

Merging Unmanned Aircraft Collected Aerial Imagery to Map the 2012 Rx-CADRE Prescribed Burn Plots



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University of Alaska Unmanned Aircraft Program

**The technology exists -
We are researching how to use the tools.**

**A research center for small, unmanned aircraft systems
providing integration of unique payloads and supporting
pathfinder missions within government and science
communities, with a special emphasis on the arctic region.**



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Why Thermal Imagery from UAS?

- Overcomes some limitations of satellite imagery
 - Fine spatial resolution
 - 3-dimensional viewing
 - Can fly under a cloud deck
 - Can approach target of interest if more detail is needed
 - Higher temporal repeatability or persistence at high latitudes
 - Less expensive



Why NOT Thermal Imagery from UAS?

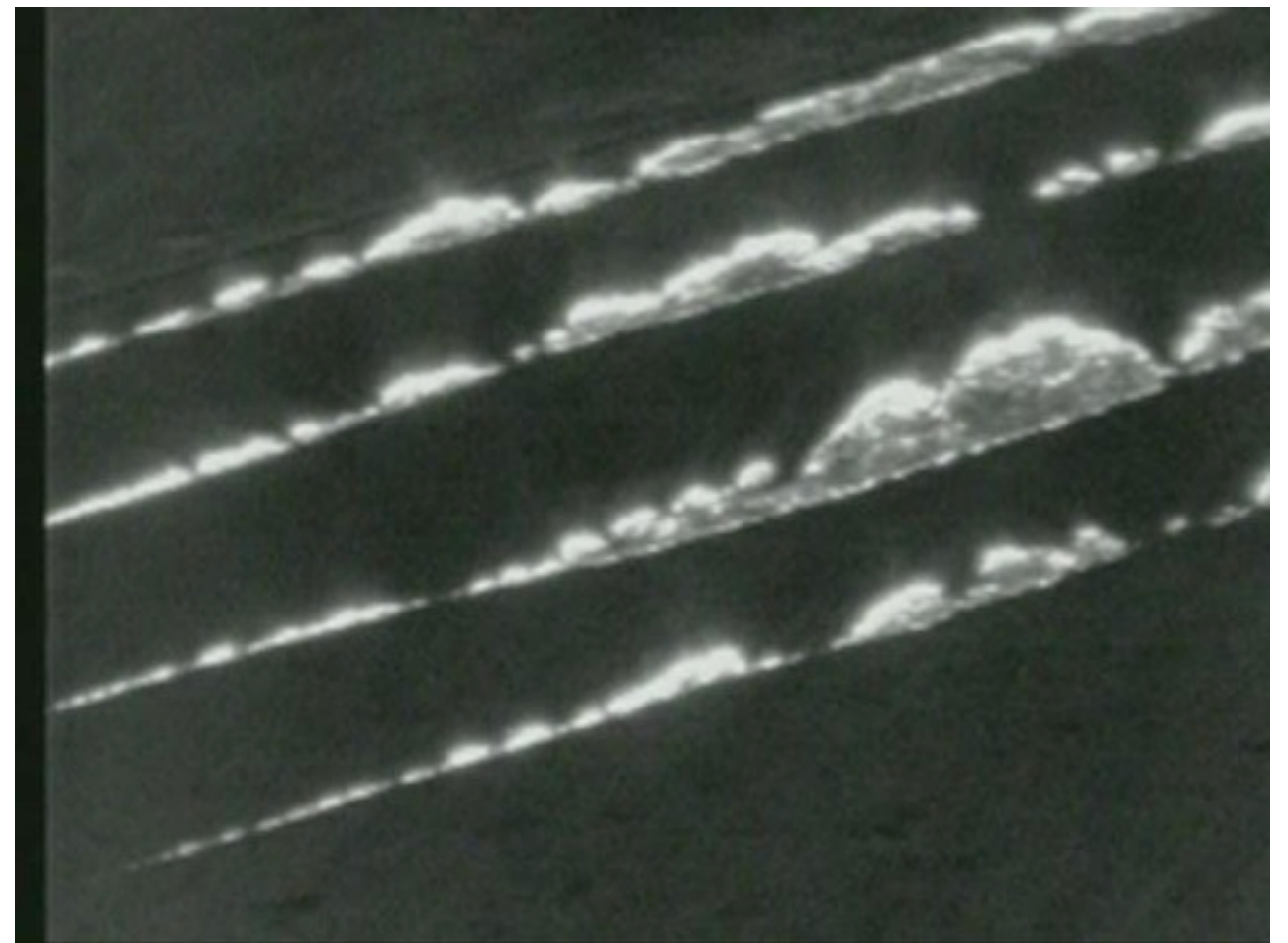
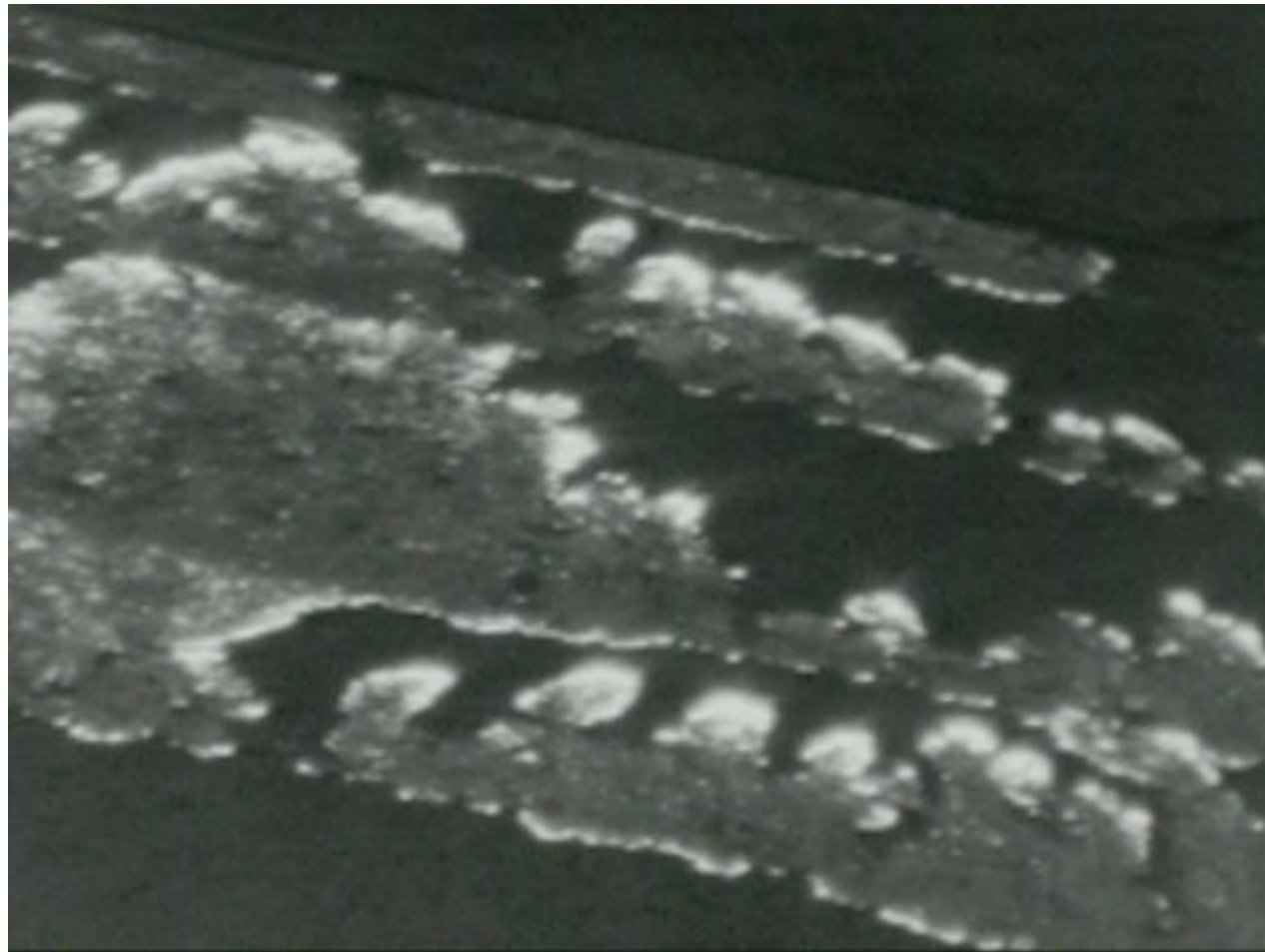
- Disadvantages
 - Smaller spatial coverage
 - Weight and size requirements limit instruments available for use
 - Deployment time can be significant
 - Unable to deploy in certain regions
 - May require FAA approval



