WEBINAR SUMMARY

a publication from the Southern Fire Exchange

Emerging Technologies in Wildland Fire

Webinar originally presented February 2024 by Nathan Burmester, The Nature Conservancy, North Carolina

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Wildland firefighting and the application of prescribed fire are practices that require a high level of detail, assurance of safety, and monitoring to successfully accomplish. As technology evolves, so does its potential for improving fire management programs. Of the many forms of technology that practitioners may use, artificial intelligence, drones, software, weather sensing, and cameras are particularly noteworthy for their rapid growth and applicability to current contexts.

Artificial Intelligence

Online Art Generators

- Great for logos and presentations
- E.g. Open AI and Adobe Firefly

Writing Assistance

- Great for creating document structure and preparing an outline
- E.g. Chat GPT

Weaknesses:

- Early stages of development and use
- Struggles processing complex requests
- Legal gray area

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Drones

Uses

- Monitoring and checking burns and smoke
- Herbicide
- Ignition
- Public outreach and social media (photo- and videography)
- Mapping

Benefits

- Can fly over hard-to-reach areas
- Unique camera angles
- Georeferenced drone images can be stitched into highly detailed maps

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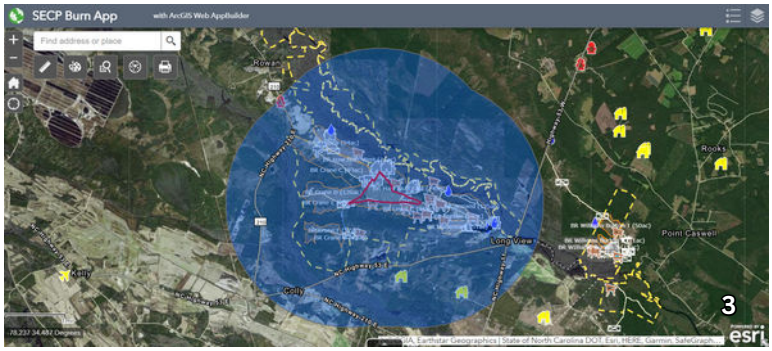
Weaknesses:

- Very high upfront cost; fragile
- Not practical for smaller properties
- Requires Part 107 Drone Pilot License[1]
- Difficult FAA regulations to navigate when using for wildland fire (e.g. the drone must be within view at all times)

Software



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ArcGIS Online Web App

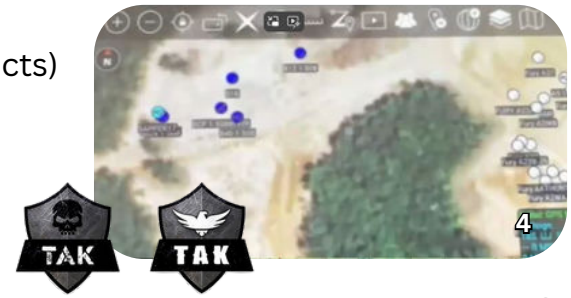
- Can use to make a custom app catered to your needs[3]
  - E.g. a burn plan map maker that creates smoke buffers at the click of a button
- Fast and simple
- Can draw, measure, and add notes
- Can be exported as georeferenced PDFs

Weakness: requires access to ArcMap or ArcGIS Online

Android Team Awareness Kit (ATAK)

- Can track the location of you and your team in real time
  - Really helpful for safety and spot-overs
- Able to import georeferenced map imagery
- Adapted from military use
  - Android Tactical Assault Kit
- Other versions[2]
  - iTAK (Apple Products)
  - CivTAK (Website)

Weakness: steep learning curve



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Planet Labs - Planet Explorer

- Decent quality satellite imagery on a user-friendly interface[4]
- Offers multispectral imagery

Weaknesses: higher quality imagery is only available during certain times of the year, requires paid account

Google Earth Explorer

- High quality satellite imagery[5]
- Free to use

Weaknesses: not as user-friendly, requires coding (Python or JavaScript)

