A review on Australian Bush fire: Calculation of area of burnt bushes in south Eastern Region during 2019-20

KiranSai.P[1], Vignesh.S[2], Abishek.S[3], R.Palson kennedy[4]
[1,2,3]*Students, Geo Informatics, Institute of Remote Sensing College of Engineering Guindy,Chennai – 600042*
[4]*Professor, Peri Institute of Technology,Chennai-48*

Abstract **- The bushfire occurred during 2019–2020 in summer on the east coast of Australia was a series of major fires occurring from November 2019 to end of January 2020 across the states of Queensland, New South Wales (NSW), Victoria and South Australia. The bushfires were exceptional in scope and the broad character of the bushfires caused smoke pollutants to be transported not only to Australia, but also to New Zealand .At the pinnacle of the bushfires, smoke plumes were infused into the stratosphere at a height of up to 19 km and hence elated across the world. The air quality monitoring data collected during the bushfire period and remote sensing data from the Moderate Resolution Imaging Spectro radiometer (MODIS) and Cloud-Aerosol Lidar and Infrared Pathfinder Satellite Observation (CALIPSO) satellites to determine the extent of the wildfires, the pollutant transport and their impacts on air quality and health of the exposed population in NSW. The results showed that the dispersion and transport of pollutants from bushfires predicted the daily concentration. The impact on health endpoints such as mortality and respiratory and cardiovascular diseases in addition millons of mammals, animals, birds, reptiles, frogs were died to that across the modelling domain was then estimated. The estimated bushfire area is calculated which is higher than previous wildfire happened and health impact on each of the Australian has cardiovascular diseases hospitalizations during November 2019 to Jan 2020.**

Index Terms **- Bushfires, South East Australia, pollutant transport, air quality effect, brunt area.**

INTRODUCTION

The 2019–20 Australian bushfire season, colloquially known as Black Summer, was a period of unusually intense bushfires in many parts of Australia. Bushfires in Australia are a widespread and regular occurrence that have contributed significantly to shaping the nature of the continent over millions of years.

Eastern Australia is one of the most fire-prone regions of the world, and its predominant eucalyptus forests have evolved to thrive on the phenomenon of bush fire. However, the fires can cause significant property damage and loss of both human and animal life. Bushfires have killed approximately 800 people in Australia since 1851 and billions of animals.

CAUSES FOR AUSTRALIAN BUSHFIRE

In recent times most major bushfires have been started in remote areas by dry lightning. Some reports indicate that a changing climate could also be contributing to the ferocity of the 2019–20 fires with hotter, drier conditions making the country's fire season longer and much more dangerous. During periods of drought, the fuel for wildfires is greater than normal, and bushfires combine to become mega fires generating their own weather and spreading fire further. Strong winds also promote the rapid spread of fires by lifting burning embers into the air. In New South Wales, dry winds originating from the Great Dividing Range abruptly raise air temperatures in the lee of that mountain range and reduce atmospheric moisture, thus elevating fire danger.

The state of New South Wales (NSW) and most of eastern Australia was in drought from 2018 to the end of 2019. In October 2019, spring rain then relieved part of western NSW. This resulted in increasing vegetation growth which increased the likelihood of fires during the subsequent summer due to more fuel load available and when meteorological conditions were more favorable to ignite fires

OBJECTIVES

- To identify the areas that got burnt during the bush fire session2019-2020 near southeastern part of Australia (NSW).
- To calculate the approximate area that got burnt during the bush firesession2019-2020 near south eastern part of Australia (NSW).

STUDY AREA

Fig1&2.SoutheasternpartofAustralia(NSW)

Denser vegetation which is available over the wide area of sceneis chosen as area of interest as it is more profound and easy to detect the unchanged and burnt areas.The study area wasestimatedas1720sq.km.
Study area contains places such as GreenCape, Erdom, Nadgee, EastBoyd.

Data Products and software used:

- Satellite imagery from USGS Earth Explorer - (LANDSAT - 8)
- ArcGIS10.8, Google Earth Pro is applicable and is used fort the project.

