ORD/NERL/ESD/LEB

EPIC

Remote Sensing Research Activities

March 2, 2005

REMOTE SENSING RESEARCH ACTIVITIES

GEOSS / Caribbean Initiative

Hyperspectral Data Analysis

CAFO / Pattern Recognition

Thermal Budget of Large Lakes

LIDAR / Impervious Surfaces

Arsenic Phytoremediation

CART / Land Cover

REMOTE SENSING DATA GATEWAY

GROUP ON EARTH OBSERVATIONS

Earth Observation Summit Participants

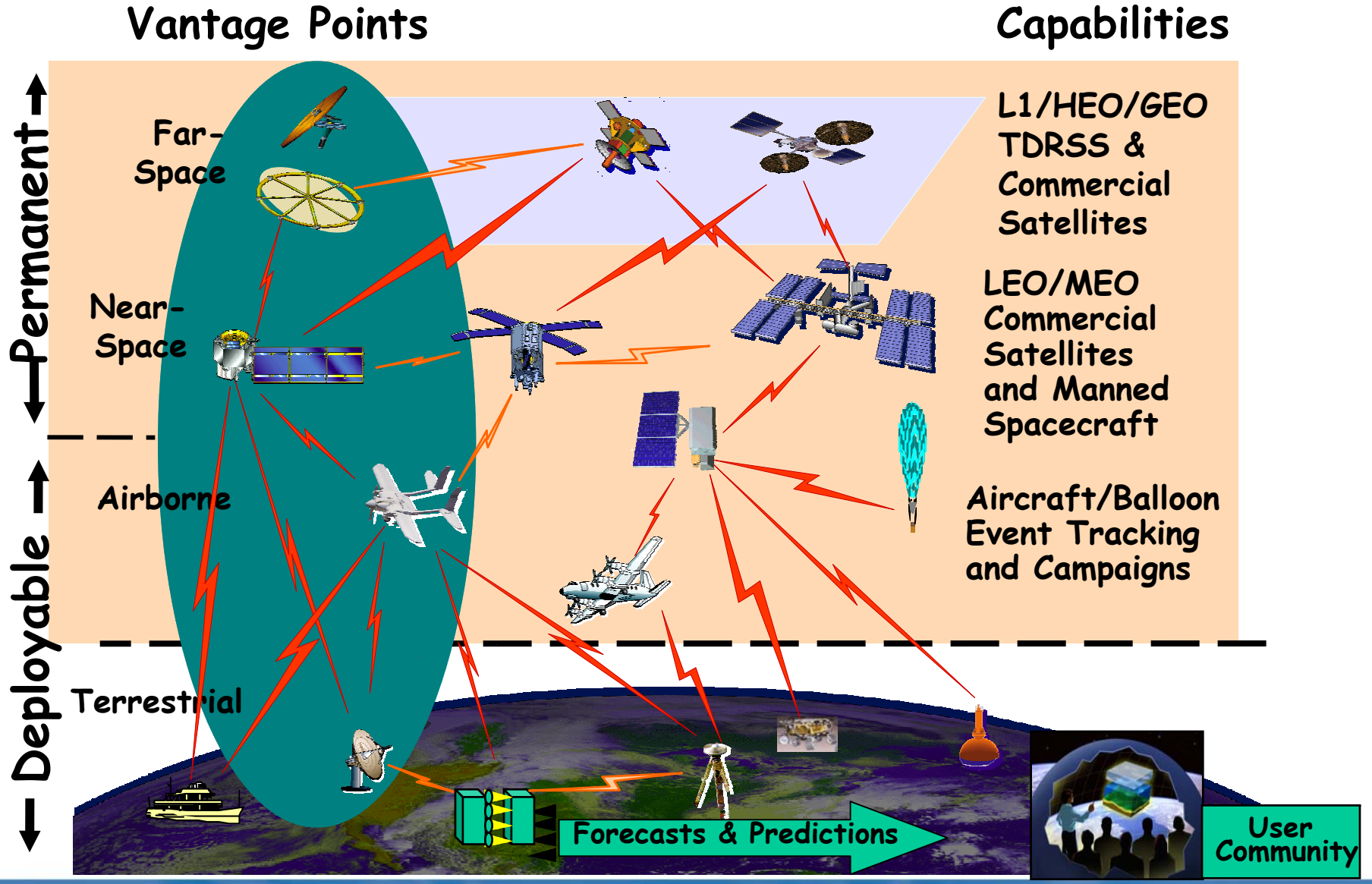
U.S. Department of State, Washington DC

July 31, 2003

RESEARCH & DEVELOPMENT

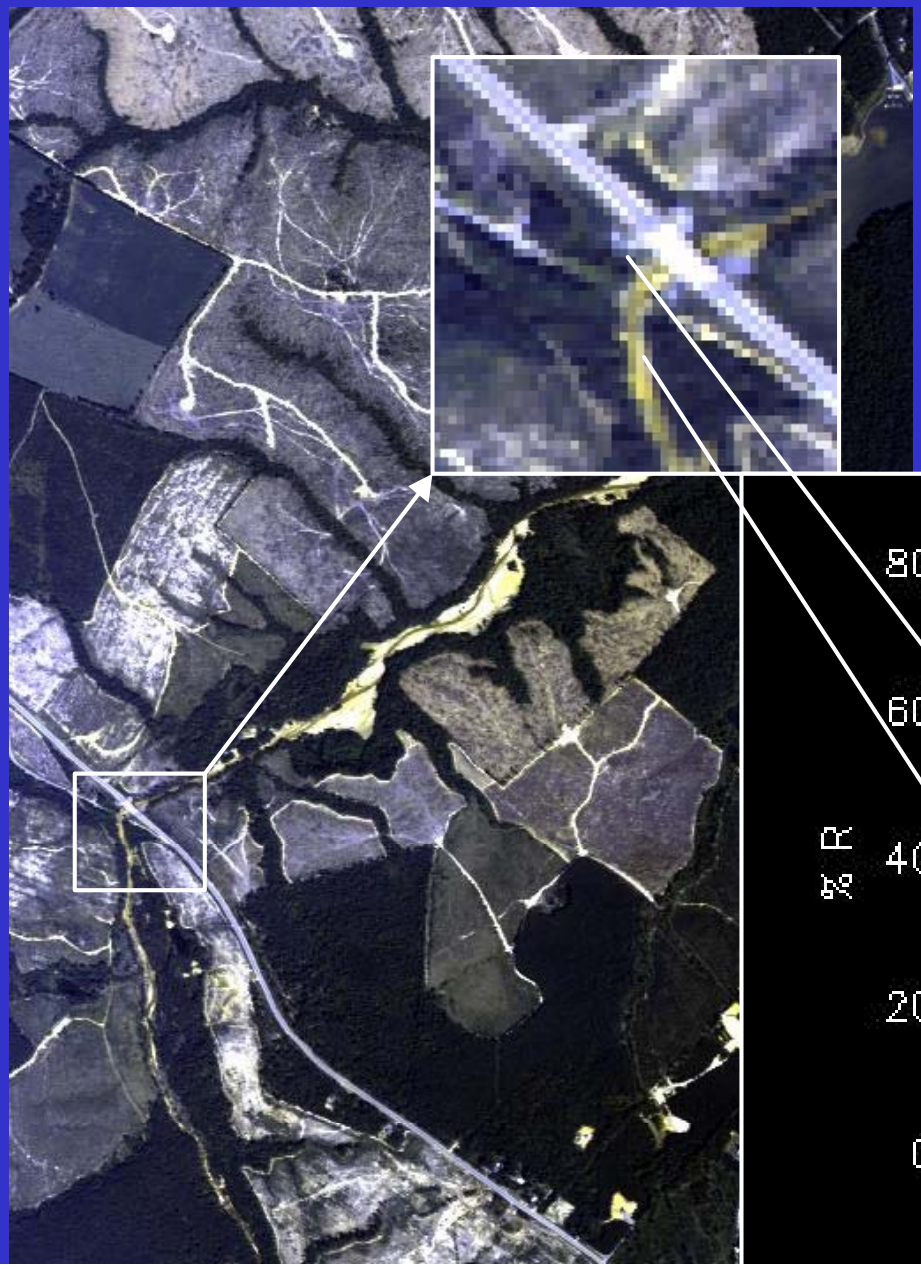
Building a scientific foundation for sound environmental decisions

