



Reflected Light Science, LLC

Emerging Remote Sensing Technologies for Detecting, Monitoring, and Mitigating Oil Spills.

William Bernard

Wbernard@reflectedlightscience.com

443.786.4471

OR

How Good is Good Enough?

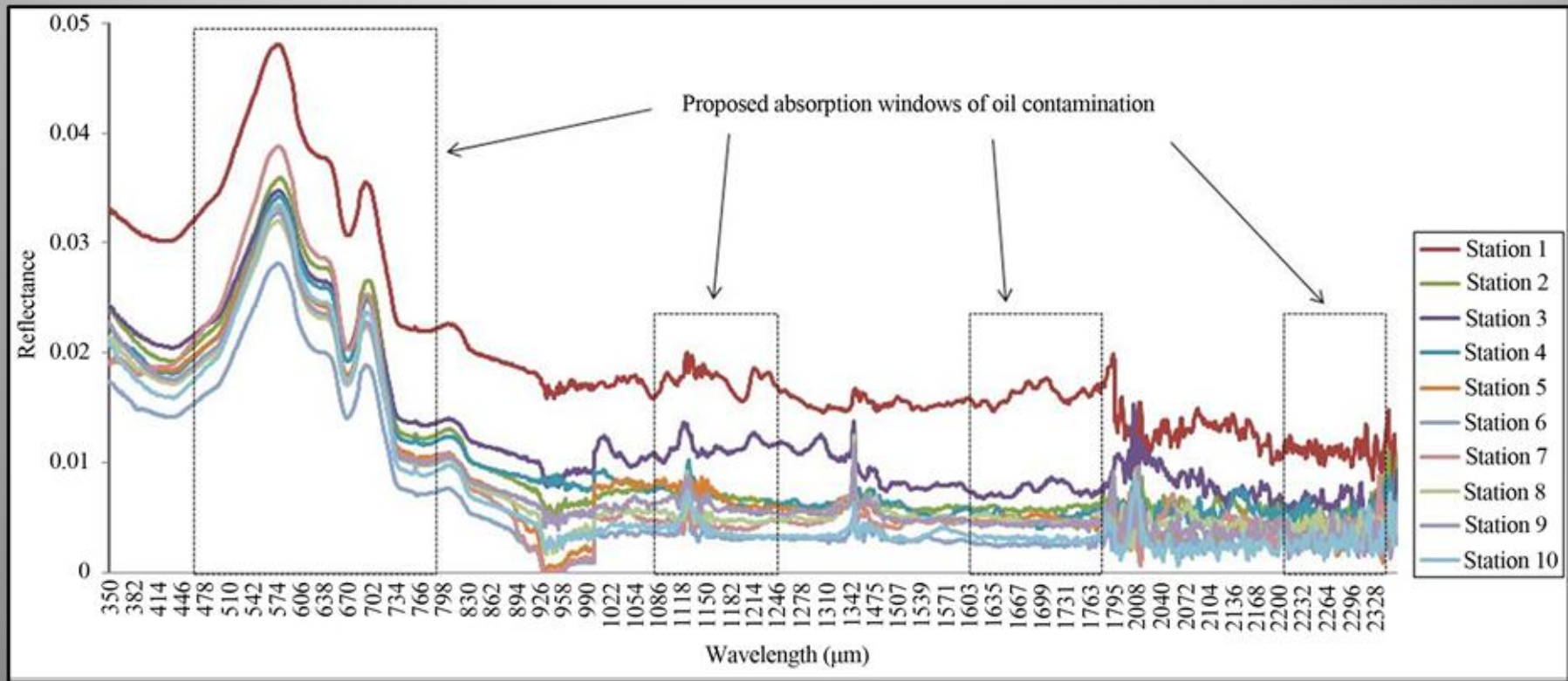
Technology for Monitoring of Areas at Risk of an Oil Spill; Spills in Progress; and Mitigation Operations

