



# RSAC Update on NIROPS- Related Activities

## NIROPS 2012 Closeout Meeting

November 7, 2012



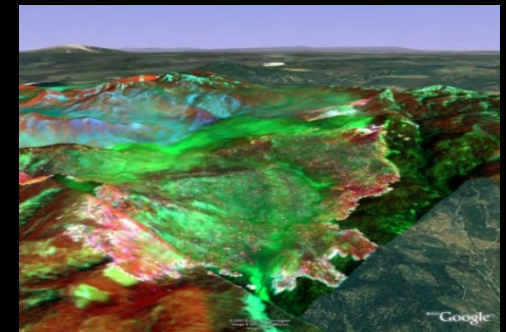
USDA Forest Service, Remote Sensing Applications Center,  
FSWeb: <http://fsweb.rsac.fs.fed.us>  
WWW: <http://www.fs.fed.us/eng/rsac/>

# Presentation Outline

- Sensor Status Update
  - AMS
  - WAI
- NIROPS Website
- 2012 Firehawk Support Summary
- Active Fire Mapping Program Update
  - VIIRS
  - R&D

# Autonomous Modular Sensor (AMS)

- 16 band sensor (VIS/NIR/SWIR/IR)
  - Multi-mission potential for USFS
- Transition from NASA to USFS ongoing
  - Interagency agreement signed
- Fit checks on 144Z conducted Sept 2012
- NASA Ames/NIROPS technical meeting Nov 2012
  - Installation details
  - Flight test planning
- Availability of AMS to USFS in early CY2013
  - Transfer delay requested to support NASA mission in Jan 2013
  - Testing & implementation spring/summer 2013



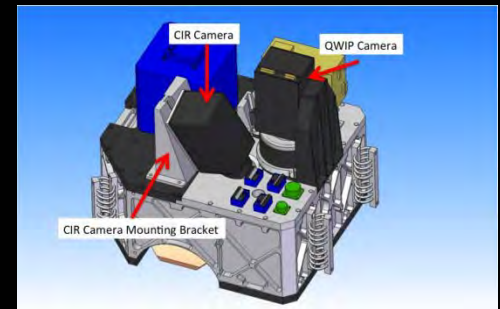
**Infrared imagery/fire detection & characterization**



**Post-fire assessment imagery**

# Wide Area Imager (WAI)

- 5 band sensor (VIS/NIR/TIR)
  - Multi-mission potential for USFS
- Developed by Xiomas under NASA SBIR
  - Currently in SBIR Phase 3
- FS contract let for WAI demo/eval mission
  - Fall 2012/Summer 2013 over western U.S. fires
  - 3 day mission
  - One 4 hour operational period per day
  - WAI installation/testing on aircraft ongoing
  - Costs split 50/50 between NIICD and RSAC
- Project aviation safety plan reviewed by R4 RAO/RASM



**WAI MWIR imagery**



**WAI MWIR imagery w/heat sources**



# NIROPS Website 2012

**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 2012 season
  - Forgotten password link on Login page
  - Additional ways to review scan box coordinates and info
  - Clean up of PDF legacy issues
- Issues during 2012 season
  - Email notification for new and updated orders did not work initially
  - Forgotten password link was erratic initially
  - The usual assortment of broken links and hiccups
- Modifications for 2013 season?
  - Submit your requests ASAP so we can compile a list for the programmer

# NIROPS Website

**NATIONAL INFRARED OPERATIONS**

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NIROPS 3833

**NATIONAL INFRARED OPERATIONS**

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**Username or password is incorrect**

Username

Password

[Sign up for an account](#) [Forgot username / password](#)



[How To Order IR](#)

[How much is this IR flight going to cost?](#)

[What IR products will I receive?](#)

[NIROPS KML](#)

**National IR Program Manager**  
Tom Mellin  
Office: 505-842-3845  
Cell: 505-301-8167

USDA   

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# IR Online Ordering Webpage

**NATIONAL INFRARED OPERATIONS**  
CARE, ADVICE, SUPPORT, TRAINING, EQUIPMENT, IR SCANNER OPERATORS, INITIAL RESPONSE, CONSULTANTS  
REQUESTS: DUE TO PROFILE, ADVISE

**NIROPS Online IR Scanner Request Form**  
- Request Fields -

**Request Properties**  
Incident Number \* ON OVS-13-2005 Incident Name \* TEST TEST SMOKESTAG  
Project Number \* 090500090 A Number 007  
Override Number 0001  
Created 2012-03-20 11:17:34  
Created By jeh

**Incident Information**  
GACC (Eastern Area GACC) ☒  
Ordering Unit 1 cadde  
Ordering Unit Phone 3750988098  
Local Dispatch cadde  
Local Dispatch Phone 3577878989  
SITL green  
SITL Phone 35098899  
Average Incident Elevation 100 (feet)  
Approximate Fire Size 2000 (acres)

**Regional IR**  
GACC IR Liaison for incident (or Regional Coordinator if assigned) ☒  
East: Liz Mitchell  
Phone 888-739-4726 x3027  
Email lizmitch@irs.fed.us  
Cell 505-301-5167

**National IR**  
Tom Melin  
National IR Program Manager  
Phone 505-642-3845  
Email tomelin@irs.fed.us  
Cell 505-301-5167  
National IR Coordinator  
Tom Melin  
Phone 505-642-3845  
Email tomelin@irs.fed.us  
Cell 505-301-5167

**IR Interpreter**  
IR Interpreter TBA  
Phone 3750988098  
Email jeh@irs.fed.us  
Cell 324452676  
IR Interpreter Location remote

