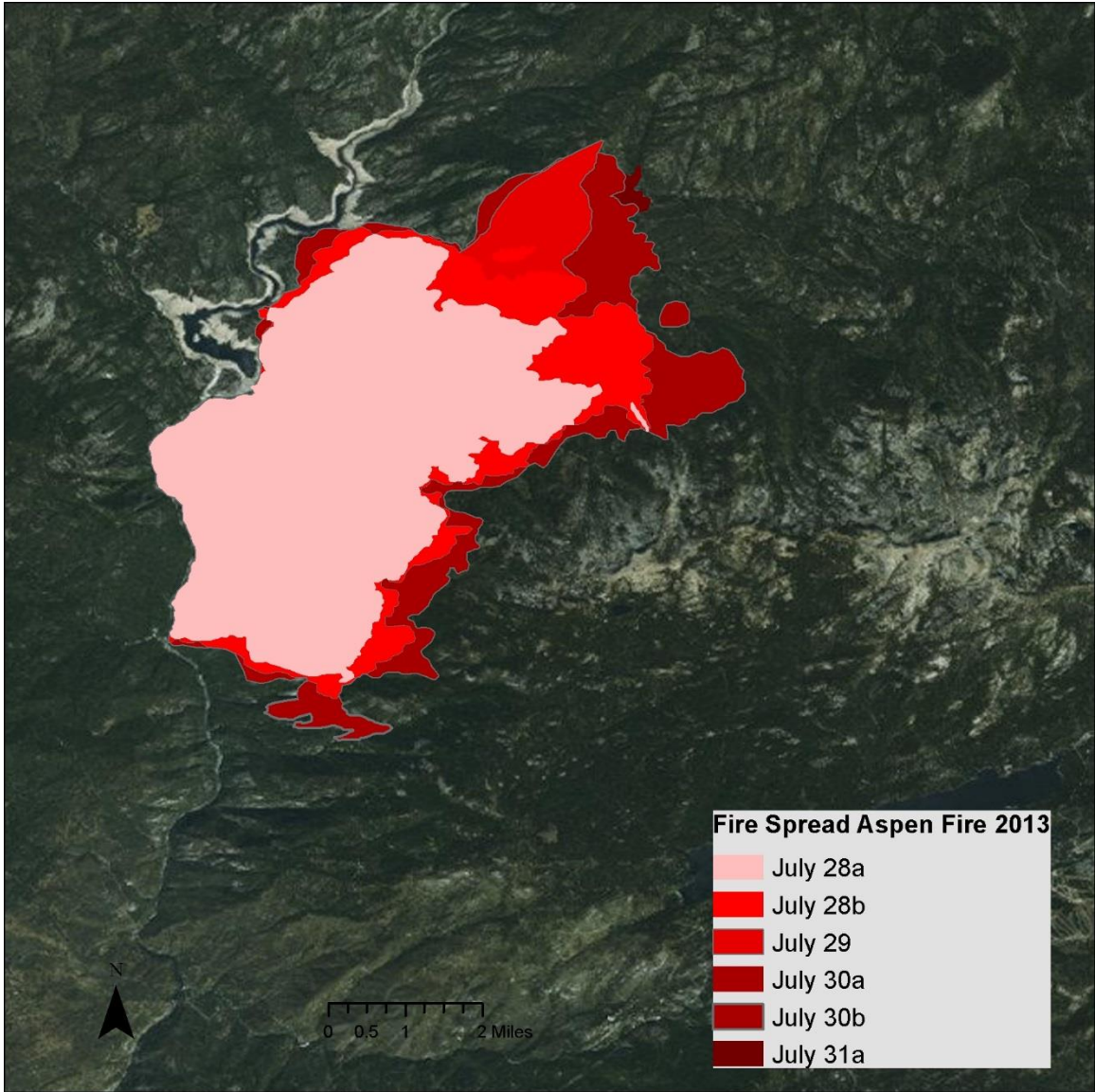


Figure 3. Spread of the Aspen fire between July 28, 2013 and July 31, 2013

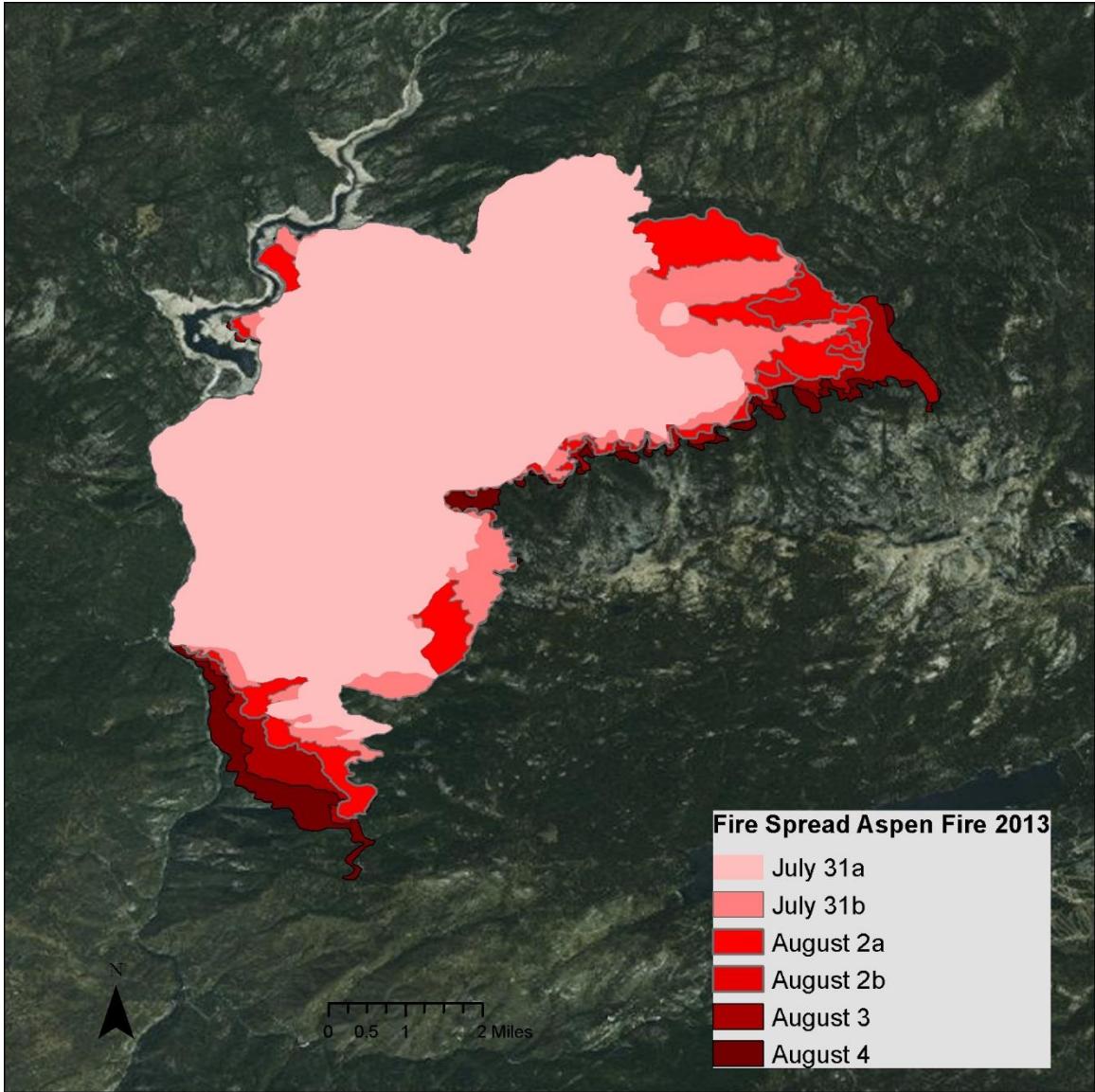


Figure 4. Spread of the Aspen fire between July 31, 2013 and August 4, 2013

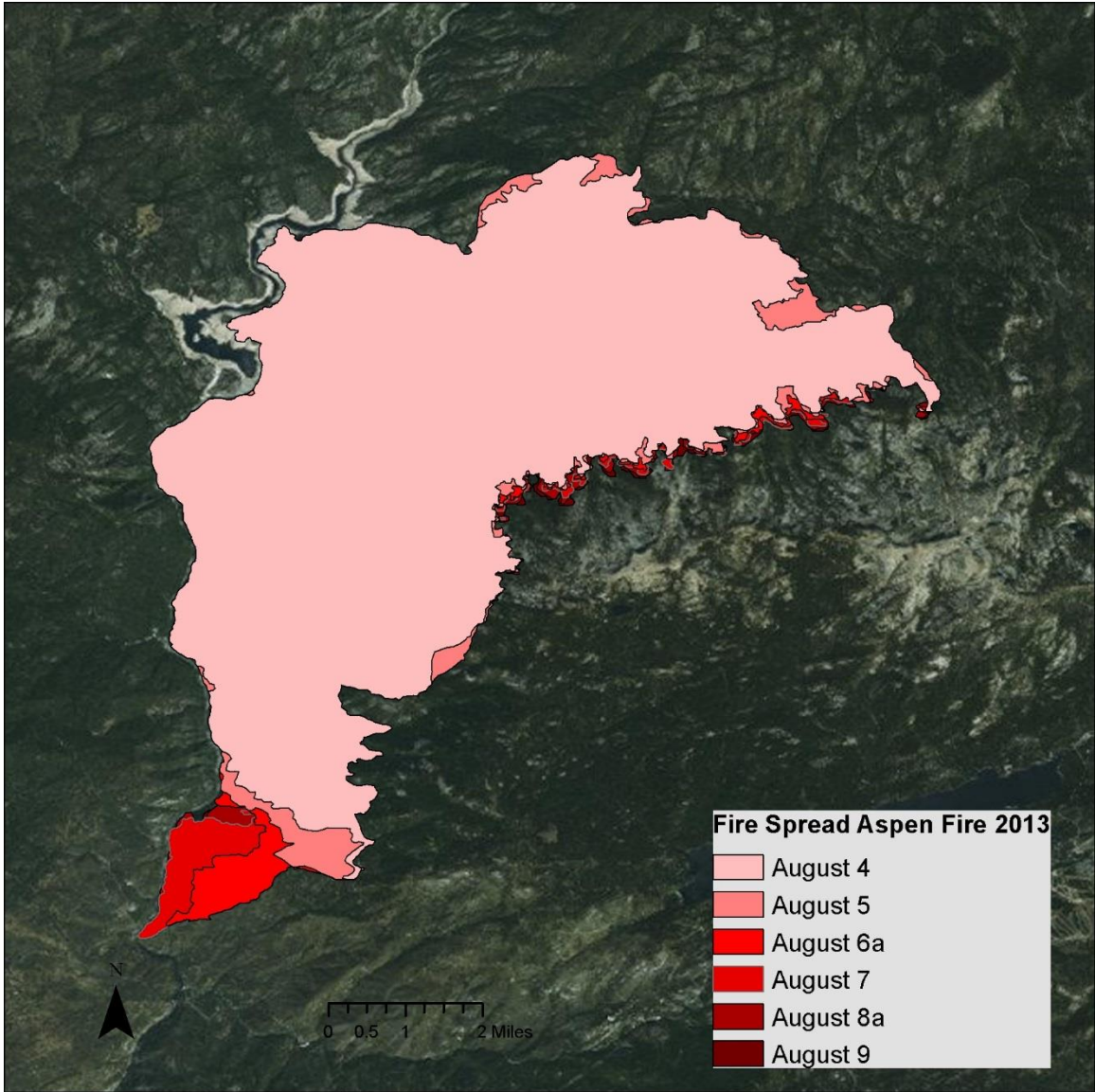


Figure 5. Spread of the Aspen fire between August 4, 2013 and August 9, 2013

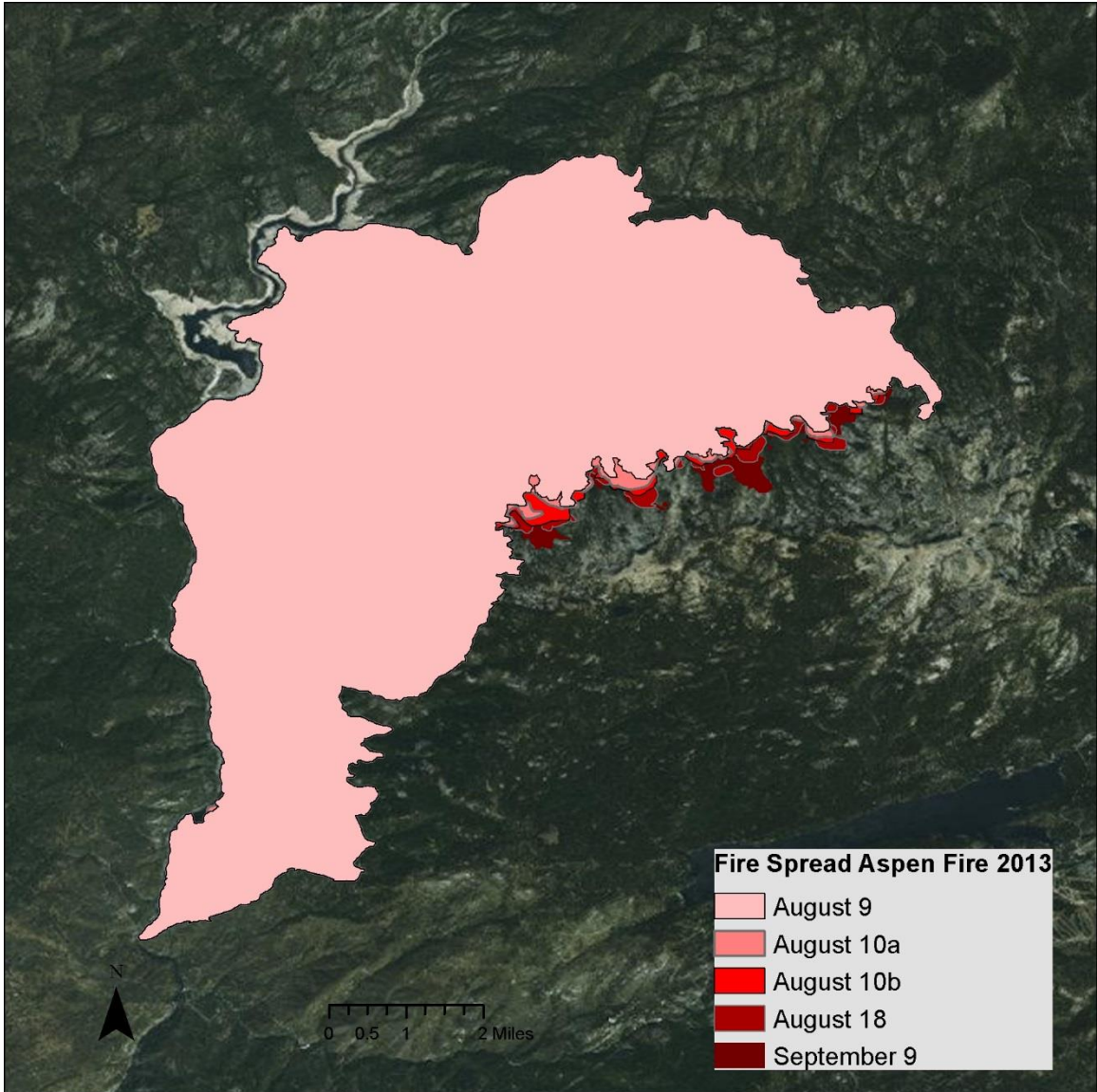


Figure 6. Spread of the Aspen fire between August 9, 2013 and September 9, 2013

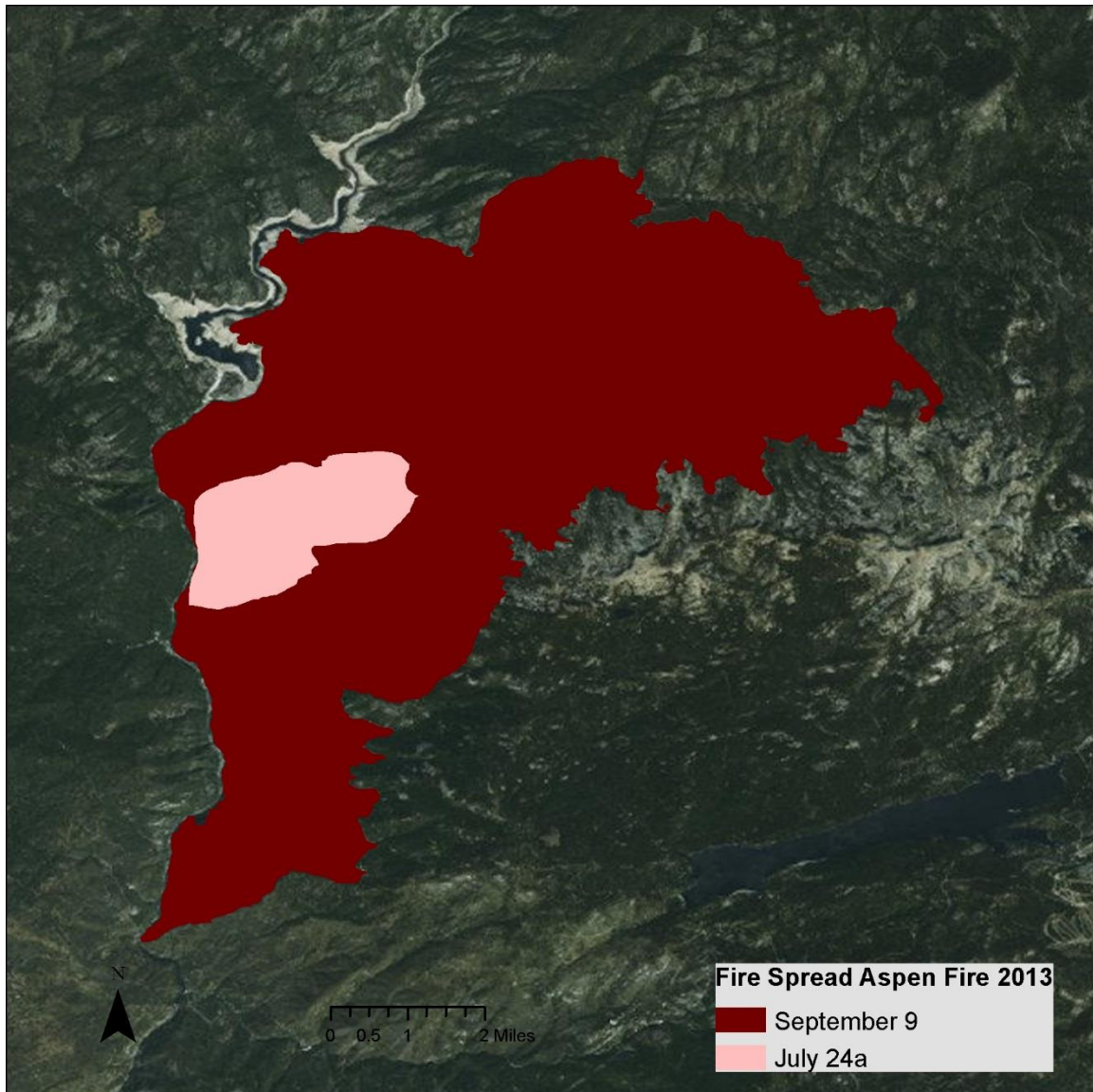