- Persistent Monitoring of Areas of Interest
- Ability to Differentiate between Oil and Water, Oil and Vegetation, Oil and Substrate on the Fly
- Share Information for Decision Making and Reporting

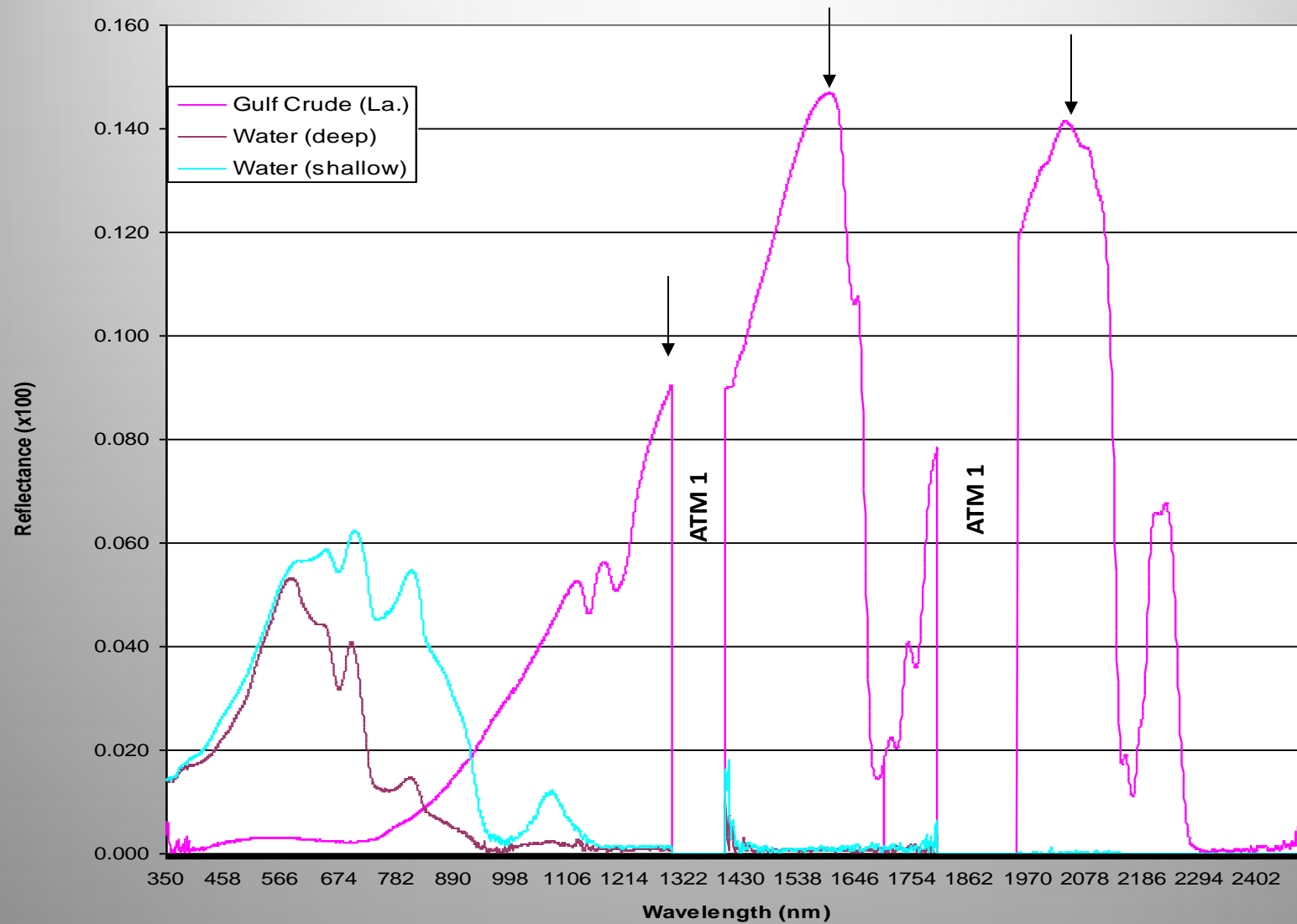
Airborne and Satellite Mapping Technologies

