



Questions & Answers Part 3 (Session A)

Please type your questions in the Question Box. We will try our best to get to all your questions. If we don't, feel free to email Britnay Beaudry (britnay.beaudry@nasa.gov).

Question 1: Has anyone examined the progress of a fire, as an event progresses over time [vs. post-fire], with a goal of predicting where a fire will move next? Clearly wind, if present, will be a factor. But, topography, fuel, and other factors are also important.

Answer 1: Yes, there are many different programs and researchers studying how various parameters affect fire spread. You can read about a few NASA-supported projects here:

<https://www.nasa.gov/feature/goddard/2019/fire-forecasting-from-smart-phone-in-wilderness>

<https://www.nasa.gov/feature/goddard/2019/through-smoke-and-fire-nasa-searches-for-answers>

Question 2: Do we have a script to calculate SPI in GEE?

Answer 2: Yes! Session 1 of this training series explains what a Standardized Precipitation Index (SPI) is and how to create your own in GEE. In the Session 1 GEE code, SPI information starts on line 71.

Question 3: What is RdNBR?

Answer 3: Relative differenced Normalized Burn Ratio (RdNBR) – a normalized version of the dNBR that removes the biasing effect of the pre-fire conditions (Miller et al 2009). The algorithm for RdNBR is calculated as:

$$\text{RdNBR} = \text{dNBR} / \text{SquareRoot}(\text{ABS}(\text{NBR pre-fire} / 1000))$$

([Source](#)) and [Miller et al 2009](#)

Question 4: If we mask out the cloudy pixels and replace them with other pixels, doesn't it affect the accuracy of the work?

Answer 4: In a way, yes. It depends on the amount of time you're using for your start and end dates of your imagery. For our pre-fire imagery, we use dates for a full year before the fire, so you can see in those cloud-free images that there aren't any missing



pixels. In our post-fire imagery, we're only using about 3 months after the Woolsey Fire ended, and you can see where there weren't any cloud-free "pixels" available and some parts of that layer are empty. If we wanted to extend our start and end dates for the post-fire layer, we would then be using data further and further from the end of the fire, which would affect the values for burn severity, etc.

Question 5: If a fire occurred in an area of frequent cloud coverage, is there a way of doing post-fire analysis using SAR instead?

Answer 5: This previous training discussed using SAR for forest monitoring:

<https://appliedsciences.nasa.gov/join-mission/training/english/arset-forest-mapping-and-monitoring-sar-data>

And this training mentions SAR for land applications:

<https://appliedsciences.nasa.gov/join-mission/training/english/arset-using-earth-observations-pre-and-post-fire-monitoring>

You can also find several articles and publications online that use SAR for fire analysis.

Question 6: Are the burn severity classification classes defined in literature or do you have to adjust them to the individual fire?

Answer 6: There's a lot of literature that discusses burn severity classes and how to best define them! For this session, we followed the Keeley, J. E. (2009). Publication as it was recommended in the UN-SPIDER Burn Severity Mapping lesson. The link to that publication is in the slides. You can also check out another methods from the Monitoring Trends in Burn Severity (MTBS) program here: <https://www.mtbs.gov/>

Question 7: How can we calculate the actual burnt area that we illustrate on the map? For example, x% area burnt moderately, y % burnt completely and so on.

Answer 7: We perform that calculation in GEE during Part 2 of the Using Earth Observations for Pre- and Post-Fire Monitoring training. You can look at the materials and code here:

<https://appliedsciences.nasa.gov/join-mission/training/english/arset-using-earth-observations-pre-and-post-fire-monitoring>

Question 8: Is there a method for assigning an uncertainty value for the hectares of affected urban area?

Answer 8: The estimation of affected population is modified from Part 1 of the [Satellite Observations for Analyzing Natural Hazards on Small Island Nations](#) ARSET training, as



well as the [Flood Mapping and Damage Assessment Using Sentinel-1 SAR Data in Google Earth Engine](#) UN-SPIDER tutorial. For all of these trainings, this methodology is meant for broad information as there are inherent uncertainties in both the methods and data. For this training, the 2015 dataset and low spatial resolution only provides a rough estimate of the affected population.

Question 9: When choosing pre- and post-fire periods, is it important to include the same seasons?

Answer 9: Yes. The pre-imagery was a full year for analysis.

Question 10: This question relates to the first training: given that no gamma distribution was applied to the SPI from training 1, to what extent can it be used to estimate fire risk? If we were to do a write-up about it, how do we justify using it without the gamma distribution?

Answer 10: Precipitation is usually not normally distributed. Therefore, a gamma probability function is typically applied. Due to limitations within GEE, this script does not apply a gamma function and assumes a normal distribution of the precipitation data. Hence, the resulting SPI values can only be used as an estimator.

Question 11: Is it possible to predict fire locations based on the historical burned scars from 10 years (or less)?

