

Forest Survey of India - Forest Fire Monitoring

Frequently Asked Questions (FAQs)

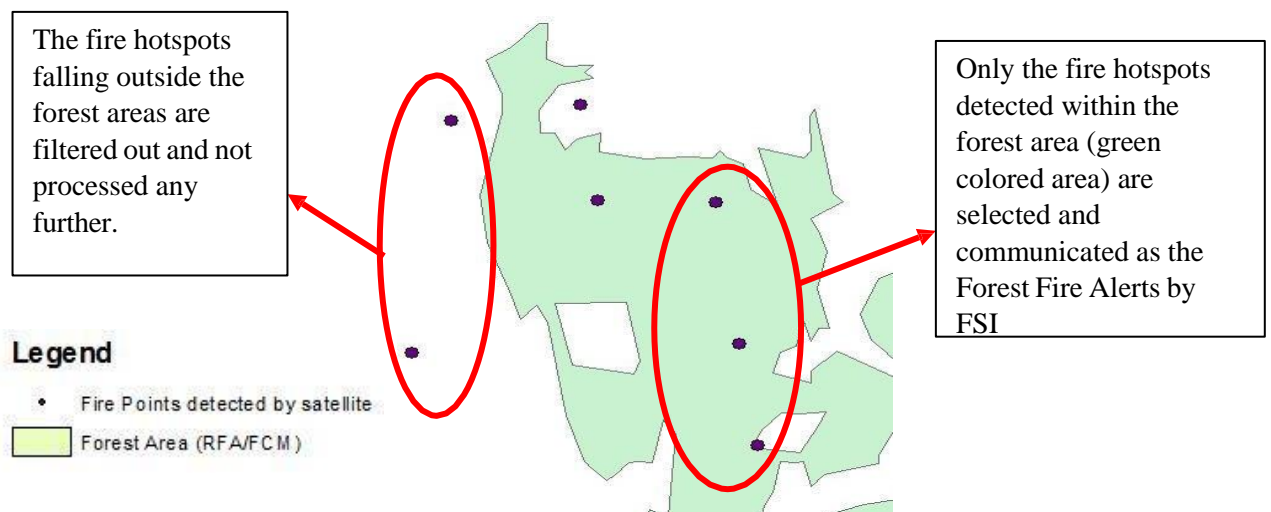
This Frequently Asked Questions (FAQ) document provides more information about the FSI Forest Fire Alert System, User Registration and Large Forest Fire Monitoring Programme. Please review this FAQ document to learn more.

1. How does Forest Survey of India (FSI) define a 'forest fire detection'?

Any fire hotspot detected by satellite i.e. MODIS and/or VIIRS sensor which gets filtered in the forest area of India (based on either state RFA (Recorded Forest Area) or state FCM (Forest Cover Maps) as per FSI) is regarded as a 'forest fire detection.

2. Are all fire hotspots detected by satellite is disseminated by FSI Alert System?

No. Only the fire hotspots which are considered as 'forest fires' i.e. which fall in the forest area of India (based on either state RFA or state FCM as per FSI) are selected and communicated as forest fire alerts by FSI.



3. Which satellite data does FSI use for forest fire detection and how does it receive the data?

Currently, FSI is using fire hotspot data generated by NRSC from MODIS (Moderate Resolution Imaging Spectroradiometer) and SNPP VIIRS (Visible Infrared Imaging Radiometer Suite – Suomi National Polar-orbiting Partnership) Satellite Sensors. The Forest fire alert system is made possible due to NASA-ISRO-FSI scientific collaboration.

4. How are the forest fires detected by satellite?

Satellite sensors record the intensity of electromagnetic radiation from Earth in various spectral wavelengths or channels. The forest fires are detected by thermal sensors aboard satellites, which can detect the temperature of objects. During satellite overpass, those areas having higher temperatures compared to surrounding areas (thermal anomalies), are picked

up by the sensors due to the radiation emitted from such areas. The data processing software identifies the corresponding fire affected pixels on the satellite data.