Coordinating Earth Observing Systems

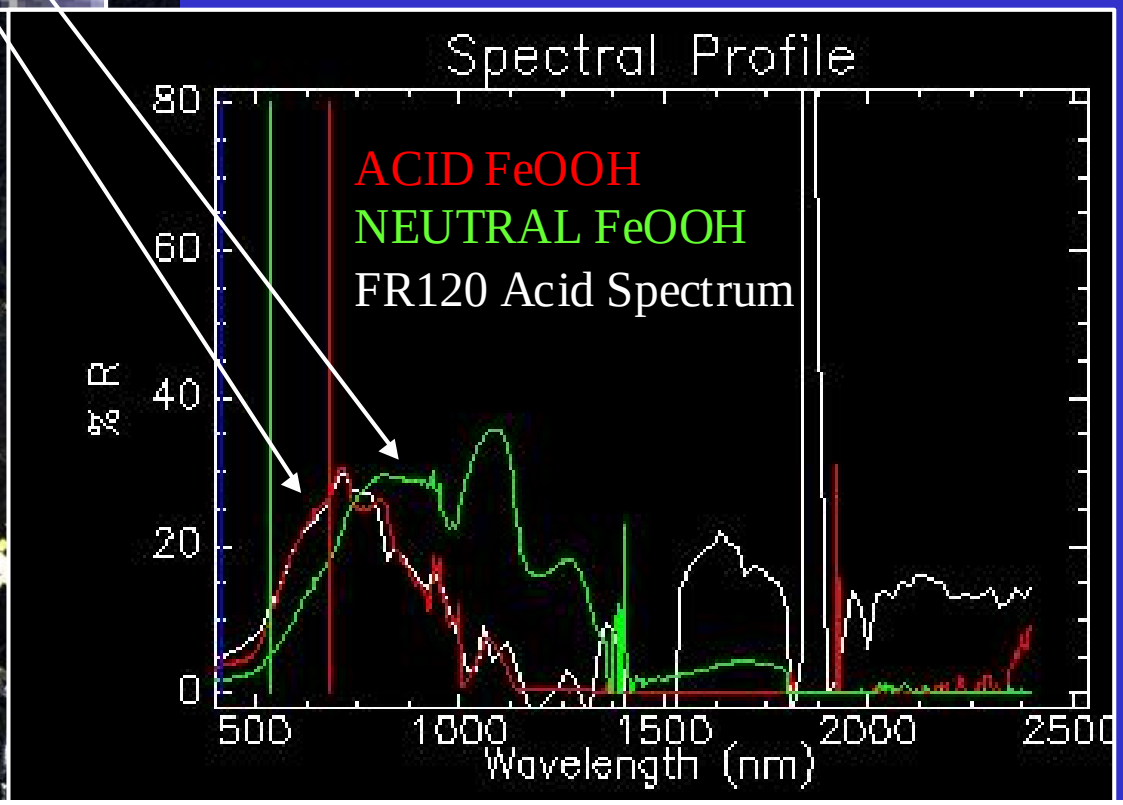


GEOSS RESEARCH INITIATIVE – The Sustainability of Caribbean Ecosystems

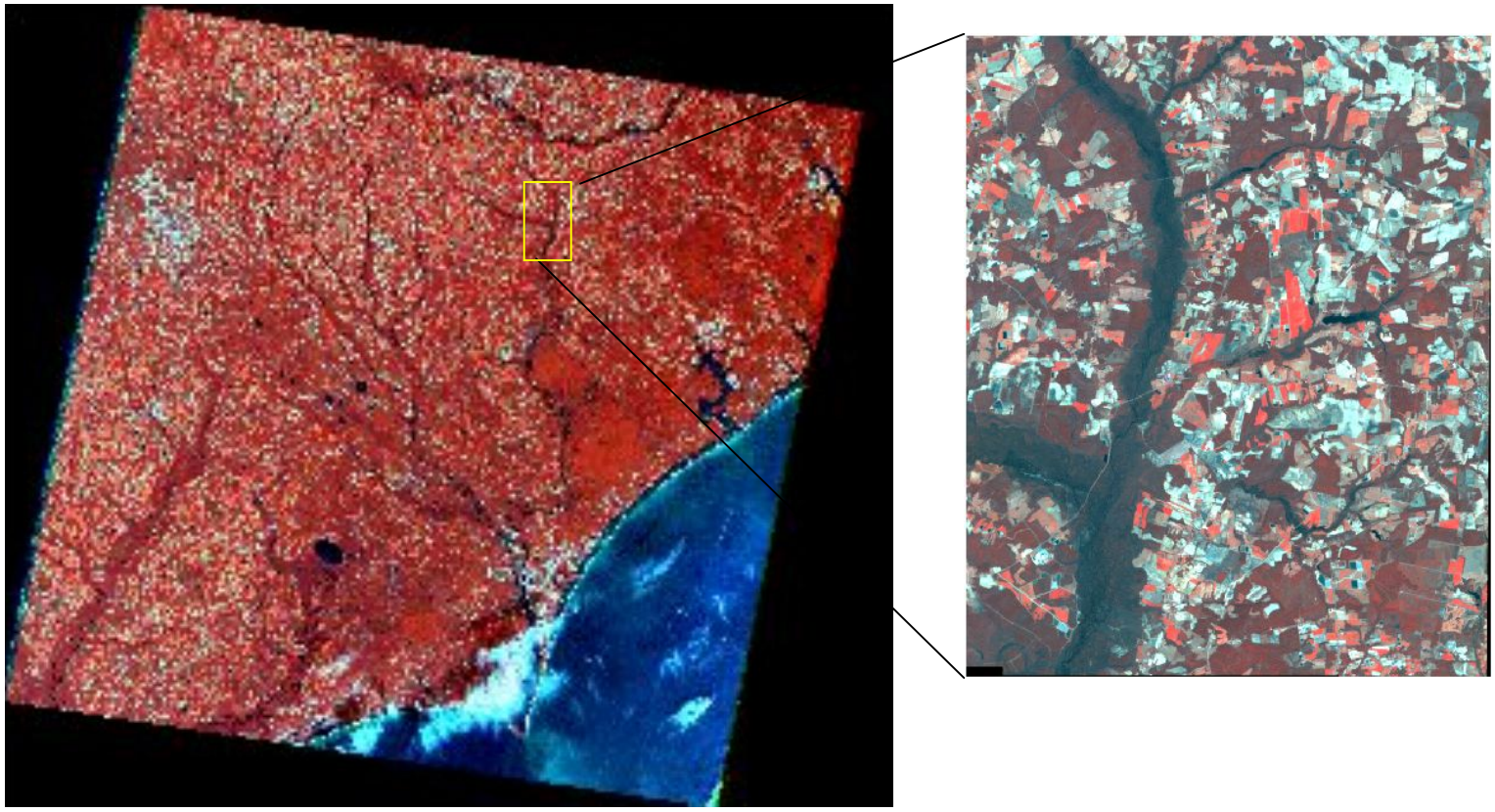
Hyperspectral Detection of Acid Mine Drainage



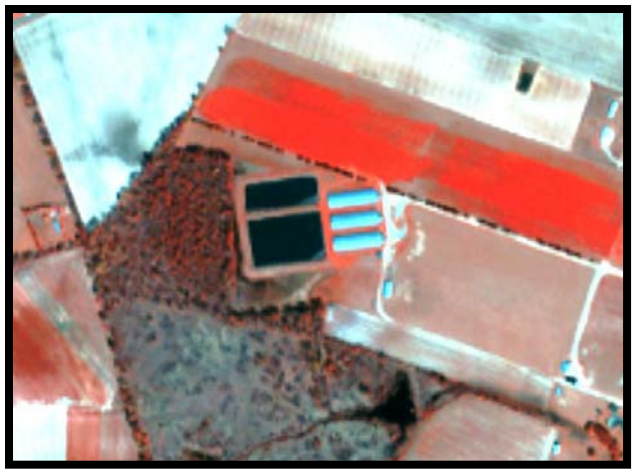
HYMAP bands 15, 13, 2 (RGB) at Contrary Creek showing acid FeOOH precipitates in stream. Spectral Profile (below) shows all 107 HYMAP bands queried to detect acid versus neutral discharges. Matching field spectrum for acid minerals is in white.