Rx-CADRE

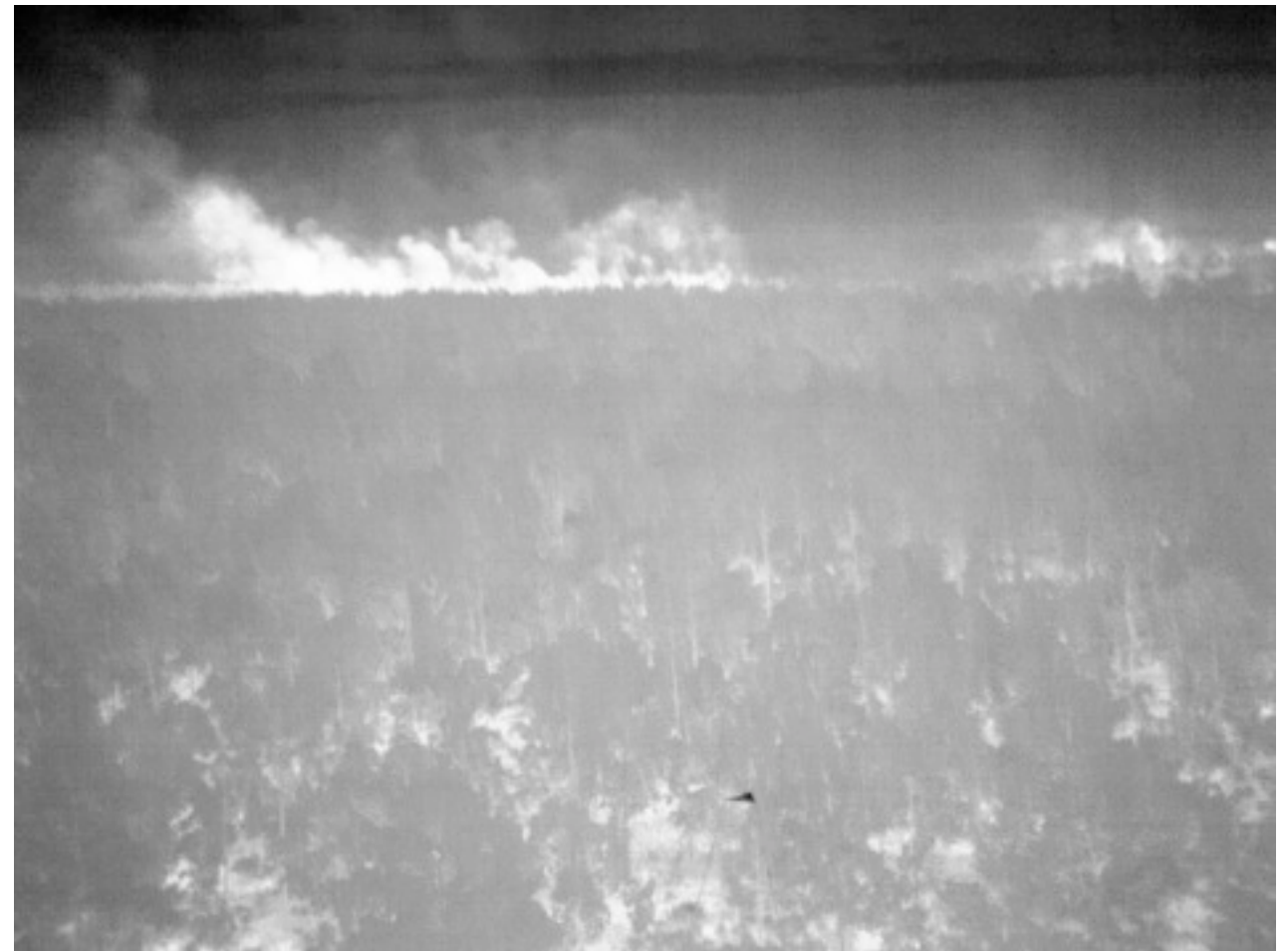
(Grass fire from ScanEagle at 1500')