**Delivery Information**  
Requested flight time (local at incident) 2200  
IR Deliverables location

**Scan Box Information**  
NOTE: Multiple scan boxes are accepted  
Add Manually Add by Google Maps

**Scanbox 3 Edit Manually Edit Google Maps Delete**

Map data ©2012 Google

**Comments**  
User Comments  
Admin Comments

Update existing request Submit as new flight request

NIROPS 3833 S Development Ave. Boise, ID 83705

**Scan Box Information**  
NOTE: Multiple scan boxes are accepted  
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Map data ©2012 Google

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**NEW:** After Saving your scan box(s) form now displays a preview of what was entered

Preview displays for both Manual Entry or Google Map Entry of coordinates



# IR Online Ordering Webpage


**NATIONAL INFRARED OPERATIONS**




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

REQUESTS QUEUE PROFILE LOGOUT

[Show Archived](#)


Incident Name (number)	Request Date	Status	Options
TEST TEST SMOKESTACK	2012-03-20 11:17:34	Assigned to: Aircraft 3	<a href="#">options</a> <a href="#">edit</a>
Mellin	2012-01-09 13:56:01	Completed by Citation 144Z	<a href="#">options</a> <a href="#">edit</a>
JUNEBERRY 3	2011-10-10 08:50:03	Awaiting Approval	<a href="#">options</a> <a href="#">edit</a>

 OUTPUT PDF

USDA    NIROPS 3833 S Development Ave. Boise, ID 83705

- Generate a PDF of your order from the Queue to check scan box coordinates and other information

1 of 1



NIROPS Online Scanner Request Form

Incident #: OK-OKS-12-20058 Project #: 0688880980 Override #: 0001 A #: 007  
 Date: 2012-03-20 11:17:34

Incident Information

Submitted by: janj

Incident Name: TEST TEST SMOKESTACK  
 Average Incident Elevation: 500 (feet)  
 Approximate Fire Size: 2500 (acres)  
 Order Unit Phone Number: 9730888088  
 Ordering Unit: cedar

Local Dispatch Phone: 9877870888  
 Local Dispatch: cedar

SITL Phone Number: 88888808  
 SITL Name and Location: green

GACC IR Liason: East: Liz McNichols  
 GACC IR Liason Phone: 888-728-2028 x3027  
 GACC IR Liason Cell: 8888888088

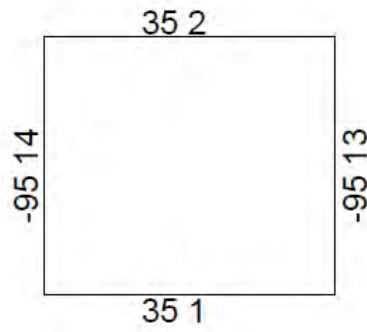
National IR Coordinator: Tom Mellin  
 National IR Coordinator Phone: 505-842-3845  
 National IR Coordinator Cell: 505-301-8167

IR Interpreter: TBA  
 IR Interpreter Phone Number: 878879087908  
 IR Interpreter Location: remote  
 Cell Number: 225452878

Delivery Information

Delivery Location: .  
 Requested Flight Time (local time to incident): 2200

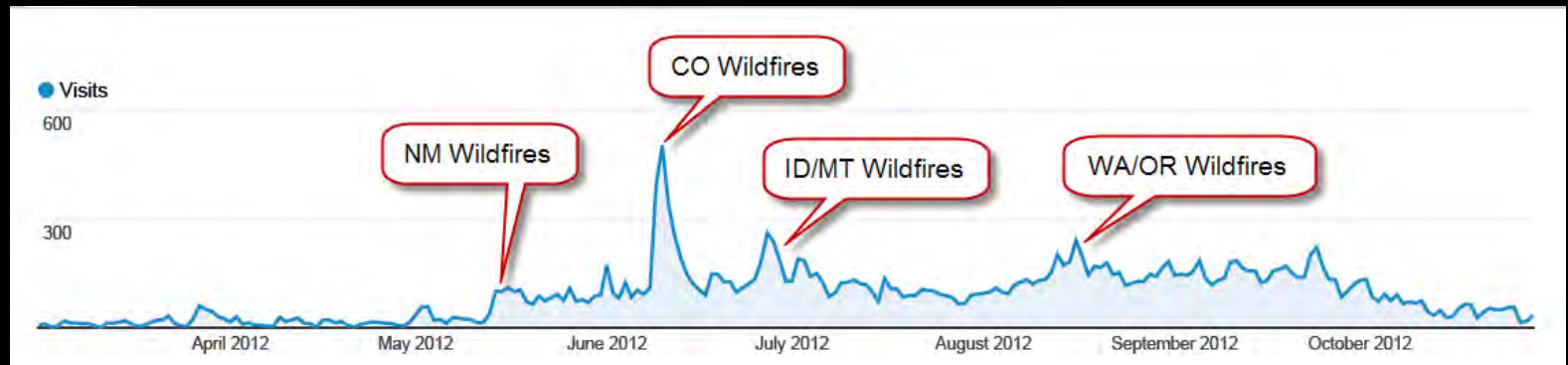
North (DMS): D: 35 M: 2, East (DMS): D: -95 M: 13  
 South (DMS): D: 35 M: 1, West (DMS): D: -95 M: 14  
 NE/SE to NW/SW (longitude): 1 NM  
 NE/NW to SE/SW (latitude): 1 NM  
 Comments: .  
 Admin Comments: .



