



RSAC Update on NIROPS- Related Activities

NIROPS 2013 Closeout Meeting

November 6, 2013



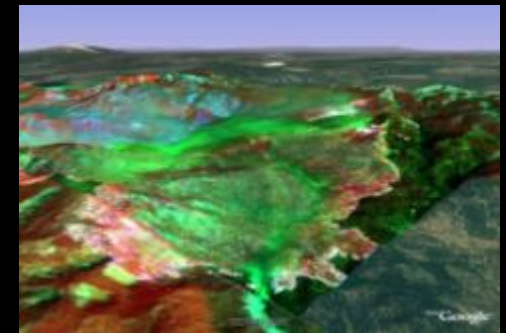
USDA Forest Service, Remote Sensing Applications Center,
FSWeb: <http://fsweb.rsac.fs.fed.us>
WWW: <http://www.fs.fed.us/eng/rsac/>

Presentation Outline

- Current & Future Sensors
 - AMS Transfer and Test Missions
 - WAI Fire Mission Evaluation
- NIROPS Website and Online Ordering
- 2013 Firehawk Support Summary

Autonomous Modular Sensor (AMS)

- Transition from NASA to USFS in March 2013
- Installed in N144Z in March 2013
- Initial test flights late March 2013
 - Northern Utah and Southern Idaho
 - Vineyards flight for Agricultural Research Service (ARS)
- Un-installed from N144Z in May 2013
 - 44Z/Phoenix needed for 2013 operational fire support missions
- NASA support agreement extended through 2015
 - Complete full implementation of the AMS sensor into Forest Service operations



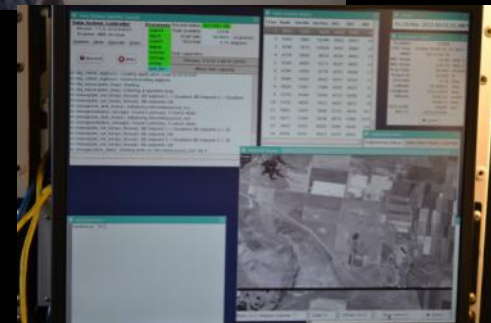
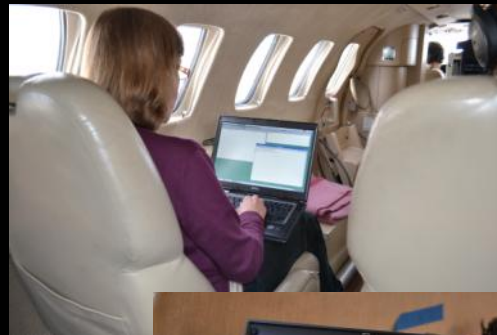
Infrared imagery/fire detection & characterization



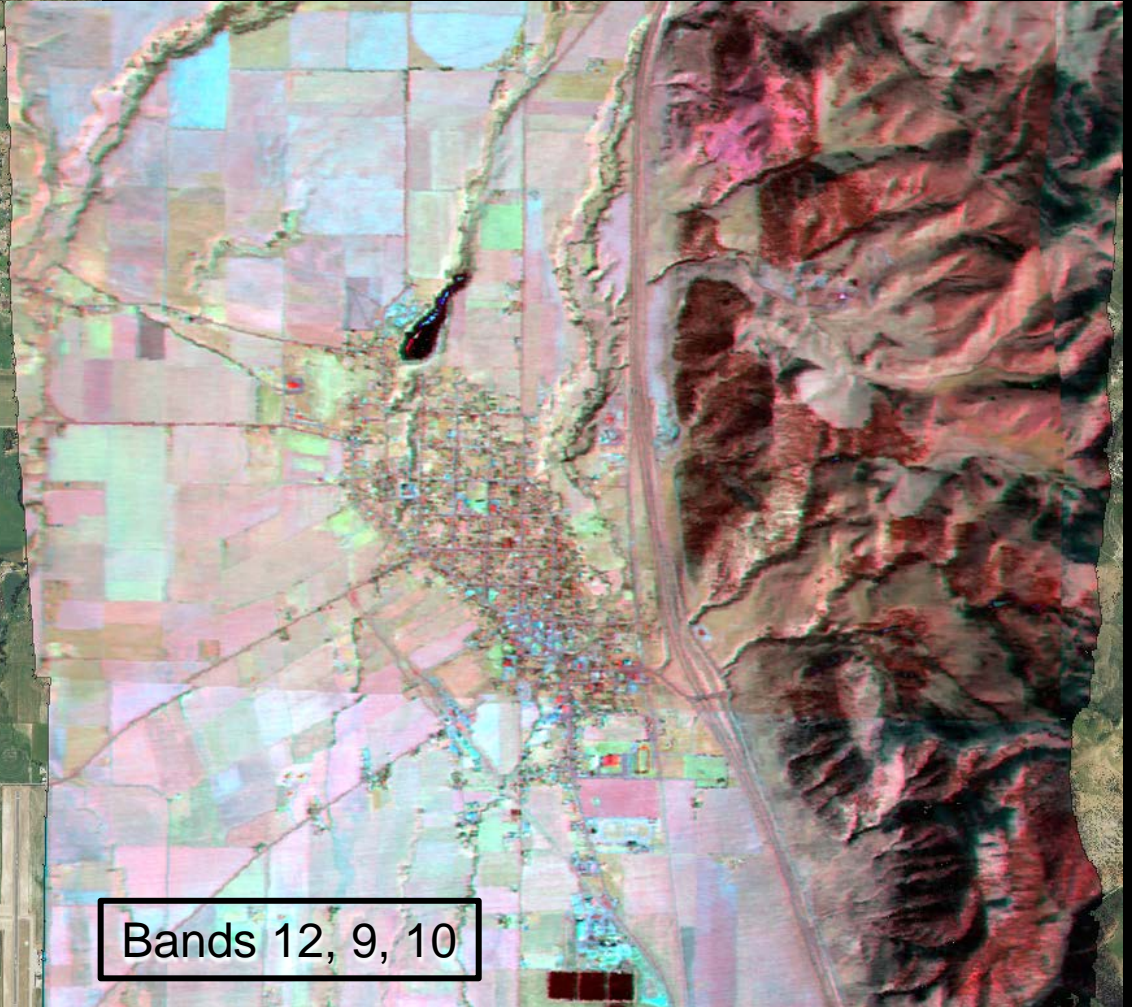
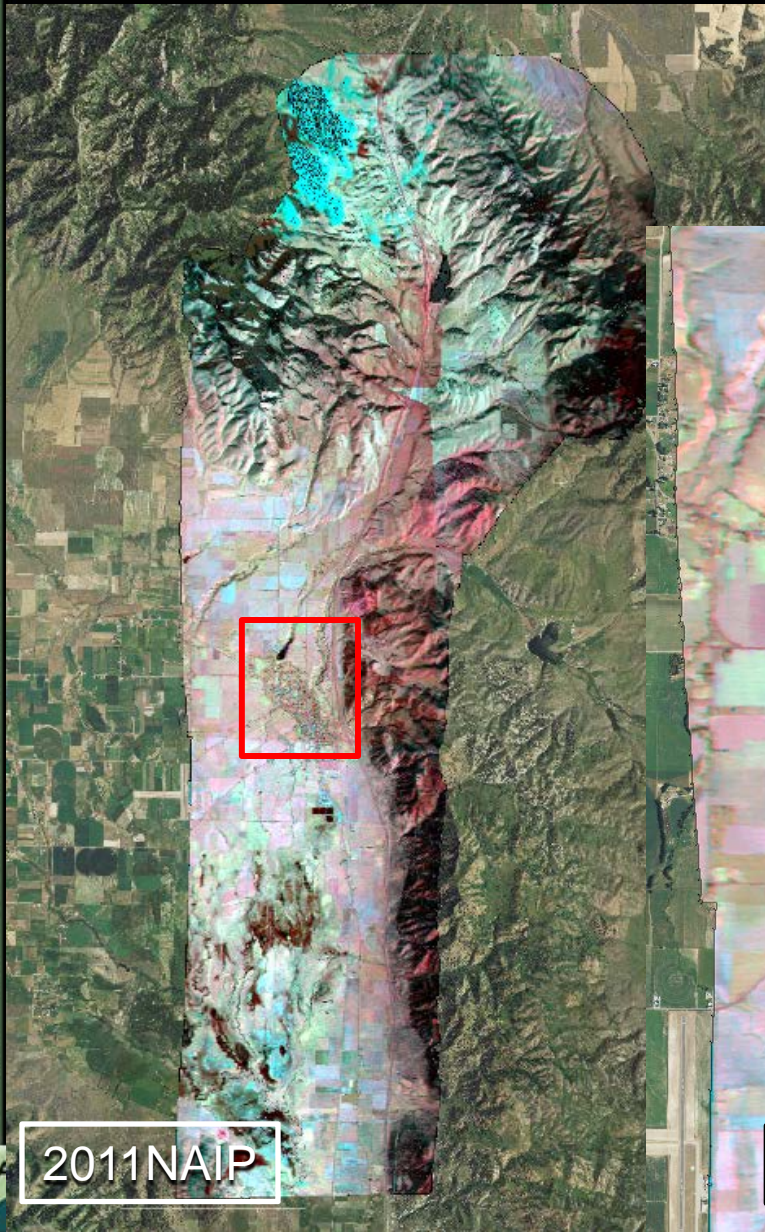
Post-fire assessment imagery

