Thermal Infrared Imagery Overview

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Presentation Outline

• What is thermal imagery?
• What is its value to you - Applications
  – Infrastructure
  – Environmental
  – Facilities Management
• Solutions
• Summary
• Questions
WHAT IS THERMAL IMAGERY
First impression of Thermal

Military Operations

Wildlife Surveillance

Transportation Analysis

Building Functionality

Internal Heat Loss
Thermal Infrared Imaging

- Thermal infrared energy is emitted from all objects temperature > 0K
- Sensors need to work where signal will pass through atmosphere

The Real technical stuff!!!
Spatial Calibration
Temperature Calibration
**APPLICATIONS**

**Thermal Imagery**

**Facility Management**
- Energy Audit
- Maintenance Issues
- Thermal Anomaly Detection

**Environmental**
- Wild fire management
- Animal counts
- Wetland mapping
- Agriculture Irrigation

**Infrastructure**
- Pipeline leak
- As-built surveys
- Solar panel inspection

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Discharges and Ground Water

• Municipal Separate Storm Sewer System (MS4) Program
• MS4 Permit Compliance

The Illicit Discharge Program is designed to detect and eliminate illicit connections and improper disposals to the MS4 system.
Applications: Infrastructure Discharges and Ground Water con’t

Technical Approach

- Flew thermal imagery over Jefferson County, KY
- Alternative to Traditional, Labor-Intensive Field Exercises
- Digital Data Collection Performed During Optimal Conditions (January)
- Dry-Weather Screening with Crews Can Take Years, Producing Limited Results at a High Cost
Assess Discharges

- Reviewed all water bodies
- Looked for plumes
- Needed to stretch imagery over the water range
- Precision was ~ 0.5°C
- Picked up a lot of thermal variations
- Some are illicit discharges

Applications: Infrastructure
Applications: Infrastructure

Leaking Irrigation

Golf Course – leak from valve box & drainage pipe in golf course irrigation system. 100 ft. N of...
Applications: Infrastructure

Tributary Discharges - New York

Tidal Flow

thermal contrast

bulk water temperatures ~25 C
Applications: Environmental

Fish Habitat

• High quality fish habitat (trout/salmon) need low stream temperature in summer
• Some streams and rivers are managed and regulated for temperature
• Can fly with helicopter or fixed wing
• Depends on sinuosity of stream
Applications: Environmental

Cold Water Tributary - Upper Columbia River, AK
Applications: Environmental

Cold Water Spring - Chuitna River, AK
Applications: Environmental

Longitudinal Temperature Profile
- Identify cold temps
Applications: Facilities Management

Heat Loss

• Building and underground pipe heat loss

• Collect when background is cold but no snow and no rain
Applications: Facilities Management

Geothermal

- Measure underground thermal activity
- Underground fires
Solutions: Energy Audit

A Thermal analysis solution with energy scoring
Solutions: Energy Audit con’t

- Area-wide energy saving tool
- Individual thermal models per structure
- Environmental management
- LEED Certification
Summary

• Thermal imagery allows us to see in a dimension that we can not see in
• Collection can be difficult because of timing and weather conditions
• There are many applications
  – Discharges
  – Heat loss
  – Fish habitat
  – Underground thermal activities
• Innovative solution to address energy audits
Questions

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