Satellite Image Properties:

- Downloaded from : LANDSAT8
- Source: USGS Earth Explorer
- Location: Australia
- Path :90
- Row: 86
- Level of classification: LANDSAT Collection–1, Level –1, Observation time : 10-09-2019and 21-04-2020
- Chosen bands : 4,5,6

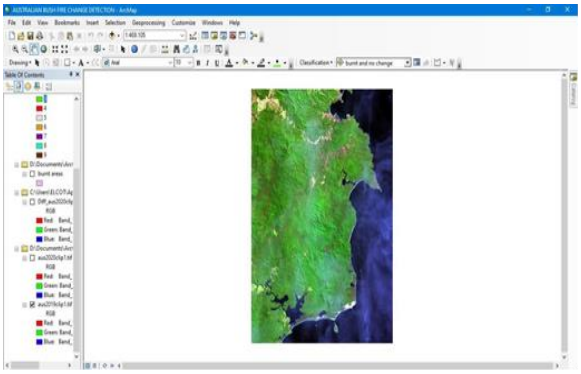

Fig 3.10-09-2019

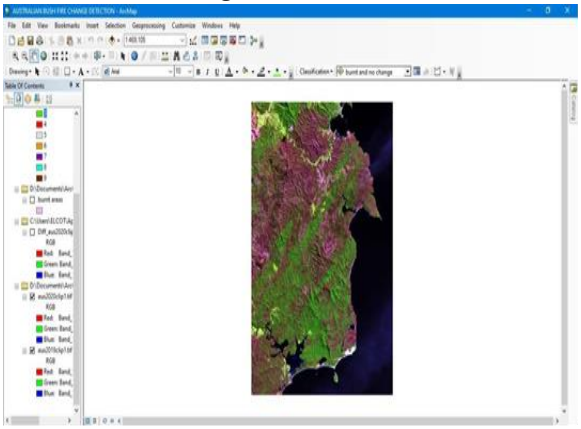

Fig 4.21-04-2020

PROCEDURE

First and for most process was began by importing the data in to the workspace(ARCMAP10.8) which has bands from 1–7of two scenes from 2019 and 2020which has been acquired from USGS website(https://earthexplorer.usgs.gov/).Thencomposi teraster layer was created by using these 7 bands. Band combination of 6,5,4 corresponding to R GB respectively was used.

SWIR1 in the band combination is sensitive to changes in water content in the leaf-tissue (turgidity).It is responsive to the moisture difference in soil and vegetation where, as the water content increases its reflect an cede creases.

It separates between clouds (dark toned) and ice/snow (light toned).NEARIR–discriminate s vegetation vigor and varieties. The fact that water strongly absorbs NIR makes this band good for definition of water bodies and distinguishes dry and moist soils. RED sensed in a strong chlorophyll absorption region, which makes it useful for discriminating soil and vegetation. It has a high reflectance for most soils region and is also helpful in delineating snow cover.

CLIP tool was used to cut the area of interest from the entire scene. Difference layer was created between 2019and 2020 images by the use of DIFFERENCE tool under IMAGEANALYSIS tab.

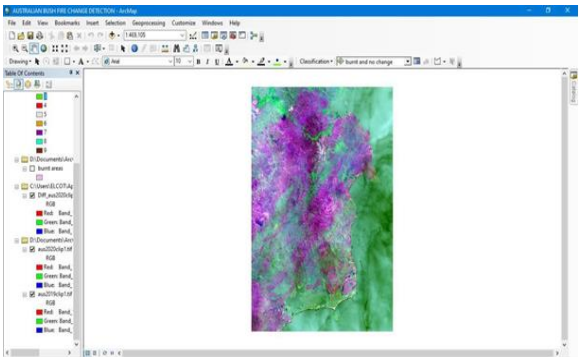

Fig5. Difference Image

Unsupervised classification was done on the acquired difference image with number of classes given as 9.

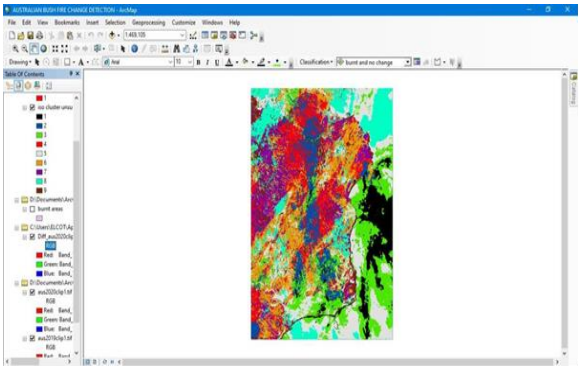

Fig6. Unsupervised classified Image

Visually interpreted the unsupervised classified image and identified the classes that represented the burnt areas using the SWIPE tool in IMAGEANALYSIS tab. Raster Calculator was used to merge all the classes that represented the brunt areas using the formula given below.