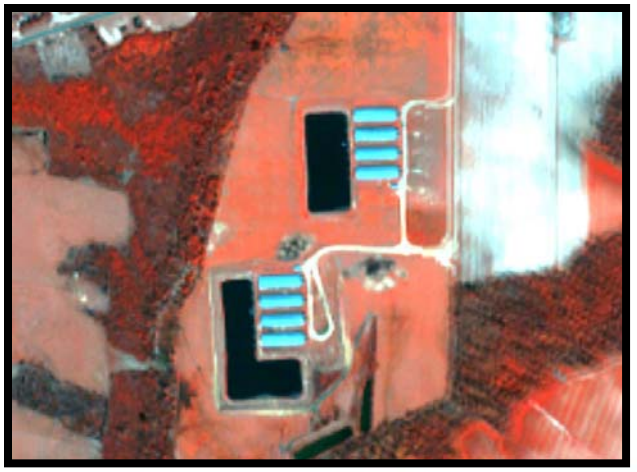


Landsat ETM Image with IKONOS Study Area Inset

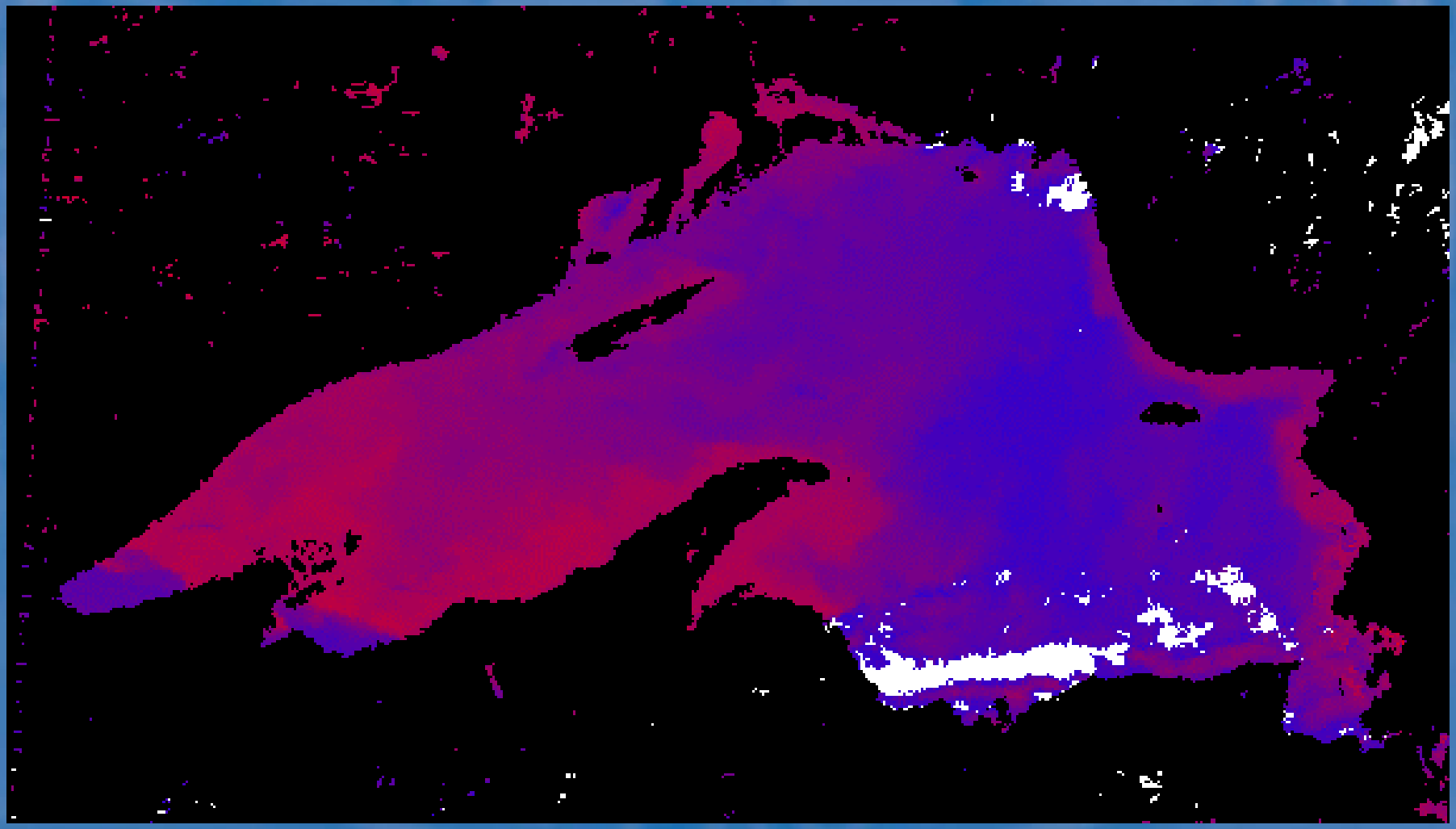


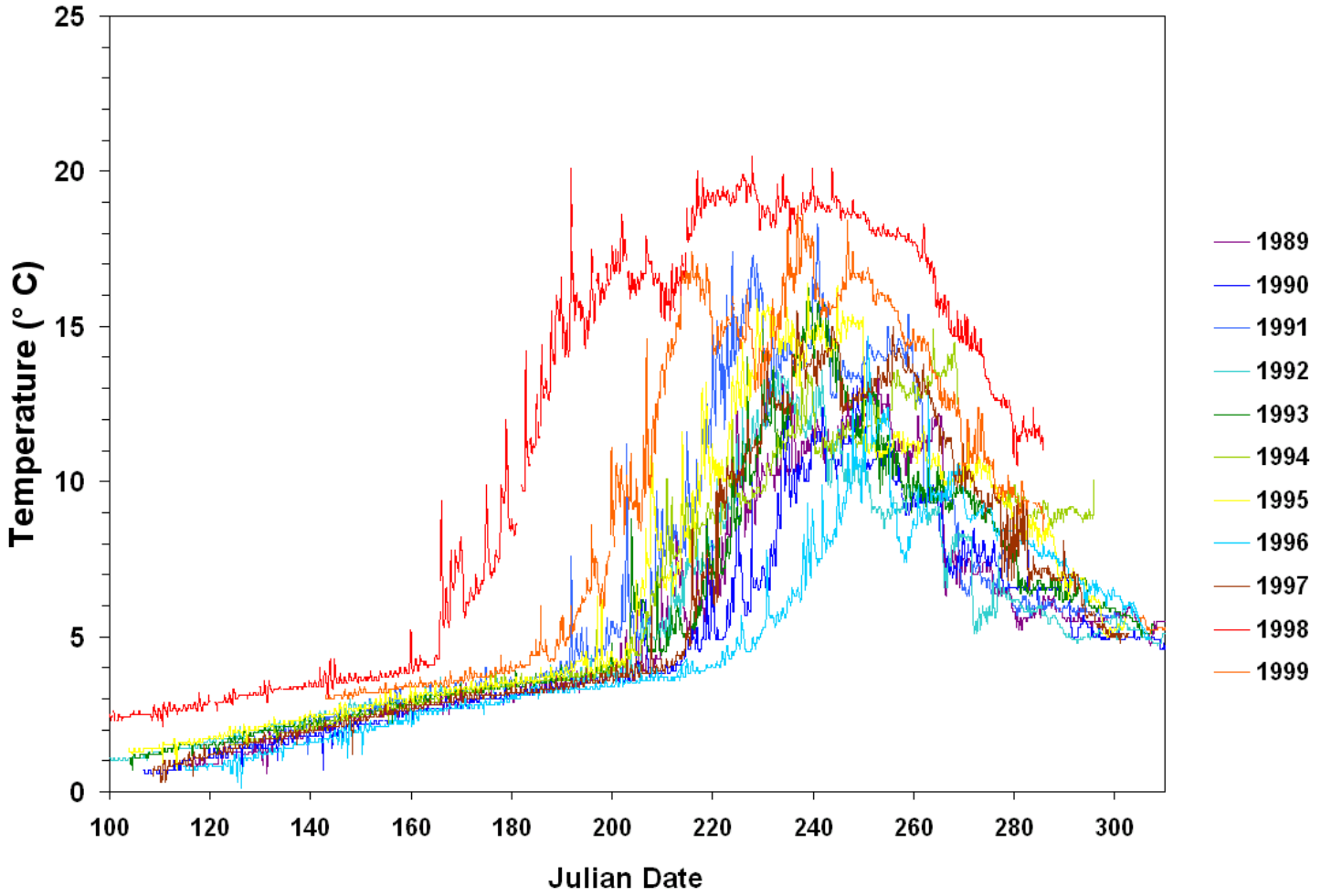
Typical AFO Signatures