**NEW: Simple graphic of scan box on PDF**


# NIROPS Website Usage Summary for 2012

March 1 – October 30, 2012



- Items of interest:
  - 22,051 visits to the website; 8,039 unique visitors
  - 299, 976 page views; Request Queue was 69.7% of views
  - 8% of visits were from mobile platforms (tablets, smartphones)

# NIROPS Brochure 2012 Edition



**❖ 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 Emergency Fire Center (NIFC) • U.S. Forest Service • Fire and Aviation Management (FAM) • Bureau of Indian Affairs (BIA) • Bureau of Land Management (BLM) • Fish and Wildlife Service • Fire Management (FMS) • National Park Service • Fire and Aviation Management (FAM) • 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 Schultz Wildlife Photography courtesy of wildlifeinfo.com (front left)  
U.S. Forest Service, Southwestern Region, Coconino National Forest NPS  
© Printed on Recycled Paper




**NIROPS**  
NATIONAL INFRARED OPERATIONS

**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](http://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.

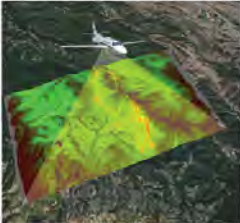
**❖ Coverage and Features**  
Each NIROPS aircraft is able to cover numerous fires, often in several states, during each mission enabling shared costs of the asset. During high levels of fire activity these planes can cover 30 incidents or more each night.




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.

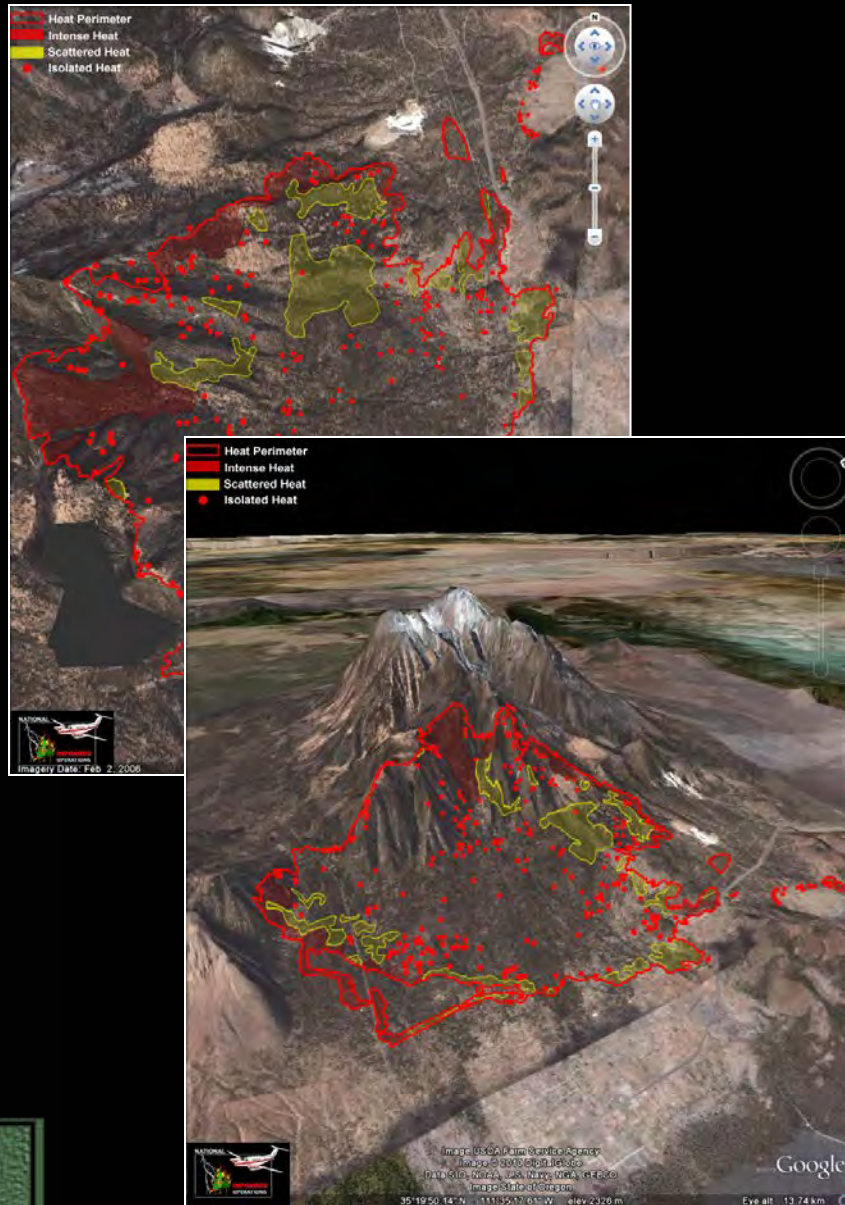
**❖ TECHNICAL SUPPORT**  
Research and development is provided by the US Forest Service Remote Sensing Applications Center, NASA, and private industry. Program oversight, Geographic Area Liaisons, and training cadre come from the pool of IRINs.

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

- Minors changes to text and format from 2011 brochure
- Sent out 440 brochures this spring
  - GACC IR Liaisons



# NIROPS KMZ Tool

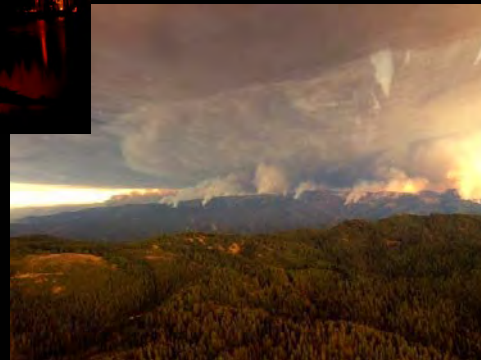


- Python scripts for both Arc 9x and Arc 10x
- “Vanishing Isolated Heat Source”
  - Occurred with Arc 10x version
  - Isolated would disappear when zooming in Google Earth
  - Python scripts modified to “force” isolated to maintain size regardless of scale

