

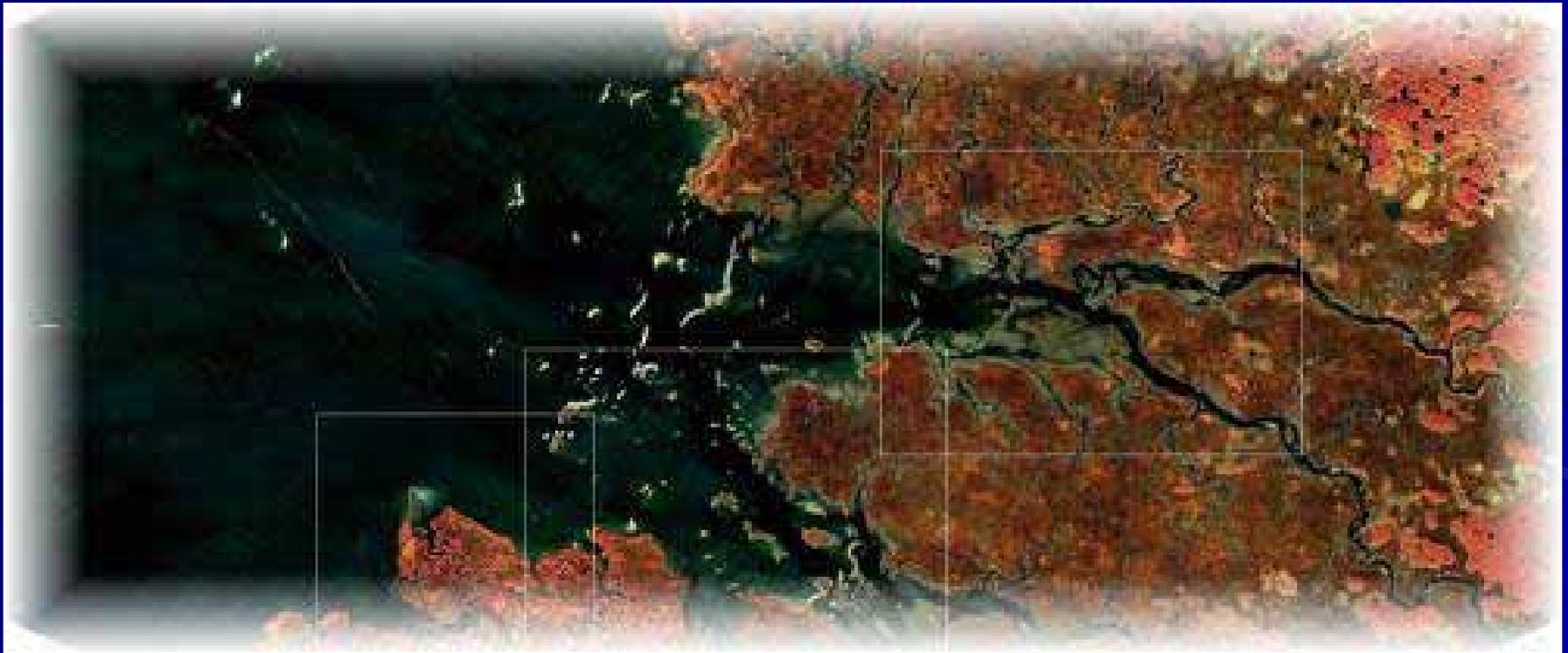


Geospatial Image-Mapping & Terrestrial Intelligence on Command

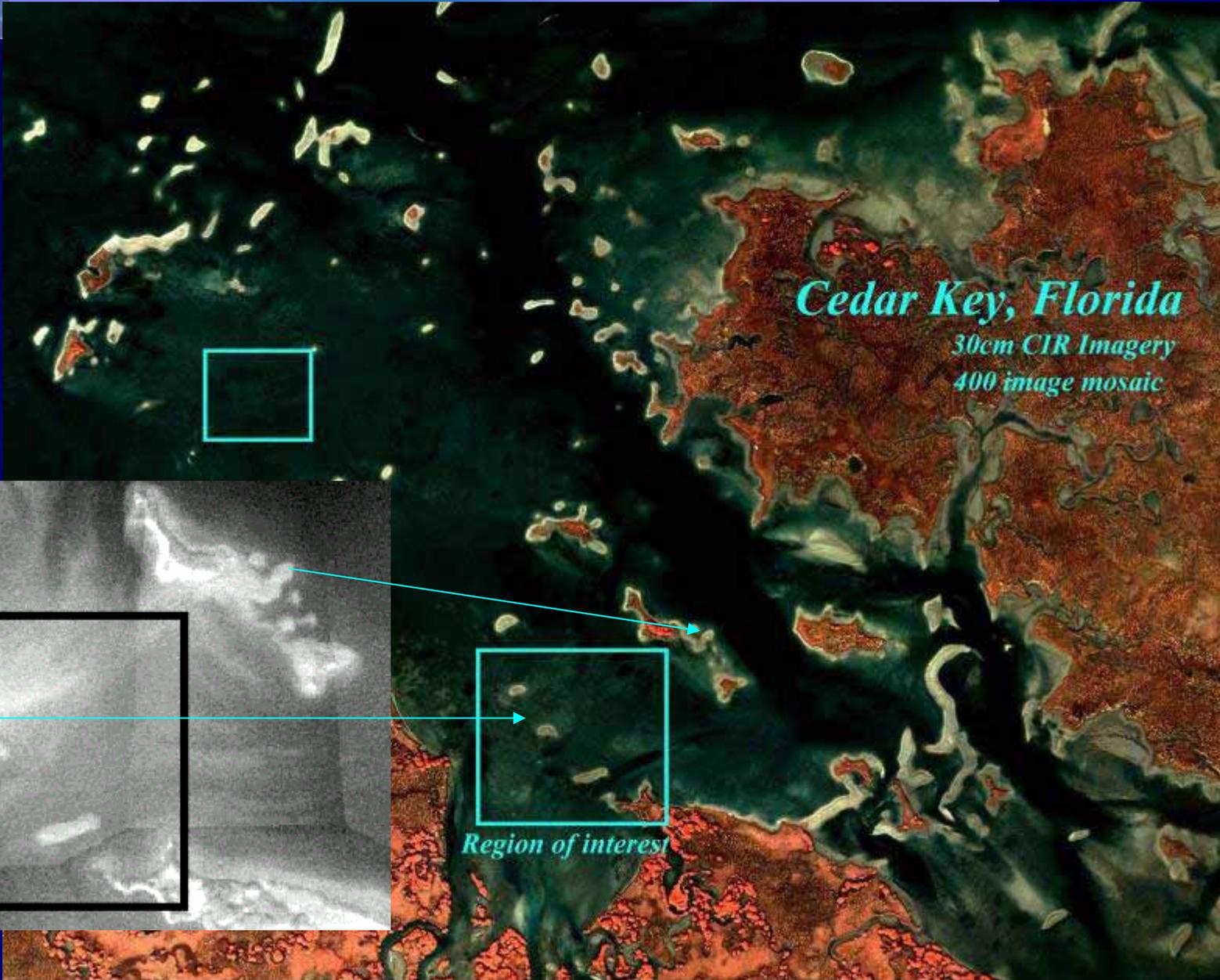
**AN AIRBORNE HIGH RESOLUTION
Thermal-Infrared and Multi-Spectral MAPPING SYSTEM**

**...Trials in the Suwannee River Basin, FL
(November 2002)**

Turtle Bay FL - November 2002 Fresh Water Spring Seep Mapping



Possible
fresh
water
spring



200 image
Three band
CIR
geoTIF
mosaic

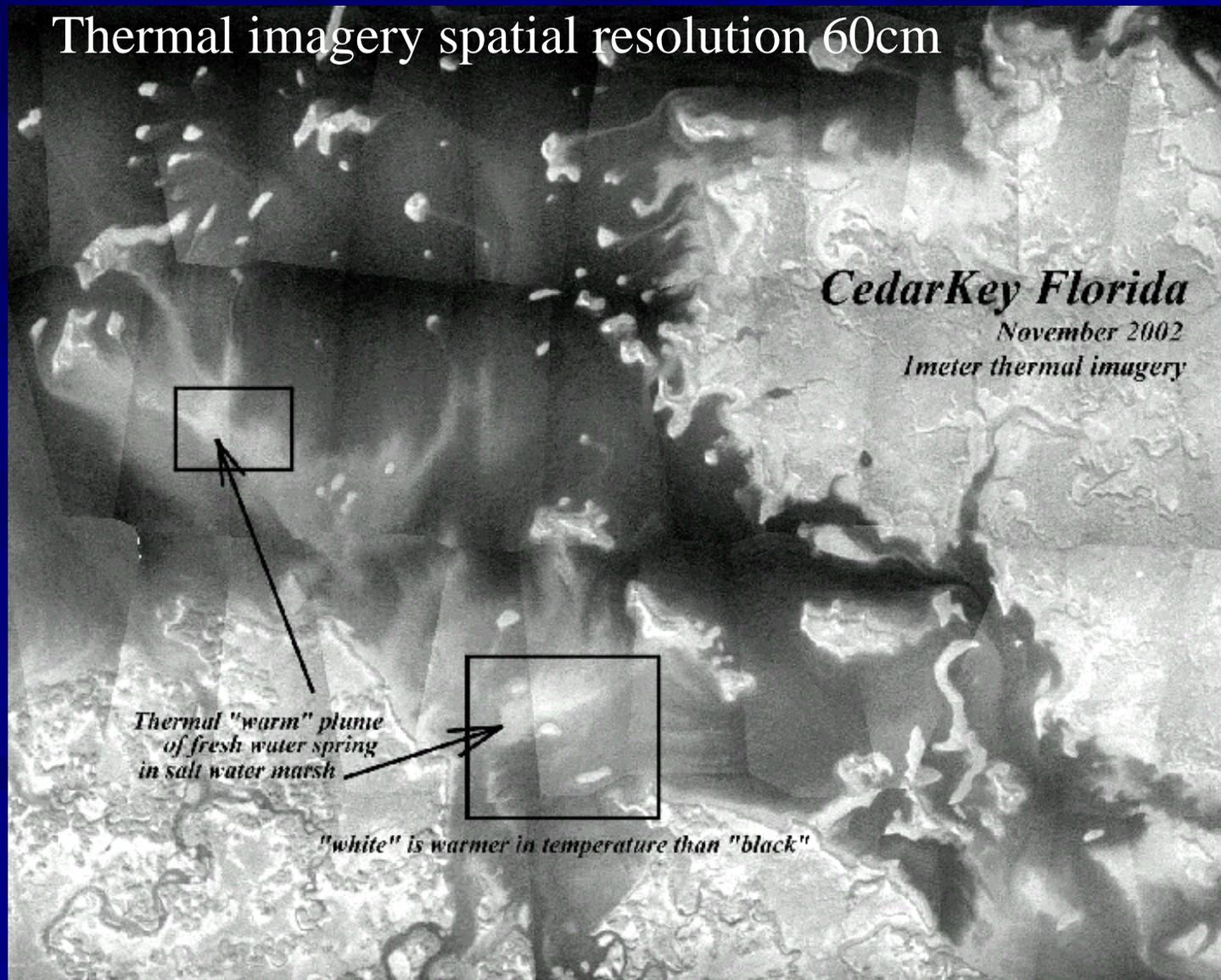
G 550nm
R 650nm
IR 805nm



Thermal imagery spatial resolution 60cm

Thermal Imagery is used on aircraft flying at 3000 ft AGL to locate natural springs and warm water seeps during winter months.