- Multispectral
- Hyperspectral
- LiDAR, Terrestrial and Benthic
- SAR
- Combination of all of the above

Oil Spill Detection and Monitoring



USACE Spectroscopy - Gulf Oil and Potomac River Water Test June 2010



Swanson Creek Oil Spill with Fusion of Multiple Data Sources

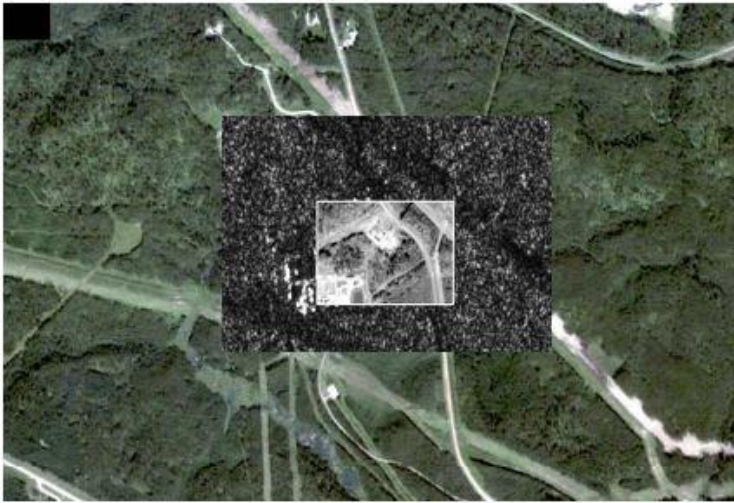
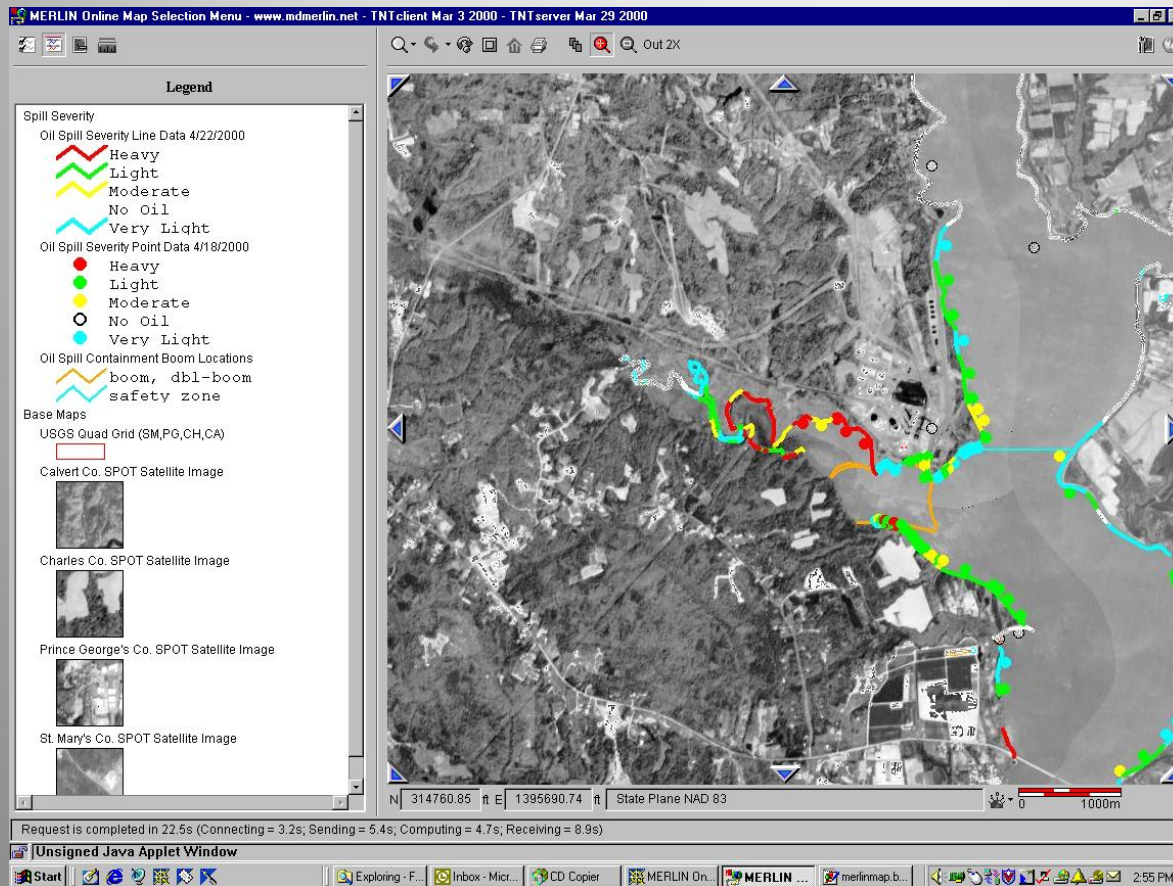