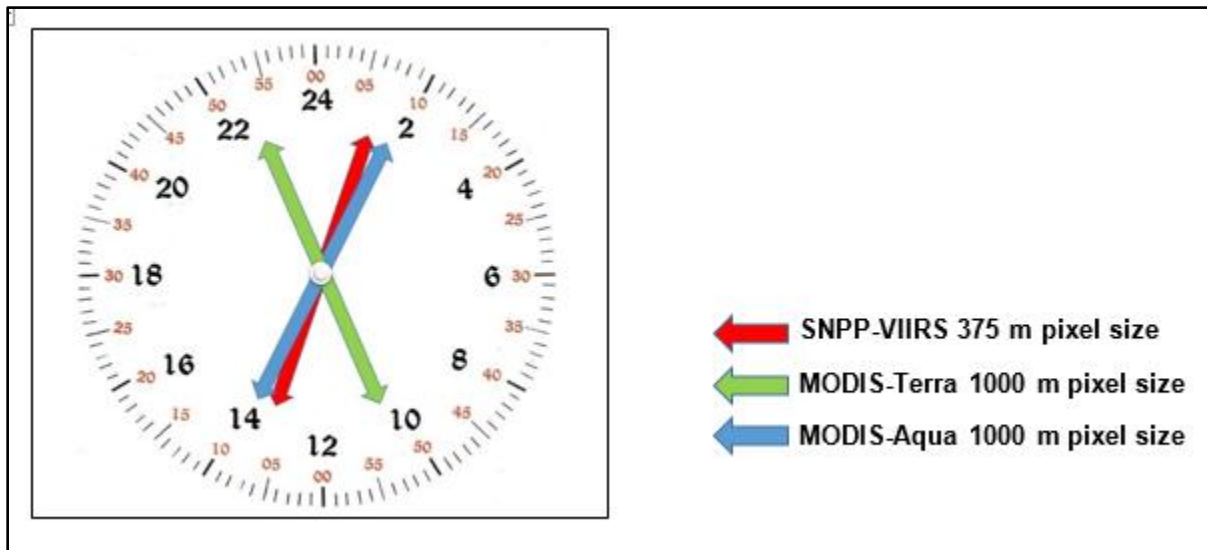
5. Does satellite based fire detection happen continuously round the clock?

No. MODIS and SNPP VIIRS sensors are aboard polar orbiting satellites and they pass over an area on earth only twice in a day. Therefore, a sensor usually provides two sets of satellite detections corresponding to the overpass timings.

For example the MODIS Aqua satellite has nominal overpass at around 10:30 am and 10:30 pm IST. Fires that are active between consecutive overpasses cannot be detected by the satellite.

6. What are the nominal satellite pass timings for MODIS and SNPP-VIIRS over India?

FSI uses fire detection satellite data from two sensors viz. MODIS and SNPP. The Terra MODIS instrument acquires data twice daily (10:30 a.m. and 10:30 p.m.), as does Aqua MODIS (1:30 p.m. and 1:30 a.m.). Therefore, four daily MODIS observations are available for forest fires. The SNPP-VIIRS also has its equatorial passes twice a day (1:30 a.m. and 1:30 p.m.). Therefore, FSI communicates forest fire alerts based on a total of 6 satellite passes in a day.



7. What is MODIS?

The National Aeronautics and Space Administration's Moderate Resolution Imaging Spectroradiometer (MODIS), with channels specifically designed for fire detection, is the most commonly used satellite sensor for detecting fires over large regions. The image resolution used for detection of fires is 1 km. A hotspot is detected by MODIS sensor using data from middle infrared and thermal infrared bands. There are two satellites carrying the MODIS sensor viz. Terra and Aqua, which together provide complete coverage of India approximately 4 times daily.

8. What is SNPP-VIIRS?

The Visible Infrared Imaging Radiometer Suite (VIIRS), operated by the US National Aeronautics and Space Administration (NASA), was designed to be the successor to both AVHRR and MODIS. There are two satellites carrying the VIIRS sensor, which has fire detection channels at both 750-m and 375-m resolution. The resolution of the VIIRS sensor is finer than MODIS and it can detect smaller fires. FSI uses VIIRS-SNPP (375-m resolution) satellite data.