One of the tools used for one of the imaging purposes



Rx-CADRE (Forest fire from Scout at 60')

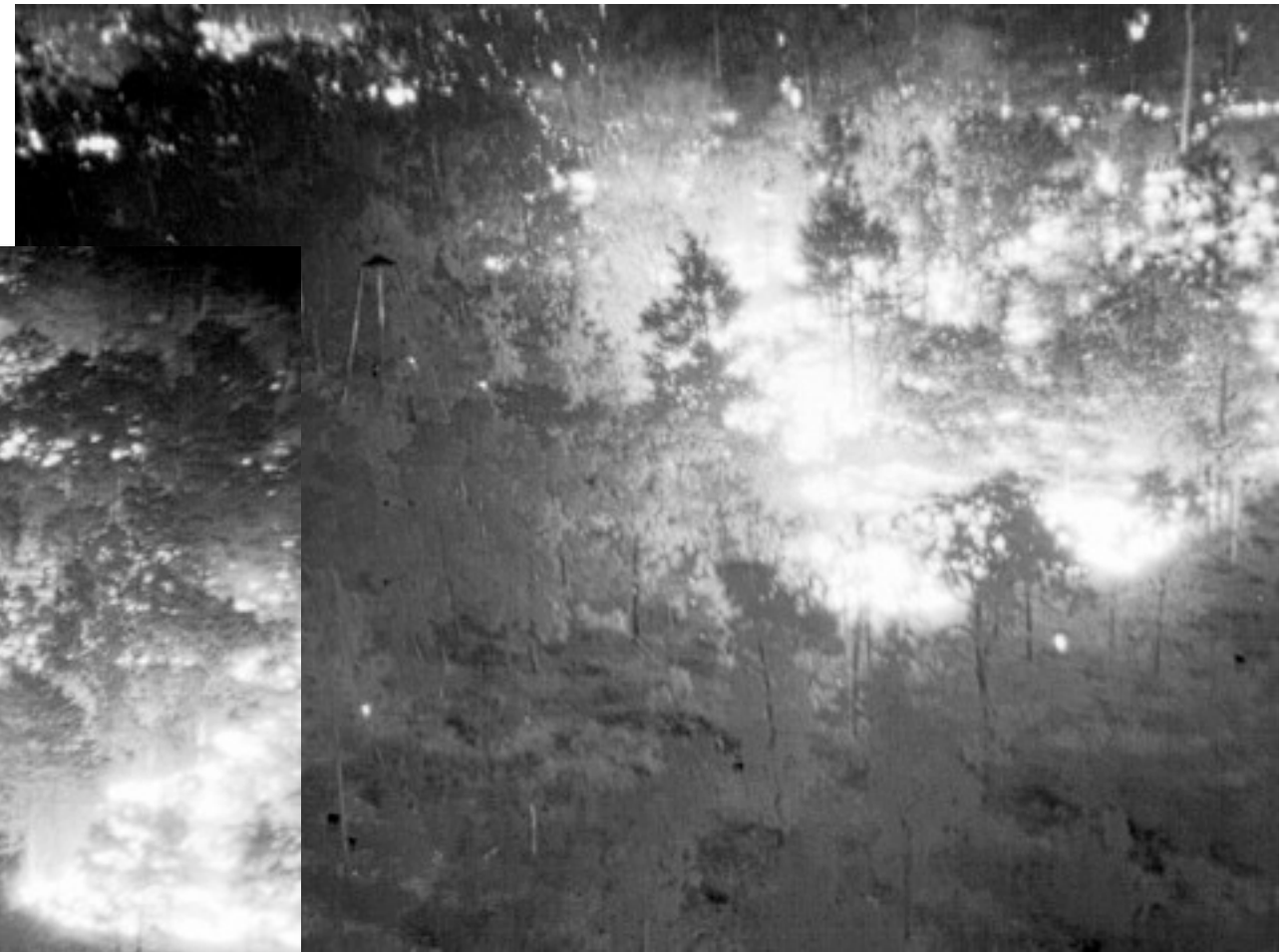
Another tool for a different purpose



Rx-CADRE

(Forest fire from Scout at 60')