Figure 1: Multi-Sensor data fusion example for pipeline monitoring



Separability of Oil, Water, and Vegetation



Oil Spill in Tidal Wetlands

- Analyzed for ability to detect hydrocarbons in the water and wetlands from hyperspectral data

Post Mortem Analysis

- Phase II operations also include a Site Characterization Study for the Swanson Creek and Marsh, Patuxent River and Tributaries, Pipeline Excavation Plan and Long Term Monitoring Plan.
- Statistics:
- 126,000 gallons of oil released (estimated)
- 49,748 gallons of net oil recovered
- 7,204,652 pounds of solid waste including oil-contaminated booms, sorbent pads, PPE and other response materials disposed of off-site.
- # Wildlife captured/released - 175
- # Wildlife captured/died -27
- # Wildlife found dead - 804

How Good Is Good Enough?

- Technology that Allows Monitoring and Detection of Oil on Land or Water
- Rapid Processing of Mapped Images and Ability to Share the Information
- Ability to Provide Locations and Volumes at the Surface
- Cost Effective Management Solutions

FalconScan Multispectral Camera



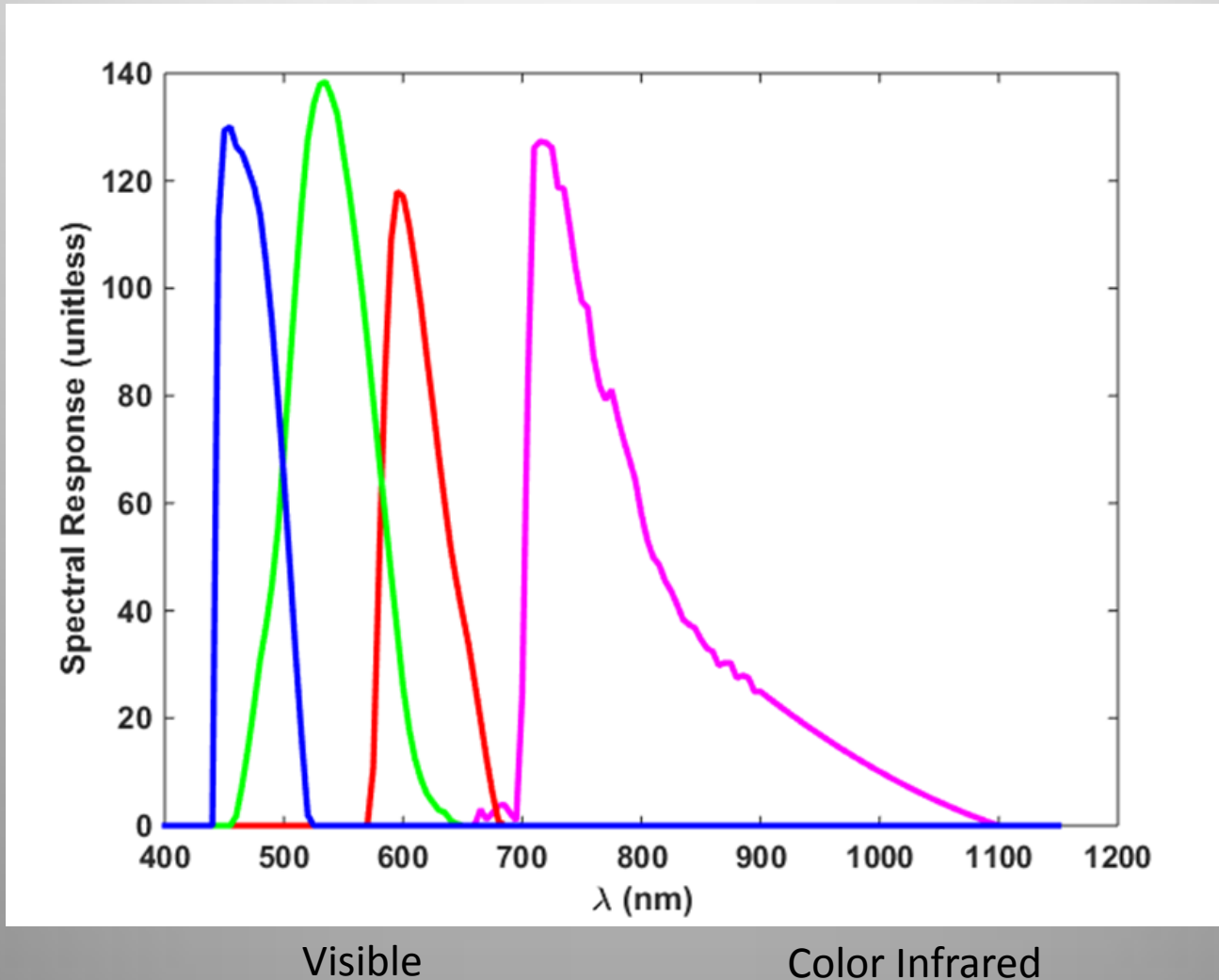
Camera In Aircraft



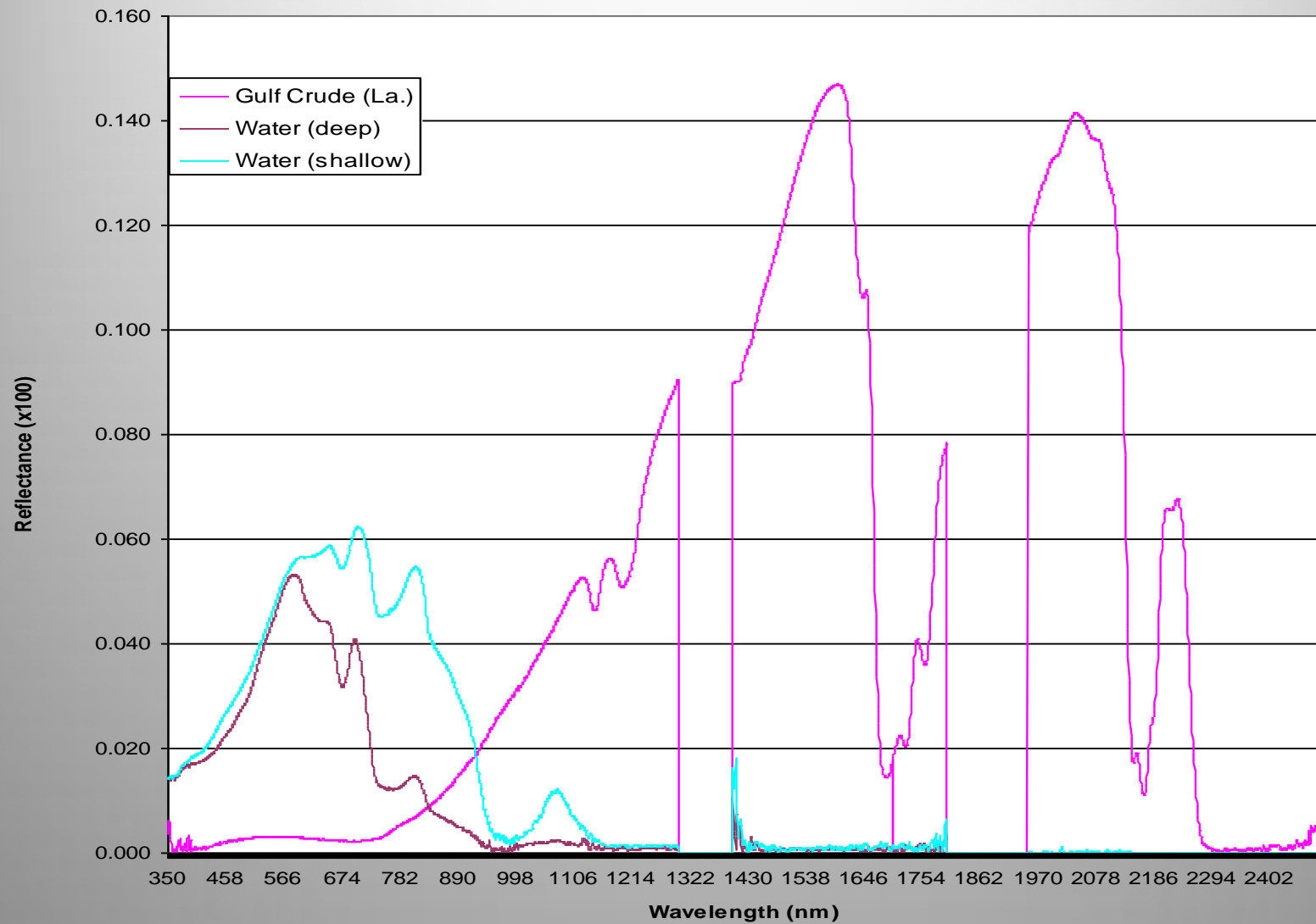
System Description

- Compact Enough to Fit in all Manned and Many UAVs and is Very Cost Effective
- Extended Spectral Range for Vegetation Detection and Monitoring
- Automated
 - Flight Line Generation,
 - Camera Trigger,
 - Cloud Processing and Mosaic of Geolocated Image,
 - Rapid Delivery of 2 or 3 D Product for Further Analysis