Temperature scale is approx.. 15 C degrees between intensity of black (cooler) and white (warmer)



Detail of
Sub-Surface
Structure



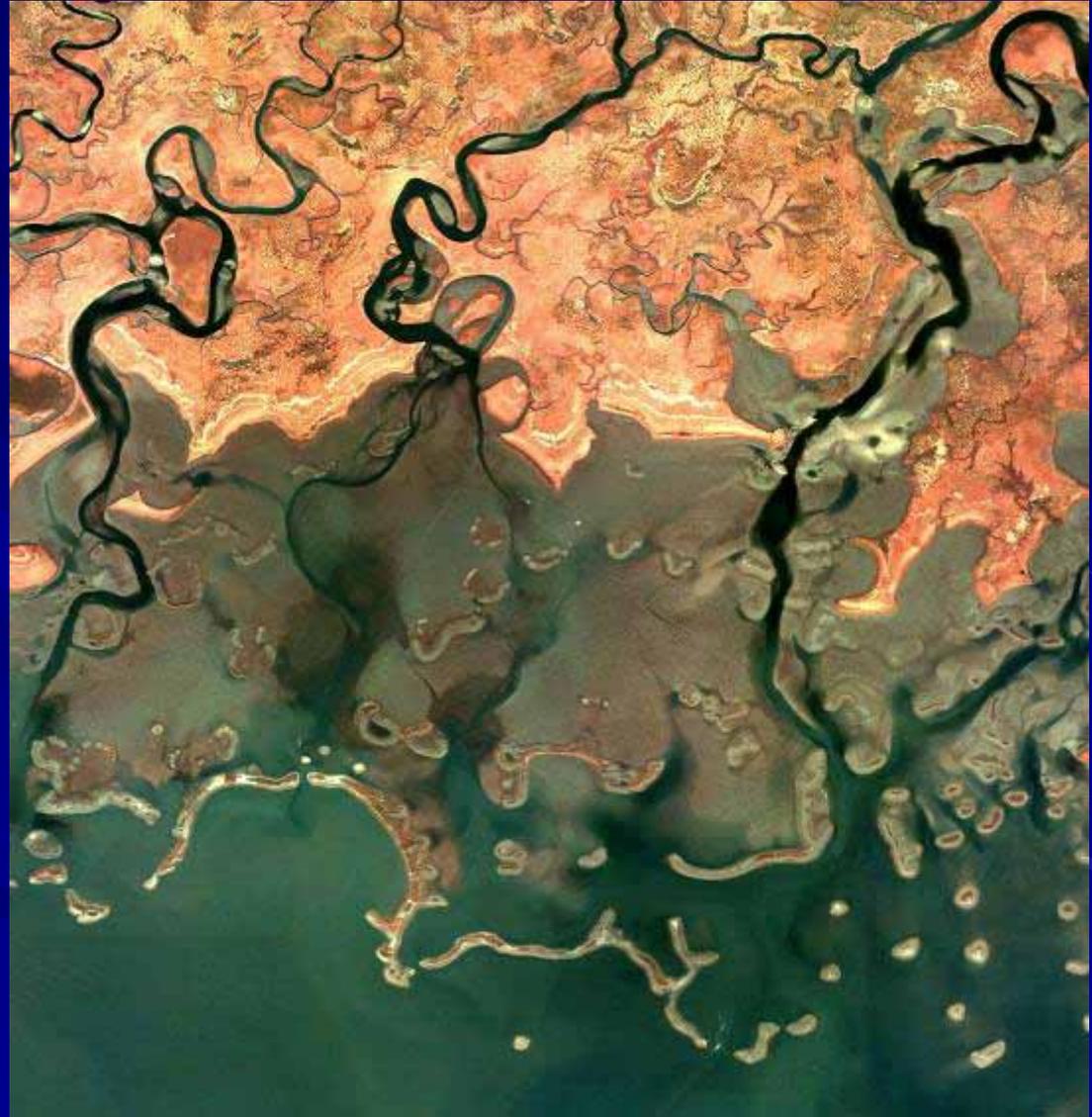
Image re-sample

Contrast
Compression is
used to enable
detailed
analysis of
sub-surface
Structure more
clearly.