AMS Utah/Idaho Mission

- Initial test flights of AMS in N144Z
- Integration of AMS with Applanix, AirCell
- Technology training and transfer



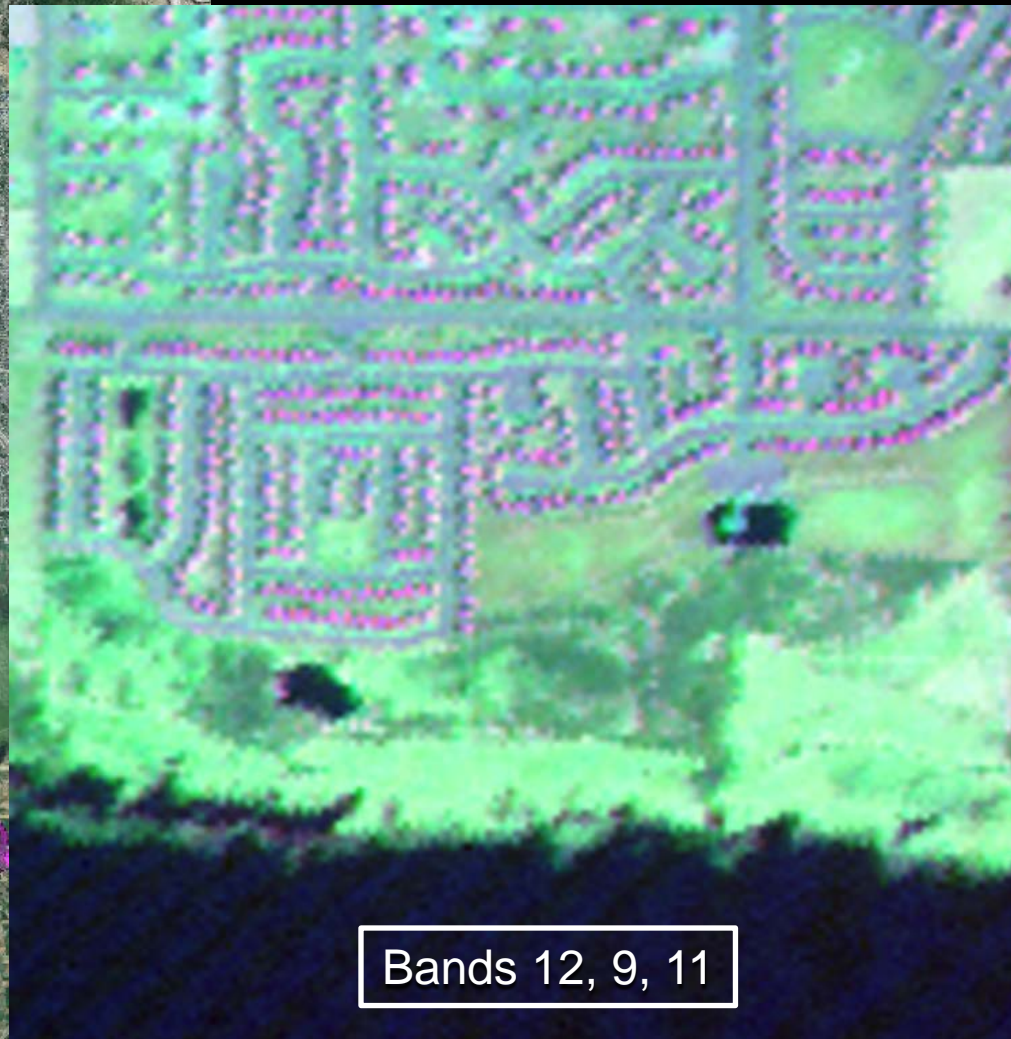
AMS Southern Idaho



AMS Utah Lake



2011 NAIP