9. What is the procedure of generation and dissemination of forest fire alerts followed by FSI?

- After a satellite overpass, the active fire spots or hotspots are received by NRSC (National Remote Sensing Centre), Hyderabad in their ground station at Shadnagar, Telangana and processed using Science Processing Algorithms (SPAs).
- The fire points are shared through email by NRSC to FSI.
- The fire alerts provided by NRSC include all thermal anomalies detected by the sensors irrespective of whether these fall within or outside forests. FSI filters out all fires other than forest fires using a custom filter which is a combination of Recorded Forest Area boundaries as well as forest cover data. Enrichment of the forest fire information is carried out by adding attributes like State, District, Division, Range, Beat, Compartment boundaries etc to the forest fire locations.
- This information is then disseminated to State Nodal Officers, registered users and also uploaded on the website of FSI in the form of Table and Maps.
- Users who have specified their areas of interest are also notified of the fires therein through SMS.



10. How much time does it take to receive fire alerts by the user once it is detected by the satellite?

After the satellite overpass, the satellite data is downloaded and processed by National Remote Sensing Centre (NRSC) using NASA's algorithm at the ground station located at Hyderabad.

After processing, NRSC conveys the locations of fires through email to Forest Survey of India. FSI excludes those fires data outside forest area using a customized forest mask and further converts these forest fire locations into customized alerts as per the users requirements for SMS and email dissemination. Usually the MODIS satellite data is processed within 40 to 60 minutes of satellite overpass by NRSC and in case of SNPP VIIRS, it takes around 60 to 90 minutes to process the satellite data. Forest Survey of India using fully automated customized software generates email alerts to the State Nodal officers within 5 minutes of receipt of email alert from NRSC. However, SMS are sent to the users usually within 30 to 60 minutes of receipt of email from NRSC.

One may visit our Forest Fire Alert System dashboard (<https://fsiforestfire.gov.in/>) for real-time updates on Fire Alert Dissemination Status.

11. Can we rely on FSI's fire alert system solely for forest fire detection in forest areas?

No. As explained in questions 5 and 6, the fire alerts are generated only when there is a satellite overpass. Currently FSI is generating forest fire alerts six times in a day from MODIS Aqua, MODIS Terra and SNPP VIIRS sensors. Each of these sensors provides two sets of data everyday in a period of 24 hours. Therefore, the forest fire alerts generated by FSI correspond to these 6 satellite overpasses and all fires data active in between these satellite overpasses cannot be detected by the satellite based fire alert systems. So it is highly recommended to use the FSI forest fire alerts for strategic purposes and not to rely on these for tactical firefighting purposes fully. Other sources of forest fire detection such as watchtowers, ground based sensors, local information etc., wherever they are available should be relied upon as the primary source for forest fire detection.

12. What are the benefits of using satellites for fire detection?

The main benefit of using satellites for detecting fires is that they can cover all of India multiple times daily at low cost. This makes them effective for detecting fires in remote, unpopulated regions, where conventional fire monitoring is less intensive. Thick smoke plumes from forest fires, often extending several hundred kilometers, can also be identified by means of satellite imagery.

13. What are the limitations of using satellites for fire detection?

Satellite fire detection has also got some limitations-

- The algorithms cannot detect fires through thick cloud or smoke. A large fire may therefore go undetected for several days and then appear or reappear later; a small fire may burn and die out without ever being detected.
- Same could be the case for ground or surface fires under very thick, dense canopy which could go undetected.
- The forest fire alerts generated by FSI correspond to only 6 satellite overpasses in a day and all fires data active in between these satellite overpasses cannot be detected by the satellite based fire alert systems.
- The time lapse between fire detection by the satellite and dissemination of the alert to the user is between 1 to 1.5 hours, depending on the sensor and processing time. This delay, along with the coarse resolution, limits the utility of satellite detection for tactical fire operations.
- The actual size of the actively burning area cannot be determined from satellite imagery. A 1-km² hotspot pixel may represent a fire as small as 100 m². In addition, an intense fire covering an area less than 1 km² may actually show up as a cluster of several hotspot pixels. This is the result of the varying size and spatial overlap of the raw, unprojected pixels.