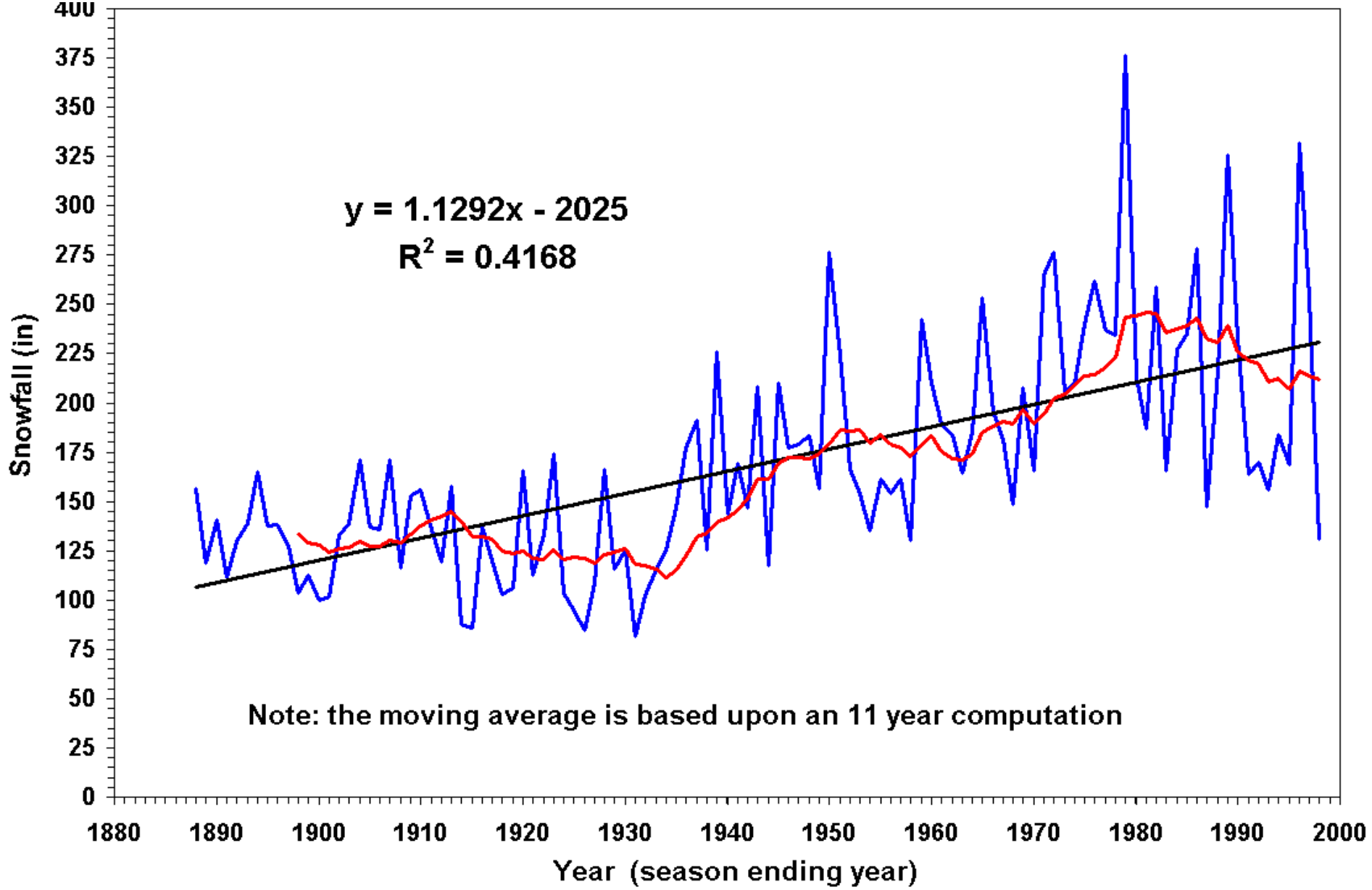
Thermal Infrared Analysis of Heat Budgets in Large Lakes Using Multi-Temporal AVHRR Data





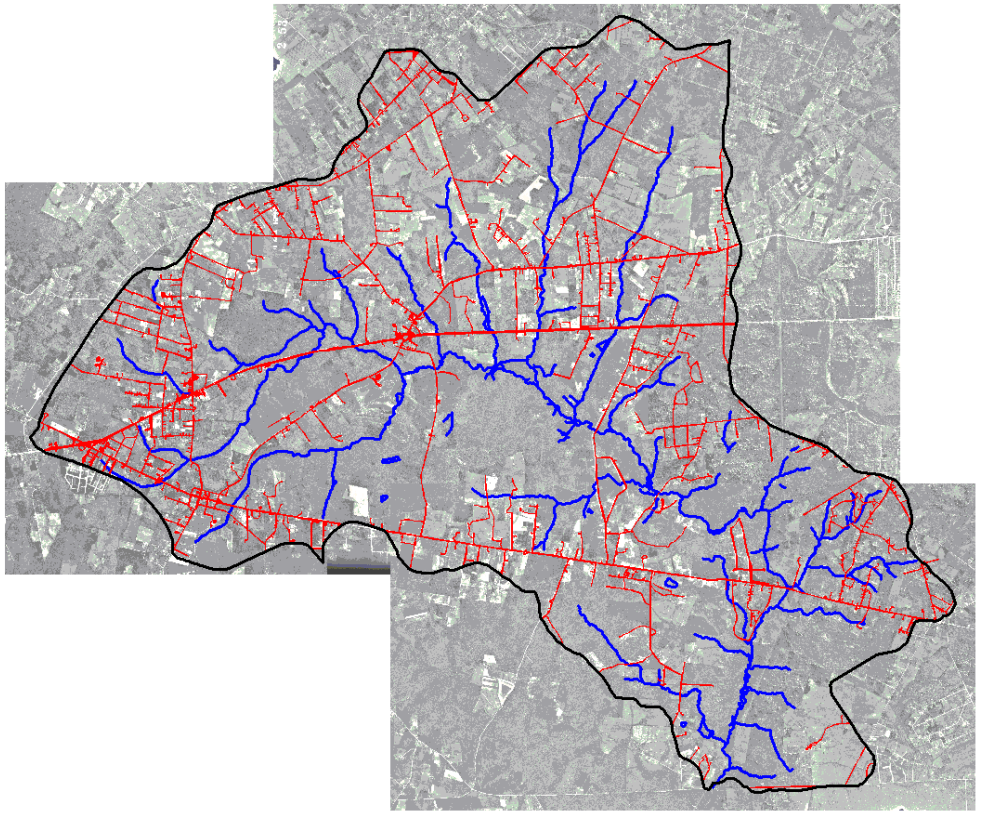
1989 - 1999 Lake Superior Buoy 45001 Water Temperature