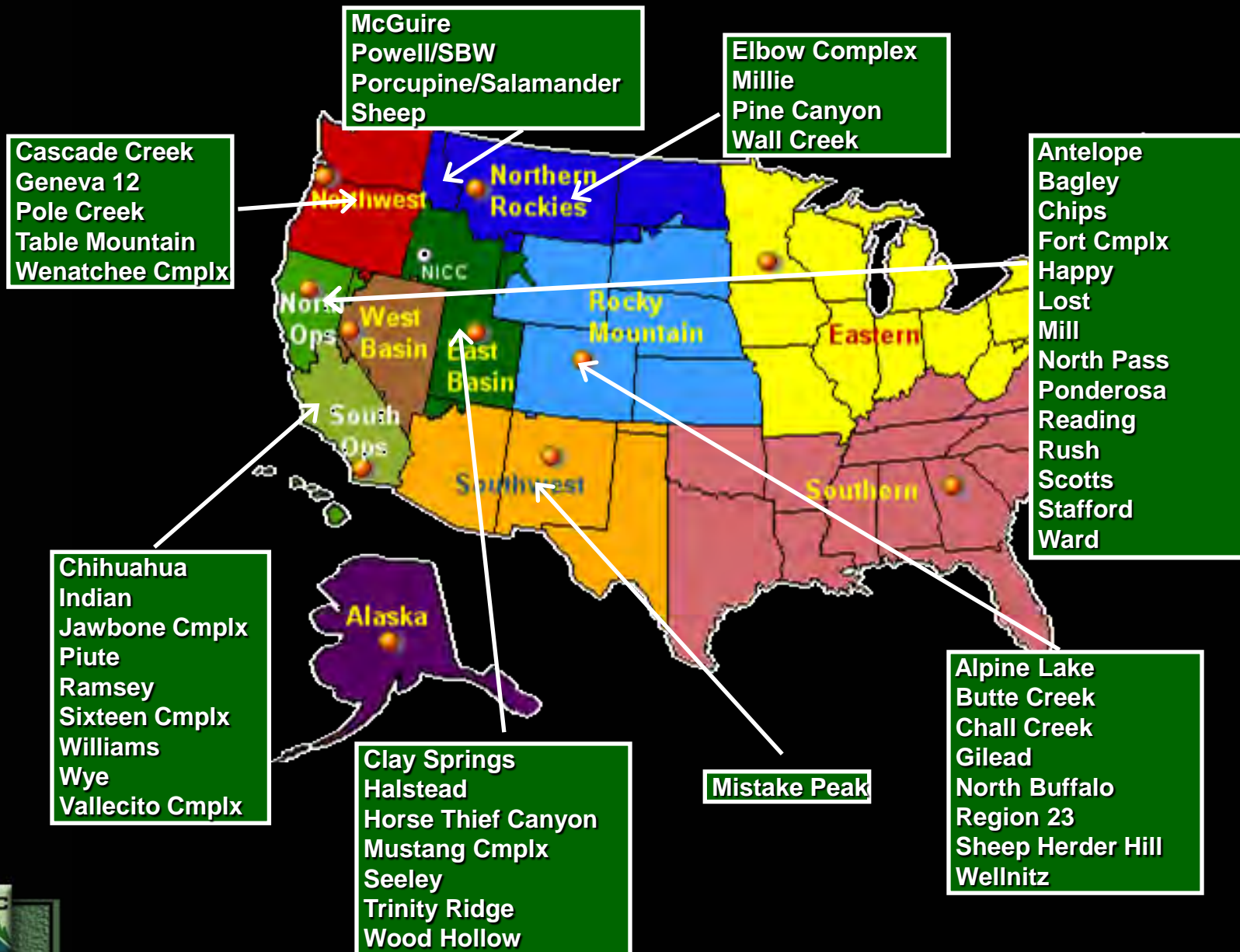


# Firehawk 2012 Summary

- Incident support started on July 1
  - Utah fires
- Incident support ended on October 8
  - Washington and Idaho fires
- Continuous from August 9