14. Does it mean that only fires more than 1 km² in size would be detected as the resolution of MODIS data is 1km X 1km?

It is not necessary. A 1 km² hotspot pixel may represent a fire as small as 100 m².

MODIS can routinely detect both flaming and smoldering fires ~1000 m² in size. Under very good observing conditions (e.g. little or no smoke, relatively homogeneous land surface etc.) flaming fires one tenth this size can be detected. Under pristine (and extremely rare) observing conditions even smaller flaming fires ~50 m² can be detected. There is no upper limit to the largest and/or hottest fire that can be detected with MODIS.

15. How are fires in non- forest areas filtered out by the alert system?

The fire alerts provided by NRSC include all thermal anomalies detected by the sensors irrespective of whether these fall within or outside forests. FSI filters out all fires other than forest fires using a custom filter which is a combination of Recorded Forest Area boundaries as well as forest cover data.

16. Does FSI disseminate all the fire alerts as received from NRSC?

No. The fire alerts provided by NRSC include all thermal anomalies detected by the sensors irrespective of whether these fall within or outside forests. FSI filters out all fires other than forest fires using a custom filter which is a combination of Recorded Forest Area boundaries as well as forest cover data. Further, enrichment of the forest fire information is carried out by adding attributes like State, District, Division, Range, Beat, Compartment

boundaries etc to the forest fire locations. After this customized processing, the forest fire alerts are disseminated to the users to help them identify the fire location accurately.

17. Why does FSI Alert System miss out on certain forest fires?

This can happen for any number of reasons.

- The fire may have started and ended in between satellite overpasses and hence, no satellite data received for it.
- The fire may be too small or too cool to be detected in the 1 km² MODIS footprint.
- Cloud cover, heavy smoke, or tree canopy may completely obscure a fire.
- Rarely due to technical glitch at NRSC's or FSI's end.

18. What is the difference in detection by MODIS and SNPP-VIIRS sensors?

	MODIS (Moderate resolution Imaging spectro-radiometer)	SNPP-VIIRS Suomi National Polar-orbiting Partnership (NPP) satellite
Sensor	36 spectral bands (channel 21,22,31)	5 HR Imagery channels (I-bands), 16 moderate resolution channels (M-bands) and a D/N Band (M13 and M15)
Satellite	Aqua & Terra	Suomi National Polar-orbiting Partnership (NPP) satellite
Launch	Dec 99 & May 2002	Oct-11
Algorithm	Contextual	Thresholding and Contextual (Hybrid)
Equatorial Pass	Terra- 10:30 am and 10:30 pm ; Aqua - 1:30 pm and 1:30 am	1:30pm and 1:30am
Resolution	1 km X 1km	375mx 375m & 750m x 750m
Night time performance	Poor	Good
Mapping small fires	No (ideally 1000 sq m)	Yes
Accuracy of mapping large fire boundaries	Poor	Good
Under Canopy Fires detection	Poor	Good

19. How is it possible that a single fire point falls in more than 1 beat?

When MODIS/SNPP detect a fire pixel, the fire could be present in any part of the (1kmx1km for MODIS or 375mx375m for SNPP) pixel but only the centroid of that particular fire-affected pixel is communicated as the fire point in the satellite data which not necessary to be the exact location of the fire point. Also, as a limitation of the satellite data, it is not possible to identify the exact location of the fire point in that pixel and therefore, all the beats/ admin levels falling under that fire-affected pixel are alerted for forest fire.

20. How do I register for forest fire alerts with FSI?

Anyone can register for forest fire alerts through FSI's website. As the fire alerts are SMS-based, users need a valid Indian mobile number to receive the fire alerts. Additionally, the users also need to specify their area of interest for subscribing to the fire alerts. The fire alerts registration page can be visited using this link. <https://fsiforestfire.gov.in/>

New User Registration

First, verify your mobile number. Then, Register yourself for SMS alert service.