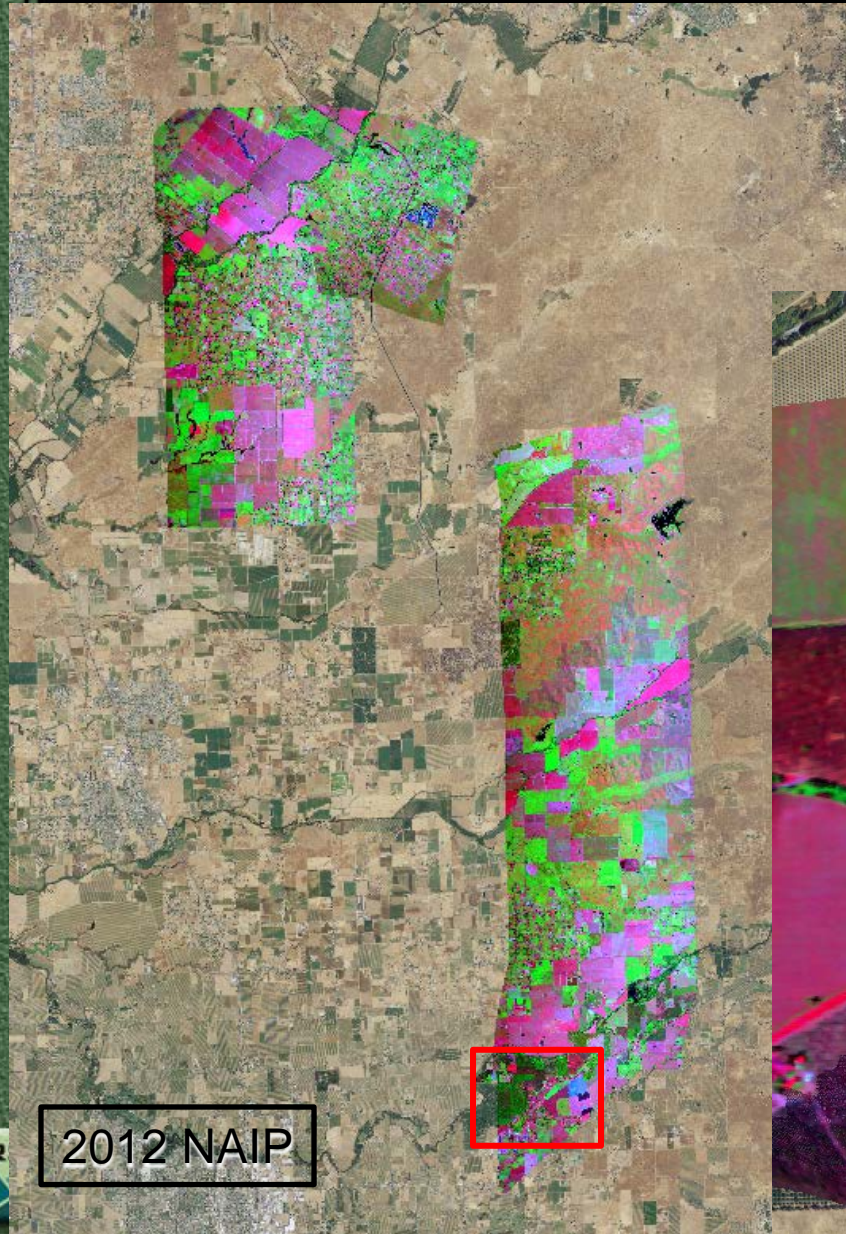
Bands 12, 9, 11

AMS Vineyards Mission

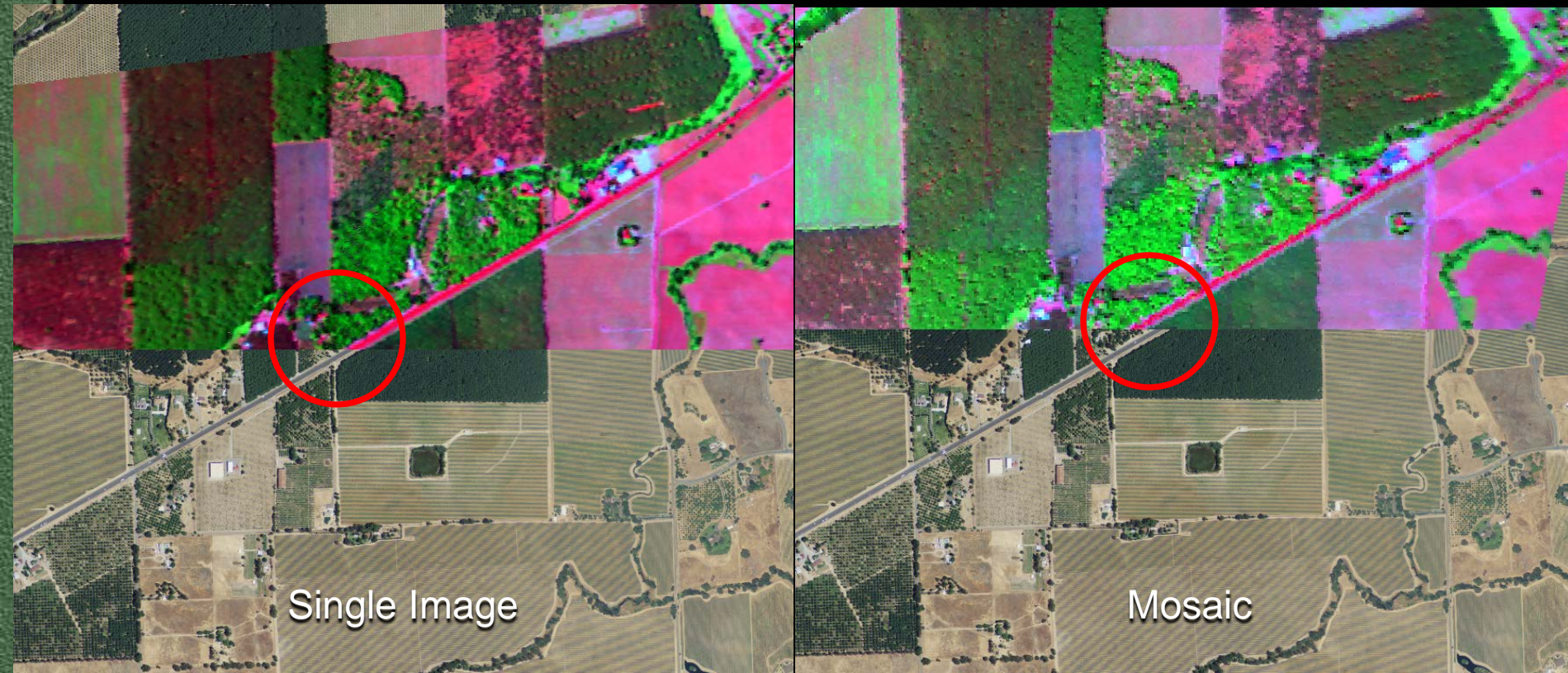
- Acquire vineyard imagery for Agricultural Research Service (ARS) and cooperating vineyards
 - Water use investigation