Seasonal records of surface temperature from a NOAA buoy in the center of Lake Superior. Note how much warmer the surface temperature was in 1998 compared to other years. 1999 also appears warmer than normal

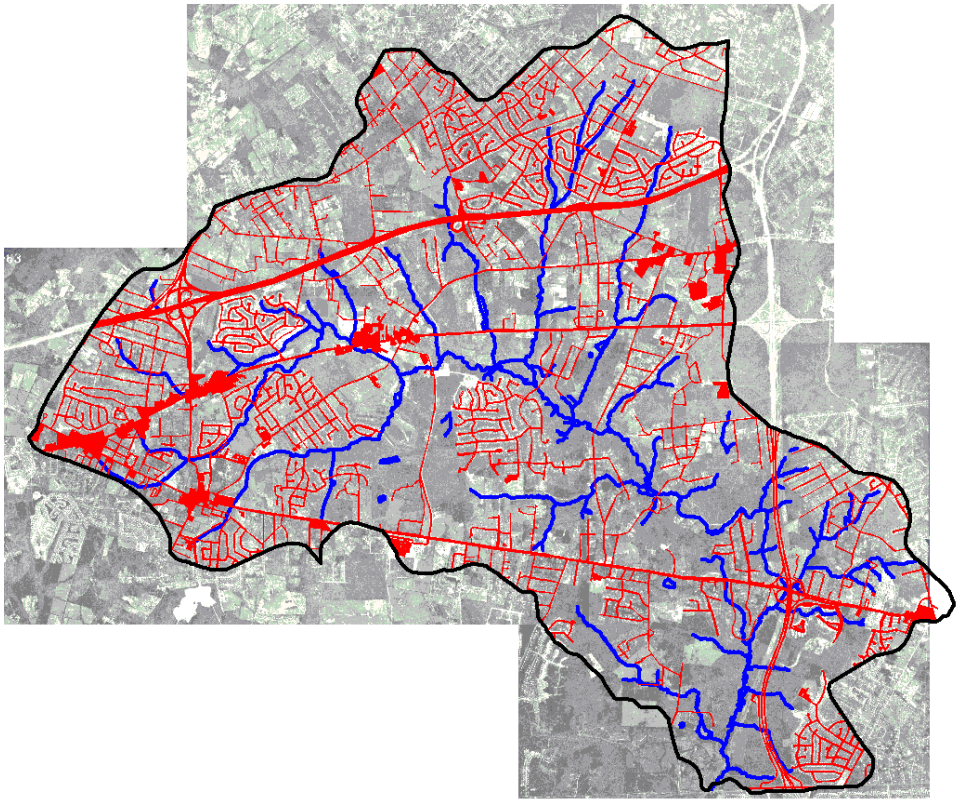


1888 - 1998 Houghton/Calumet Seasonal Snowfall Amounts

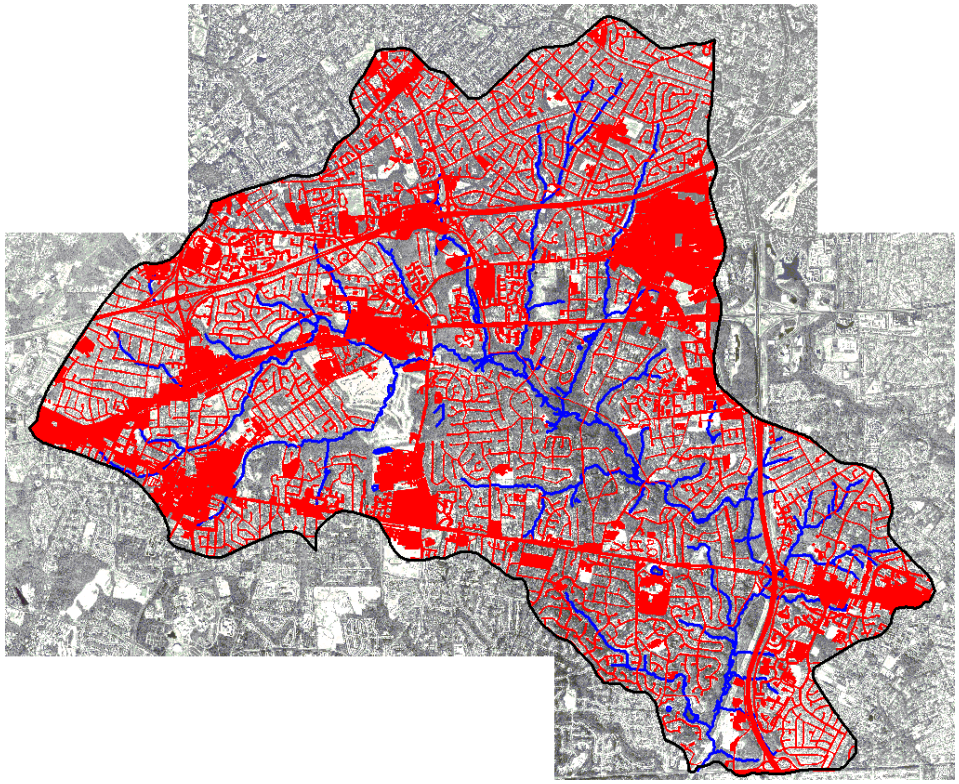
Impervious Surfaces
Accotink Watershed - 1949



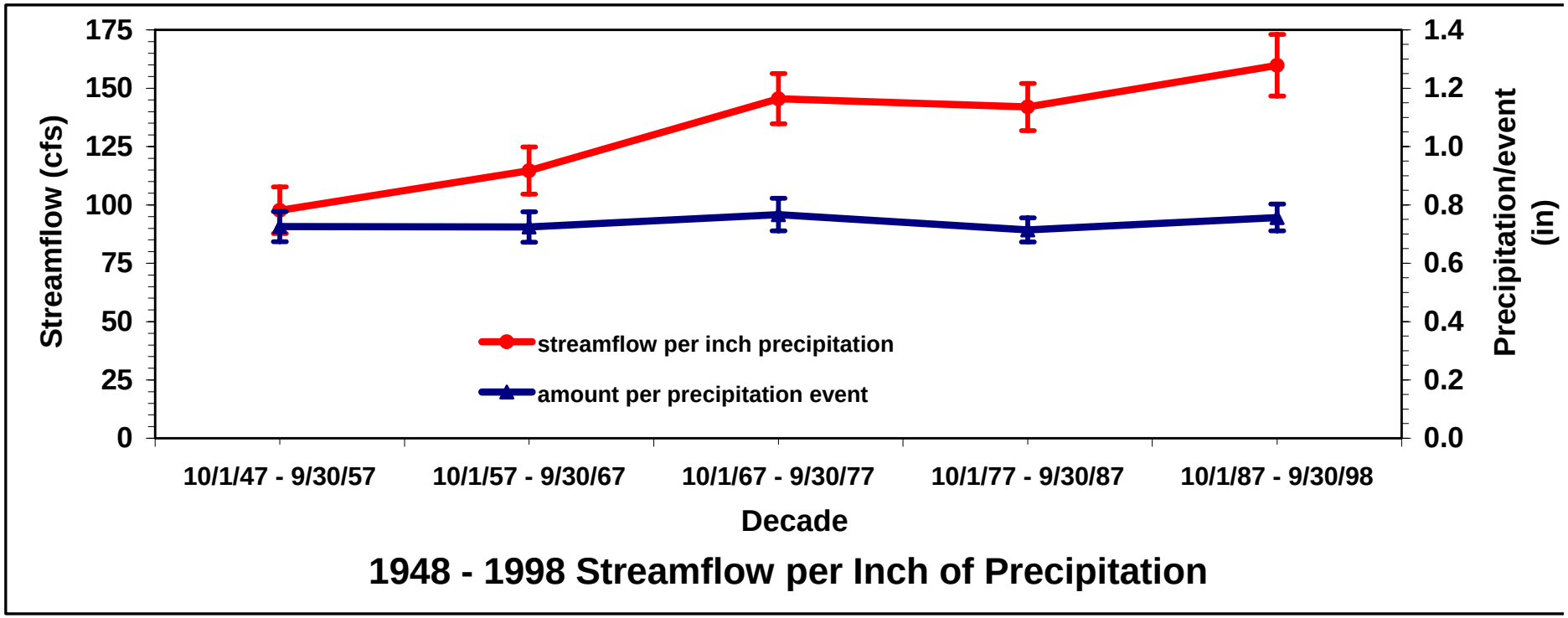
Impervious Surfaces Accotink Watershed - 1963



