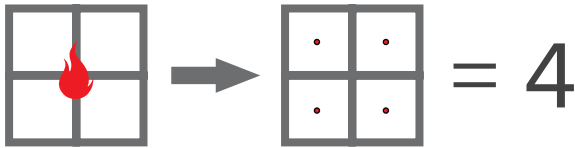


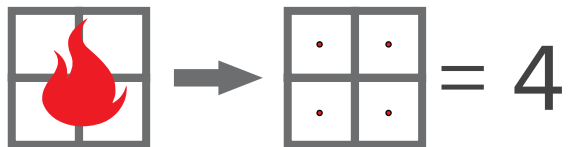
Fire Monitoring 101



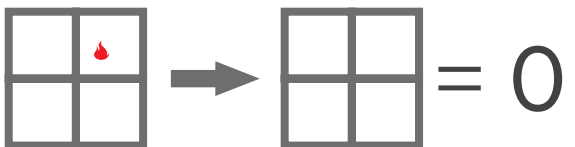
Counting Fires. Satellites count a fire each time one passes over, so a long-burning fire could be counted multiple times. The satellites collect the fire data with an area of land represented by a single pixel, and provide the information as a point at the center of the pixel. This data cannot be used to count burned area, or distinct fires; here's why:



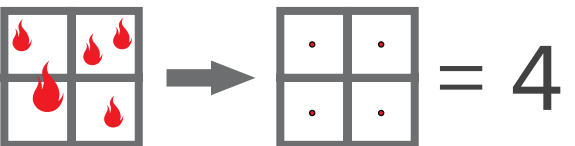
If a fire is at the crosshairs of four pixels, it would be counted four times.



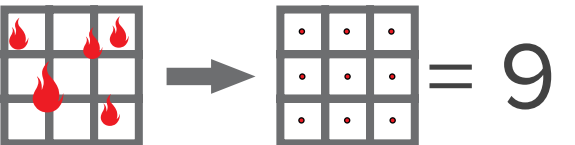
It would be counted the same regardless of how big the fire is, if it stays inside the same area represented by those pixels.



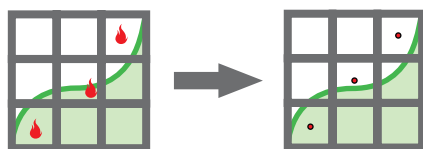
And if it's too small relative to the area represented by a pixel, it will not be counted at all.



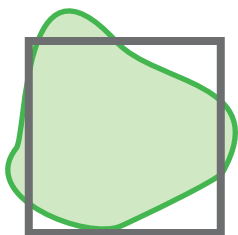
If a pixel represents a large area and there are many small fires, it would still count no more than one point per pixel.



Newer satellites have higher spatial resolutions (i.e. each pixel represents a smaller land area), so the same number of distinct fires would have a higher fire count compared to other satellites.

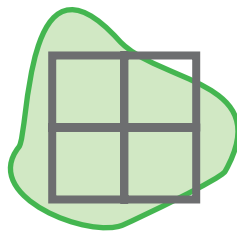


Frontier Fires and why edges matter The point is the center of a pixel, no matter where in that area the fire is occurring, so it is possible to both over-count and under-represent fires on the border of an area. Many fires occur close to the edge of a forest or protected area, making it difficult to determine if they are inside or outside. While many fires are on already degraded land or agricultural frontiers, they contribute to drying out the forest edge ecosystem, making these edges more susceptible to fires and droughts. This degradation causes a dieback of tropical forest that is replaced by grasses and shrubs, permanently changing the tropical forest biome to a savannah-like biome.



MODIS

1 pixel = 1km²
2003–present
best for long-term comparison



VIIRS

1 pixel = 375x375m²
2013–present
best for detecting smaller fires and locations more accurately

There are many types of satellites that can detect “thermal anomalies” (including fires); MODIS and VIIRS are two of the most popular and are both from NASA.

Why 30% confidence? False fire detections are possible, so we omit low-confidence fire pixels to provide conservative counts. Following NASA's guidelines, that means using a threshold of $\geq 30\%$ confidence.

(see page 47 in Giglio, L., W. Schroeder, J. V. Hall, C.O. Justice. (2018). *MODIS Collection 6 Active Fire Product User's Guide Revision B*. University of Maryland, College Park, MD, US. 64 pp. http://modis-fire.umd.edu/files/MODIS_C6_Fire_User_Guide_B.pdf [accessed September 19th, 2019].)