AMS Vineyards

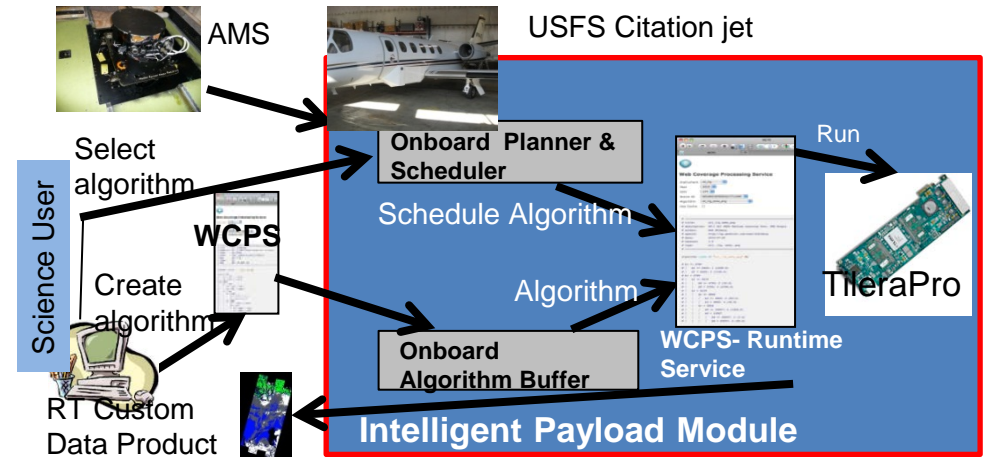


AMS Vineyards

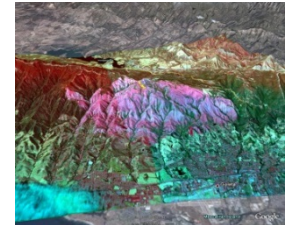


Objective

- Employ Tiera components on airborne sensor missions to ensure operability and enhance the TRL levels for future satellite (HyspIRI) operations via the use of multicore processor technology.
- Demonstrate the end-to-end operations concept for use of the Intelligent Payload Module (IPM) for low latency users of NASA Decadal Survey missions using **airborne** vehicles as initial feasibility testbed platforms:
- Provide delivery of data products in near real-time for quick-looks assessment of processed information from a proven autonomous sensor system



Graphic shows vision to develop & validate the HyspIRI operations concept for the high-speed multicore onboard processor **Intelligent Payload Module (IPM)** using a USFS Citation jet and the NASA AMS sensor system.



Approach

- Integrate IPM testbed into box that can be flown in collaboration with the recently transferred NASA Autonomous Modular Scanner (AMS) sensor onboard a US Forest Service Citation jet, during missions of opportunity over fires in the western US
- Configure the IPM as though it is on a satellite
 - Send real-time processing commands to through IPM, dictating development of AMS sensor Level II products to derive / deliver.

Airborne Mission Test Collaboration

US Forest Service, National Interagency Fire Center - National Infrared Operations (NIFC-NIOPS); NASA-Ames Research Center; CSUMB, UPC

Key Milestones

- Engineering Design Review and A/C Fit-check 11/12
- Initial IPM flight box complete 12/12
- Initial Flight experiment on USFS Ci 13

- WCPS upload, L2 process only, (single processing layer)

AMS Next Steps

- Continue training/technology transfer to the FS for AMS ground station operation and data processing systems
- AMS Technical support
 - Augment/customize the AMS ground station interface and data processing software
 - Refine existing software user interface
 - Band/channel selection; process and status updates
 - Maintain AMS software functionality after FS computer updates
 - Increase data storage and data backup storage
 - Ingest and delivery of near-real time AMS imagery and derived products to CDE and decision support systems



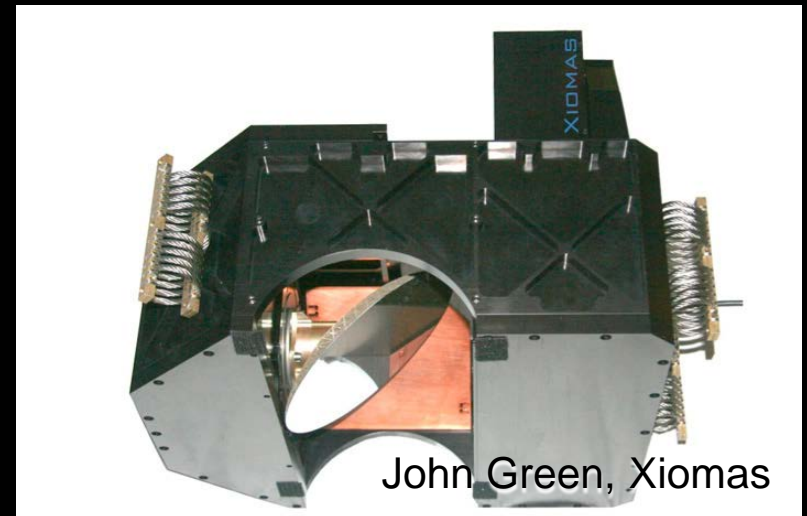
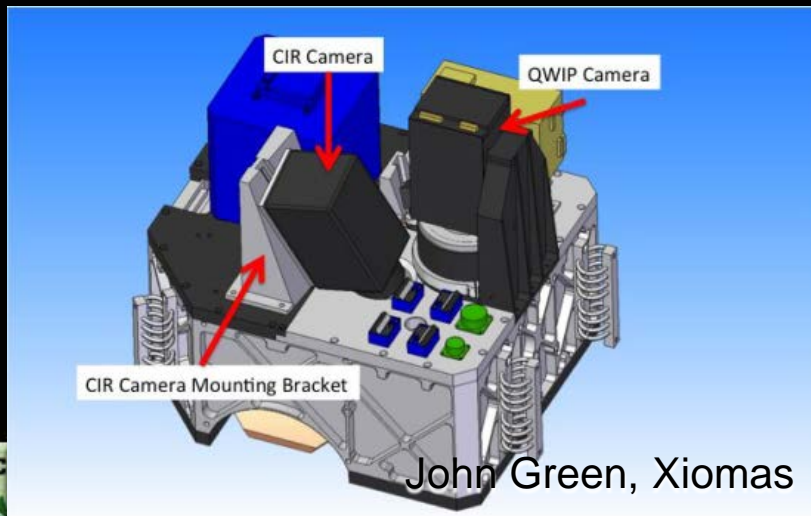
AMS Next Steps

- Technical support con't
 - Integration of AMS with AirCell systems
 - Data delivery; Operation of AMS from the ground
 - Access to Ames Airborne Sensor Facility for semi-annual sensor calibration
 - Consultation and engineering support for long-term AMS maintenance
 - Hardware upgrades; sensor cooling system maintenance
 - Consultation and recommendations for enhancement of AMS sensor technical capabilities



Wide Area Imager (WAI) Evaluation

- 5 band sensor (CIR/TIR)
 - Multi-mission potential for USFS
 - 2-channel thermal sensor using QWIPS
 - CIR digital camera
- Developed by Xiomas under NASA SBIR



WAI Evaluation Mission

- WAI deployed to Boise on Photo Science, Inc. aircraft
- First deployment of WAI for wildfire mapping
- Missions were flown on July 24-July 26
 - Fires northeast and east of Boise
 - Coincident with NIROPS flights of the same fires
- No daytime flights due an issue with the CIR camera



WAI Evaluation Mission

- All missions flown at 17,000 ft. ASL
 - 8,000 to 10,000 ft. AGL over the fires
- Field of View (FOV) set to 45°