1. Personal Information

2. Registration Category

Personal Information

Full Name *

Category

-- Select Category --

Services

-- Select Service --

Organization *

State *

-- Select State --

Mobile No. *

Enter 10-digit mobile number

Email

Send OTP & Continue

21. Is registration for forest fire alerts with FSI restricted only to State Forest Departments?

No. The user registration for SMS-based forest fire alerts is open for all. From State forest departments to researchers, students to general public, anyone and everyone can register for forest fire alerts with FSI and receive forest fire alerts for their area of subscription.

22. Do the registered users also receive forest fire alerts through e-mail?

No. The registered users will receive the forest fire alerts as SMS text only. The forest fire alerts are disseminated together with Google Earth compatible KML files through email ONLY to the nodal officers of State Forest Departments.

23. Is there any registration fee?

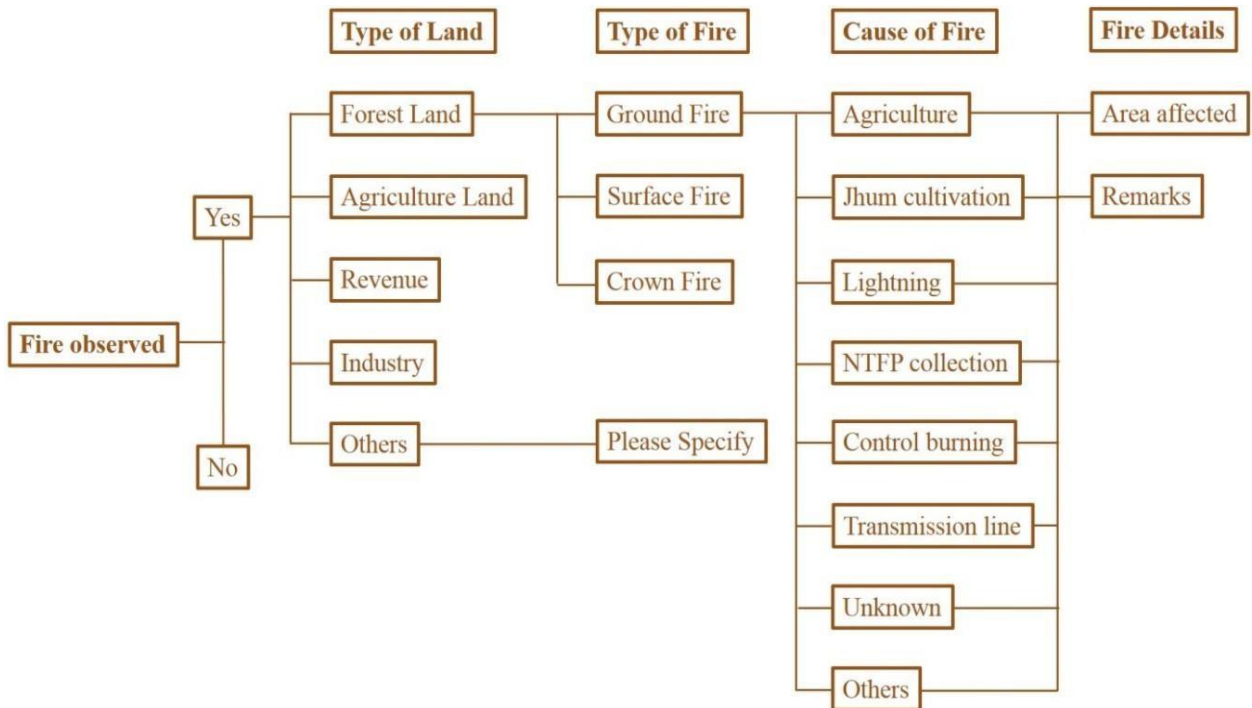
No. Registration is absolutely free for everyone. FSI Forest Fire Alert System is solely for the benefit of people of India. One just has to provide his/her valid Indian Mobile number along with his/her basic details to get successfully registered with FSI Forest Fire Alert System.

24. Can I receive customized fire alerts only for my area of interest or place of posting?

Yes. There is a provision of 'Customized Alerts'. SMS forest fire alerts are provided as per requirement of users which could be upto beat level, wherever, the administrative boundary layer has been made available by the State Forest Departments. A user can register for a maximum of 3 areas of interest. Also, a particular state user can also register for other states/admin levels.