# Firehawk 2012 GACC Support



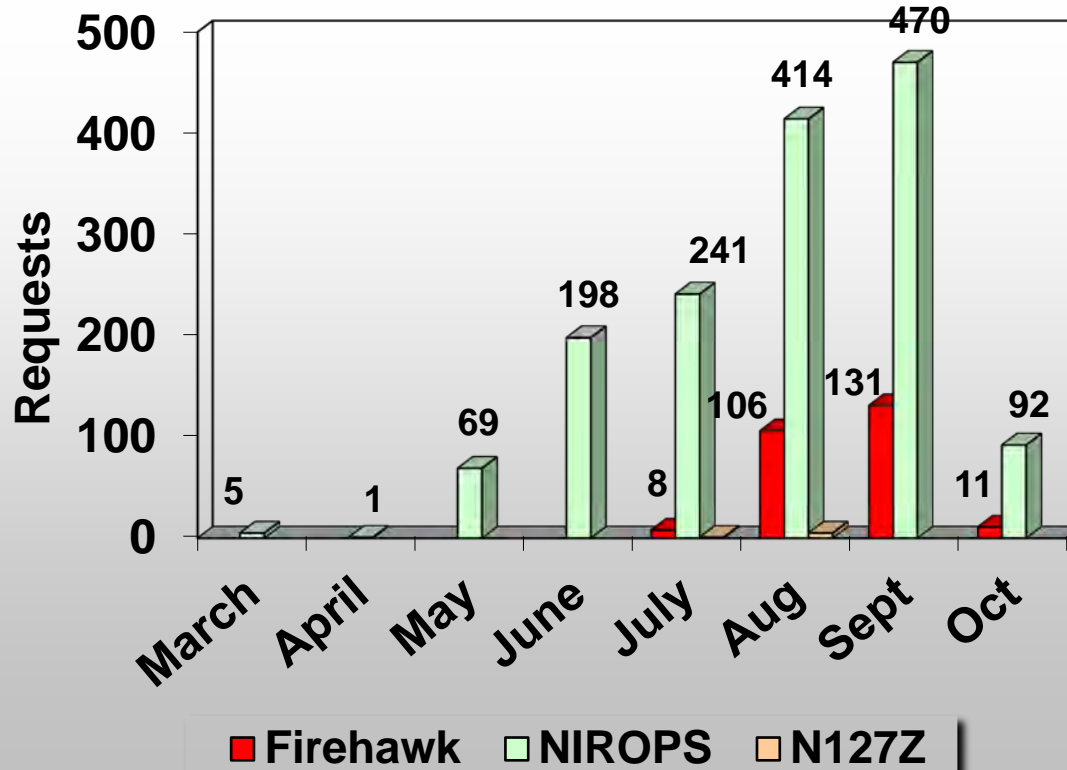
# Firehawk 2012 GACC Support

GACC	No. of Fires	No. Days Support	UTF-Weather	UTF-Tech. Issue	Acres
EGB	8	19		11	901,373
NOPS	19	138		7	656,134
NR	16	25		15	250,502
NW	13	27		7	147,218
RM	8	31	3	10	235,491
SOPS	15	28			58,180
SW	1	2	2		5,220
Total	80	270	5	50	2,254,118

(Through October 30, 2012)



# Firehawk and NIROPS 2012 Support



Apr: n/a  
May: n/a  
Jun: n/a  
Jul: 3 %  
Aug: 25 %  
Sep: 28 %  
Oct: 12 %

Through October 30, 2012

17 % of the support requests in 2012 were assigned to Firehawk



# Forest Service Active Fire Mapping (AFM) Program

## Currently Leveraged Satellite Sensor Assets w/Thermal Capabilities

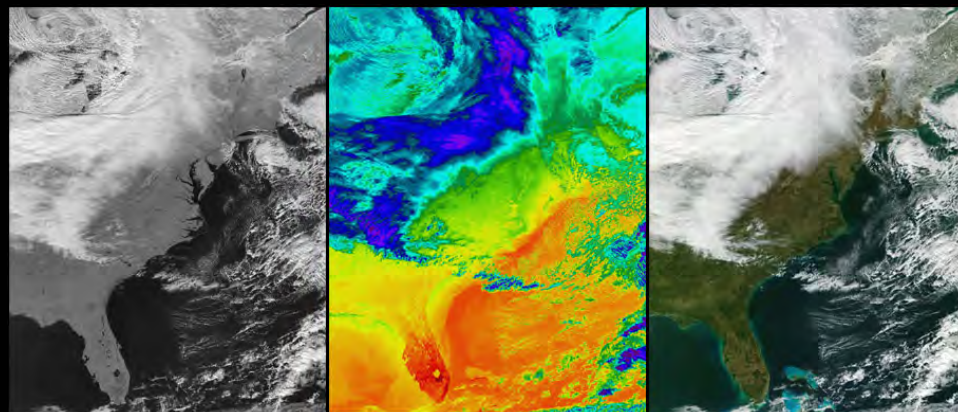
Sensor	Platform Type	Spatial Resolution (Reflectance/TIR Bands)	Temporal Resolution (per instrument)	Fire Algorithm	Data Source
MODIS	Polar orbiting	250m, 500m, 1km/1km	2 times daily	MOD14/MYD14	Direct Readout; NASA Rapid Response System
AVHRR	Polar orbiting	1.1km/1.1km	2 times daily	FIMMA	NOAA Direct Readout via NOAA NESDIS
GOES Imager	Geostationary	1km/4km	4 times hourly	WF-ABBA	NOAA NESDIS
VIIRS	Polar orbiting	375m/750m	2 times daily	VIIRS Active Fire	Direct Readout; Rapid Response

<http://activefiremaps.fs.fed.us>



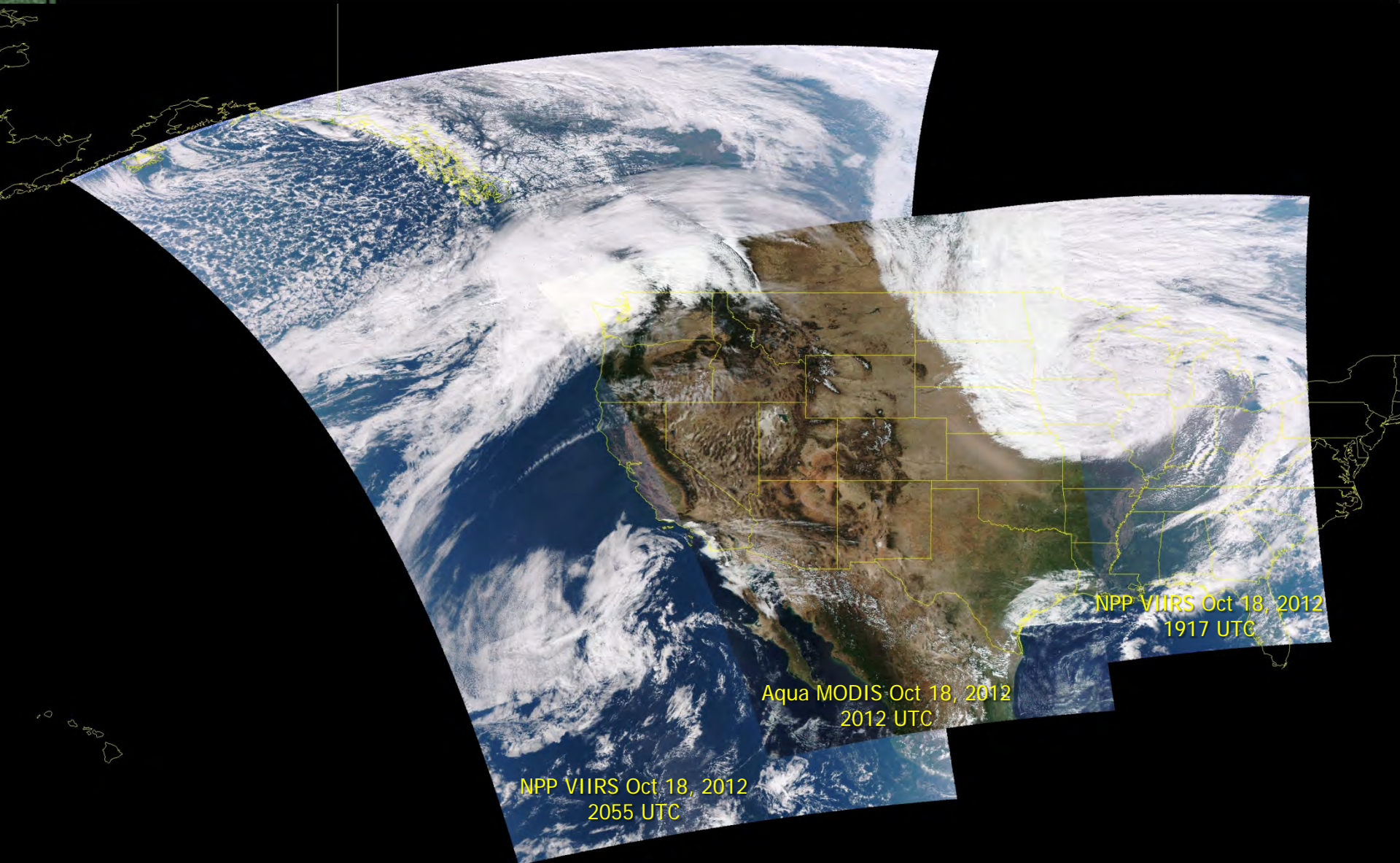
# Visible Infrared Imager Radiometer Suite (VIIRS)