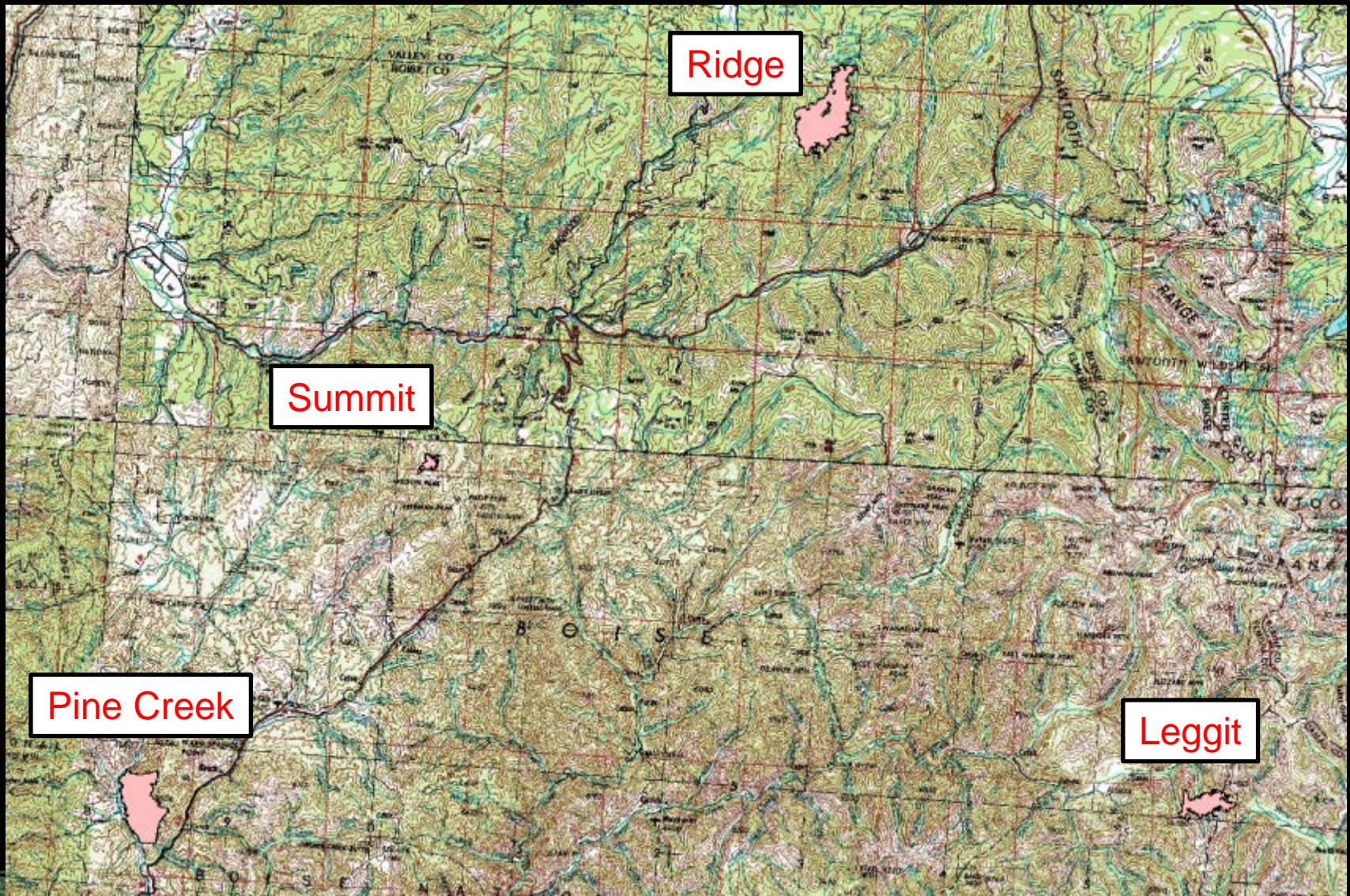


Piper Navajo
John Green, Xiomas

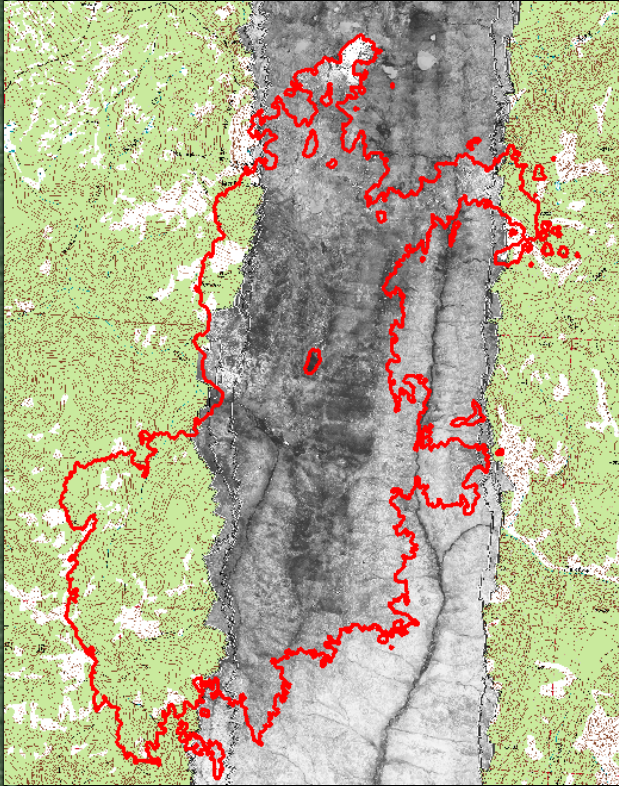


WAI Installation
John Green, Xiomas

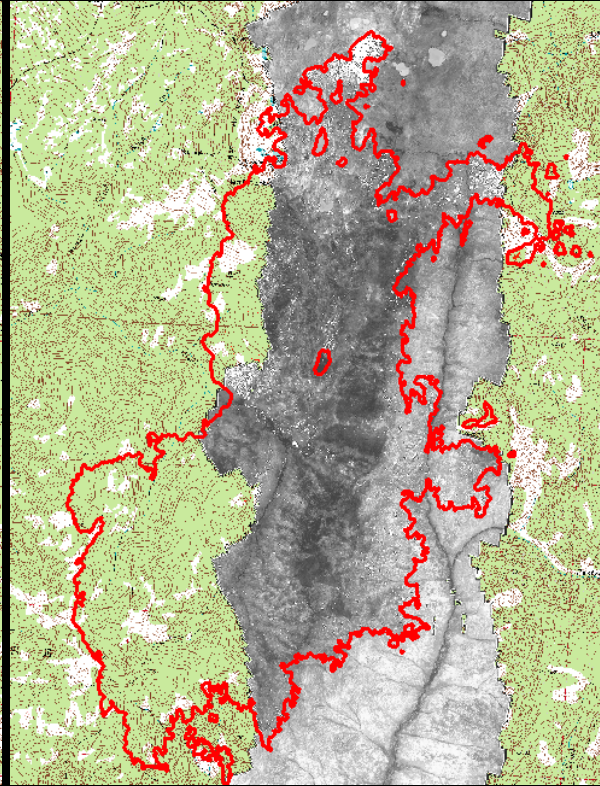
WAI Evaluation Missions



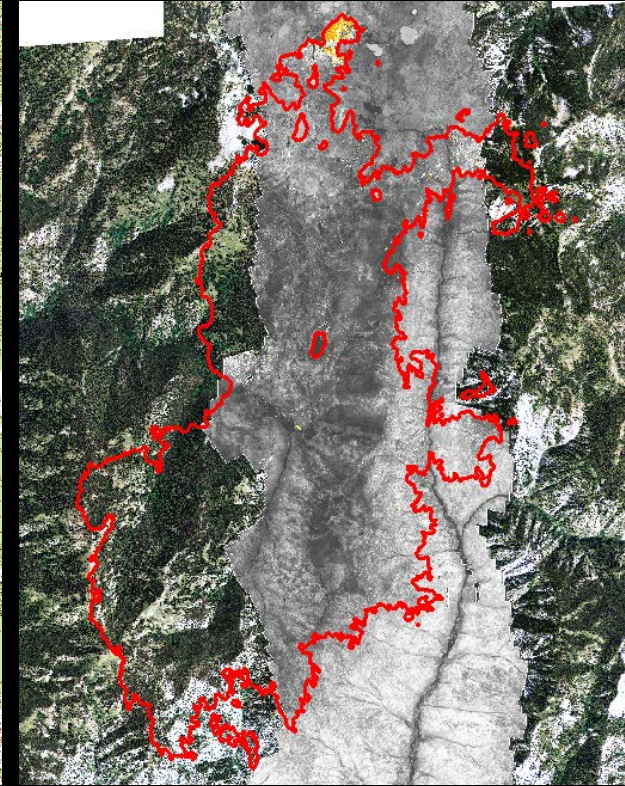
WAI Fire Mission



Long Wave IR

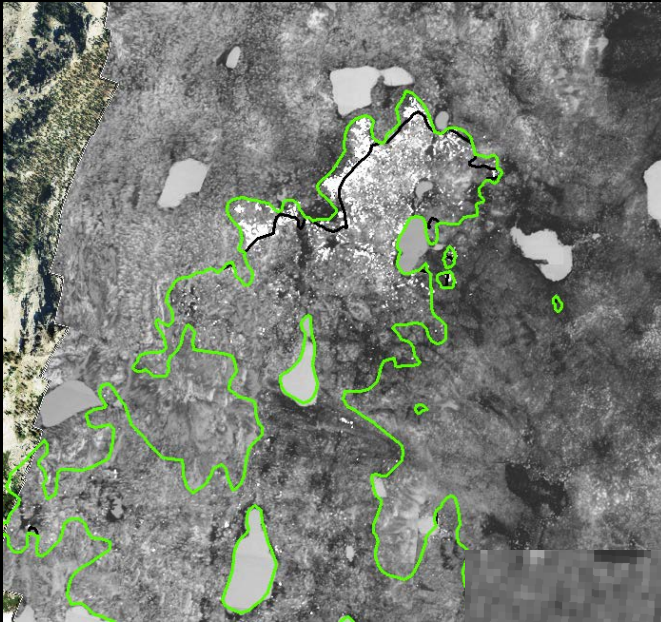


Mid Wave IR

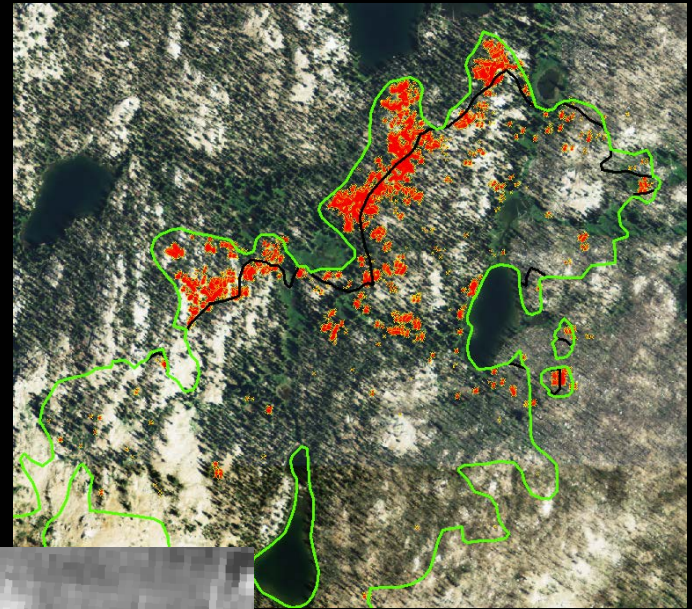


Fire Layer

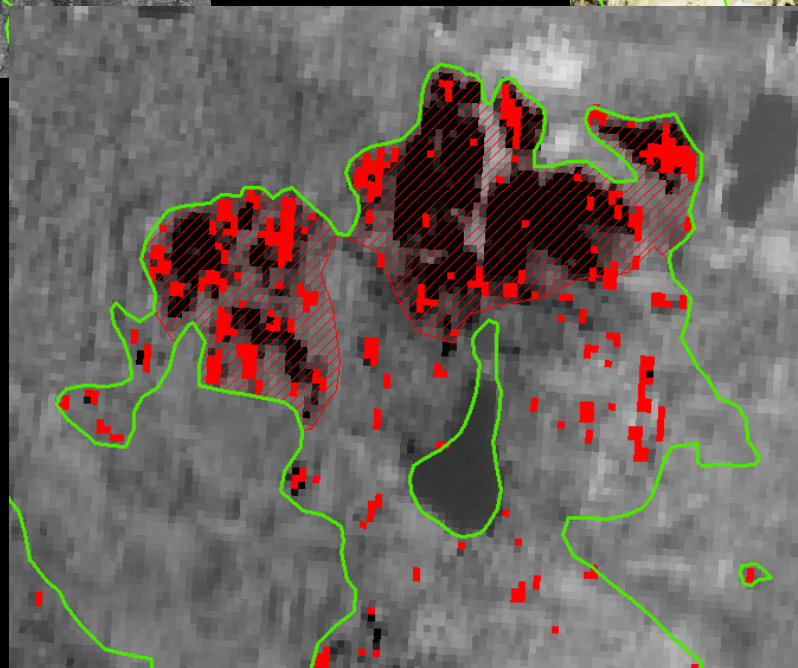
WAI Mission



WAI LWIR
White=Hot



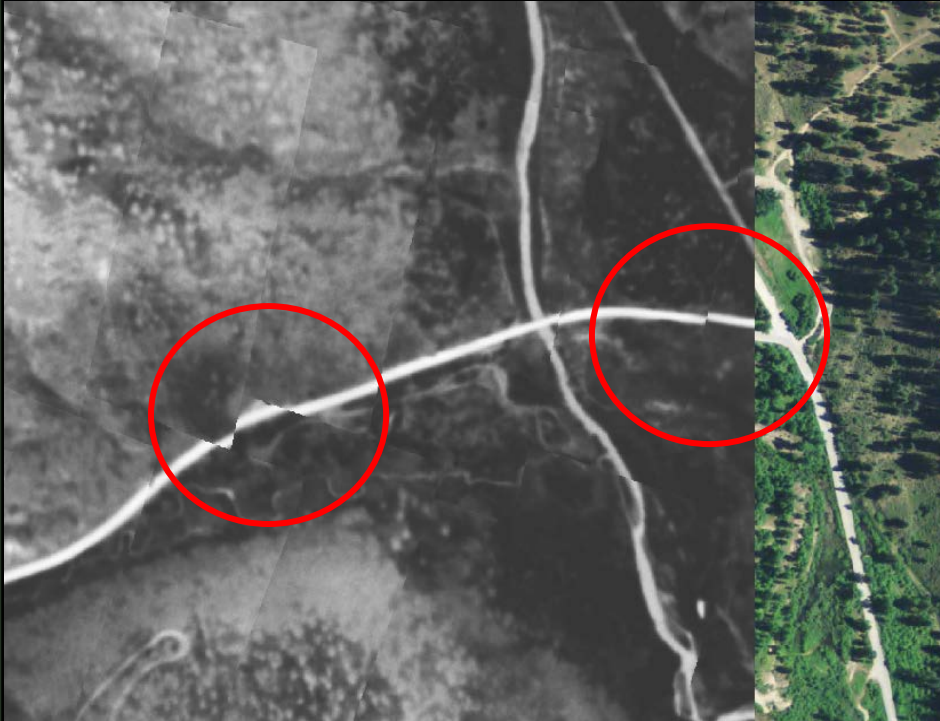
WAI KAB
Heat Layer



Phoenix Imagery
Raw Heat & Interp

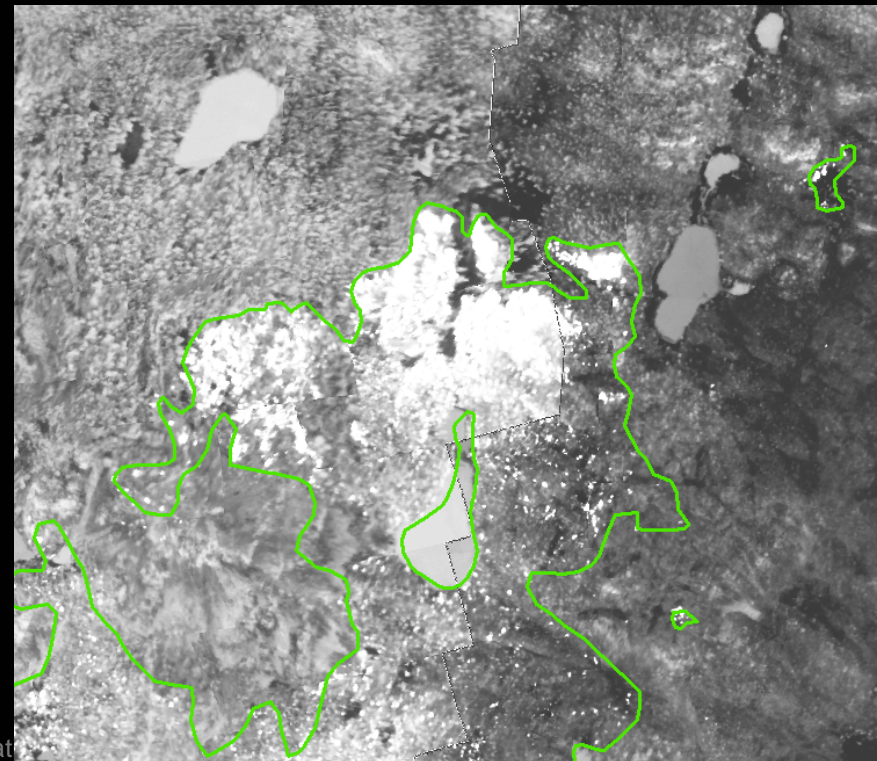


WAI Mission



Frame-to-frame registration
Pine Creek Fire

Duplicate detects
Ridge Fire



WAI Next Steps

- Acquire day time CIR imagery and day time thermal imagery
- Harden the sensor system
 - Upgrade to TMAS data system
 - Improve connectors and cables
 - Improve shielding
- Improve frame to frame registration
- Improve documentation
- Automation of the sensor's operation



N182Z Update

- WO F&AM and Region 8 are working on an agreement to form a working group that would govern the use of N182Z within the agency
- Project proposals for use of N182Z would be submitted to the working group
- When not tasked for project work, N182Z would be used for typical missions, ex. admin flights
- Additional work is still required to formulate a proposal to F&AM utilize N182Z for NIROPS technology evaluation, and operational support when needed.



NIROPS Website 2013

NATIONAL INFRARED OPERATIONS

HOME ABOUT REPORTS IMAGERY LINKS TRAINING IRIN AREA IR SCANNER ORDERS SOCIAL WORKSHOP CLOSEOUTS