("iso cluster unsupervised classification(10)"==2) |("iso cluster unsupervised classification (10)"==4) |("iso cluster unsupervised classification(10)"==6)|("iso cluster unsupervised classification (10)"==7)|("iso cluster unsupervised classification (10)"==9)

Where 2,4,6,7,9 are classes and isocluster unsupervised classification(10)is unsupervised classification layer

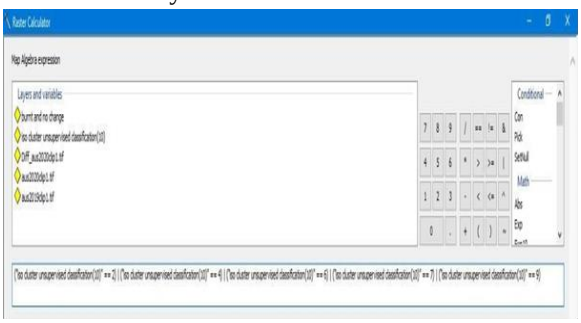

Fig7. Raster calculator

Raster calculator converts the unsupervised classified layer into a layer which contains only two classes which are burnt and unchanged area. Then the raster layer is converted into feature- class layer (polygon) by using RASTER TO POLYGON CONVERTER tool and the resultant polygon contains only the brunt area as only the row containing the attribute value of burnt area is selected. The polygons are dissolved using the geoprocessing function DISSOLVE. The area of polygon is calculated using the CALCULATE GEOMETRY function by which the approximate area of burnt area can be calculated.

RESULTS

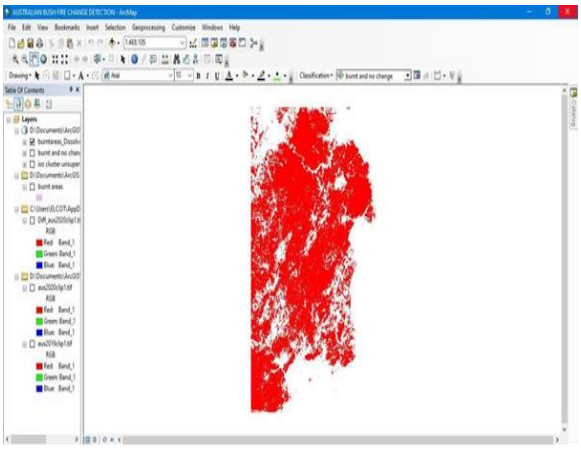

Fig8. Burnt image.

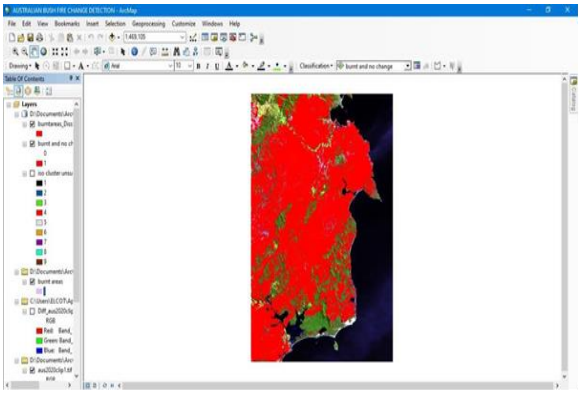

Fig9.Burnt area Image imposed on 2020 image.

CONCLUSION

Our concentrated area was estimated as 1720sq.km in which 1157sq.km was found to be burnt. The RED color earmarked shows the area that got burnt .It was estimated that around 67% of vegetation got burnt in our area of interest during the 2019-2020 session of Australian Bush fire. In addition to that, almost 143 million mammals, 180 million birds, 2.45 billion reptiles ,51 million birds & animals were killed or relocated by this Australia's worst demoralizing bushfire during 2019-20.It is approximately three times larger than earlier estimate released during January.

REFERENCES

[1] Impacts of 2019-2020 Bushfire on NSW by ITHYMAN,STAHYONG. accessed 10 july2021

[2] Assessing the extent of Australia forest burnt by RICHARD THACKWAY, Accessed 1 Aug.2021

[3] New WWF report:3 Billon animals impacted by Australia's bushfire crises,28 july2020.

[4] The Summer 2019–2020 Wildfires in East Coast Australia and Their Impacts on Air Quality and Health in New South Wales, Australia. Int J Environ Res Public Health. 2021 Apr; 18(7): 3538.Hiep Duc Nguyen, Merched Azzi, Stephen White,1 David Salter, Geoffrey Morgan, Accessed 19 june2021

[5] https://www.unep.org/news-and-stories/story/ten-impacts-australian-bushfires 22jan2020.