Oblique still images of the fire taken every 4 seconds

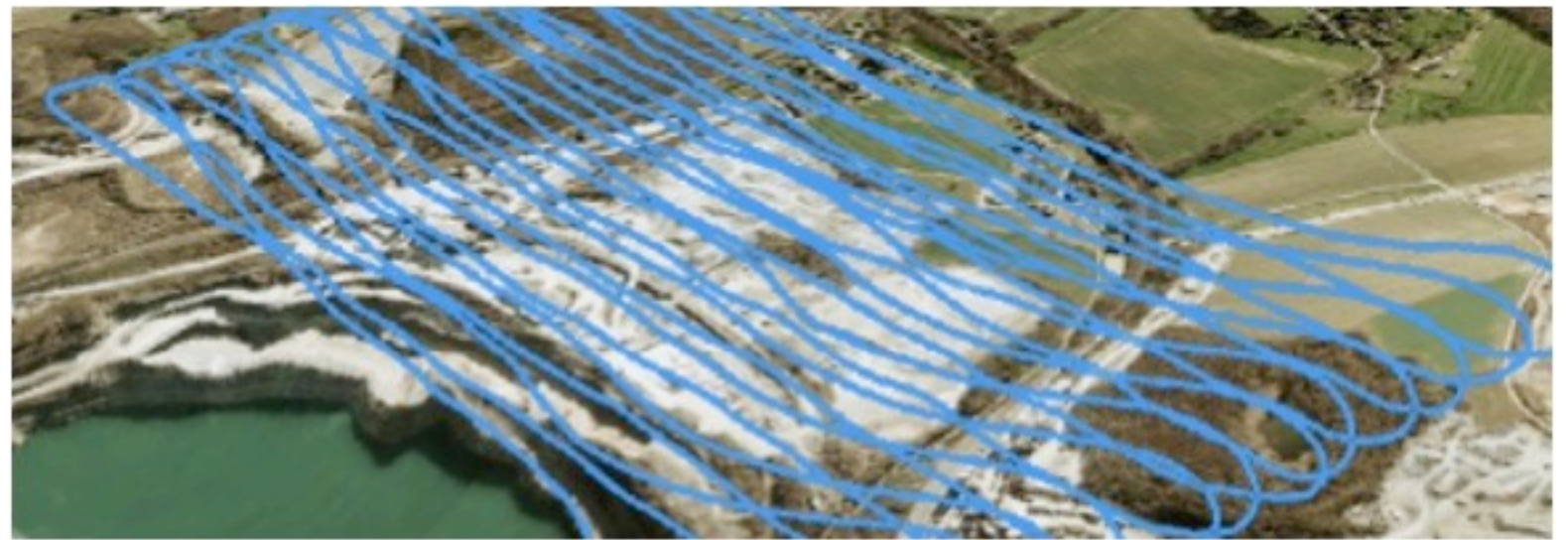


Calibration
fires



Mapping Visible and Thermal Imagery

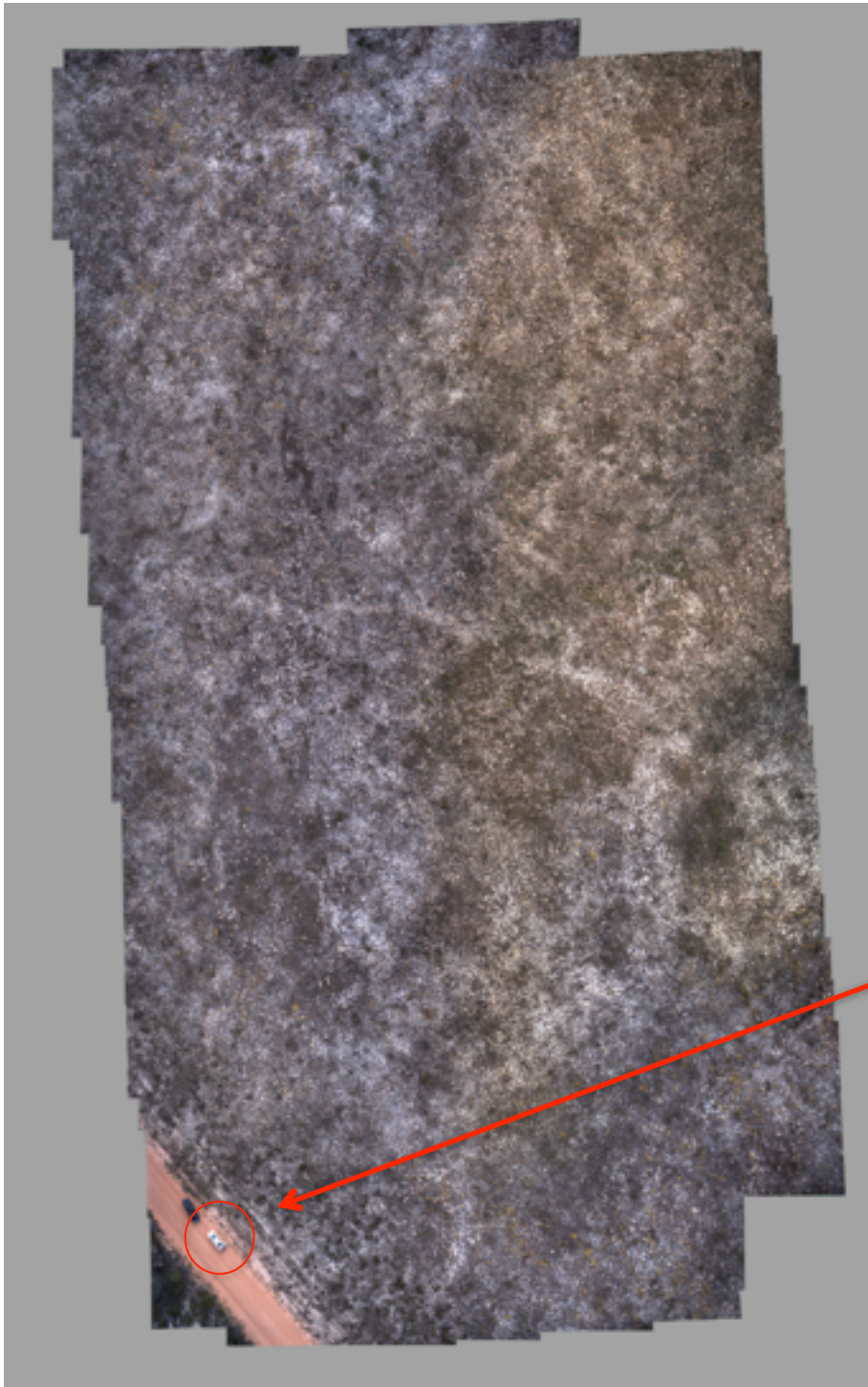
Use “structure-from-motion”
techniques developed for 3-D surveying to produce 3-D thermal maps



Orthophoto mosaics are created by projecting the texture of raw
images onto the generated Digital Surface Model