Serving the fire management community with Infrared Imagery since 1964.



[Download the NIROPS KML](#)



NIROPS 3833 S Development Ave. Boise, ID 83705



NIROPS Website and IR Ordering Page

- Modifications for 2013 season
 - Auto-generation of user accounts for specific email domains
 - MODIS 0-6 and 0-12 hour detects display in Google Map
 - Re-formatted the PDF output
- Issues during 2013 season
 - The usual assortment of hiccups and broken links
 - “Check box” for scan orders doesn’t always display
 - Average elevation truncates if a comma is entered in the box
- Modifications for 2014 season?
 - Submit your requests ASAP so we can compile and prioritize a list for the programmer

NIROPS Website Usage Summary for 2013

March 1 – October 31

- Items of interest:
 - 21,314 visits to the website; 7,205 unique visitors
 - 274,625 page views
 - 19% of visits were from mobile devices
 - Tablets – 10%
 - Smart Phones – 9%

Year	Visits	Unique Visitors	Page Views	Smart Phone(%)	Tablet(%)
2013	21,314	7,205	274,625	9	10
2012	22,089	8,053	300,319	6	3
2011	18,073	6,829	90,367	3 (mobile)	
2010	10,436	3,052	69,290	1 (mobile)	

NIROPS Brochure

- Minor changes to text and format
- Distributed 167 brochures
 - GACC IR Liaisons
 - CalFire

● CAPABILITIES
National resource dispatches from the National Incident Coordination Center.

Flies multiple fires across multiple geographic areas in same mission.

Covers large fires quickly equating to low cost per acreage.

Detects heat source as little as 6 inches at 10,000 feet above ground.

Timely delivery of interpreted, GIS-ready intelligence.

Continuous technical improvement.