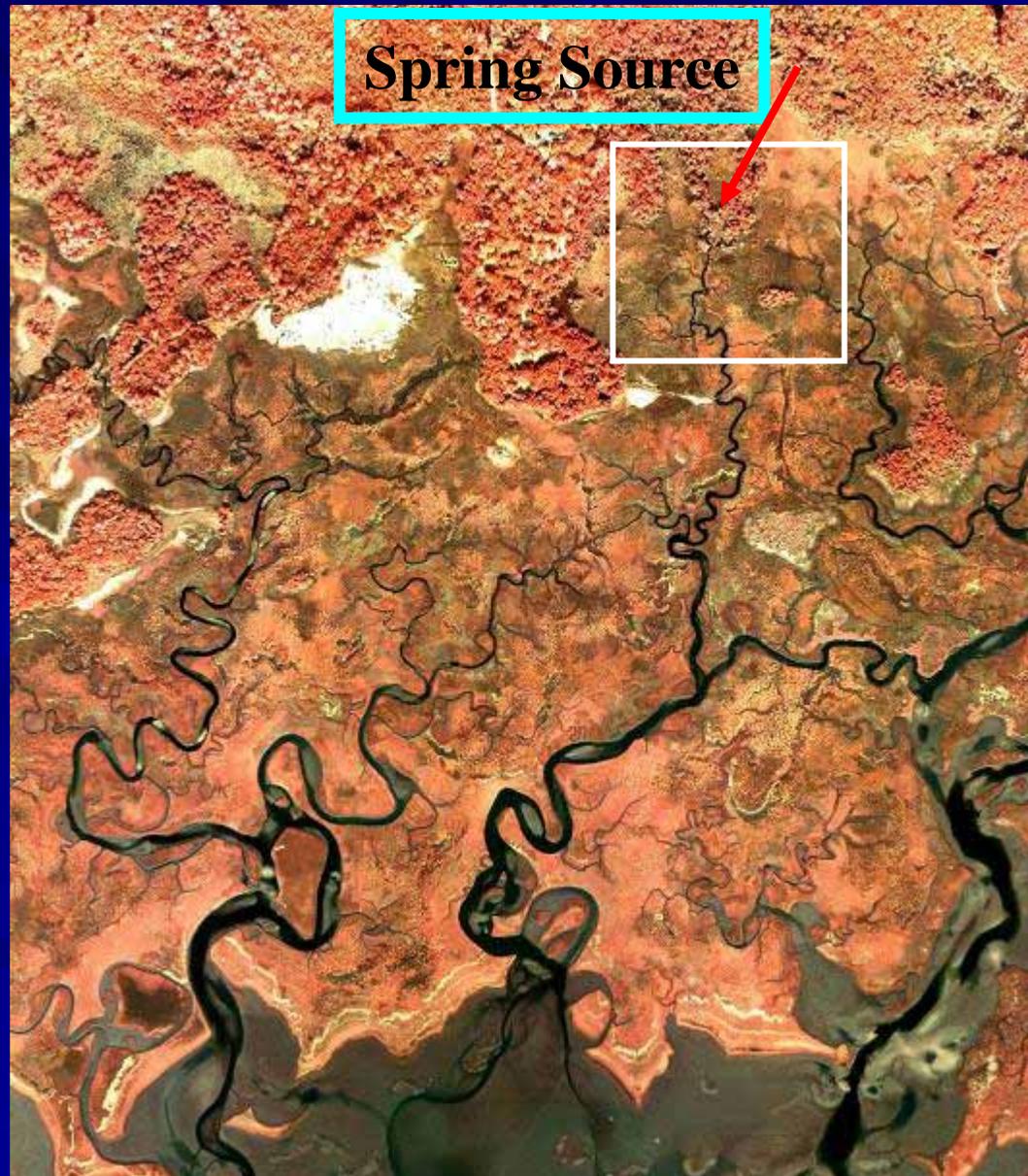
*300 image
mosaic*

*Spring Creek
FL
30cm CIR*



250 image
mosaic
Spring Creek
FL

30cm CIR





Spring Source

note the difference in temperature
of warmer stream than one to west

Elbow River
Weaslehead
Glenmore
Reservoir,
Calgary AB
Aug 22, 2002

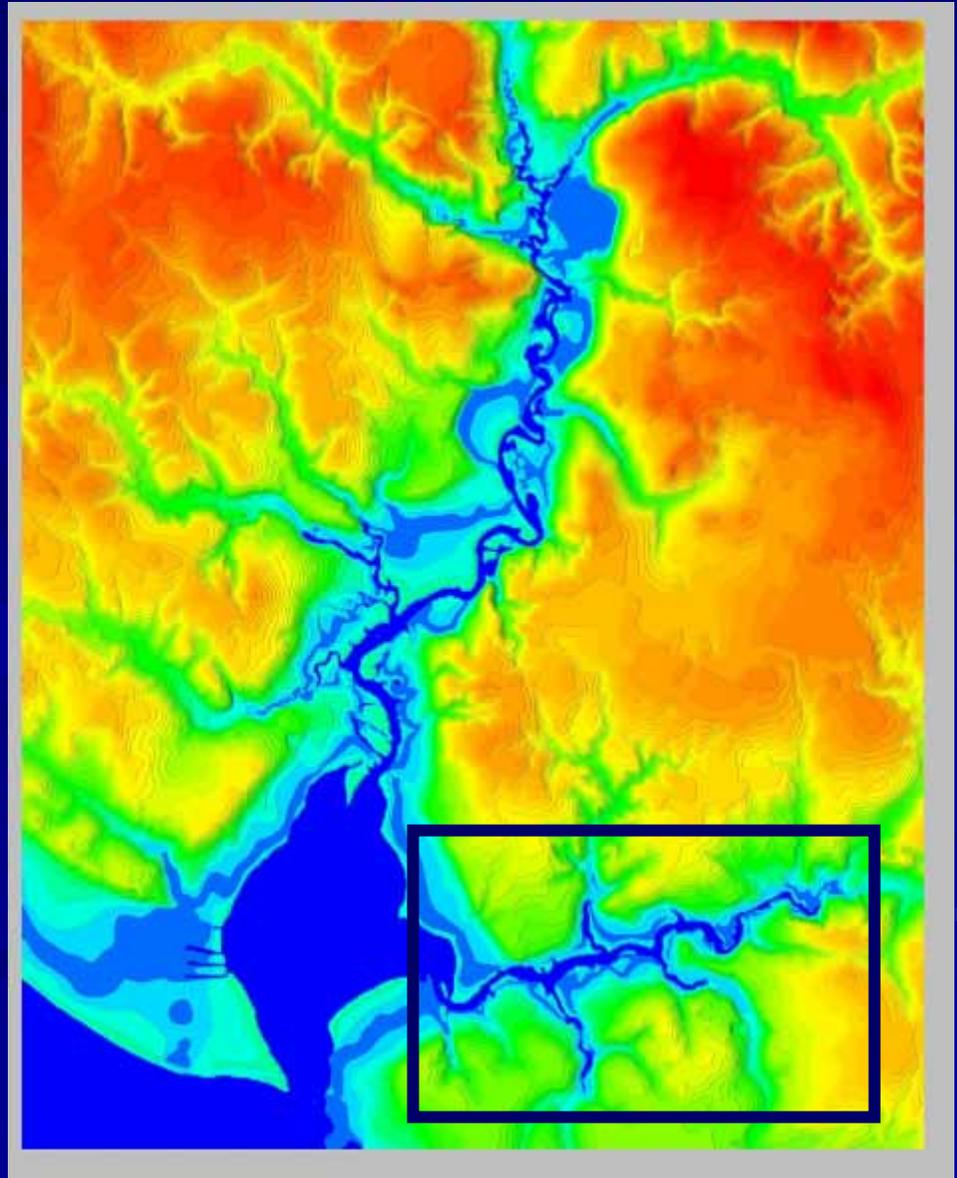
Hidden
Channel
mapping

30cm CIR
150 image
mosaic



USGS 1m DEM
Weeks Bay
Magnolia River
Fish River

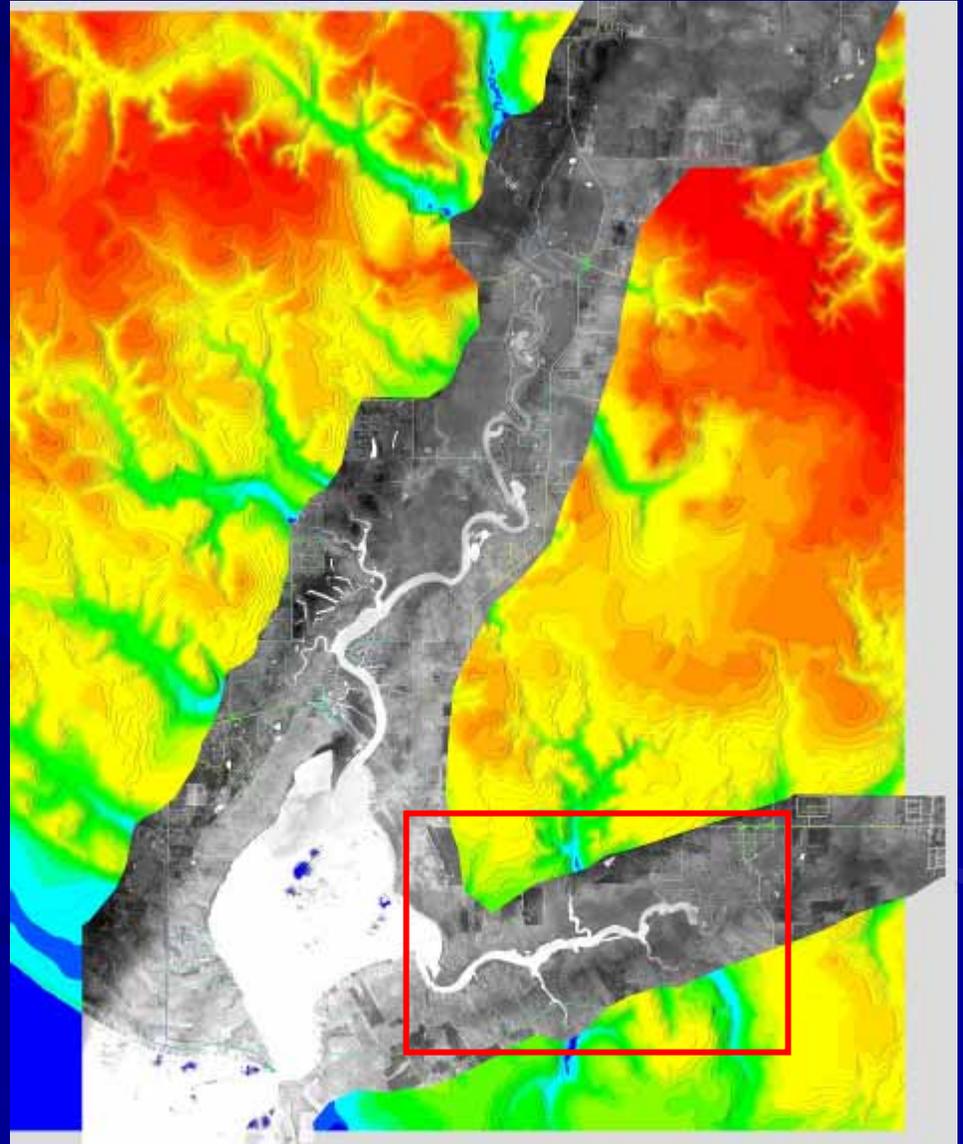
Gulf Shores
Alabama
Aug 04, 2004



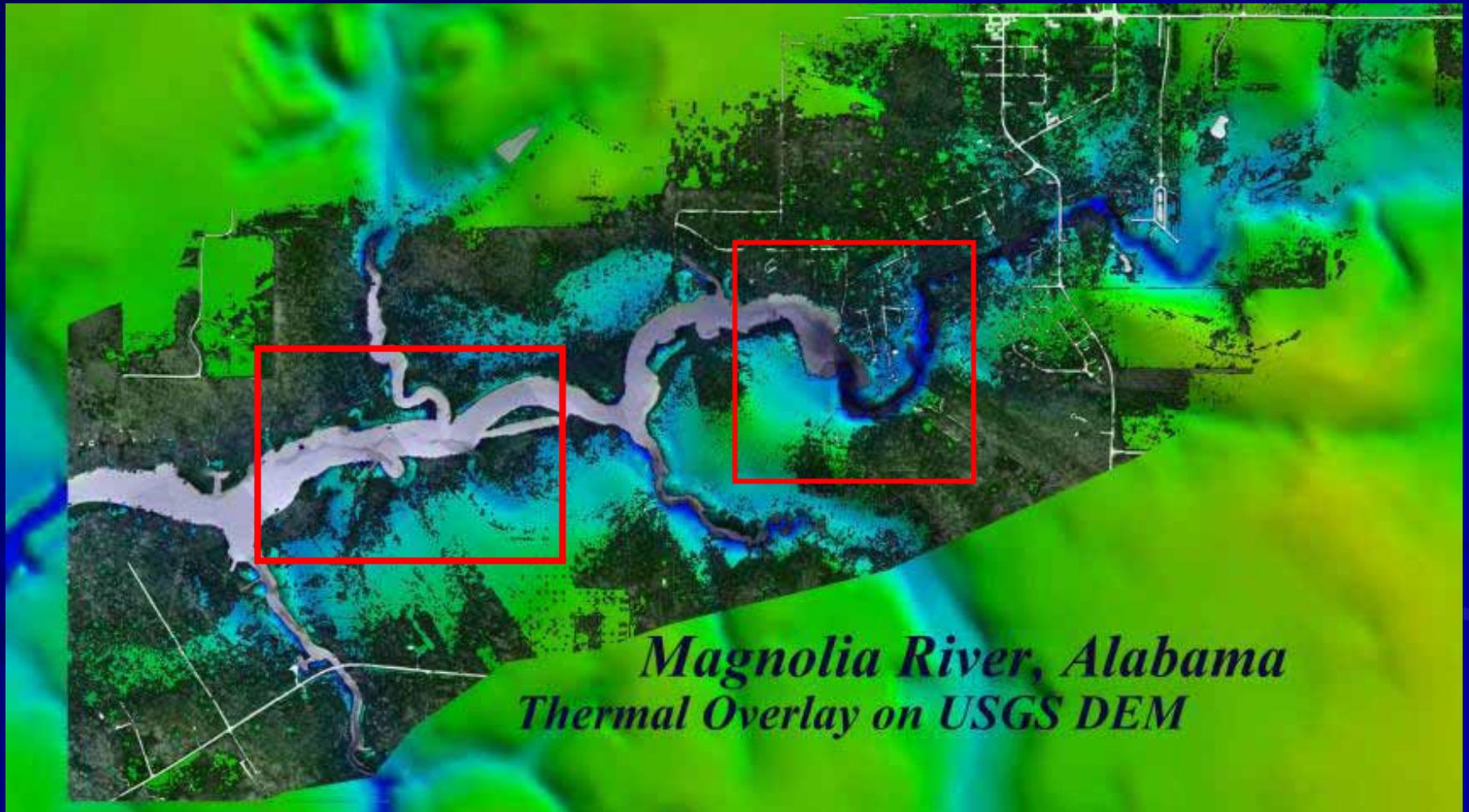
USGS 1m DEM
&
Thermal

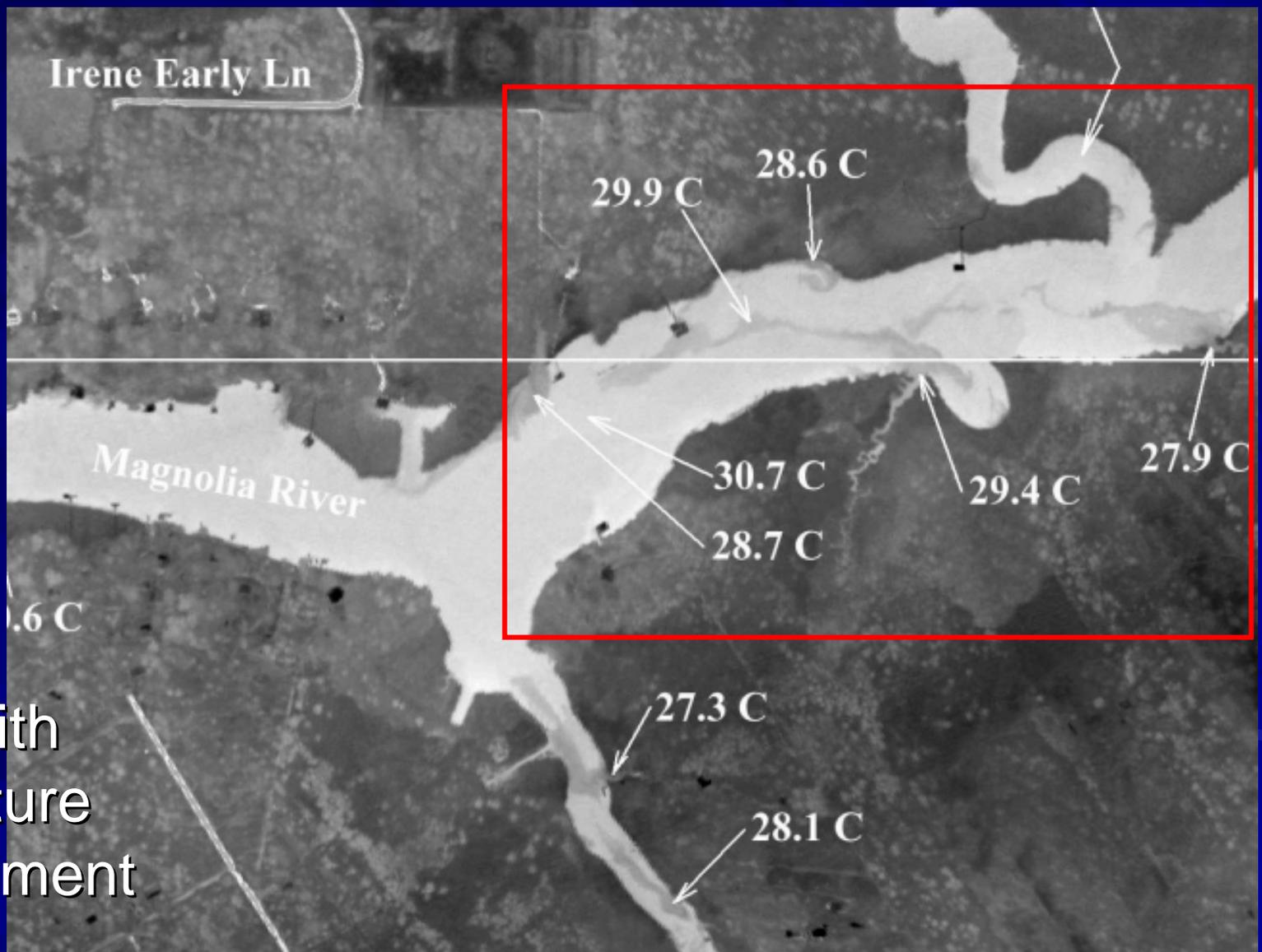
Weeks Bay
Magnolia River
Fish River

Gulf Shores
Alabama
Aug 04, 2004

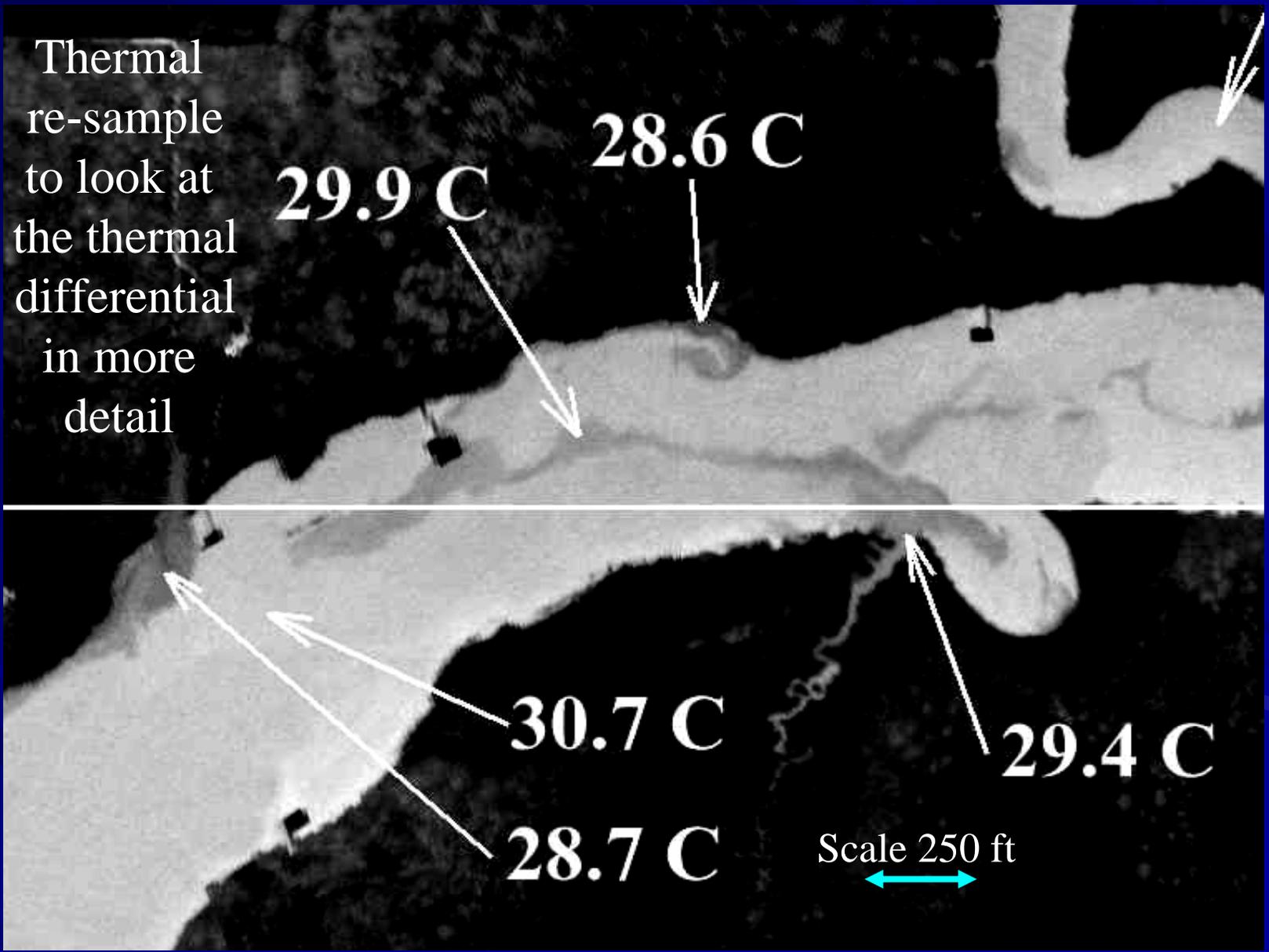


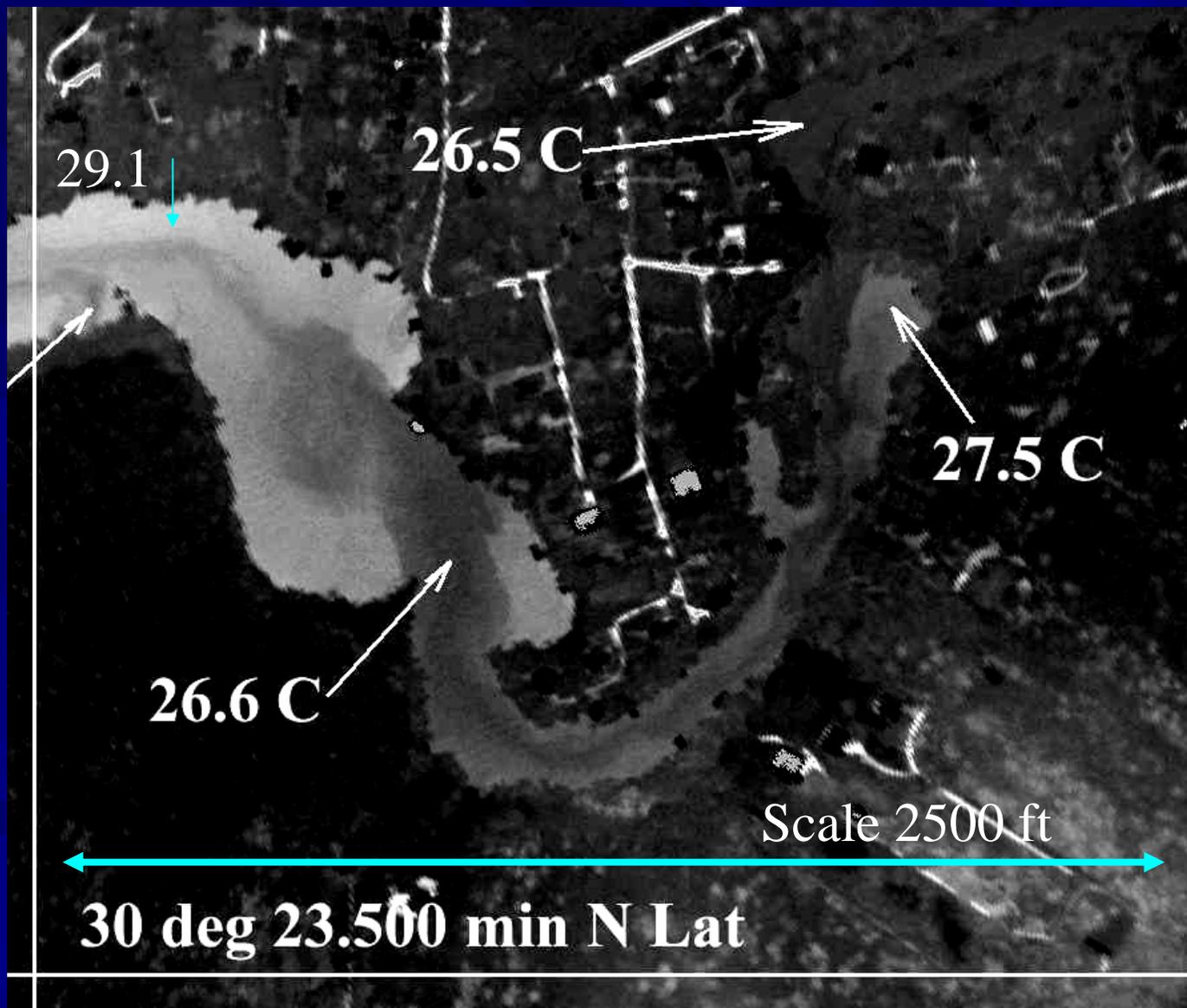
Thermal Profile of Magnolia River





Thermal Profile with temperature measurement

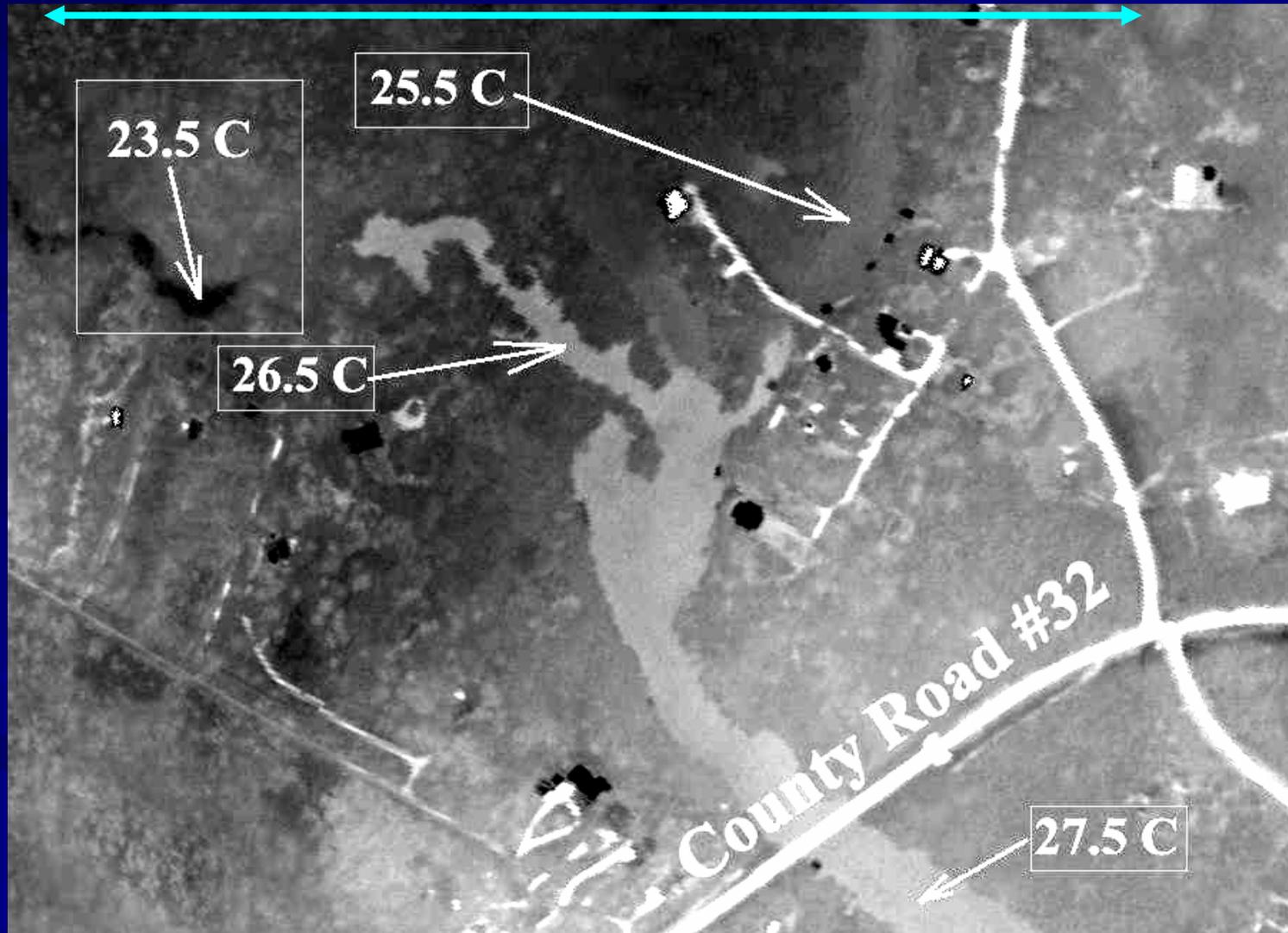




Source of
Magnolia
River

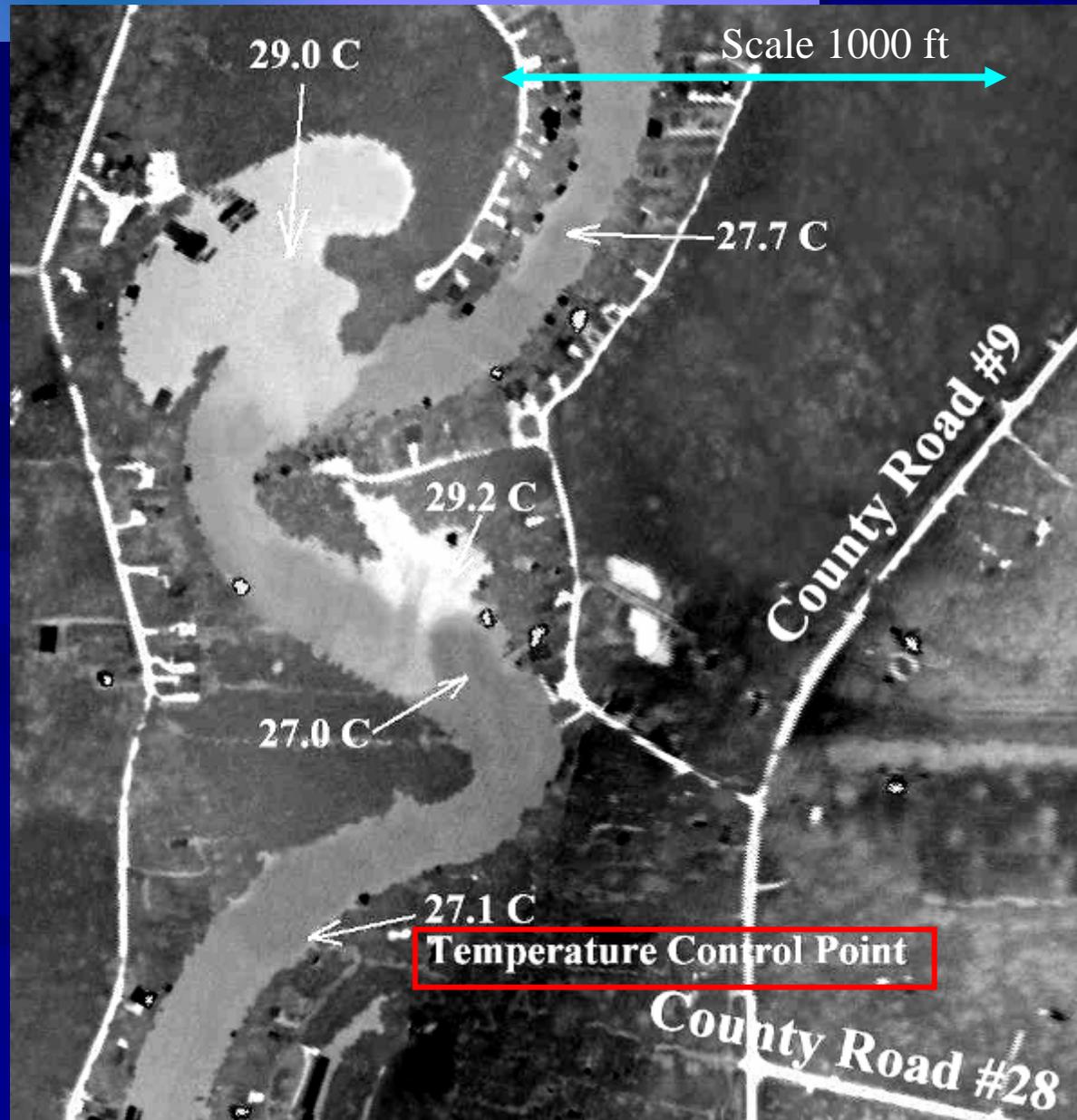


Scale 1000ft