Mapping Missions Summary

Large Grass Fire I Highly Instrumented Plot I Preburn

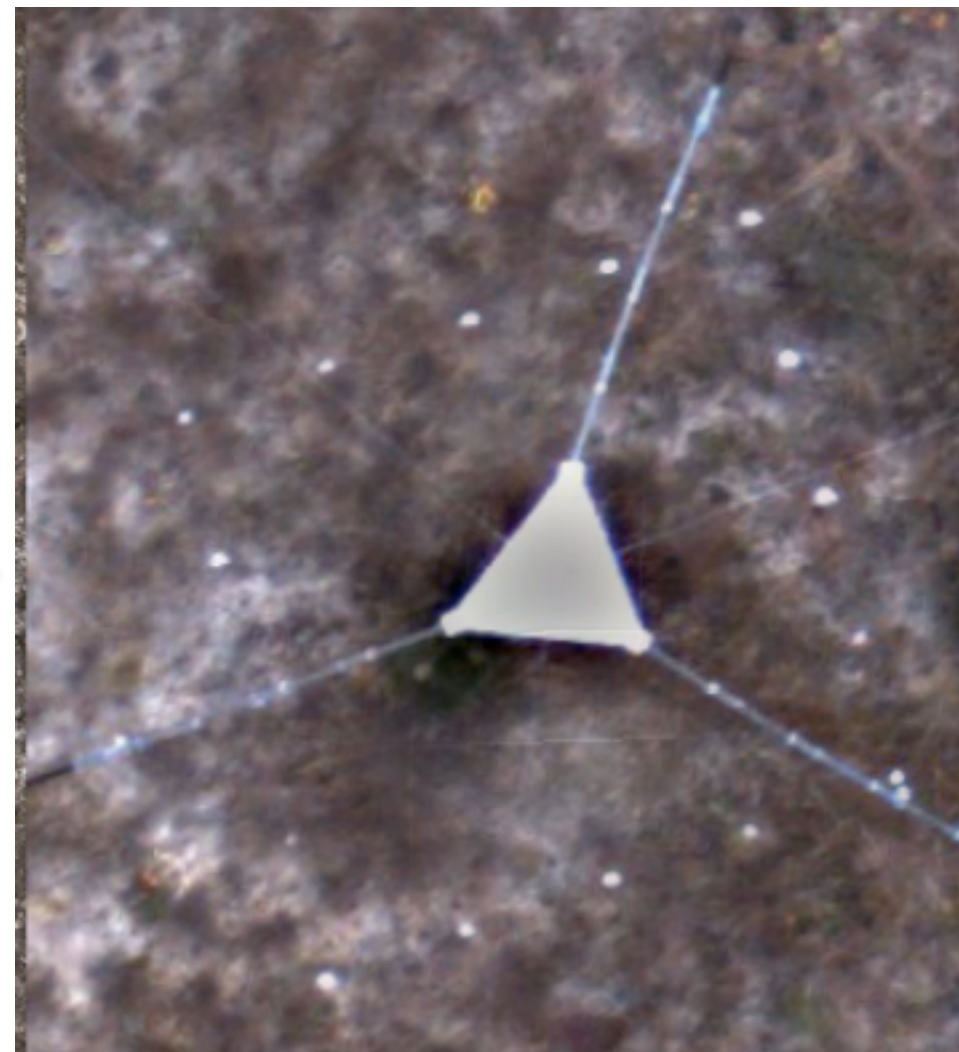
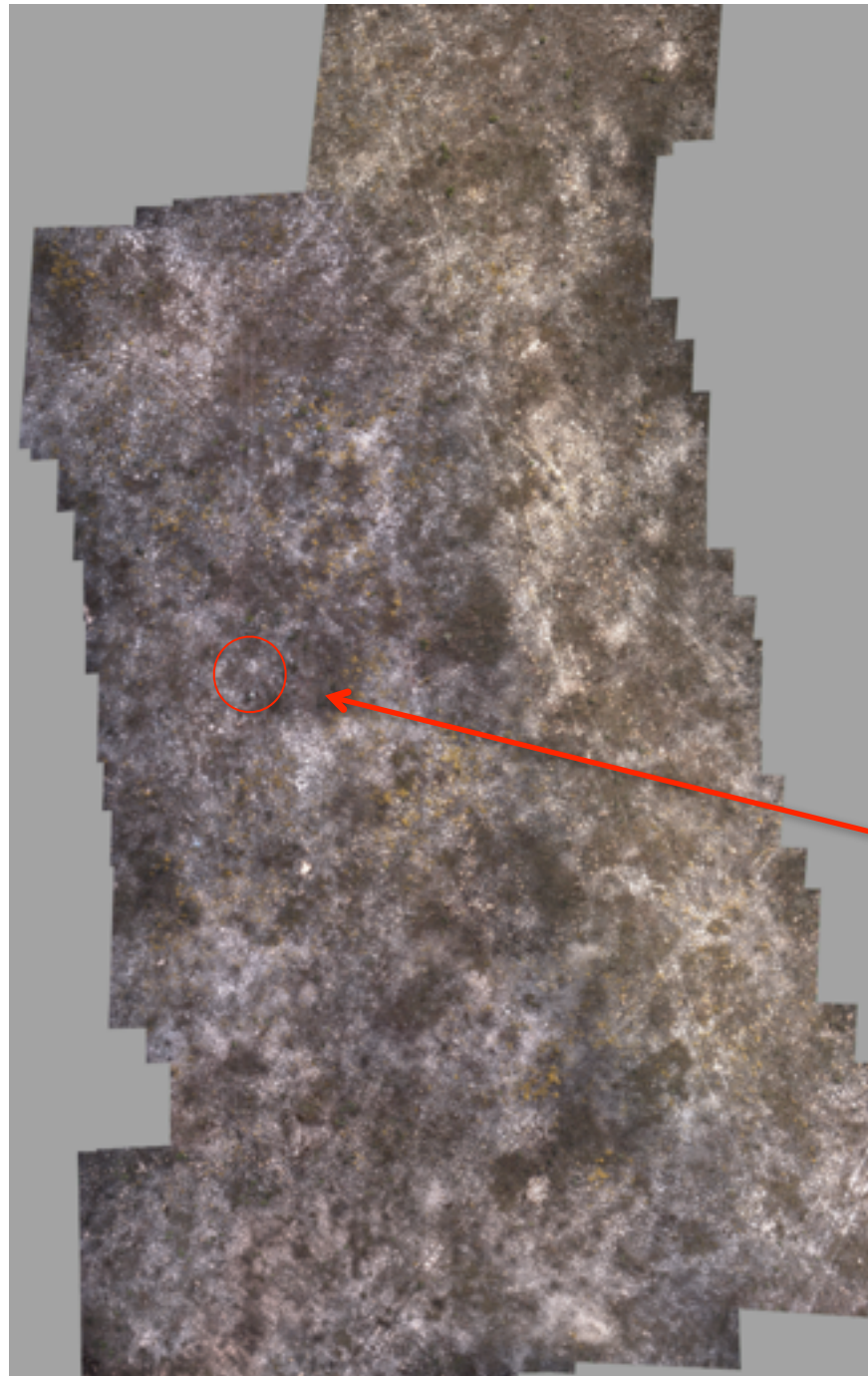


