CSIR Advanced Fire Information System (AFIS)

SAFNet Meeting
28 July 2021
AFIS service components

Before a fire (prepare):
- Fire danger forecast
- Wildfire risk mapping
- Seasonal fire weather

During a fire (respond):
- Detect fires with satellites
- Early warning alerting
- Monitor fires in progress
- Fire spread modeling

After a fire (report):
- Burned area mapping
- Burned area statistics
- Seasonal reporting
### AFIS: past, present, future

- Philip Frost initiated AFIS in 2003 at the CSIR's Satellite Applications Centre
- Relocated to CSIR Meraka Institute (Pretoria) in 2005
- Riaan van den Dool joined CSIR and AFIS team in 2011
- Restructing: Meraka Institute absorbed into CSIR NextGen Enterprises and Institutions (NGEI) cluster
- Philip Frost left CSIR in 2019 to join [https://immap.org/](https://immap.org/)
- Riaan van den Dool took over primary responsibility for AFIS from Philip Frost in 2019

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>CSIR SAC</td>
<td>2003</td>
<td>2004</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CSIR NGEI</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>2019</td>
<td>2020</td>
</tr>
<tr>
<td>Riaan vdDool</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

18 years
AFIS Data Products

The following wildfire information products are currently available:

- 1km and 375m active fire (VIIRS and MODIS)
- 15min thermal hotspots (Meteosat Second Generation)
- Weather forecast (3 days, hourly)
- Weather actual measurements (hourly)
- Fire Danger Index (FDI) forecast (3 days, hourly)
- Fire Weather Index (FWI) forecast (3 days, daily)
- FDI actual measurements (hourly)
- Veld age (monthly)
- Burn sum/frequency (monthly)
- Fire return interval (monthly)
- Burned area (monthly)
AFIS NextGen Viewer and Mobile App

https://viewer.afis.co.za
AFIS NextGen Viewer and Mobile App 2019

https://viewer.afis.co.za

Android: Google Play Store
iOS: Apple App Store
Etosha, Namibia, 2021
Summit Trail Fire, Washington, 2021

27 July 2021
Summit Trail Fire, Washington, 2021

Source: https://inciweb.nwcg.gov/

27 July 2021
Summit Trail Fire, Washington, 2021

27 July 2021
Summit Trail Fire, Washington, 2021

27 July 2021
Dixie Fire, California, 2021

23 July 2021
Dixie Fire, California, 2021

Fires:
- 0-24 hours
- 1 day
- 2 days
- 3 days
- 4 days
- 5 days
- 6 days
- 7-30 days

23 July 2021
Dixie Fire, California, 2021

23 July 2021

23 July 2021

26 July 2021

Fires:
- 0-24 hours
- 1 day
- 2 days
- 3 days
- 4 days
- 5 days
- 6 days
- 7-30 days

CSIR

Touching lives through innovation
Burnt area mapping

Number of times burnt since 2000

- 0
- 1 - 2
- 2 - 4
- 4 - 6
- 6 - 10
- >10

CSIR
Touching lives through innovation
Burnt area statistics

Burned area statistics now available via an API:
https://api.afis.co.za/docs#/default/get_burntarea_stats_burntarea_stats__get

![Graph showing burnt area statistics in the Fynbos biome from 2001 to 2019. The graph indicates varying levels of burnt area across different years, with peaks and troughs.]
Burnt area statistics

Burned area statistics now available via an API: https://api.afis.co.za/docs#/default/get_burntarea_stats

<table>
<thead>
<tr>
<th>Request URL</th>
</tr>
</thead>
<tbody>
<tr>
<td><a href="https://api.afis.co.za/burntarea_stats/?start_date=2020-01-01&amp;end_date=2020-12-31&amp;province=Western%20Cape&amp;category=admin">https://api.afis.co.za/burntarea_stats/?start_date=2020-01-01&amp;end_date=2020-12-31&amp;province=Western%20Cape&amp;category=admin</a></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Code</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>200</td>
<td></td>
</tr>
</tbody>
</table>

Response body:
province;district;municipality;category;catname;to_date;area_ha
Western Cape;Cape Winelands;Breede Valley;admin;admin;2020-01-01;0.0
Western Cape;Cape Winelands;Breede Valley;admin;admin;2020-02-01;698.224
Western Cape;Cape Winelands;Breede Valley;admin;admin;2020-03-01;193.112
Western Cape;Cape Winelands;Breede Valley;admin;admin;2020-04-01;0.0
Western Cape;Cape Winelands;Breede Valley;admin;admin;2020-05-01;0.0
Western Cape;Cape Winelands;Breede Valley;admin;admin;2020-06-01;0.0
Western Cape;Cape Winelands;Breede Valley;admin;admin;2020-07-01;99.2102
Western Cape;Cape Winelands;Breede Valley;admin;admin;2020-08-01;0.0
Western Cape;Cape Winelands;Breede Valley;admin;admin;2020-09-01;0.0
Western Cape;Cape Winelands;Breede Valley;admin;admin;2020-10-01;0.0
Western Cape;Cape Winelands;Breede Valley;admin;admin;2020-11-01;150.193
Western Cape;Cape Winelands;Breede Valley;admin;admin;2020-12-01;84.4392
South Africa: National Fire Danger Rating System (NFDRS)

Fire Weather Index (FWI)
13 November 2020

Source: CSIR/AFIS

Fire Danger Index Values
Today Fri 13 Nov 2020

Source: SAWS
Seasonal Fire Weather Severity

Daily FWI/DSR 1980-2020 in a data cube

Figure 40: Diagram showing the structure of the Canadian Fire Weather Index (FWI)
Cumulative Daily Severity Rating (cDSR)

Fire danger indices historical data from the Copernicus Emergency Management Service: https://doi.org/10.24381 cds.0e89c522
Cumulative Daily Severity Rating (cDSR)
Cumulative Daily Severity Rating (cDSR)
Cumulative Daily Severity Rating (cDSR)
Cumulative Daily Severity Rating (cDSR)
Cumulative Daily Severity Rating (cDSR)

Cumulative DSR means - Knysna x=23.0543 y=-34.0425 - 2020-11-23 12:00:00

- 40 year mean
- 40 year mean + 2 std dev
- 2010-2019
- 2000-2009
- 40 year mean
- 1990-1999
- 1980-1989

40 year mean - 2 std dev
Cumulative Daily Severity Rating (cDSR)
Infrastructure exposure to extreme Seasonal Fire Weather

ESKOM Transmission Line Network

2020 Fire Season
Conclusions

• AFIS is alive and well, 18 years and counting
• New AFIS Viewer and Mobile launched in 2019
• Burned Area Statistics API available
• South African NFDRS review and improvement underway
• Cumulative Daily Severity Rating for seasonal monitoring
• Looking forward to future engagement with SAFNet members