Spectral Response Of FalconScan



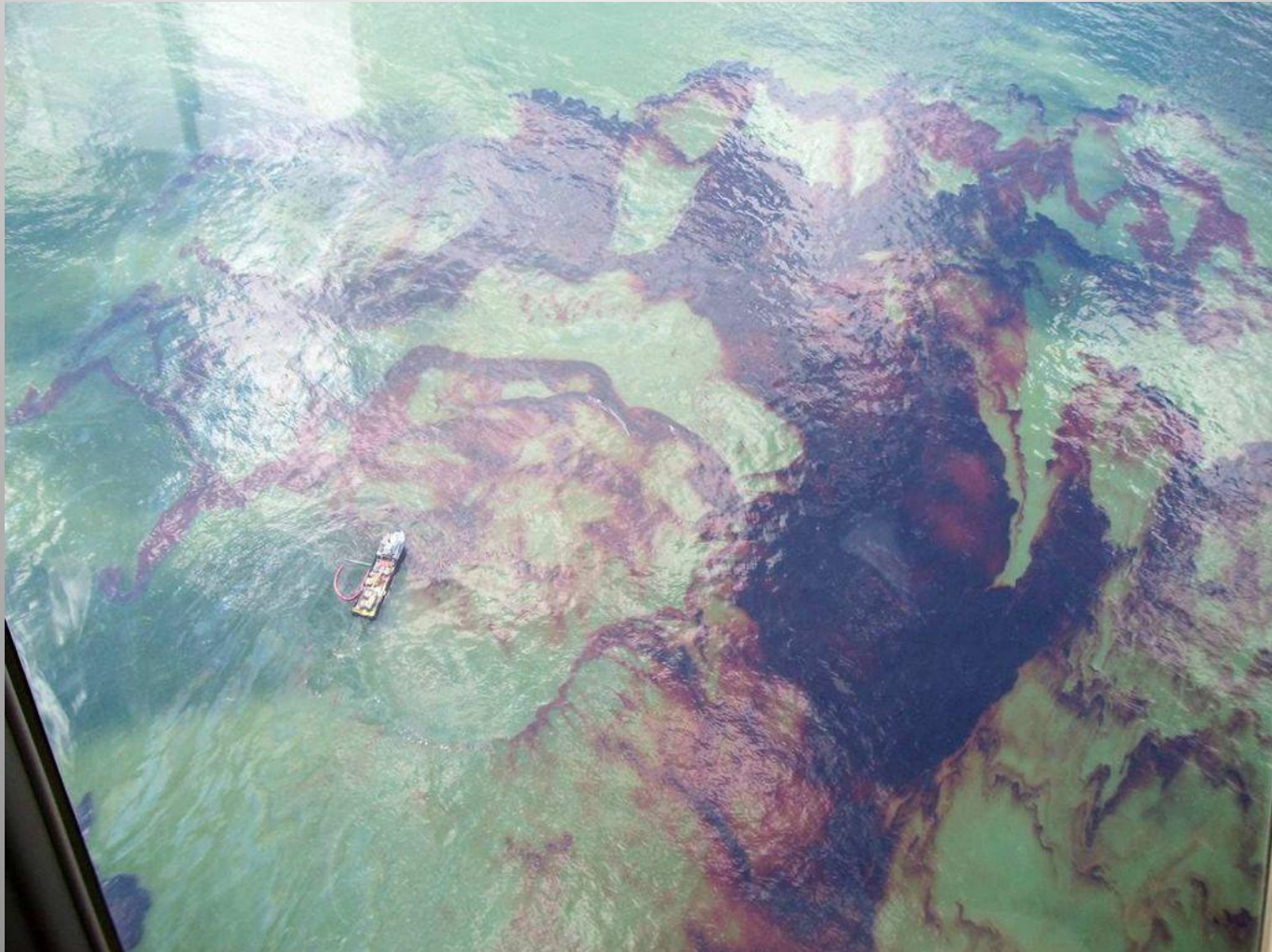
USACE Spectroscopy - Gulf Oil and Potomac River Water Test June 2010