- Suomi National Polar-orbiting Partnership (S-NPP)
  - ♦ NOAA-NASA mission
- Orbit configuration
  - ♦ 1:30PM afternoon pass
  - ♦ Ascending node
  - ♦ 3,000 km swath
- NPP VIIRS and Aqua MODIS observations times are similar
- Data latency
  - ♦ NRT data available via X-band direct readout
  - ♦ RSAC X-band station is collecting MODIS and VIIRS
- Only one VIIRS sensor currently
  - ♦ JPSS-1 (2015)
  - ♦ JPSS-2 (2019)





# VIIRS and Aqua MODIS



# VIIRS Fire Product

- NOAA operational fire product
  - 750 meters
  - Based on MODIS C4 algorithm
  - Available from NOAA CLASS
  - Validation ongoing
  - Effects of sensor specifications TBD
- NASA direct readout fire product
  - 750 meters
  - Based on MODIS C6 algorithm
  - Available from RSAC
  - Validation/feedback back to NASA
- 375m fire product
  - Development by UMD
  - USFS PSW and RSAC providing support

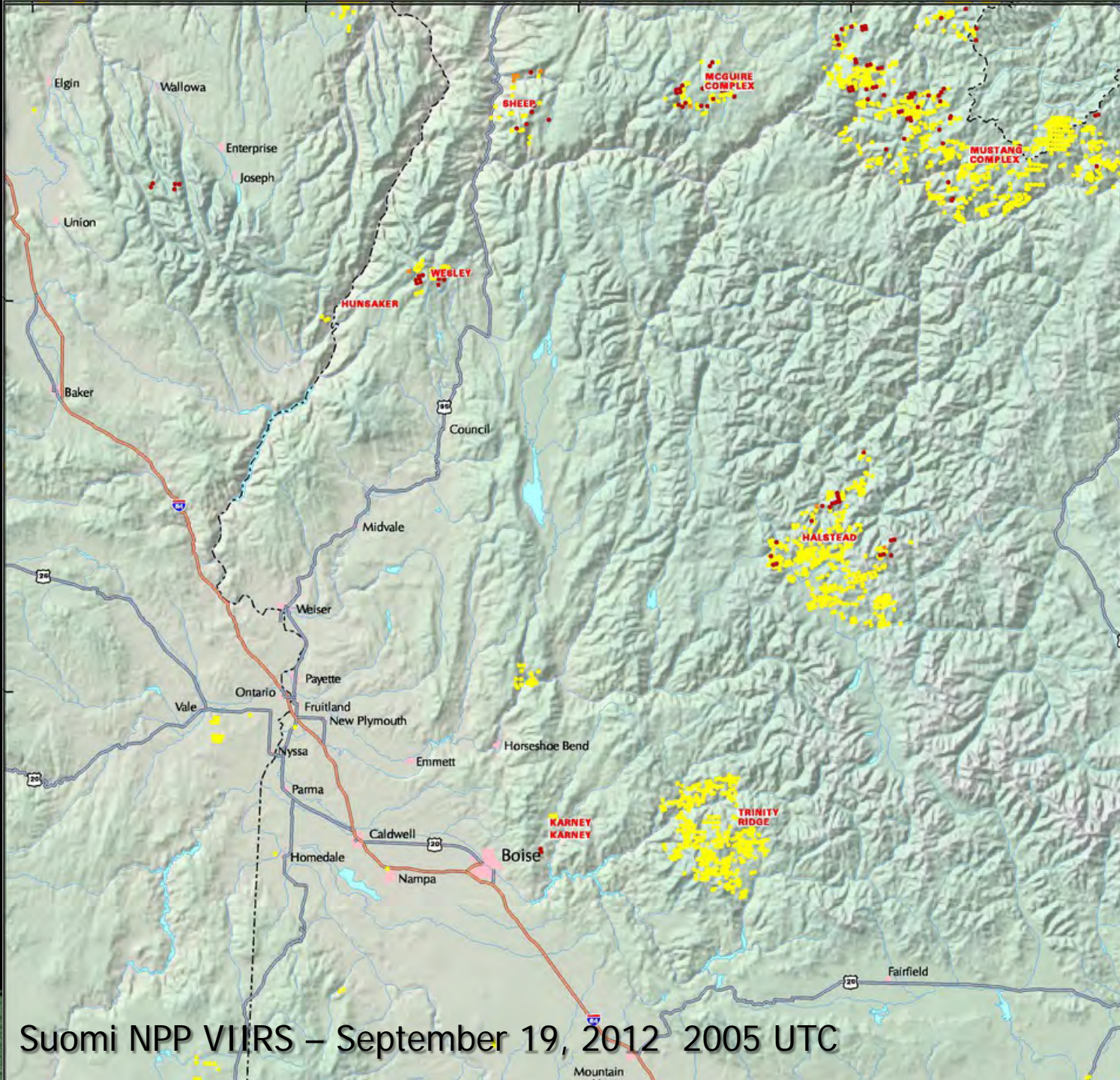
Comparison of 22-band NPOESS VIIRS with MODIS bands