25. How to provide feedback to the fire alerts?

A link is included in all the forest fire alerts at the end of the SMS to enable users to provide feedback on aspects such as whether fire has actually occurred or not, extent of area burnt (in Ha) and also any other observations they may want to make. Also, for any detailed feedback, users can mail us at forestfiremonitoring@gmail.com.



26. There has no forest fire occurred but agricultural fire, what should be my feedback response?

If you detect a fire as per the FSI Forest Fire alert irrespective of the area, you may enter 'Fire Observed' as 'yes' even if it's not a 'forest fire'. Further, you may mention it as a fire in agricultural land or such.

27. Are Industrial fires near forest areas such as Coal fires etc. are also disseminated as forest fires?

Satellite detects any active fire irrespective of its source. Filtration of forest fire is done at FSI. In some cases, fires in industries or agricultural land lying very close to forest area or falling under the RFA boundaries of states are sometimes considered as Forest Fires. Although utmost care is taken to mask out such industrial fires to avoid any false alarm, still sometimes, such fires are disseminated as forest fires.

28. Are user feedback utilized for improvement of the fire alert system?

Yes. User feedback is very crucial in the improvement of the fire alert system. It gives an estimate of the accuracy of the satellite data and fire alert system. Fire points with repetitive feedback of 'non-forest fire' such as 'industrial fire' or 'revenue land' are manually masked out to avoid any further false alarms. It also helps to carry out various analysis of the types and causes of the forest fires.

29. I am a resident of Lucknow and had previously registered for the district Lucknow, Uttar Pradesh. I am now temporarily posted in Uttarakhand. Is it possible to change my area of subscription? What are the methods?

Yes, it is possible. The alert portal allows its registered users to delete, edit or modify its preferences.

There are 3 methods for the same-

- The user has option to delete his/her registration by unsubscribing.
- The user can add a state or any admin level in addition to already registered areas to a maximum limit of 3 areas of interest.
- The user can modify its subscription by deleting already registered areas of interest and adding new subscriptions to a maximum limit of 3.
- User can also subscribe for any state/admin level other than his/her home state.

30. What is the Large Forest Fire Monitoring Programme by FSI?

Forest Survey of India has launched Large Forest Fire Monitoring Programme using near real time SNPP-VIIRS data. The programme detects minimum of 3 SNPP pixels in close proximity to identify a Large Forest Fire. Once detected, it is continuously monitored until it is put off. The programme scans the fire for additional 3 days after its inactivity to detect dormant fires, if any. FSI disseminates Large Forest Fire alerts with the objective to identify, track and report serious forest fire incidents so as to help monitor such fires at senior level in the State Forest Department and also seek timely additional assistance that may be required to contain such fires.

31. What is the procedure of generation and dissemination of forest fire alerts followed by FSI?

Automatic Self Detection & Dynamic Growth Model for Large Fire Monitoring Using Python Script

1. 'Large Forest Fires' are identified by carrying out the clumping of fire polygons with criteria being atleast 3 SNPP forest fire polygons to be detected in close proximity. This one clump is considered as a single 'large forest' fire.
2. Unique large fire nomenclature is assigned to every large forest fire based on its range/district name.
3. If any fire in the subsequent satellite passes is within 500 m buffer of any of the previous continuing large fire, then it's continued under the same name of the previously continuing fire.
4. Such continuous monitoring is done until the fire douses and for additional 3 days after the inactivity of the fire.
5. Based on steps 1 – 4, a 'Large Forest Fire Database' is generated.
6. Dataset of active large fire layer of the current pass of satellite in continuation with its fire extensions from the previous passes is created.
7. Enrichment of the forest fire information is carried out by adding attributes like State, District, Division, Range, Beat, etc. to the large forest fire polygons.
8. This information is then disseminated to State Nodal Officers as kmz through e-mail, to registered users through SMS and also uploaded on the FSI fire geo-portal for interactive viewing.

32. How may we contact the Centre for Forest Fire Studies of FSI?

For any queries, feedback or suggestions, you may contact us at 0135-2752901 or write to us at forestfiremonitoring@gmail.com