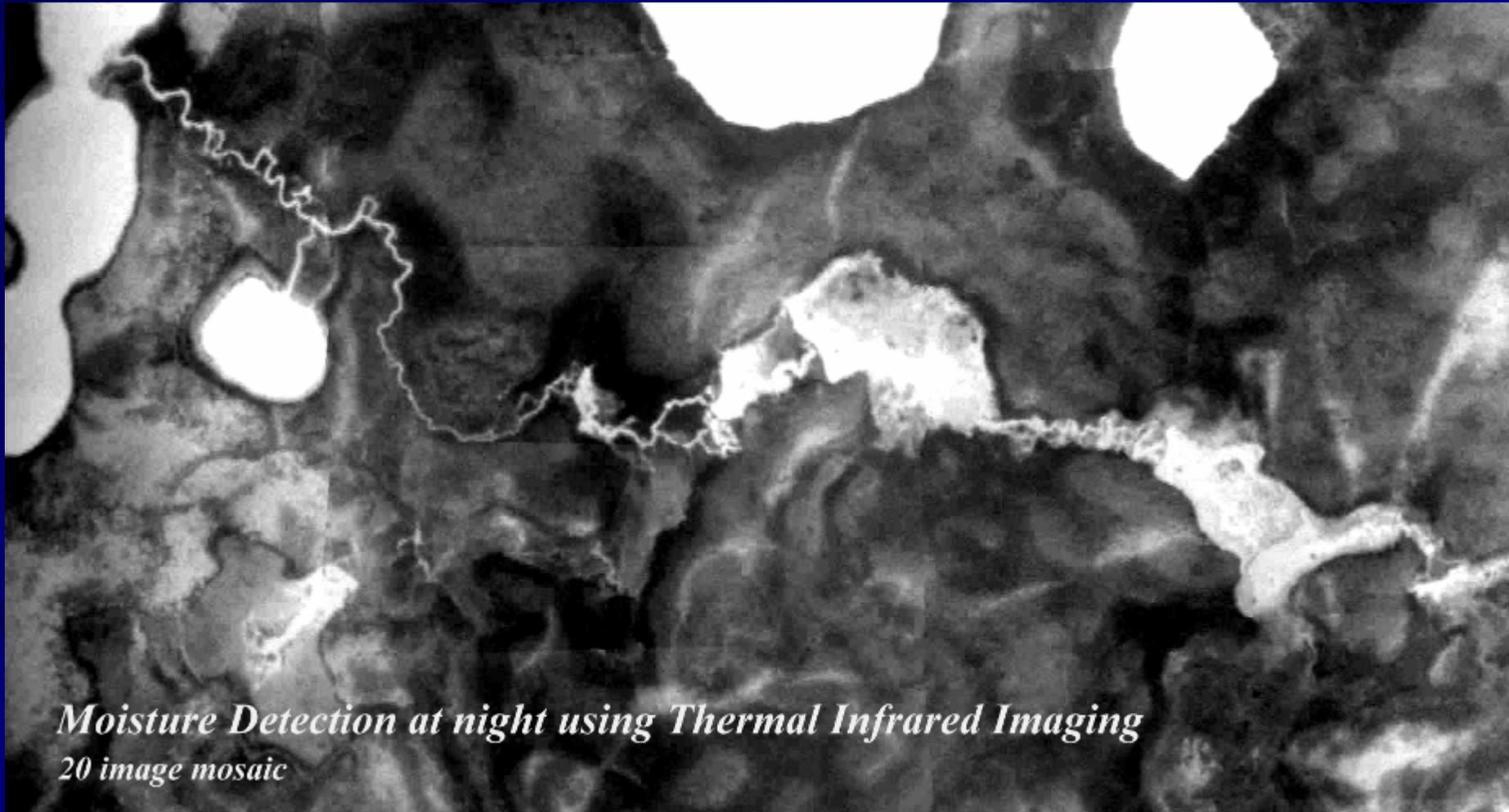


Fish River



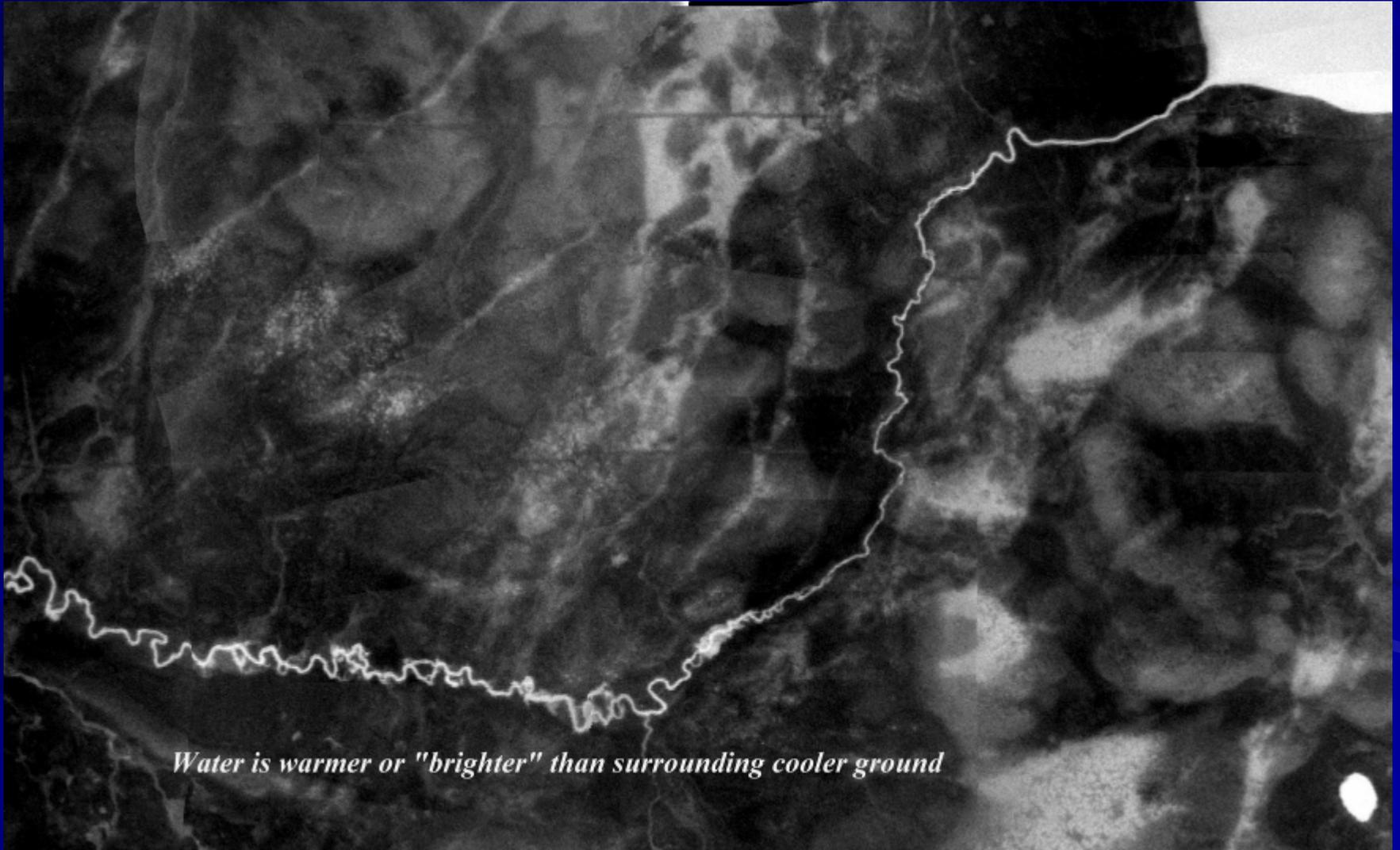


Tributary course mapping - Thermal Infrared



*Moisture Detection at night using Thermal Infrared Imaging
20 image mosaic*

Moisture and Stream mapping - 150 image mosaic



Thermal Map - 900 image mosaic



Moisture Distribution Analysis





Industrial Intelligence – An Airborne View

- Industries everywhere, require intelligent information to manage assets and conduct efficient mission operations.
- “Smart-Data” requires “Smart-Systems” that “combine” a number of technologies that are operated from a unique vantage-point (airborne).
- We use Fully digital configurations, with fast & sophisticated processing that provide rapid response and wireless delivery of imagery where and when it is needed.



Image Mapping Intelligence – Target Markets

■ Our Airborne Image-Mapping Services was designed for...

- Fire-Mapping & Fire-Suppression Mission-Critical Initiatives

The system was seen as a natural fit for...

