



Questions & Answers Session 1

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 Cindy Schmidt (cynthia.l.schmidt@nasa.gov), Amber Jean McCullum (amberjean.mccullum@nasa.gov) or Josh Picotte (jpicotte@contractor.usgs.gov)

Question 1: Are there set values for those thresholds in the FMT?

Answer 1: No, there are not set thresholds. The thresholds are calculated per dNBR or NBR image. You can physically change the thresholds in the tool too.

Question 2: What does dNBR mean?

Answer 2: dNBR is the difference between pre- and post-fire NBR images.

Question 3: Can we consider 5% variations in NDVI?

Answer 3: If the pre- and post-fire NDVI images differ by $\geq 5\%$ NDVI, then the image pairs don't match well. Generally, you only want the NDVI values in the vegetation type your examining to differ by only a percentage or two. 5% is just a general rule of thumb.

Question 4: Can you map burning in sugar cane plantations?

Answer 4: In southern Florida there are sugar cane plantations that burn. These can be difficult to map, because any agriculture area can exhibit a lot of changes that do not relate to burning. If you have good fire occurrence data it is possible to map fires in sugar cane fields. I would not recommend mapping burn severity in sugar cane fields, because it is difficult to separate the different burn severity breakpoints. In herbaceous areas, such as sugar cane fields, Monitoring Trends in Burn Severity generally just maps severity as burned (low) and unburned.

Question 5: Does the FMT plugin work only with QGIS 2? If so, will one be created for QGIS 3?

Answer 5: Right now the plugin only works with QGIS 2. In the future, we're planning on editing it to work with Python 3, thereby enabling its use in QGIS 3. I don't have a



good timeline for this work right now. You can install multiple version of QGIS, if you already have QGIS 3.0 installed.

Question 6: How do I differentiate between burned scar area and bare soil area in respect to the digital number?

Answer 6: It can be difficult to differentiate between a burned area and bare soil area, because fire can result in the removal of all vegetation (i.e. bare soil). I don't have a specific DN value to differentiate between the two.

Question 7: When estimating the burned area by relating it to the pollutants PM10 and PM2.5, what methods can I apply?

Answer 7: You would need to understand the relationships between fuel characteristics and the amount of PM10 and PM2.5 released as the fuels burned. If you have developed relationships between burn severity and PM10 and PM2.5, you might be able to estimate the amount of PM2.5 and PM10 released during fire.

Question 8: Can I only use post-burn Landsat imagery to delineate burned area, or is there an freely-available online platform that I can use to conduct this analysis?

Answer 8: You could copy and paste any predetermined fire perimeter into the shapefile created by the FMT. Fire products are available for the MODIS sensor:
<https://modis.gsfc.nasa.gov/data/dataproduct/mod45.php>

Question 9: Can you use Sentinel 2 to conduct wildfire mapping?

Answer 9: Yes, the same method could be applied to Sentinel 2 data. However, currently the FMT is not configured to work with Sentinel 2 data.

Question 10: Does the FMT only work with Landsat Imagery?

Answer 10: Currently, the FMT only works with Landsat imagery.

Question 11: Can I use the FMT outside the US?

Answer 11: Yes, it is fine to use outside the US. I've (Josh Picotte) done some testing in Brazil and the outputs looked good.

Question 12: Is there online support for FMT questions?

Answer 12: Yes, there is a "contact us" form on the QGIS FMT distribution website
<https://mtbs.gov/qgis-fire-mapping-tool>.



Question 13: What is the difference between fire severity and burn severity?

Answer 13: Fire severity is defined by the amount of vegetation/soil organic matter loss resulting from fire, while burn severity is often tied to organic loss and ecosystem response. So, there isn't a lot of difference between the two. For a good explanation of the terms see: Keeley, J. E. (2009). *Fire intensity, fire severity and burn severity: a brief review and suggested usage. International Journal of Wildland Fire, 18(1), 116-126.*

Question 14: Please explain the values of burn severity levels outlined in the FMT exercise using the dNBR ranges. How do I define thresholds if I want to use it elsewhere of US? Is there reference documentation?