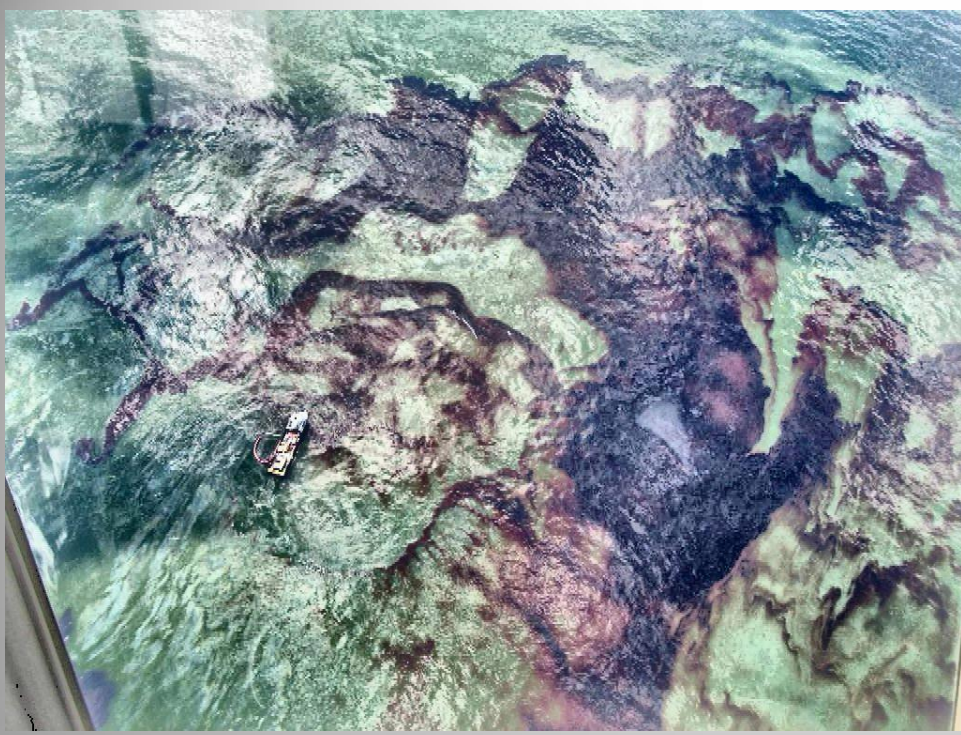


Additional Processing of Digital Images on the Fly

- Original Image is unchanged
- Progressive and gradual application of processing formula allows end users to see everything in the image
- Enhances dark images
- Differentiates Oil from Water, Land or Vegetation
- Reduces haze and smoke
- Change Detection over time for Measurements

Original Multispectral Photo of an Oil Spill from Aircraft

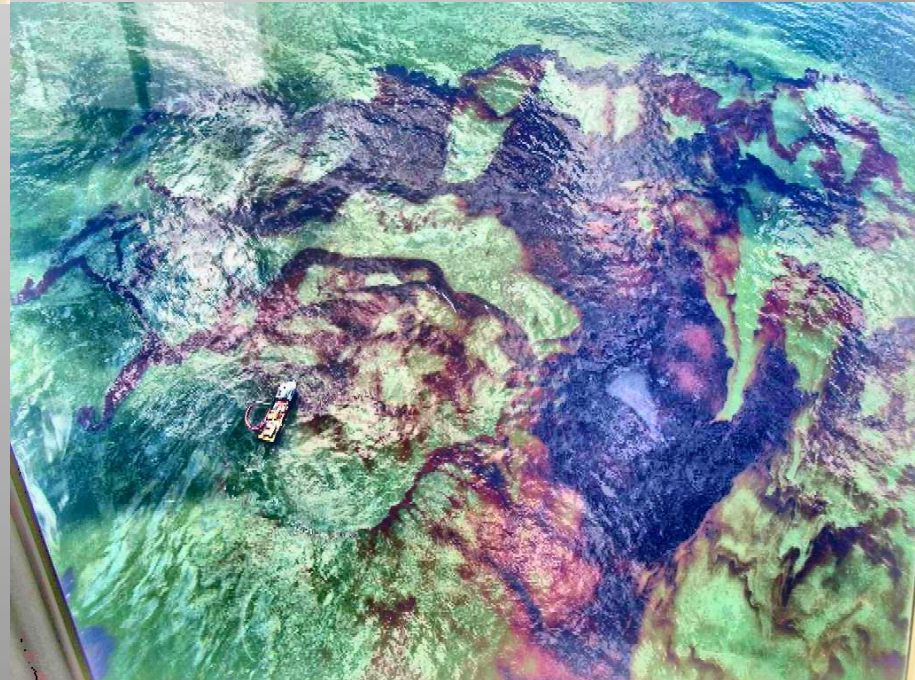




No Color Enhancement

Digital Enhancement

With Color Enhancement



Benefits of Multispectral Images for Oil Spill Detection and Monitoring

- Automated and Cost Effective Camera Systems for Collection of Images from Almost any Aircraft,
- Faster Computers to Process Data, and
- Transmission Technologies that Allow almost Immediate Sharing of the Results
- Additional On the Fly Processing of Multispectral Images Provides Rapid Answers to Questions

Thanks

For More Information please contact:

Bill Bernard

Reflected Light Science

443.786.4471

Wbernard@ReflectedLightScience.com