Figure 7. Spread of the Aspen fire between July 24, 2013 and September 9, 2013

Discussion

Burning in a steep river canyon the Aspen fire was mostly terrain driven. However local wind patterns and drought also played a role in driving the fire. During the day as air in the valley warmed, temperature and pressure differences within the drainage resulted in an up-canyon wind flow that would typically reach speeds of 15mph. This up-valley flow would usually peak mid-afternoon to late afternoon and last until after sunset. Similarly as the air in the drainage cooled at night, the colder air would drain down-canyon resulting in down-canyon winds. As fire behavior picked up later in the day these up canyon winds helped drive the fire over containment lines and contributed to long range spotting. Also with 2013 being one of California's driest years on record, fuel moisture contents were extremely low contributing significantly to ignitability. Most small streams and other water sources were dried up greatly

limiting water sources for fire engines and increasing water turnaround times. Our data shows that the days with the greatest amount of spread occurred during the first nine days of the fire as it was burning upslope, exploiting the terrain of the canyon. Once the fire reached the ridgeline and the terrain flattened out, the fire calmed down allowing firefighters to effectively manage it.

Conclusion

Driven by the terrain the aspen fire spread quickly eventually reaching a size of 22987.17 acres. The day of the greatest fire spread was July 28th, when the fire spread 4198.11 acres in one day.

Many factors affect the rate of fire spread, and maps like these help fire response crews more fully understand fire behavior and its affects. Terrain and wind play huge roles in fire behavior, but time since the last fire (ie. regime) is also considered, which is why it is important to have accurate data on when the fire occurred and what its behavior was in this location. The Aspen fire spread quickly at times and covered a large area, threatening nearby towns. The more we know about fire behavior and spread, the more effective and safer we can be when suppressing wildfires.

Acknowledgements

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