Impervious Surfaces Accotink Watershed - 1994



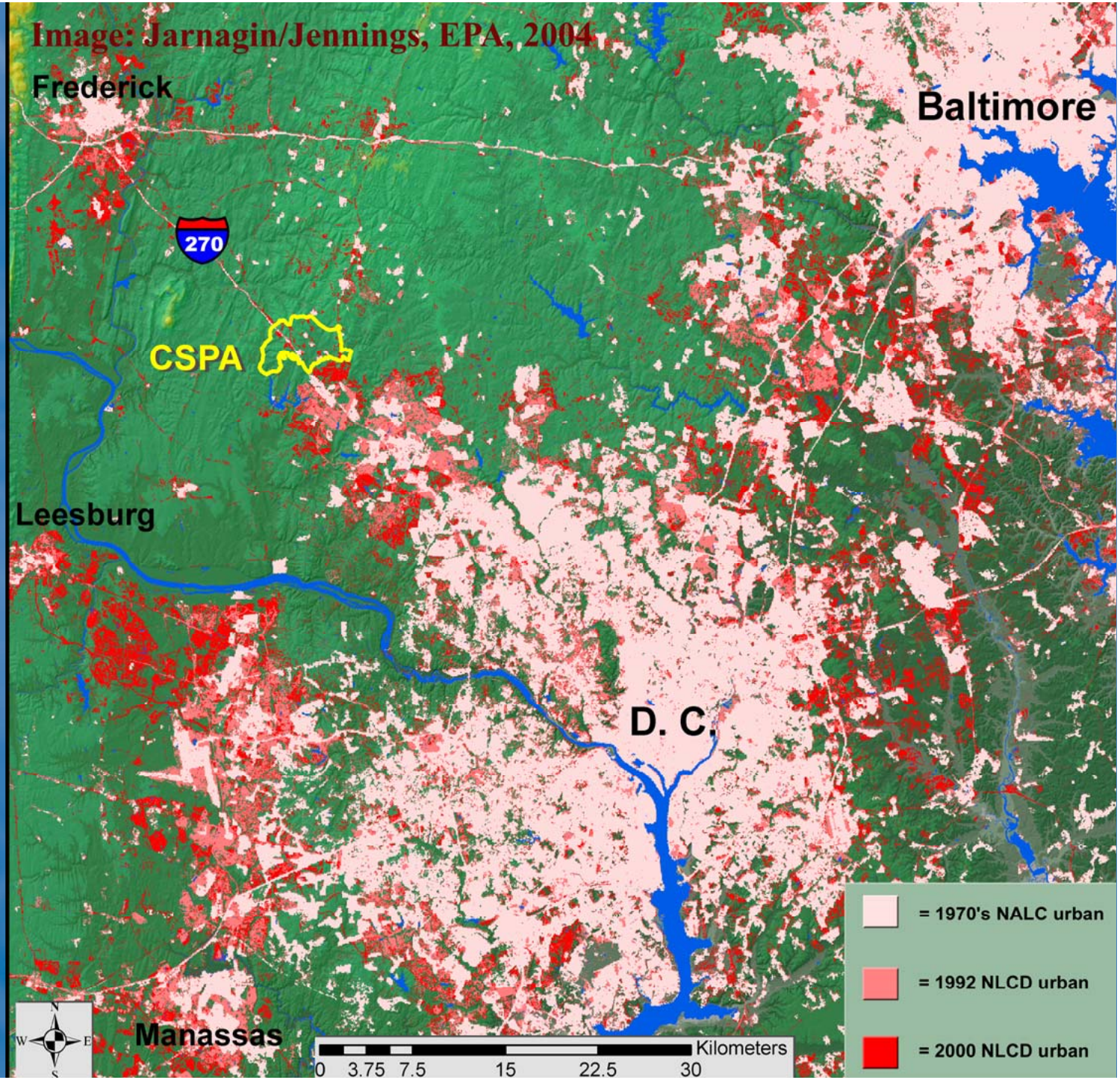
Impervious Surfaces
Changes in Hydrology



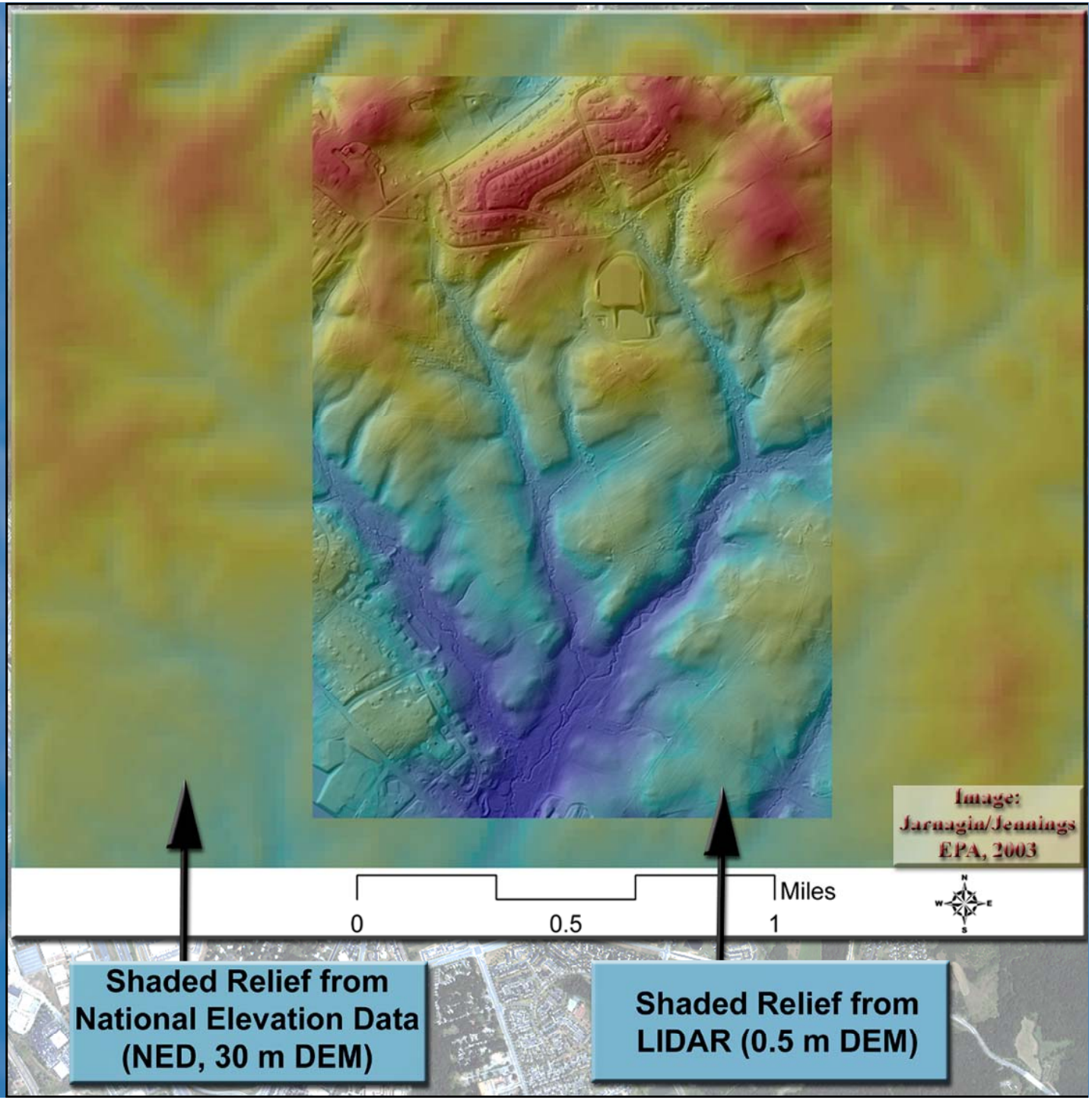
1948 - 1998 Streamflow per Inch of Precipitation