Answer 11: Here are some resources that discuss fire forecasting and modeling:

<https://www.nasa.gov/topics/earth/features/fiery-past.html>

<https://www.earthdata.nasa.gov/resource-spotlight/wildfires>

<https://www.earthdata.nasa.gov/learn/pathfinders/wildfires-data-pathfinder>

<https://www.earthdata.nasa.gov/learn/pathfinders/wildfires-data-pathfinder/find-data#pre-fire>

<https://www.earthdata.nasa.gov/learn/toolkits/disasters-toolkit/wildfires-toolkit>



Questions & Answers Part 3 (Session B)

Please type your questions in the Question Box. We will try our best to get to all your questions. If we don't, feel free to email Britnay Beaudry (britnay.beaudry@nasa.gov).

Question 1: I checked the SWAT software and it is for ArcMap 10.x, which Esri will be retiring soon. Most Esri managers like me are no longer licensing this for users, and Esri has also asked us to stop. Is there any indication the software development team will be making/updating an ArcPro version? Just wondering if you knew that status or if they would keep to the QGIS track.

Answer 1: I am not aware of the SWAT development team's plans for accommodating or updating ArcSWAT compatibility with newer versions of ArcGIS or ArcGIS Pro. Dr. Raghavan Srinivasan is one of the SWAT developers, he is usually responsive via email r-srinivasan@tamu.edu. Perhaps you could direct this question to him for more information.

Question 2: Could you please reiterate the reasons why you went for the population data you used in this demonstration, as there is also (for example) <https://www.worldpop.org/> which is yearly (interpolated) and at 100m resolution, and several others?

Answer 2: We chose the JRC Human Settlement layer because it is already available in Google Earth Engine and has global coverage. It has also been used in the "Satellite Observations for Analyzing Natural Hazards on Small Island Nations" ARSET training and the "Flood Mapping and Damage Assessment Using Sentinel-1 SAR Data in Google Earth Engine" UN-SPIDER tutorial for providing rough estimations of affected populations.

Question 3: Does the post-fires date in the code correspond to a recognized fire event? What factors are considered to select post-fire date? Should we estimate it during the dry season? What other criteria should be involved?

Answer 3: When using satellite data you should think about the temporal resolution of the satellite/sensor you're using. In this training we used Landsat 8 which doesn't have the best revisit time when compared to others available. Because of this, we selected a 3-month post-fire period in order to better view the entire study area (and increase our odds of cloud-free imagery), but because of this we're also looking at the study area



several months after the fire, which can impact the values of the burn severity, NBR, etc. As you explore the code on your own, I highly recommend you experiment with the post-fire dates to see how these values change over time.

Alos, look for other datasets with lower revisit times.

Question 4: Can I create a table to estimate the quantity of hectares affected for each land cover? Additionally, what methods can you suggest to assess the correlation between burn area and other datasets, such as tree height, biomass, etc.?

Answer 4: We perform that calculation in GEE during Part 2 of the Using Earth Observations for Pre- and Post-Fire Monitoring training. You can look at the materials and code here:

<https://appliedsciences.nasa.gov/join-mission/training/english/arset-using-earth-observations-pre-and-post-fire-monitoring>

Question 5: Why is Unspecified field in the smoke extent?

Answer 5: Please refer to the code creator's GitHub to find more information about categories created and overall application information:

[GitHub - tianjialiu/HMS-Smoke: HMS Smoke Explorer: To visualize NOAA's Hazard Mapping System \(HMS\) smoke product](#)

Question 6: I'm not clear on the enhanced regrowth areas - were these areas burned? If so, why wouldn't you include them in the 'burned areas' layer?

Answer 6: The areas that are enhanced regrowth may be data collected from later in our post-fire timeframe (the three month period after the Woolsey Fire). We used Landsat 8 for this analysis and due to cloudy imagery we needed 3 months after the fire to get a full view of our study area. We can tell from other satellites and sensors (such as MODIS) where exactly the burn scar is, so we know this area is regrowth rather than unburned land. It is also important to know your study area well.

Question 7: According to which parameter do you classify fire severity?

Answer 7: Burn threshold of from the dNBR (prefire NBR -). In the slides we describe how these are calculated.



Question 8: I understand that NASA data sets are being moved to cloud services. Will this affect the access via the NASAaccess R package?

Answer 8: No! We will make sure NASAaccess data links are updated so that end users are not affected. Please let's know if you experience any problems when utilizing NASAaccess functionalities.

Question 9: Is there a calculation that describes fire severity based on vegetation types that take longer to burn and grow back? To elaborate, a plant that isn't as flammable yet burned would indicate a worse event. Or a vegetation type that takes longer to grow back, you would say that the fire impacted the environment more.

Answer 9: Here are some interesting articles that are related to your question:

<https://www.webpages.uidaho.edu/for435/Labs/Readings/White%20et%20al%201996.pdf#:~:text=Variation%20in%20spectral%20response%20following%20fire%20is%20a,differences%20in%20re-vegeta-%20tion%20patterns%20among%20these%20communities.>

<https://www.usgs.gov/programs/climate-adaptation-science-centers/science/understanding-fire-caused-vegetation-type>

<https://link.springer.com/article/10.1007/s13762-022-04500-5>