Weather

Kestrel Fire Weather Kit[6]

- Automatically calculates fine dead fuel moisture and probability of ignition
- Maintains graph of daily measurements
- Can be placed on a tripod where it moves with the wind throughout the day
  - Great for keeping at the fire
- Instant data capture, can capture as fine-scale as every second
  - Links to phone app, exportable data
- AA-Battery powered


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Weaknesses: too many options, not user-friendly

KestrelMet6000[7]

- Measures:
  - Temp., Rel. Humidity, Wind Speed and Direction, Rainfall, Pressure
  - Add-Ons:
    - Soil Moisture, Soil Temp., Solar Irradiance, Leaf Wetness
- Relatively cheap
- Solar powered with backup battery
- Access to Ambient Weather Network


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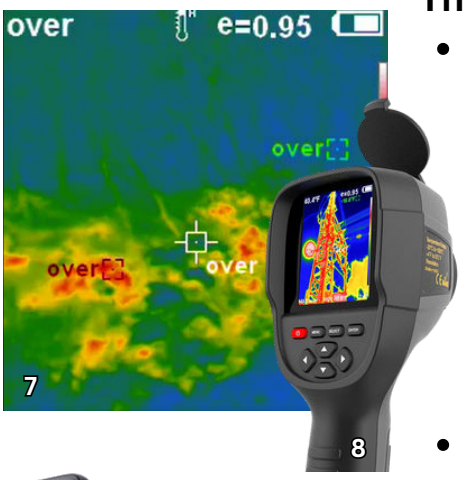
Weakness: Ambient Weather Network reliability is questionable

Cameras

360 Degree Camera[8]

- Monitoring
  - A unique way of capturing all directions at once
  - Absolves the need to properly position all monitoring cameras in the same direction
- Public outreach and social media
  - Uniquely engaging photos and videos

Weaknesses: Expensive, difficult to share and use 360 images



7 8

Thermal Camera

- Burn management and monitoring
  - Checking for hotspots during mop-up
  - Can capture smoldering or small fires that are not readily visible to the average person
- Can be fitted to a drone

Weaknesses: expensive, can be difficult to calibrate during the day (sun's radiation makes most vegetation register as hot)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Trail Camera

- Relatively cheap
- Remotely activated options available[9]
- Great potential for monitoring
  - E.g. monitor rain gauge and fuel conditions in real time


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12

Weakness: Conspicuous and often sought after by thieves and bears

References and Related Materials:

1. **FAA Part 107 Become a Drone Pilot** https://www.faa.gov/uas/commercial_operators/become_a_drone_pilot
2. **CivTAK and ATAK** https://www.civtak.org/atak-about/
3. **ArcGIS Online Web App Builder** https://developers.arcgis.com/web-appbuilder/
4. **Planet Labs Planet Explorer** https://developers.planet.com/docs/apps/explorer/
5. **Google Earth** https://earth.google.com/web/@0,0,0a,22251752.77375655d,35y,0h,0t,0r
6. **Kestrel Fire Weather Kit** https://kestrelinstruments.com/fire-weather-kit
7. **Kestrel Met 6000** https://kestrelmet.com/weather-stations?_gl=1*1txwdlh*_up*MQ..&gclid=CjwKCAjwk8e1BhALEiwAc8MHiPRmhd6QpoYtqrsLmUogAxNDewsD7IWy4w4CRhe3UxUspaZywITuzxoCLLsQAvD_BwE
8. **Insta 360 Cameras** https://www.insta360.com/
9. **Muddy Brand Trail Cameras** https://www.gomuddy.com/products/categories/trail-cameras/

Photos Sourced From: Mackenzie Wirick (1); Adobe Firefly (2); Nathan Burmester (3, 4, 7, 10, 11); Kestrel (5, 6); Insta 360 (9); Muddy Outdoors (12).