Thirty years of urban land cover:

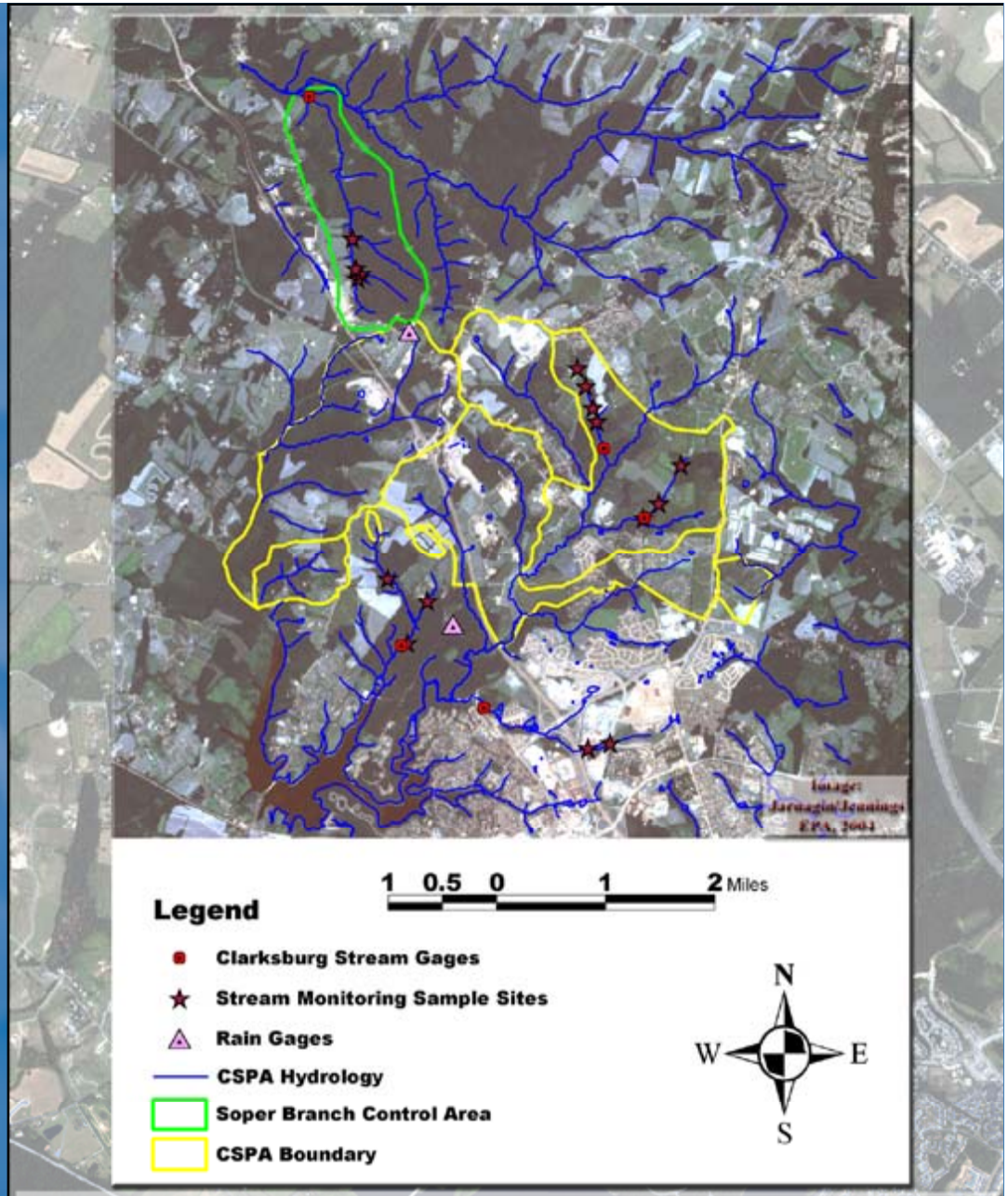
A geospatial display of development patterns at a local/regional metropolitan scale



Building a better Digital Elevation Model (DEM): The National Elevation Data (NED), 30-meter pixel spatial resolution, is compared with a sub-meter DEM derived from a LIght Detection And Ranging (LIDAR) overflight



Clarksburg Maryland Special Protection Area showing subwatersheds, stream and precipitation gage locations, and water quality monitoring locations. Impervious surfaces, changes in topography, and BMPs from the suburban development will be correlated with changes, or lack of changes, to water quality and quantity in a BACI (Before, After, Control, Impact) study.



CSPA Streamflow and precipitation gages and monitoring locations. USGS WRD, University of Maryland College Park, Environmental Systems Analysis, M-NCPPC and Montgomery County DEP are collaborating on the collection of these data. The base map is an IKONOS 4-meter satellite image obtained in June 2002.

300 Ferns in Controlled Greenhouse Experiment

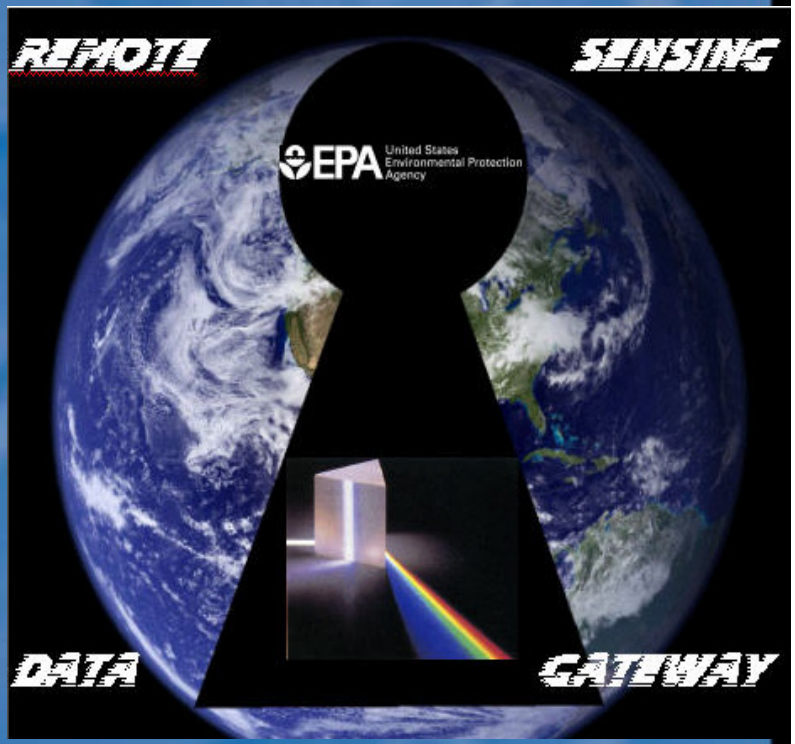
Visible, Infrared and Fluorescence Spectroscopic Analysis