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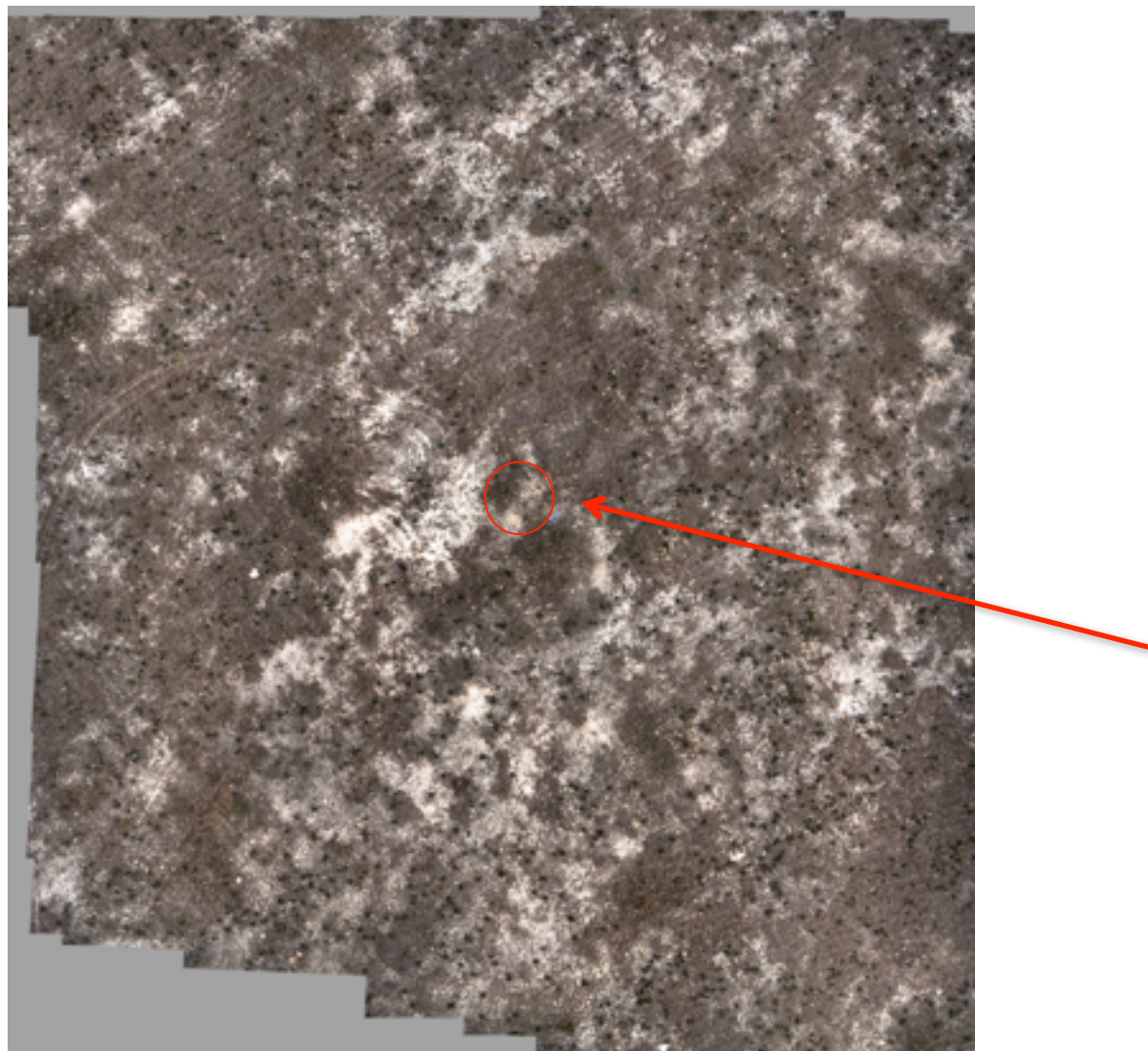
Mapping Missions Summary