NPOESS VIIRS		MODIS	
Band number	Central wavelength (μm)	Band number	Central wavelength (μm)
M1	0.412	8	0.412
M2	0.445	9	0.443
M3 (blue)	0.488	3 (blue)	0.469
M4 (green)	0.555	4 (green)	0.555
M5 (red)	0.672	1 (red)	0.645
M6	0.746	15	0.748
M7	0.865	2	0.858
M8	1.240	5	1.240
M9	1.378	26	1.375
M10	1.61	6	1.640
M11	2.25	7	2.13
M12	3.7	22	3.959
M13	4.05	23	4.05
M14	8.55	29	8.55
M15	10.763	31	11.03
M16	12.013	32	12.02
DNB	0.7	No equivalent width	No equivalent width
I1	0.64	1 (red)	0.645
I2	0.865	2	0.858
I3	1.61	6	1.64
I4	3.74	22	3.959
I5	11.45	31	11.03

I bands - 375m

M bands - 750m





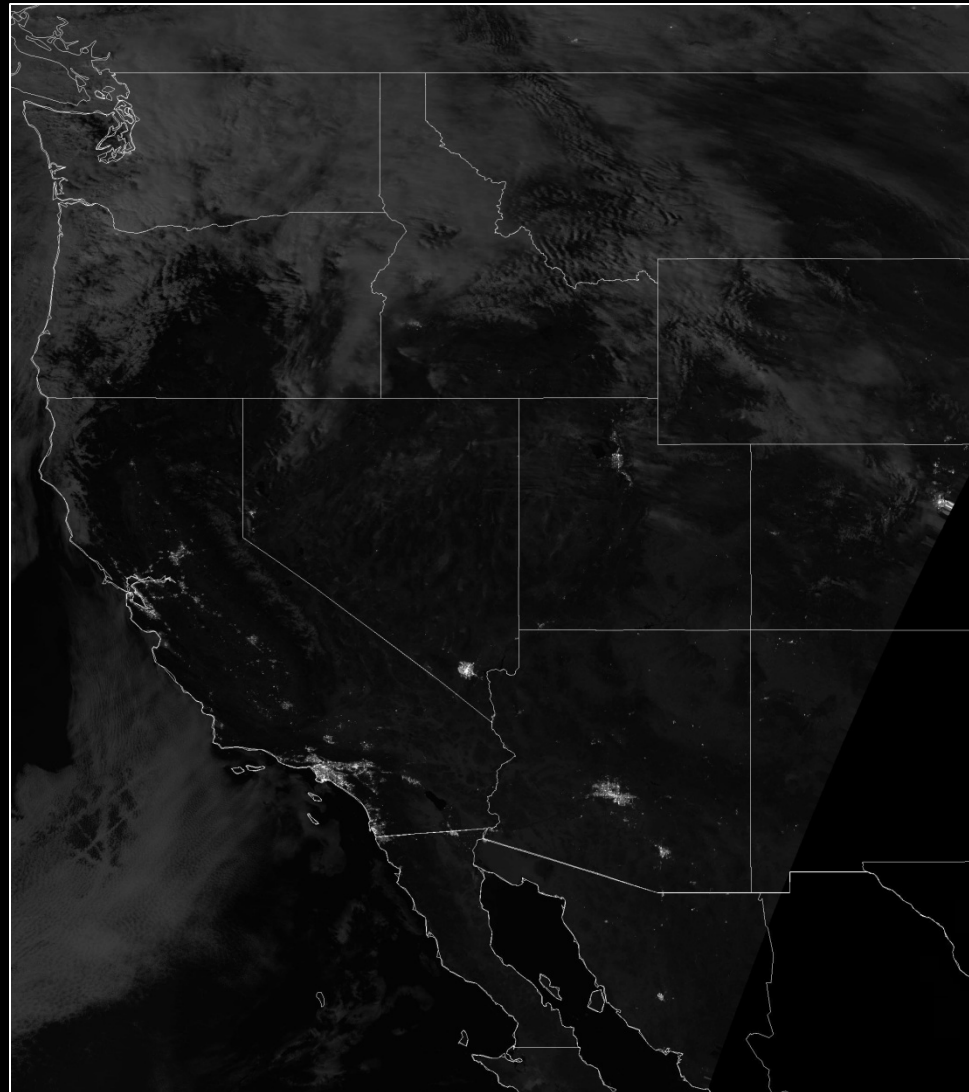
Suomi NPP VIIRS – September 19, 2012 2005 UTC