PARTNERS National Interagency Fire Center (NIFC) • U.S. Forest Service – Fire and Aviation Management (FS) • Bureau of Indian Affairs (BIA) • Bureau of Land Management (BLM) • Fish and Wildlife Service – Fire Management (FWS) • National Park Service – Fire and Aviation Management (NPS) • U.S. Geological Survey (USGS) • U.S. Forest Service Remote Sensing Applications Center (RSAC) • National Aeronautics and Space Administration (NASA) • U.S. Army Aviation & Missile Research Development & Engineering Center (AMRDEC)

2010 Schatz Wildlife Photography courtesy of @SchatzPhoto.com (Instagram)
U.S. Forest Service, Southwestern Region, Coconino National Forest NPS
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NIROPS has been flying thermal infrared detection and mapping missions since 1969. These missions provide critical fire intelligence for incident management teams.

● Mission Workflow

- The incident places an Infrared Flight (IR) request through the online scanner order site (nirops.fs.fed.us).
- An A-number is generated with the local dispatch unit; incident orders an Infrared Interpreter (IRIN, O-number).
- One of the planes flies the fire and delivers the imagery to the IRIN.
- The IRIN interprets the imagery and delivers maps, logs, and GIS-ready files to the incident. These products are suitable for numerous uses at the incident.

● Coverage and Features

Each NIROPS aircraft is able to cover numerous fires, often in several states, during each mission enabling shared costs of the asset. During high levels of fire activity these planes can cover 30 incidents or more each night.