Large Grass Fire I Highly Instrumented Plot 3 Preburn



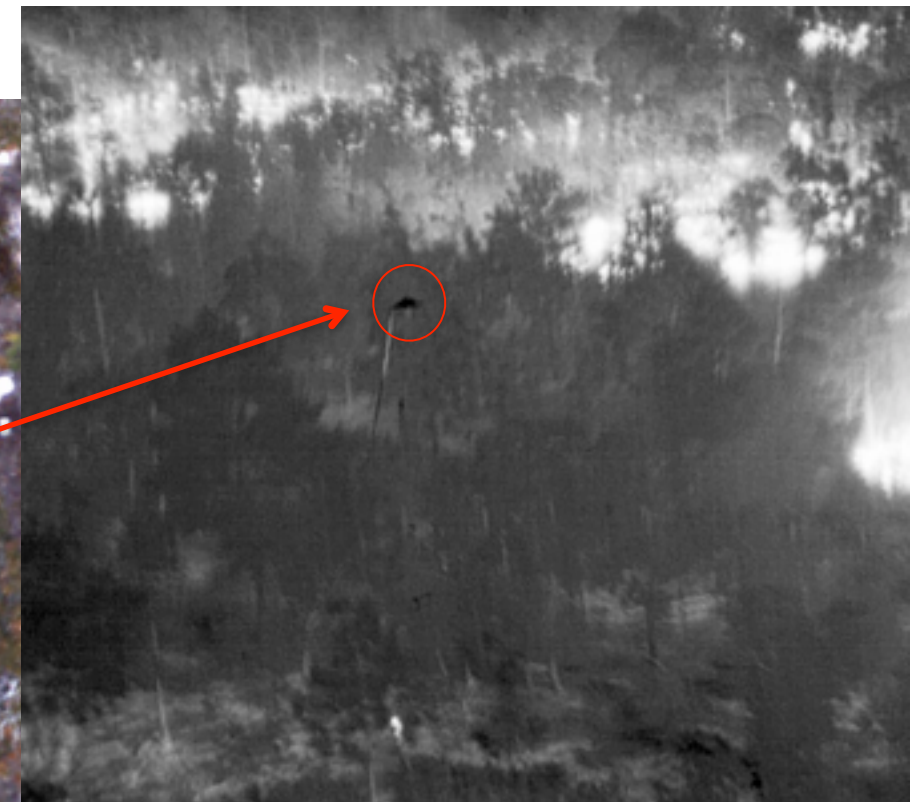
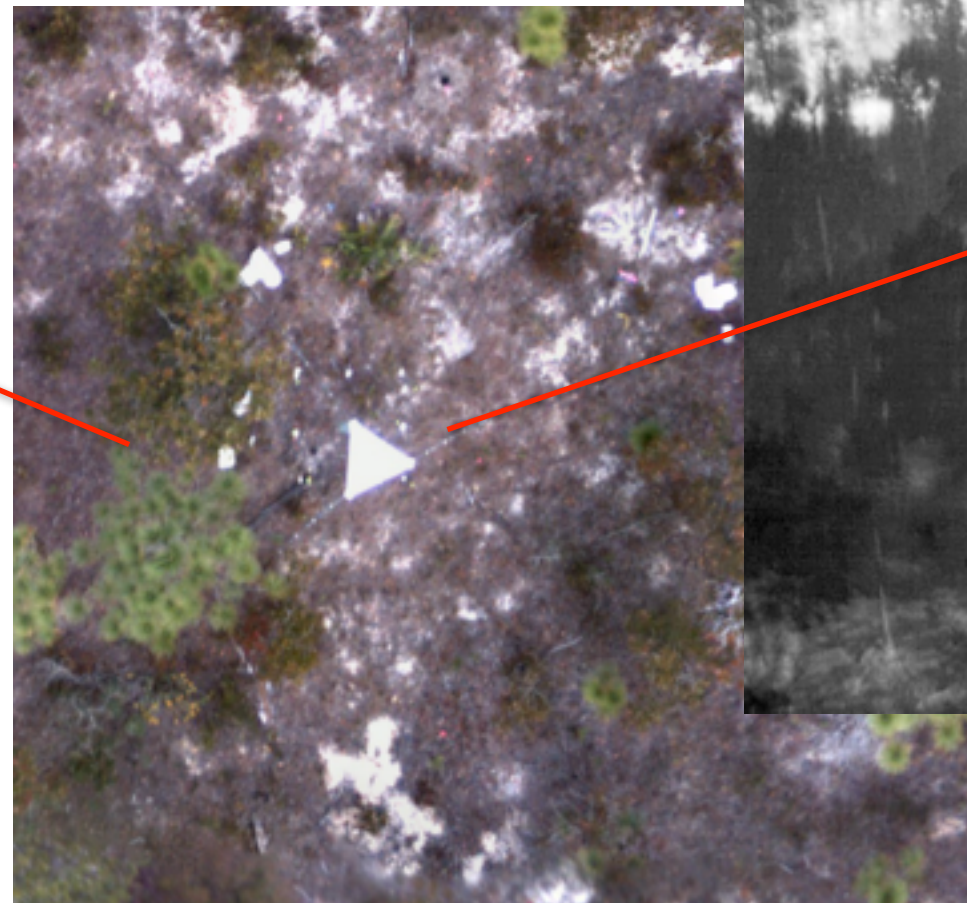
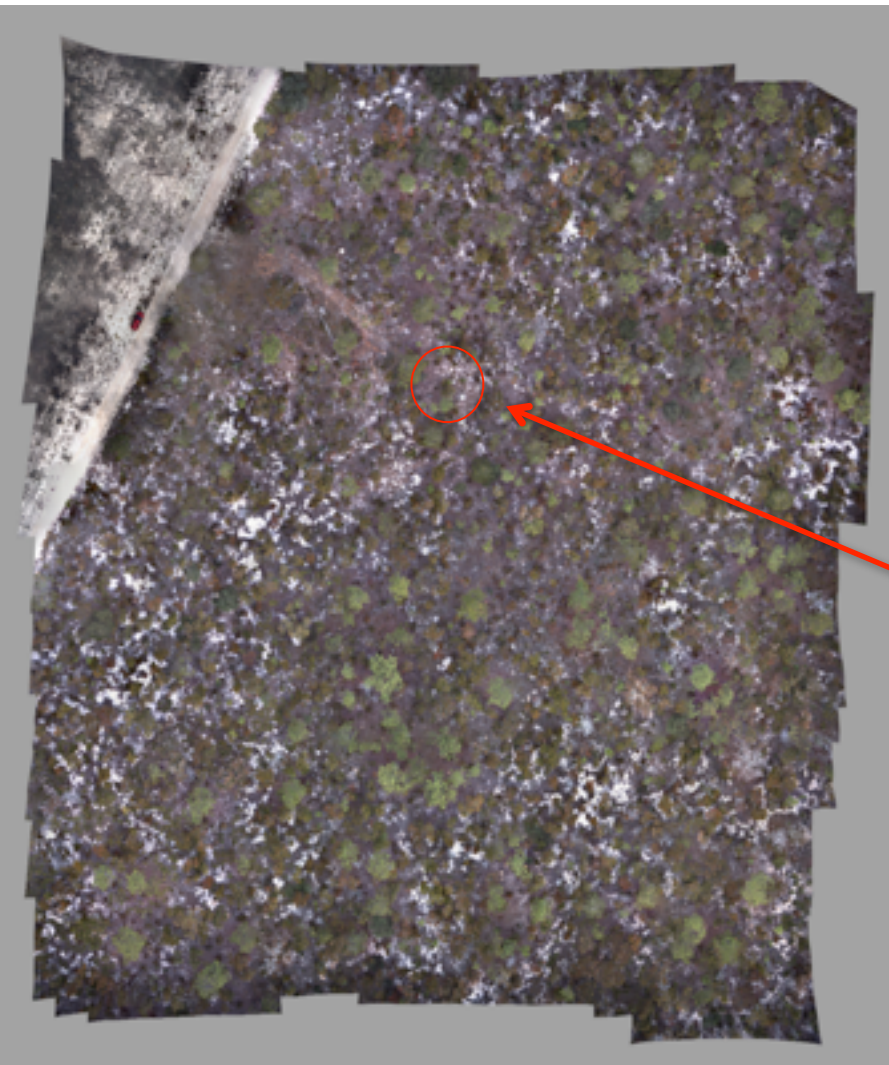
Mapping Missions Summary