Effects of As on Control Ferns – 8 weeks

USACE
Phytoremediation Pilot
Lot 15, Spring Valley

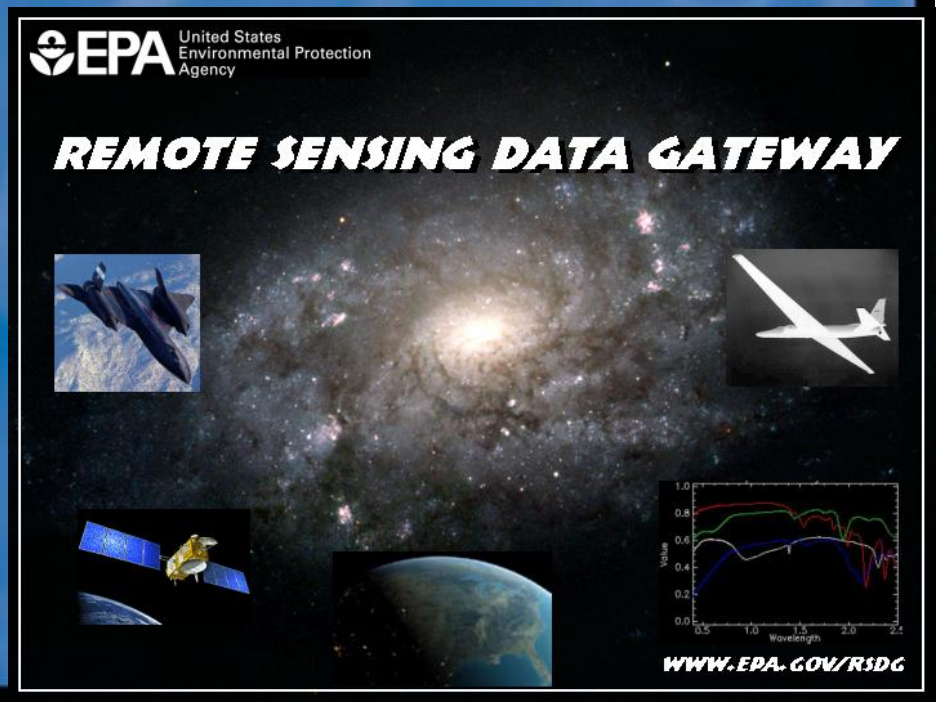
REMOTE SENSING DATA GATEWAY

- *High Bandwidth Search/Access to Global holdings of remotely sensed data*
- *Unique METADATA search engine*
- *Internal and External Search capability*
- *Direct download / expedited acquisition processes*
- *Long Term archival function*



RSDG DEVELOPMENT ISSUES

- *Collection and Consolidation of EPA Remote Sensing Data Holdings*
- *A2D Conversion of EPA RS Archive*
- *BW/Hardware/Software Issues*
- *Agency Web Standards/Security…*
- *Funding / Partnerships*

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CF 12000
CF 13000

The EPA Remote Sensing Archive Collection

~4,250 Analysis Reports (some digital)

~75,000 Cut Frames of film

~5,500 Rolls of Film (a lot is unique)

~3,700 digital frames on CD/DVD

~500 Soil Surveys

Landsat TM Scenes, IKONOS, Hymap, Hyperion, AVIRIS

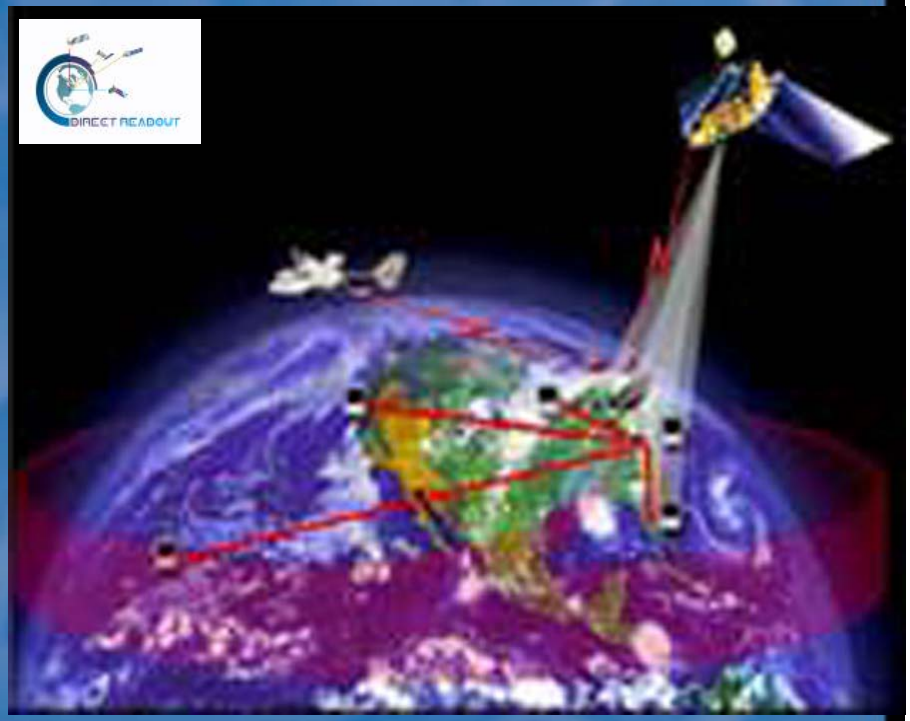
DOQQs

Hard Copy Maps (1:24k, 1:100k, 1:250K…..)

Books, index prints, metadata records

RSDG Progress

* Demonstration Project
* 2005 Science Forum
* Intranet web site (soon)
* Partnership Development
* On-going Data conversion



RSDG Home Page

EPA Remote Sensing - Microsoft Internet Explorer

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U.S. Environmental Protection Agency

Remote Sensing Data Gateway (RSDG)

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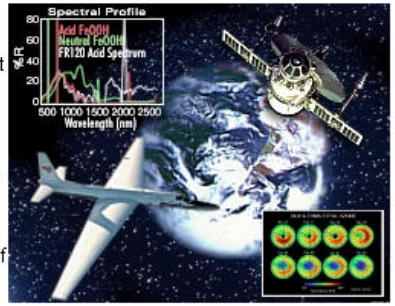
- Satellite Imagery Archive
- Sub-orbital Imagery Archive
- Real Time, Near Real Time, ASAP
- Imagery Collections
- Publications & Presentations
- Training
- Related Links
- Data Requests



Over the past 20 years, the science of Remote Sensing has witnessed an extraordinary evolution of technology and analytical capabilities. Sensors and systems have been developed to a level of scientific and engineering sophistication that was unthinkable when the first Landsat Instrument was placed in orbit in 1972. An international suite of commercial and government sensors and systems now routinely provide us with digital capture, Global Positioning System (GPS) based ortho-rectification, and sub-meter spatial resolution, even from orbital platforms. Highly specialized and refined sensors such as those in NASA's Earth Observing System (EOS), are driving the research agenda and providing critical information to our understanding of global climate and earth system processes. Hyperspectral instruments such as AVIRIS, Hyperion and Sebass, have proven capabilities to identify material based on energy/matter interactions at the molecular level. Remotely sensed data on earth systems and processes is of critical and growing importance to environmental monitoring, global climate research and the mission of the Environmental Protection Agency. Global concepts of human and ecosystem health, sustainability and natural disaster preparedness and response all depend heavily on remotely sensed data.

Applications of Remote Sensing Data

Hazardous Waste Site Analysis - How can an investigator find out if today's ballfield is yesterday's hazardous waste site? Historical analysis provides the information necessary obtain a chronological understanding of a site's development and activities which can lead to the identification of a specific problem.

Emergency Response - response capabilities to react to emergency situations such as hazardous material releases and natural disasters like hurricanes (Hugo) and earthquakes (San Francisco/Oakland, CA). Remote sensing provides information to on-site personnel regarding circumstances not easily or safely observed from the ground.

Wetlands - Wetland analyses are performed in support of various sections of the Clean Water Act concerning enforcement, permitting and advance identification. Analysis of historical aerial photography is often the only means of establishing the prior existence of wetlands on lands that have been dredged or filled, and calculating wetland loss acreage necessary for mitigation settlements. Aerial photographs can also provide information concerning vegetative type, periodicity of flooding, tidal influences, and affected drainage patterns.

Internet

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Remote Sensing Issues and Research Opportunities

- *UV/VIS/IR/LIFI Spectroscopy*
- *New Instruments Sensors*
- *GEOSS integration potential*
- *Terrestrial Remote Sensing Instrument R & D*
- *White Paper issues*