- Enhanced Regrowth, High = - 500 to -251
- Enhanced Regrowth, Low = -250 to -101
- Unburned = -100 to +99
- Low Severity = +100 to +269
- Moderate-low Severity = +270 to +439
- Moderate-high Severity = +440 to +659
- High Severity = +660 to +1300

Answer 14: Each of these severity levels were determined by relating (regression equations) dNBR to the Composite Burn Index values. You would have to put in Composite Burn Index (CBI) validation plots yourself to do this elsewhere in the US, although there are other papers that have found different burn severity thresholds. The best reference to start with is: Key, C. H., & Benson, N. C. (2006). *Landscape assessment (LA)*. In: Lutes, Duncan C.; Keane, Robert E.; Caratti, John F.; Key, Carl H.; Benson, Nathan C.; Sutherland, Steve; Gangi, Larry J. 2006. *FIREMON: Fire effects monitoring and inventory system. Gen. Tech. Rep. RMRS-GTR-164-CD. Fort Collins, CO: US Department of Agriculture, Forest Service, Rocky Mountain Research Station. p. LA-1-55, 164.*

https://www.fs.fed.us/rm/pubs/rmrs_gtr164/rmrs_gtr164_13_land_assess.pdf

Question 15: Are the provided Landsat images in the FMT TOA corrected?

Answer 15: Landsat scenes will be TOA corrected as long as you request the "TOA" option within ESPA. The directions on how to get ESPA TOA data are in the documentation.



Question 16: In the Indian subcontinent today the biggest issue is "crop residual burning/stubble" can this tool be used for it?

Answer 16: Yes, the tool could be used to map the fire perimeters of fields for which there is residual burning/stubble. It is important that a user know where the fires actually occurred, because managed agriculture fields often are spectrally similar (visible soils and damaged vegetation) to fires. I probably wouldn't map burn severity in croplands, because of inherent problems in teasing apart levels of burn severity.

Question 17: What are the recommended time gaps to obtain of pre and post fire imagery to determine burn severity?

Answer 17: Generally we obtain a pre-fire image during the same season of burn one year before the acquisition of the post-fire image. An initial assessment would be if you obtained a post-fire image during the same season as when the burn occurred. An extended assessment would be if you obtained the post-fire image one year after the anniversary of the fire date during the peak of the growing season.

Question 18: As far as I'm concerned ecological ecosystem recovery after fire is not always related to the severity index derived from remote sensing. Are there other methods instead spectral indices to assess severity?

Answer 18: Short answer: yes, that's true. It can be the amount of rainfall or amount of available nutrients after the fire. Most of the methods we look at are spectral in nature. We could go out on the ground and physically measure burn severity. This tool uses Landsat imagery, and if it doesn't make sense, I just wouldn't use the tool.

Question 19: Is it possible to use some kind of brightness temperature to determine wildfire locations and burn perimeter? Is there any spectral library for classification of fire type?

Answer 19: Yes - you could use some kind of brightness temp to delineate the fire scar. With Landsat we're looking at the thermal products, which tend to saturate quickly. That saturation can bleed into other pixels, so I don't recommend using it. It's only valid for mapping when a fire's occurring. I'm not aware of another spectral library right now.

Question 20: What is the dNBR offset and how is it used in the FMT?

Answer 20: The dNBR offset is used to create the RdNBR. It can also be used for fire comparisons. You could subtract the offset value from all pixel values in your dNBR



imagery, to do between-fire severity comparisons. It allows you to compare fires that occur in different places. You want to get as close to 0 as possible. There is no offset value for NBR.

Question 21: Would it be justifiable to do the data processing for forest fire extent and severity mapping without conducting field work?

Answer 21: So - For fire extent, definitely. You can see the burn scar clearly in Landsat imagery. Because Landsat pixel resolution is at 30 m, you might have some error in the perimeter delineation because of pixel size/user error. I haven't seen a lot of problems with using fire perimeter data from Landsat data. Burn severity, however, is a different case. If you can somehow tie severity to what you're actually seeing on the ground, you could do it without conducting a lot of field work. If you want to get more exact points for the burn severity image, you want to go out and collect composite burn index data on the ground and relate this to the imagery. There are many published papers that explain how to use CBI data in concert with dNBR. If CBI does relate to dNBR (or NBR), e.g. a high severity pixel as shown by imagery is high severity on the ground, you can use it. It's really up to the user to determine if the imagery makes sense.

Burn severity can work really well for forested areas if the fire affects the canopy or if the canopy is sparse enough for Landsat to pick up the vegetation change. If the forest canopy is dense enough and hasn't been affected by the fire, then the burn severity imagery may not work. Monitoring burn severity in shrublands is often ok. In herbaceous areas you shouldn't delineate burn severity. You have to be careful how you define burn severity and what assumptions you're making when using the tool.

Question 22: Can we map the burn severity of soil?

Answer 22: Each pixel is an amalgamation of all burn severity responses, including vegetation and soil. When you map burn severity, you're mapping both vegetation and soil burn severity. You'd have to determine for your area if the imagery related well to soil burn severity. The imagery generally reflects vegetation burn severity better than soil burn severity.

Question 23: Can we evaluate the burn severity while it is actively burning?



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Answer 23: It is best to wait until the fire have ended. We generally due assessments either right after the fire or with one year after the fire. We generally don't monitor severity while the fire's still burning.