Large Grass Fire 2 Highly Instrumented Plot 1 Preburn



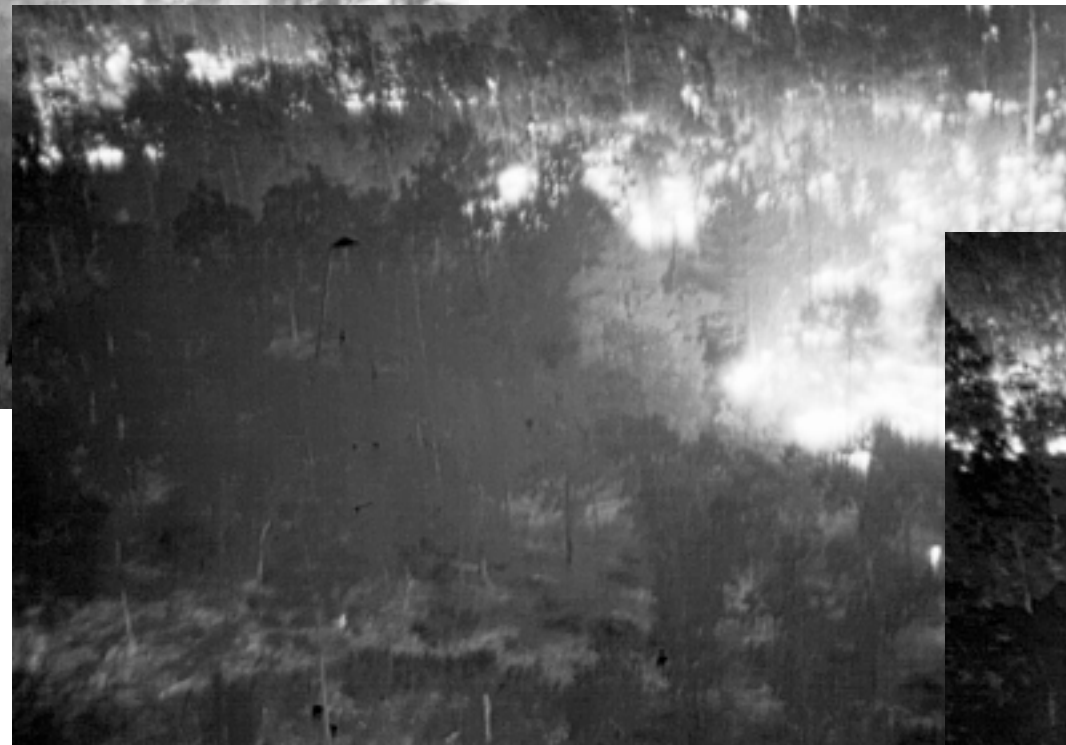
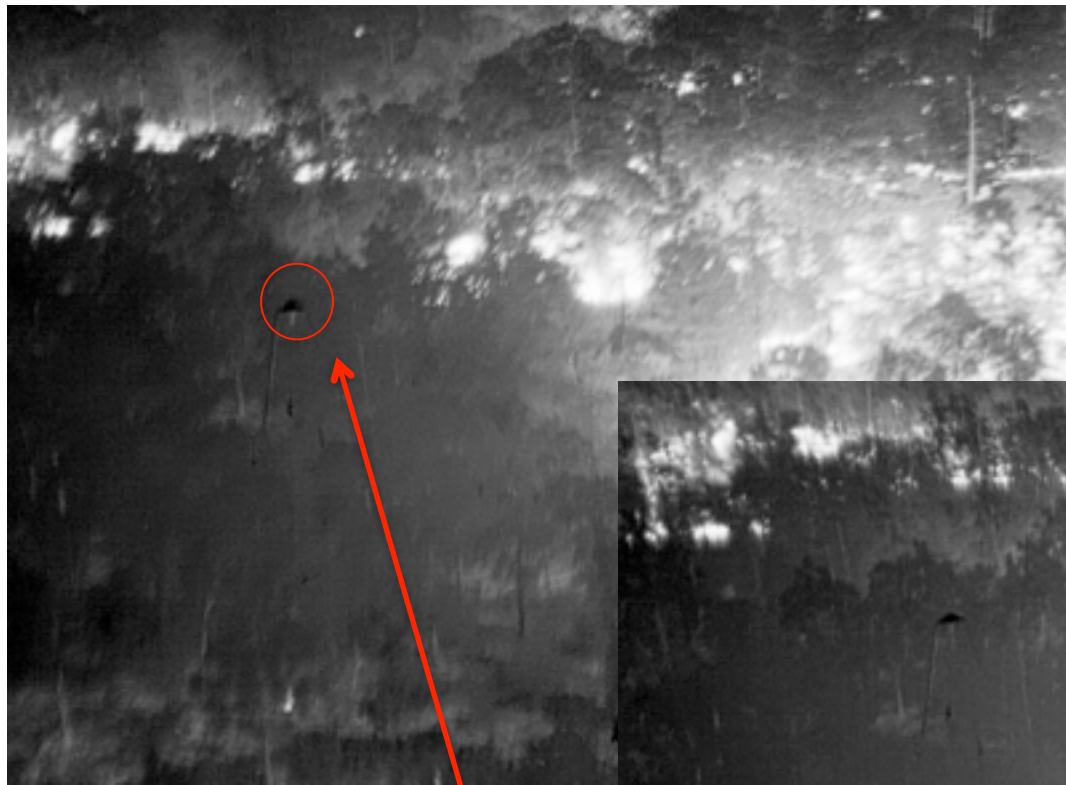
Mapping Missions Summary

Large Forested Fire I Highly Instrumented Plot I



Time Series Burning Photos

Attempted to capture several minutes of LWIR images every 4 seconds from a “fixed” location overlooking the HIP’s burn



HIP I Tower

Collected Data Shortcomings

UAF did not setup visible ground control points to adequately georeference the 3d mosaic images - the results are 3d images that lack “localization” to produce the high resolution accuracy products that were possible.

Many flights lacked adequate overlap of the imagery resulting in inadequate data to mosaic.

When combined the mapping effort that started out as a “lets see what we can do” at the last minute and could have enjoyed better advance planning. Now that the potential is demonstrated such advanced planning is necessary to take this product to the next step.

The time series fire imagery was interesting for observing fire propagation. However, without fixed locations to consistently study or tie the imagery to the earth the value for modeling may be questionable.

Data Availability - Now

All the raw images collected are now color calibrated.

All the mosaic images are generated (three large burns and the few test plots that were flown).

The real-time fire imagery is available in organized date/time folders.

Documentation about what exists is complete.

Barring any specific questions coming from the Raleigh discussions that UAF may be able to answer this data will be provided to Tom Zajkowski (our UAS Point of Contact for Rx-CADRE) for archive and use by any who needs/wants the imagery to better explain what they see in other data sets.