- Agriculture & Environmental Management
 - Crop Control (Maximizing/Minimizing/Eradication)
 - Water, Fertilizer & Augment Programs
- Environmental
 - Herd, Livestock & Wildlife Migration & Management
 - Vegetation
 - Waterways
 - Terrain, Space & Territory Planning
 - Emergency Response & Logistics (Earthquake, Flooding, etc.)

Start of Lost
Creek Fire,

Alberta Canada

Our system was
designed for
rapid delivery of
mapping
imagery

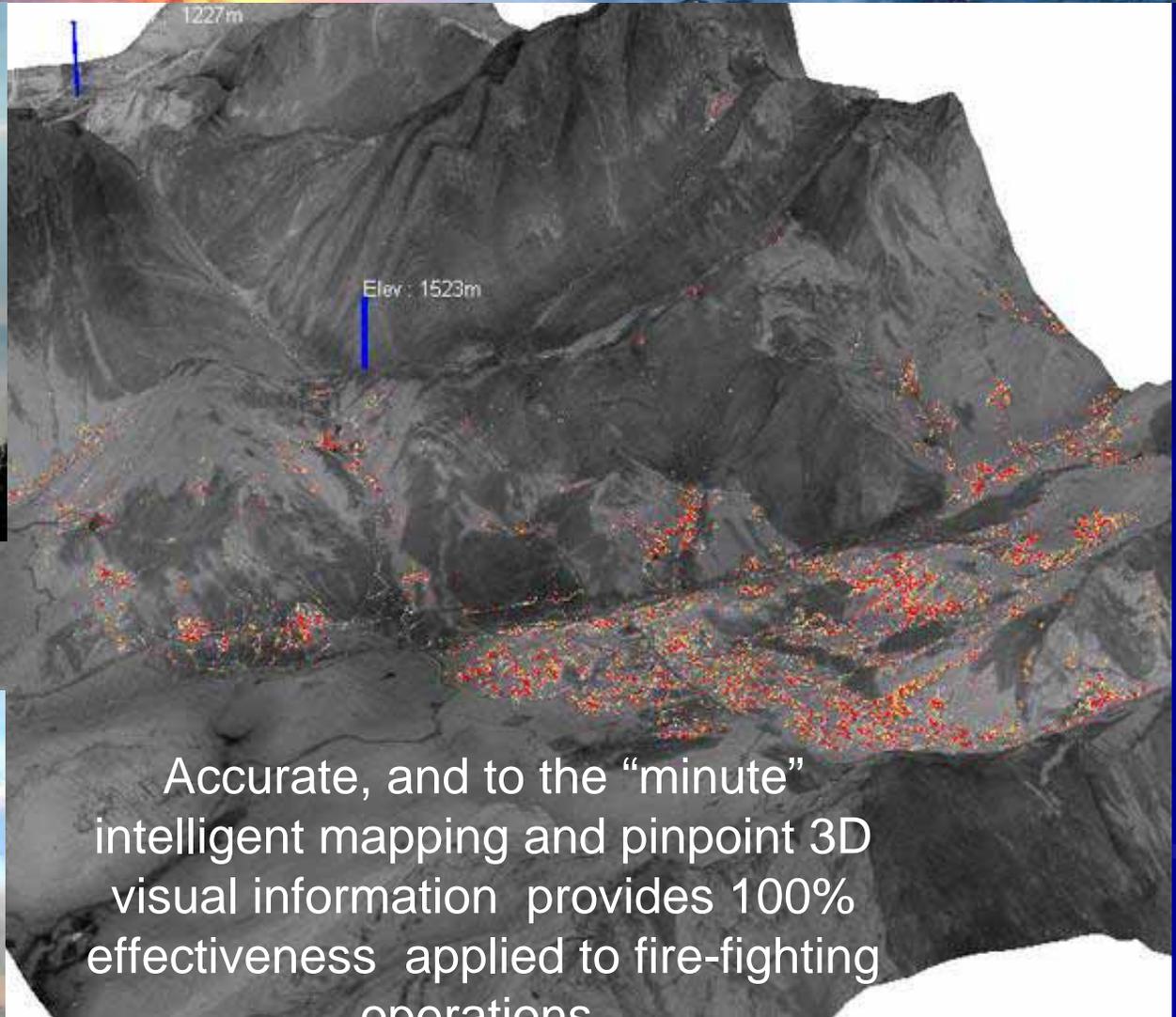


Fire Mapping & Fire Suppression



Hundreds of millions of dollars are spent fighting fires in North America every year. Intelligent-Mapping realizes huge savings of valuable resources, by deploying them most-accurately where the action is needed most.

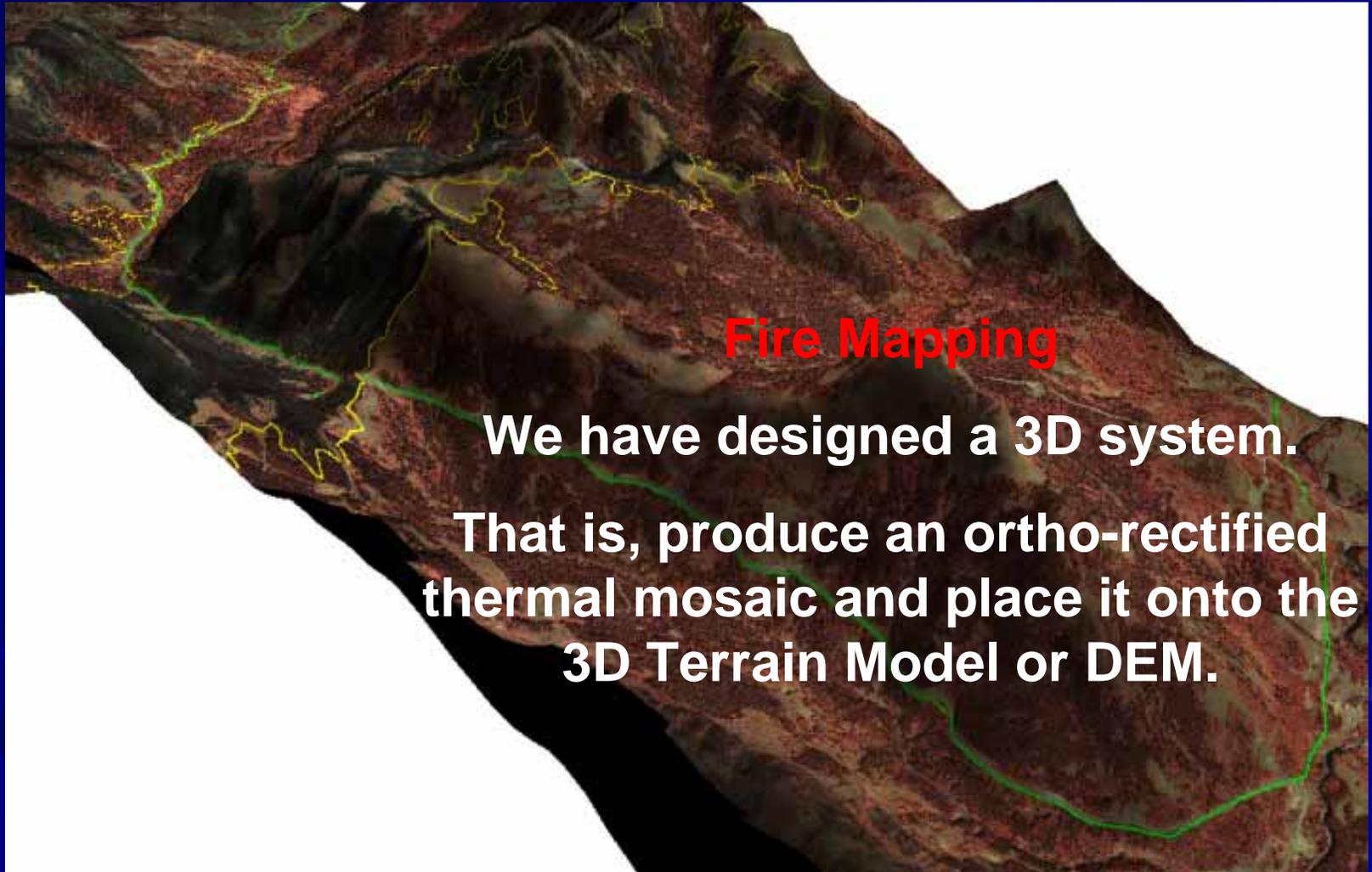
Mission Critical Operations – Fire Suppression



Accurate, and to the “minute” intelligent mapping and pinpoint 3D visual information provides 100% effectiveness applied to fire-fighting operations.