# AFM and VIIRS

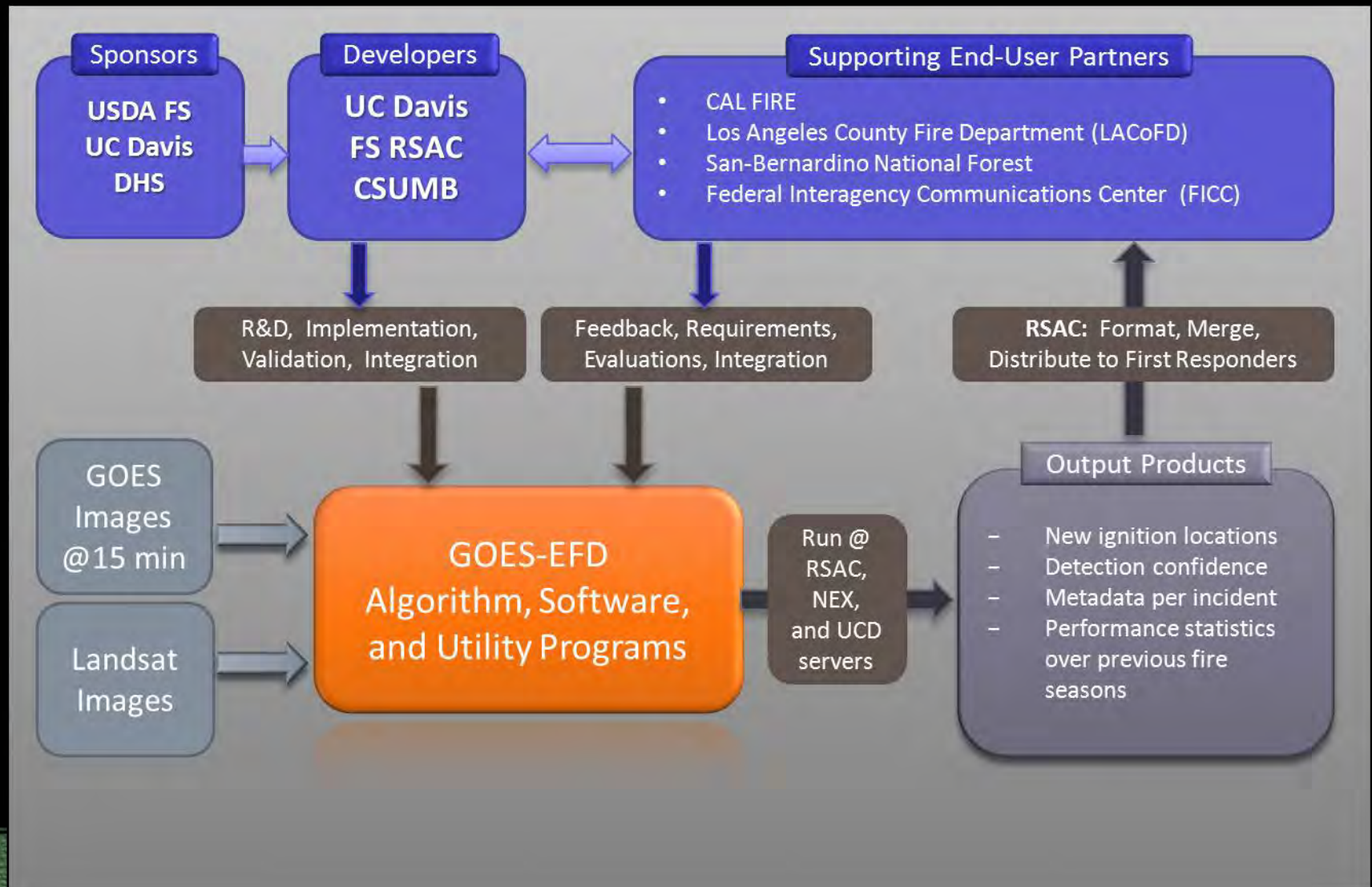
- VIIRS data/product availability
  - May 5, 2012 to present for CONUS
  - Direct readout data only
  - Coverage may be incomplete
- Provisional VIIRS fire products available
  - JPG/PDF fire detection maps
  - Fire detection KMLs
  - Fire detection GIS data
- Reflectance imagery subsets available soon
  - True color
  - False color
  - Day/night band (DNB)



VIIRS Day/Night Band Oct 28, 2012 0928 UTC

# Ongoing R&D Efforts Related to AFM

- GOES Early Fire Detection (GOES-EFD)



# Ongoing R&D Efforts Related to AFM

- Use of moderate resolution sensor assets for fire detection
- Objective:
  - Develop and exploit a suite of active fire detection data from moderate resolution sensors
  - Spatial resolutions ranging from 20-375m
  - Frequency of 2-4 overpasses a day for any location in the CONUS region and Alaska
  - Infuse data into existing operational activities
- NASA ROSES 2011 Wildland Fires RFP (Schroeder & Riggan Co-PIs)
  - Beginning 1 year feasibility study

Sensor	Agency	Swath (km)	Spatial Resolution (m)	Revisit Time*	Launch	Equator Crossing (daytime)	Data Acquisition Plan
NIRST*	CONAE&CSA	182	351	1 day	June 2011	6:00 pm	On-demand
NPP/VIIRS	NASA&NOAA	3,000	375	12 h	Oct 2011	1:30 pm	Continuous
LDCM	NASA&USGS	185	30	16 days	Dec 2012	10:00 am	Continuous
TET-1	DLR	178	356	1 day	Fall 2012*	11:30 am	On-demand*
Sentinel-2A	ESA	290	20	2-3 days	2013	10:00 am	Continuous
BIROS	DLR	178	356	1 day	2013	1:30 pm (tentative)	On-demand*
Sentinel-2B	ESA	290	20	2-3 days	2014	10:00 am	Continuous
<i>Complementary Data Sets Available for Historical/Retrospective Analyses &amp; Applications</i>							
Landsat5 TM	NASA&USGS	185	30	16 days	1984	9:45 am	Continuous
Landsat7 <sup>†</sup> ETM+	NASA&USGS	185	30	16 days	1999	10:00 am	Continuous
ASTER <sup>‡</sup>	NASA&METI/Japan	60	30	16 days	1999	10:30 am	On-demand





# Thanks

## Comments/Questions?



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