Both aircraft are equipped with Phoenix Imaging Systems as well as AirCell telecommunications equipment.

● System Features

- 2 Thermal Bands (3-5µm and 8-12µm).
- 120° Field of view.
- 2 thermal bands distinguish fire from hot background objects.
- 6 mile swath width at 10,000 feet.
- Ortho-rectification with GPS, IMU, DEMs.
- Capable of capturing 185,000 acres per hour.

The program is made up of three overlapping resources:

● OPERATIONS

Scanners and technicians are based at the National Interagency Fire Center (NIFC) in Boise, ID. Aircraft and pilots based at the US Forest Service Intermountain Region, as well as a nationwide network of IRINs from many Federal, State, and local agencies.

● TECHNICAL SUPPORT

Research and development is provided by the US Forest Service Remote Sensing Applications Center, NASA, and private industry. Program oversight, Geographic Area Liaisons, and training cadre come from the pool of IRINs.

● COORDINATION

Facilitated by the Aircraft Desk at the National Incident Coordination Center (NICC) at NIFC. During high levels of fire activity, regional and national infrared coordinators are utilized. NICC and NIROPS coordinate the use of private vendors and other resources to supplement the high demand for thermal intelligence during these periods.



NIROPS KMZ Tool



- Redesigned as a stand alone executable
- More latitude for shapefile names
- Compatible with Arc 10.0 and 10.1

NIROPS KML Tool Build 49

Heat Perimeter

Intense Heat

Scattered Heat

Isolated Heat

KMZ

Incident Timezone

Create KMZ Close

Firehawk 2013 Summary

- Incident support started on Jun 21
 - Carstens Fire, CA SouthOps
- The majority of support requests were from the Alaska GACC
- Incident support ended on August 21
 - Alaska fires

Firehawk 2013 GACC Support

Lodgepole
Papoose
Thunder City

California Point
Gold Pan Complex
Moose Meadow



Aspen
Carstens

Birch Creek
Mississippi
Moon Lake Complex
Stuart Creek #2
Tetlin Ridge Junction

Firehawk 2013 GACC Support

Geographic Area	No. of Fires	No. of Support Requests	UTF-Weather	UTF-Tech. Issue	Acres
AK	9	57	9	10	276,572
EGB	7	3	0	1	31,026
NOPS	0	0	0	0	0
NR	3	3	0	2	17,138
NW	0	0	0	0	0
RM	0	0	0	0	0
SOPS	2	3	0	1	16,030
SW	0	0	0	0	0
TOTAL	21	66	9	14	340,766

(Through October 31, 2013)

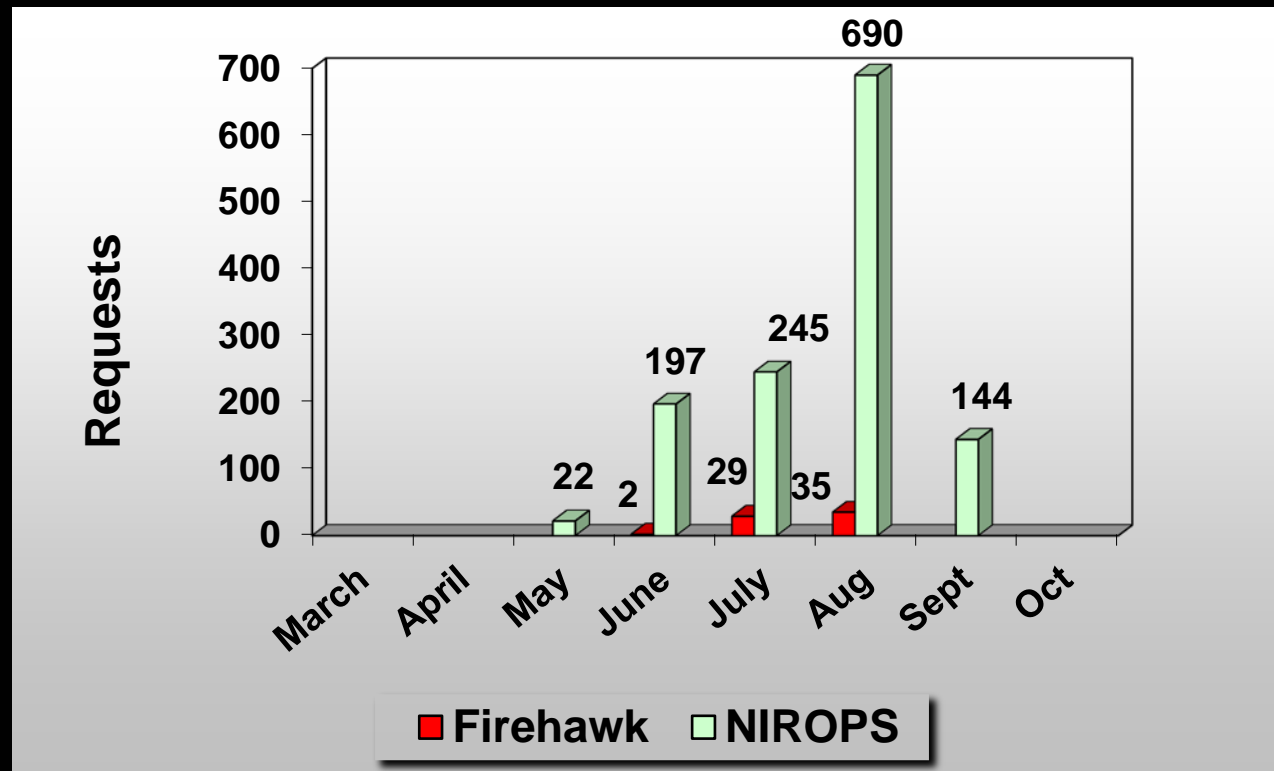
Firehawk 2013 Incident Support

Incident	No. of Fires	Geographic Area	No. of Support Requests	UTF-Weather	UTF-Tech. Issue	Acres ¹
Aspen	1	SOPS	1		1	14,322
Birch Creek	1	AK	2	1		24,923
California Point	2	NR	1			5,138
Carstens	1	SOPS	2			1,708
Gold Pan Complex	3	NR	1		1	9,000
Lodgepole	1	EGB	1		1	20,132
Mississippi	1	AK	11	2	6	67,288
Moon Lake Complex	5	AK	30	3	5	76,548
Moose Meadow	1	NR	1		1	3,000
Papoose	1	EGB	1			9,439
Stuart Creek #2	1	AK	13	3	3	87,064
Tetlin Ridge Junction	1	AK	1	1		20,749
Thunder City	2	EGB	1			1,455
TOTAL	21		66	9	14	340,766

Reported acres are from the last night of Firehawk support, which may not match the final reported acreage for the incident.



Firehawk 2013 Support to NIROPS



Apr: n/a
May: n/a
Jun: 1%
Jul: 12 %
Aug: 5 %
Sep: n/a
Oct: n/a

Through October 31, 2013

5% of the support requests in 2013 were assigned to Firehawk



Thanks

Comments/Questions?



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WWW: <http://www.fs.fed.us/eng/rsac/>