Aerial attack plans, 3D visualization assists Mop-Up Fire Suppression



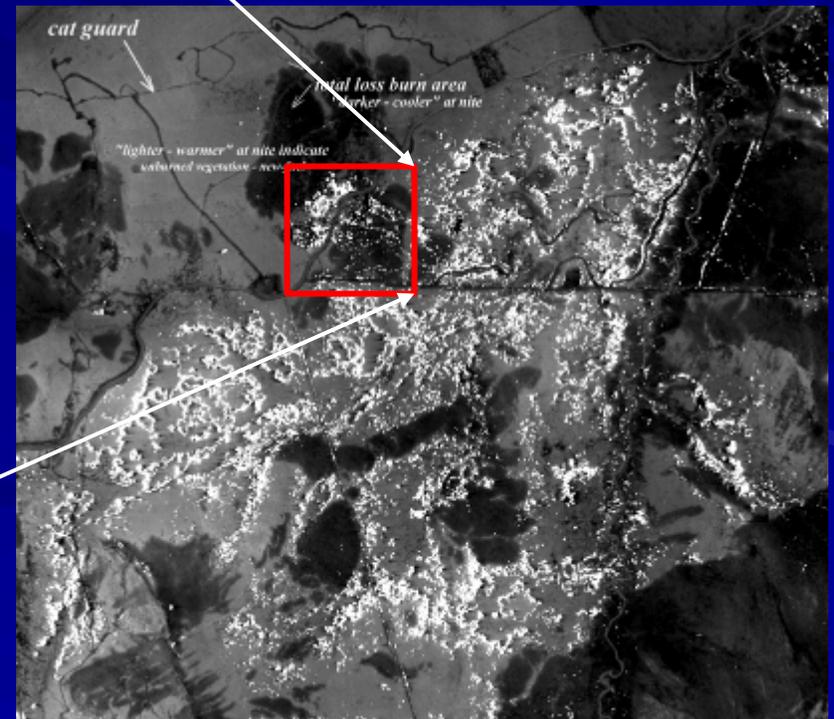
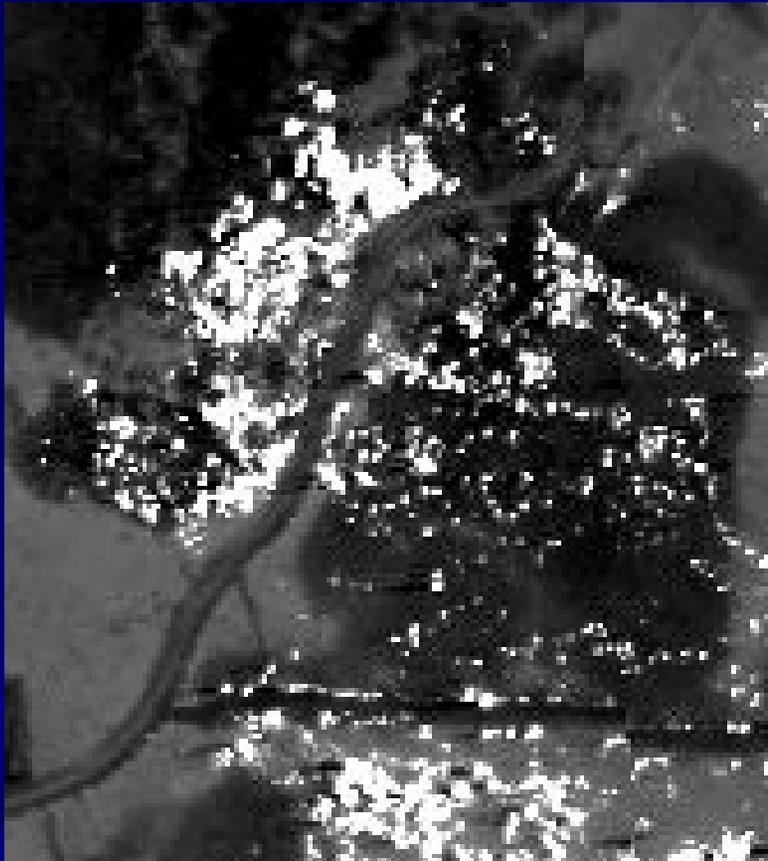
Fire Mapping

We have designed a 3D system.

**That is, produce an ortho-rectified
thermal mosaic and place it onto the
3D Terrain Model or DEM.**

Aerial Infrared-Imaging Today, Mop-Up Fire Detection 2004

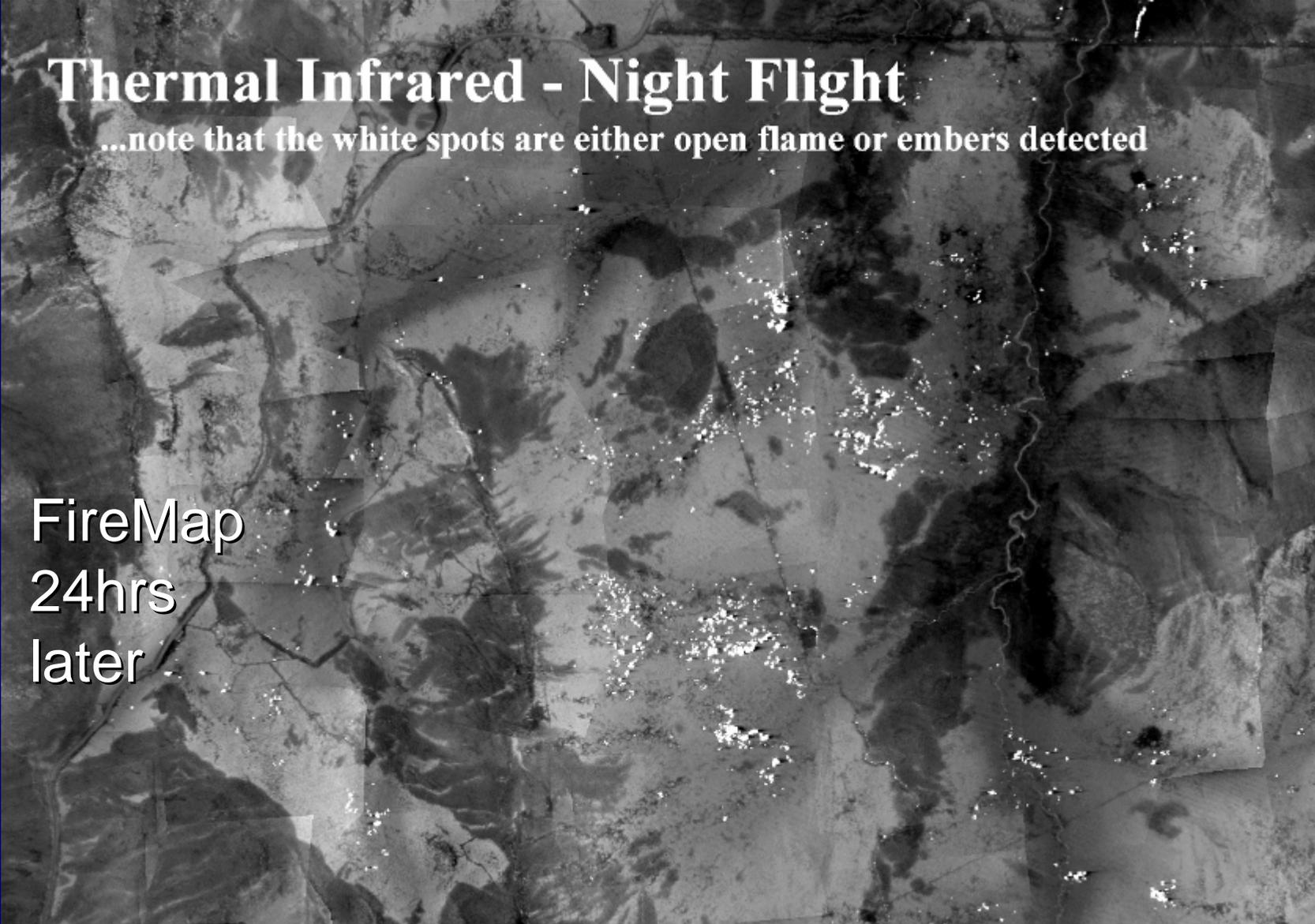
*What you
Can't
see,
Can Hurt
you!!*



Thermal Infrared - Night Flight

...note that the white spots are either open flame or embers detected

FireMap
24hrs
later

A thermal infrared night flight image showing a landscape with a large, bright, irregularly shaped area of high temperature, likely a fire. The image is composed of several overlapping rectangular panels, creating a mosaic effect. The bright area is surrounded by darker, cooler regions. The text 'FireMap 24hrs later' is overlaid on the left side of the image.

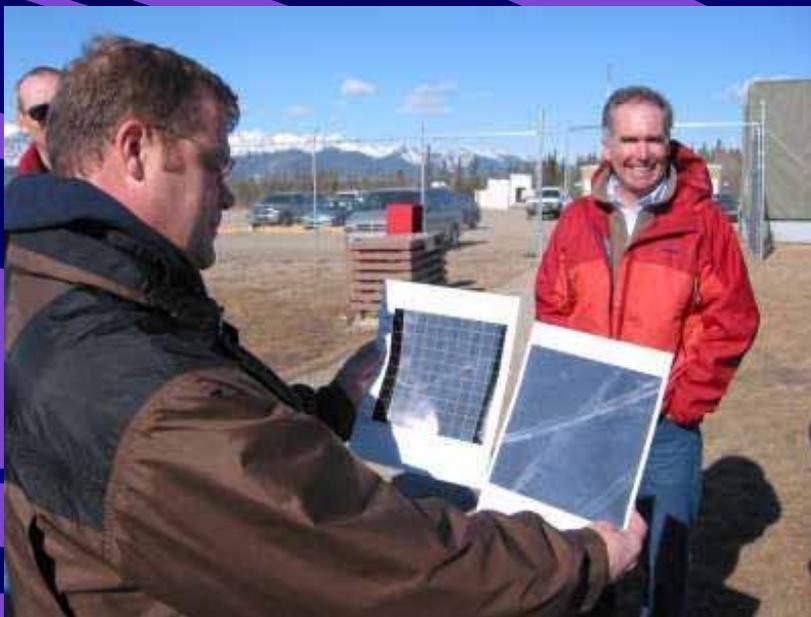
Fire Mapping

Navigate to the spot with simple hand held devices.



The 3D maps are put back in the field with ruggedized pen tablet or hand-held with GPS to navigate to the area of interest in real-time

...for that matter, to go one step further,
technology is available today
in broadband wireless systems
to email the image mosaics
back to the field or suppression aircraft.

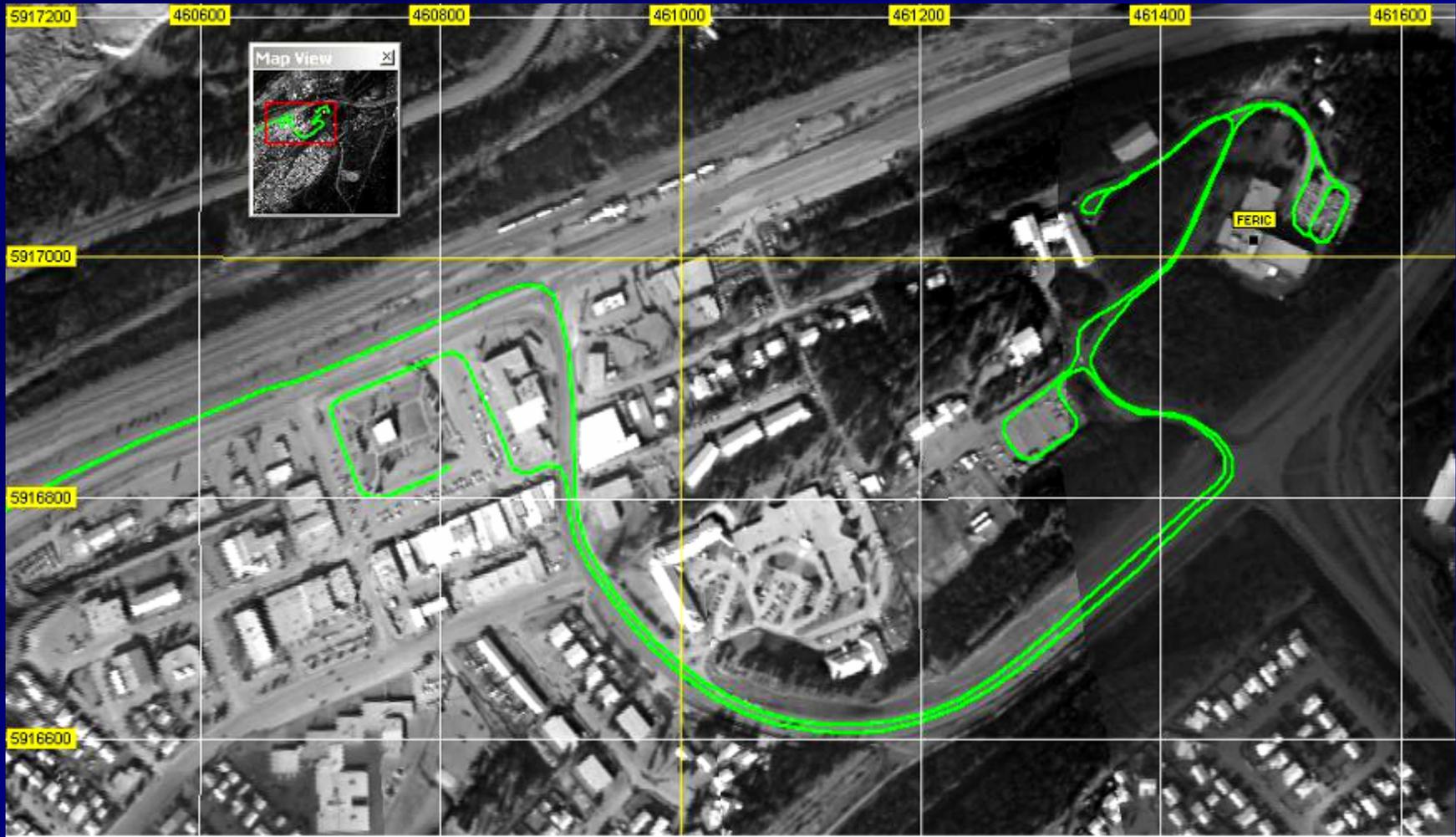


Ground personnel will
have the very accurate
thermal hot spot map with
GPS to virtually stand
on the
hot spot if it's hard to
find...

Image-Maps
are geoTIF
files and are
used on
Laptops and
PDA devices
with GPS
immediately,
as moving
map displays
to navigate.



The Technology - GPS Track Over Image (2m accuracy)

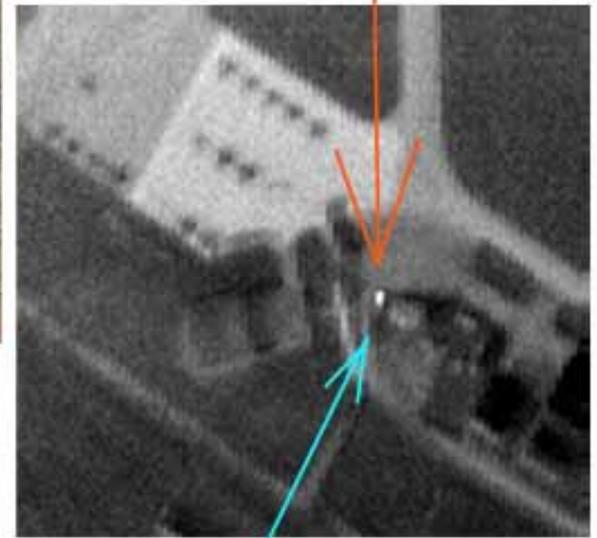


Raymond
MS
Airport
60 image
thermal
mosaic



The Technology

Sub-pixel Fire Detection



*Thermal Imagery of 10" open flame detected from 7500' AGL
Mitsubishi Thermal Infrared 4.0um to 5.9um filter*



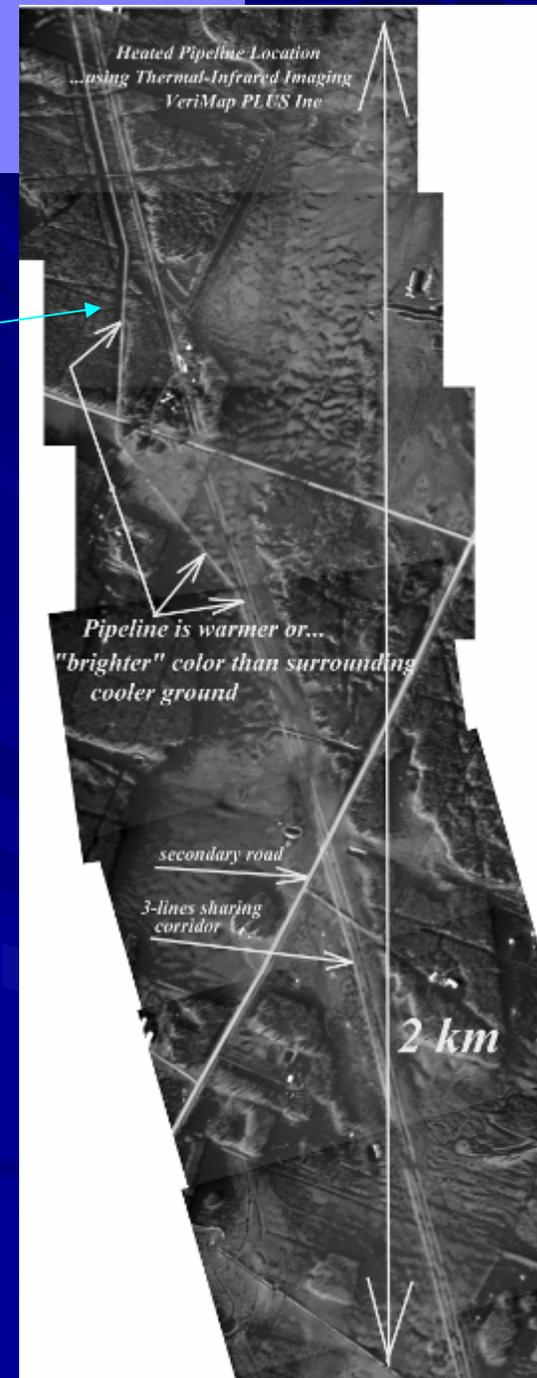
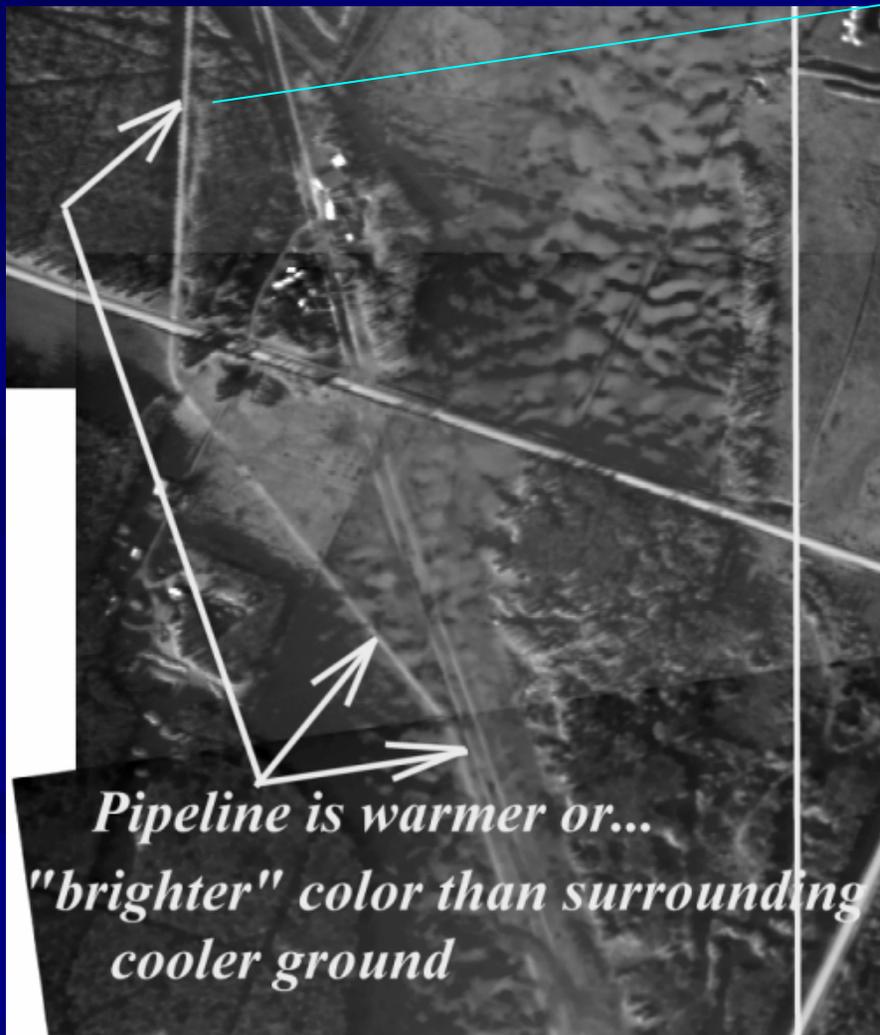
Image Mapping Intelligence – Target Markets

■ As well as...

– Terrestrial Based Assets (Energy & Utilities)

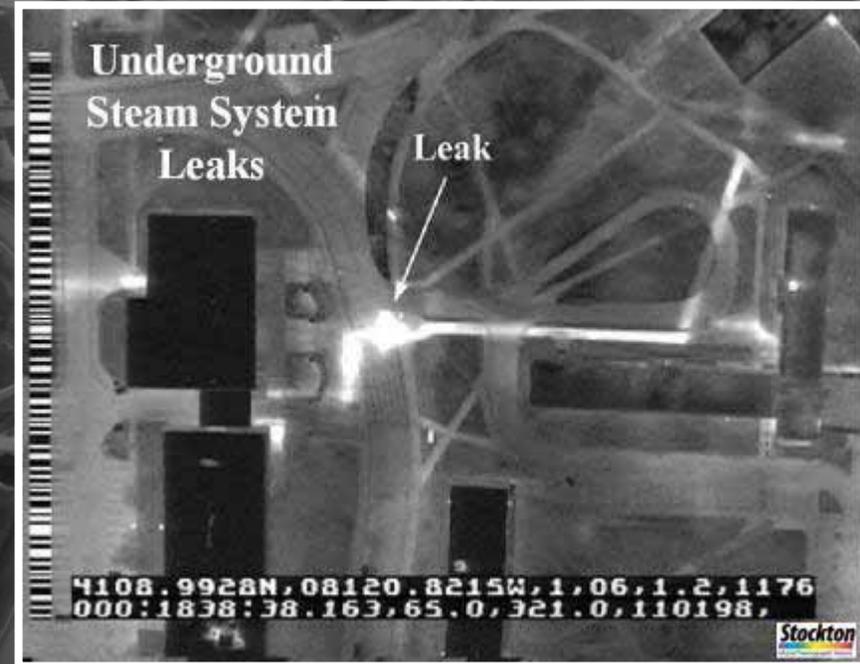
- Oil & Gas, Pipeline Transport
- Electrical & Powerline
- Roads, and Surface Transport Facilities
- Dams & Holding Structures
- Commercial/Industrial Buildings and Structures

Pipeline Location Mapping



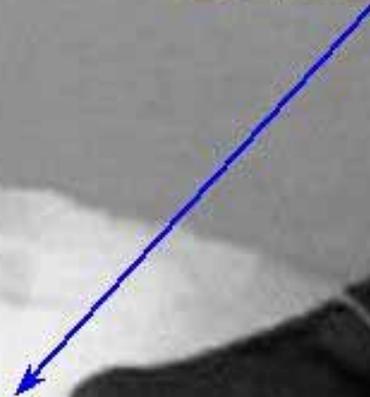
Asset Management

- Pipeline Mapping
- Electrical Grid Mapping
- Railway, Road, Transport
- Bridges, Terrestrial Assets
- Buildings, Commercial Property

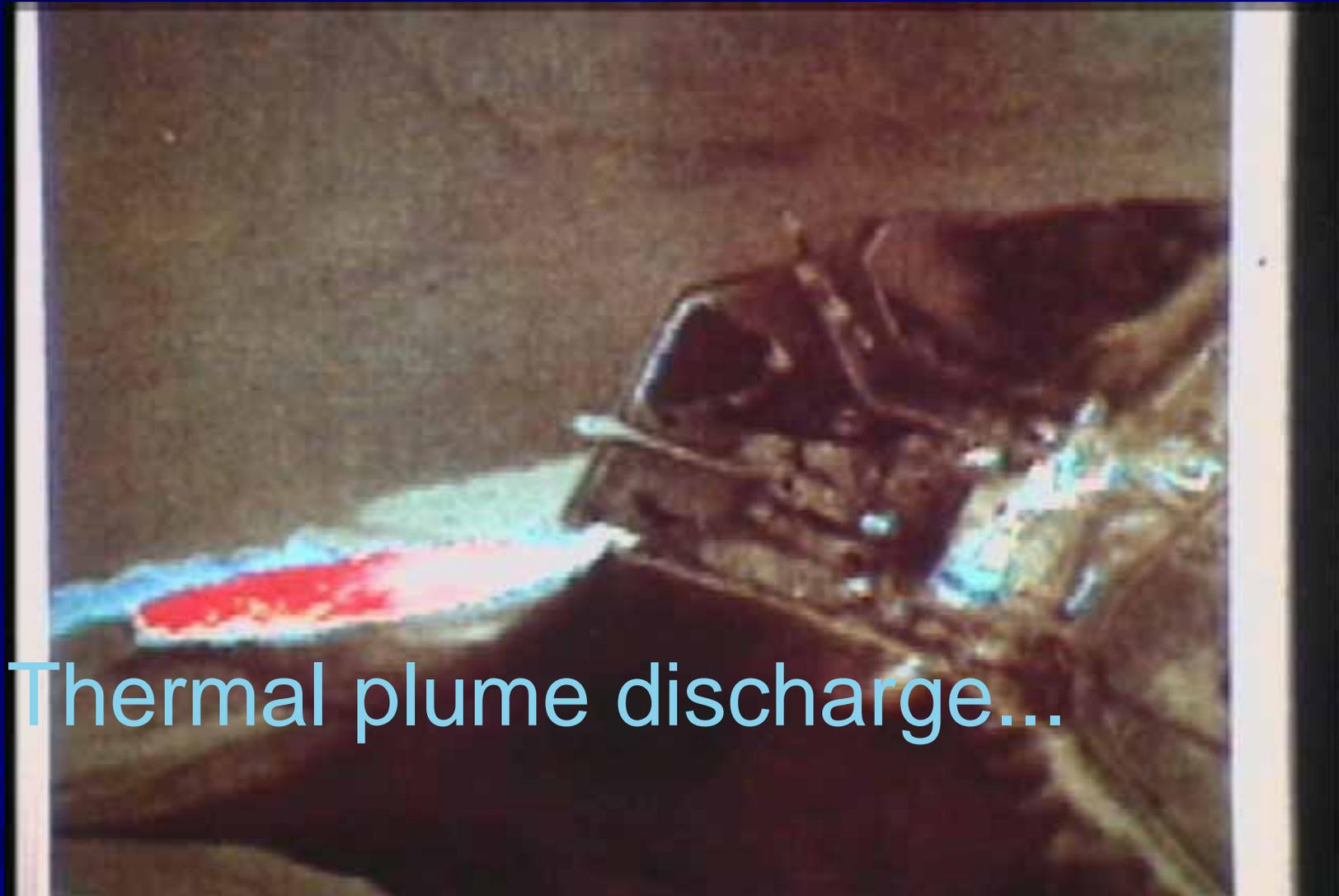


Environmental Impact Surveys

Cooling Tower
Discharge



Nuclear Power Plant



Thermal plume discharge...

How to read a
Thermogram
White is warmer
Black is cooler

Infrared Mosaic Strip Map
Settling Pond

Sensor: Mitsubishi M700
Altitude: 2000' AGL
Temp: 10 C

1.0 km

Image resolution: 0.7m



Note the warm discharge thermal pattern in area...

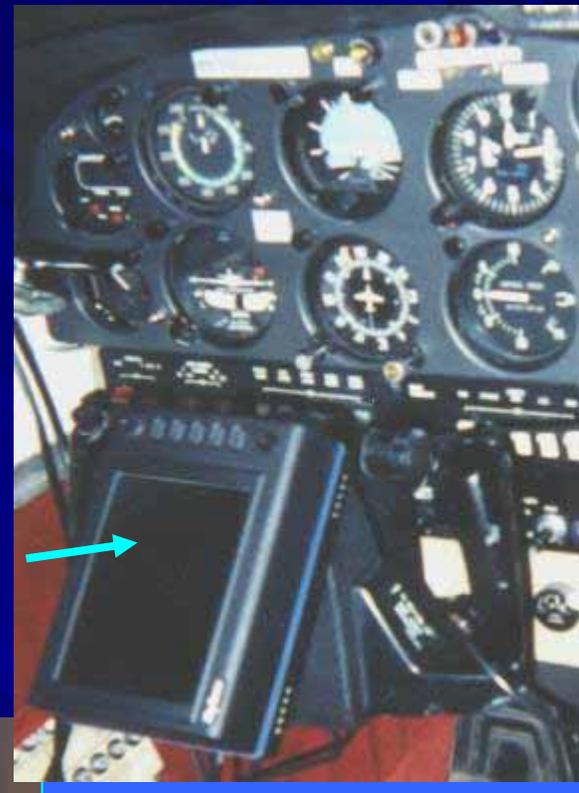
VeriMap PLUS

The Technology

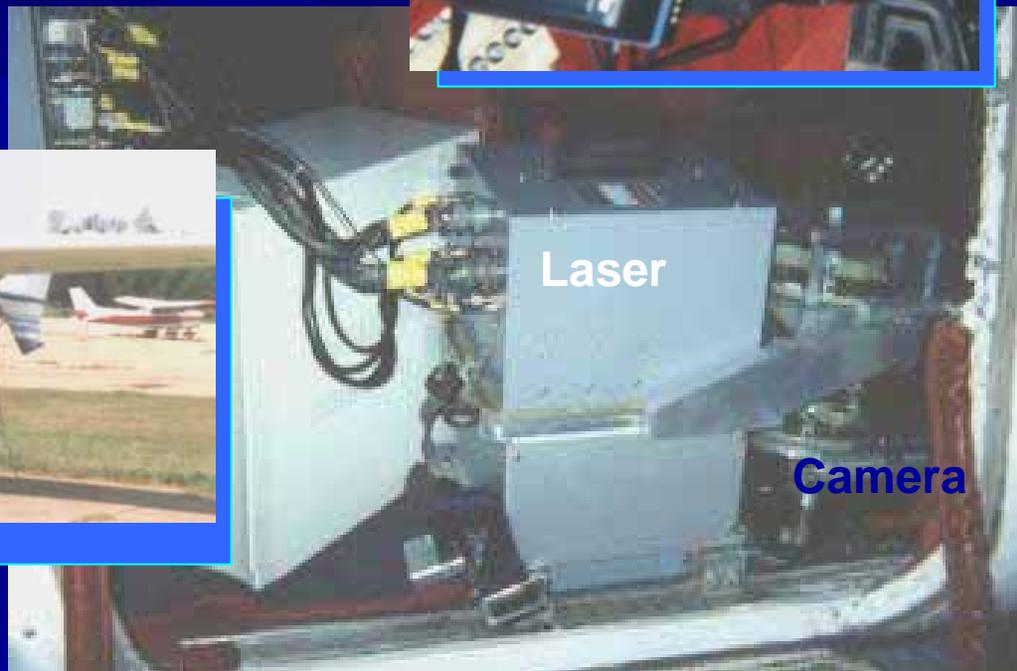
A quick tour ...

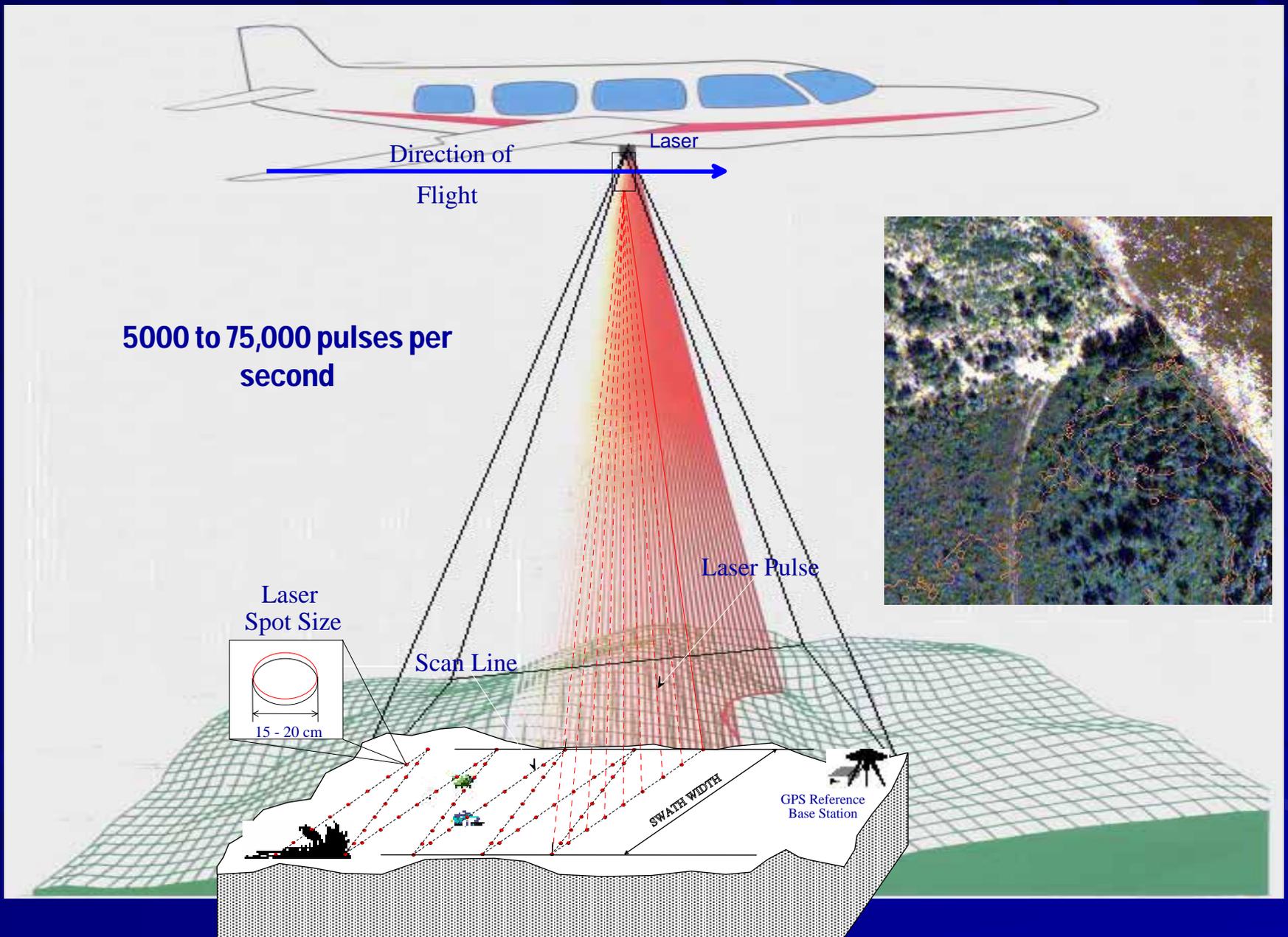
Airborne MK IV installed Jan 2000

Pilot digital
navigation
electronic
flight display
keeps driver on-
line



Twin Engine Cessna 337E
SkyMaster



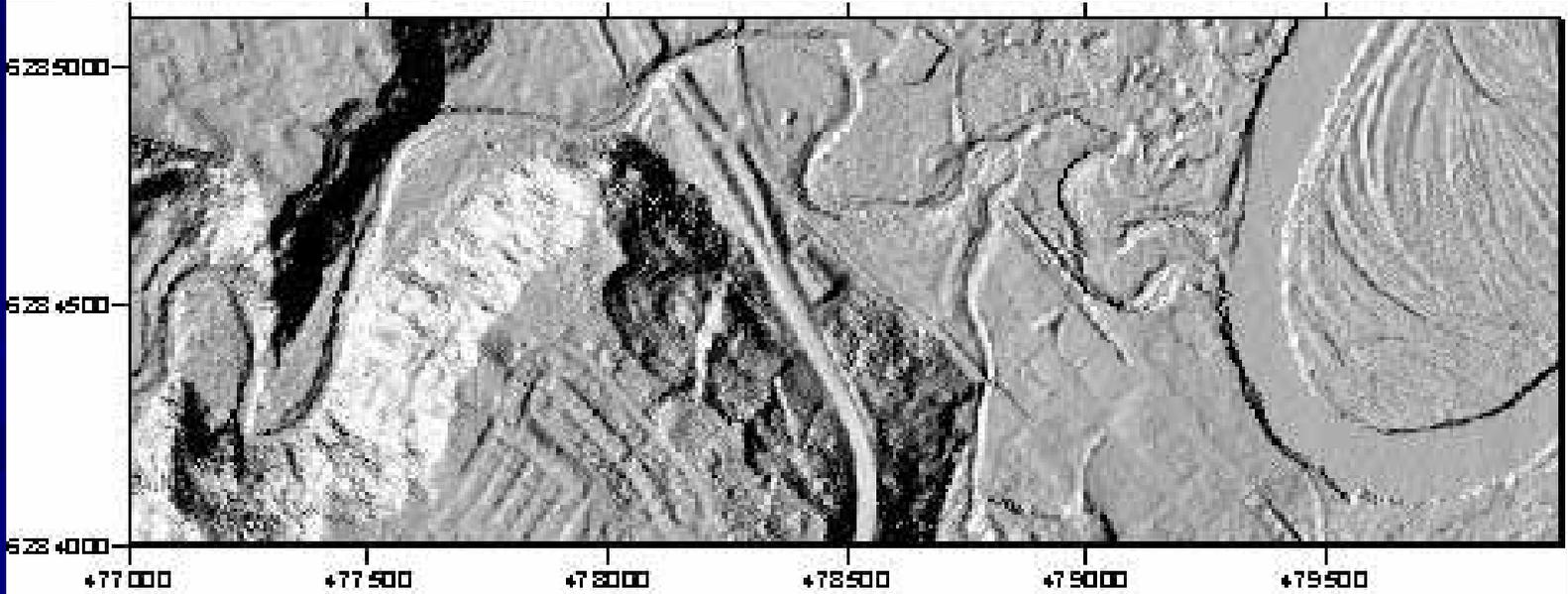


Ft McMurray, AB



...approximately
700

50 cm images
total



State of the Art Processing

To initialize our automated rectification and mosaic routines, we require...

- digital imagery (.tiff) with event marker tags
- the DGPS flight trajectory
- the detailed LiDAR DEM
- INS orientation tags

Quality Control verifies we have complete coverage over the area of interest (no imagery gaps allowed).

We then create intermediate file sets of

- imagery orientation from the INS/trajectory**
- a DEM.geotif at the final image resolution**

Rectification of each image is completed.

Then a mosaic is run to create the tiles of desired size and datum

Conclusion ...

- ...over the past 7 years we have developed the Rapid Mapping System.
- Prices have dropped from \$3.00 per acre to \$0.50 per acre in some applications
- 3m Imagery can be available for \$0.10 per acre in some Agriculture applications
- Our latest advancement is to move the mapping system into a high altitude aircraft to achieve mapping production rates of 1,000,000 to 3,000,000 acres per session...
- ...and deliver that imagery in 24hrs



Photo Copyright Brandon Sciamme

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