



# The Earth Science Applications Mississippi Geospatial Workforce Development Education & Training Initiative

*November 13, 2002*





## *The NASA Vision*



- *To improve life here*
- *To extend life to there*
  - *To find life beyond.*

## *The NASA Mission*

- *To understand and protect our home planet*
- *To explore the universe and search for life*
- *To inspire the next generation of explorers*
- *...as only NASA can.*





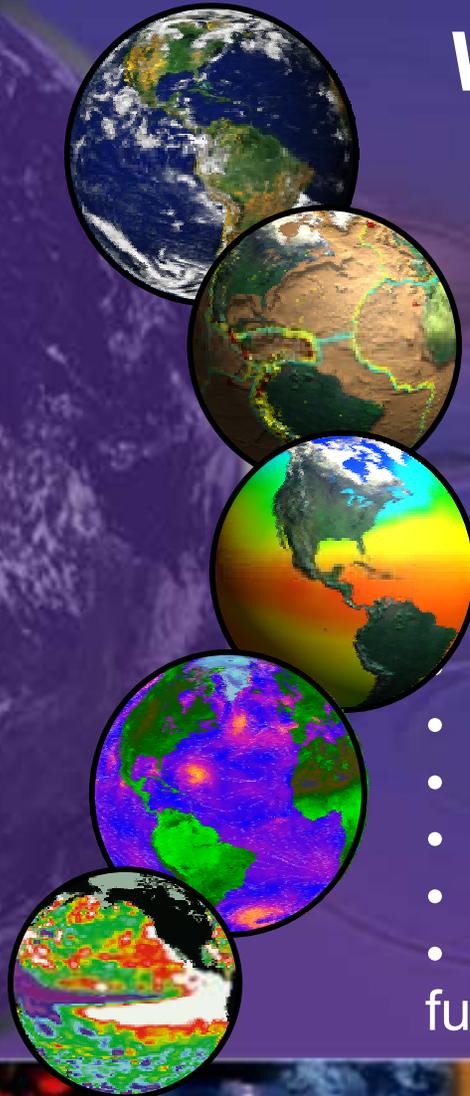
# Earth Science Enterprise

## *Vision*

- Enable effective applications of
- Earth science information that
- benefit the quality of life on
- Earth.

## *Mission*

- Develop a scientific understanding of the Earth system and its response to
- natural and human-induced
  - changes to enable improved
  - prediction of climate, weather, and
  - natural hazards for present and future generations.





# *NASA's Earth Science Enterprise Applications Program*

## *Mission*

- Expand and accelerate the realization of societal and economic benefits from Earth science, information, and technology.





## Mission

- To optimize benefits from NASA's Earth Science investments through systems engineering to advance decision support tools that serve the Nation.





# Earth Science Enterprise Science Questions





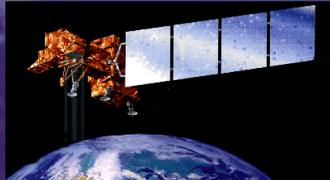
Earth Science Enterprise

# Missions Defined by Questions

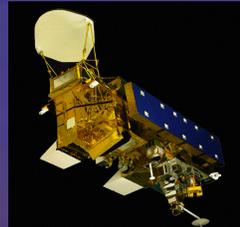
## Longer-term Missions - Observation of Key Earth System Interactions



Terra



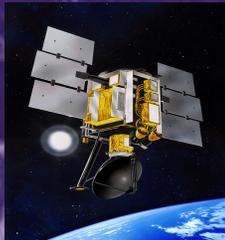
Landsat 7



Aqua



Aura



QuikScat



ICESat



Jason-1

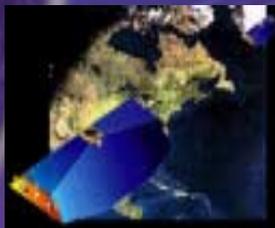
## Exploratory - Explore Specific Earth System Processes and Parameters and Demonstrate Technologies



VCL



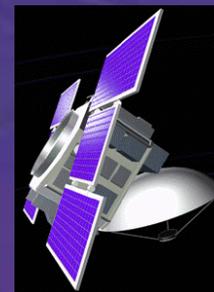
SRTM



GRACE



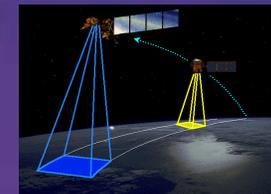
CALIPSO



Cloudsat



Triana



EO-1

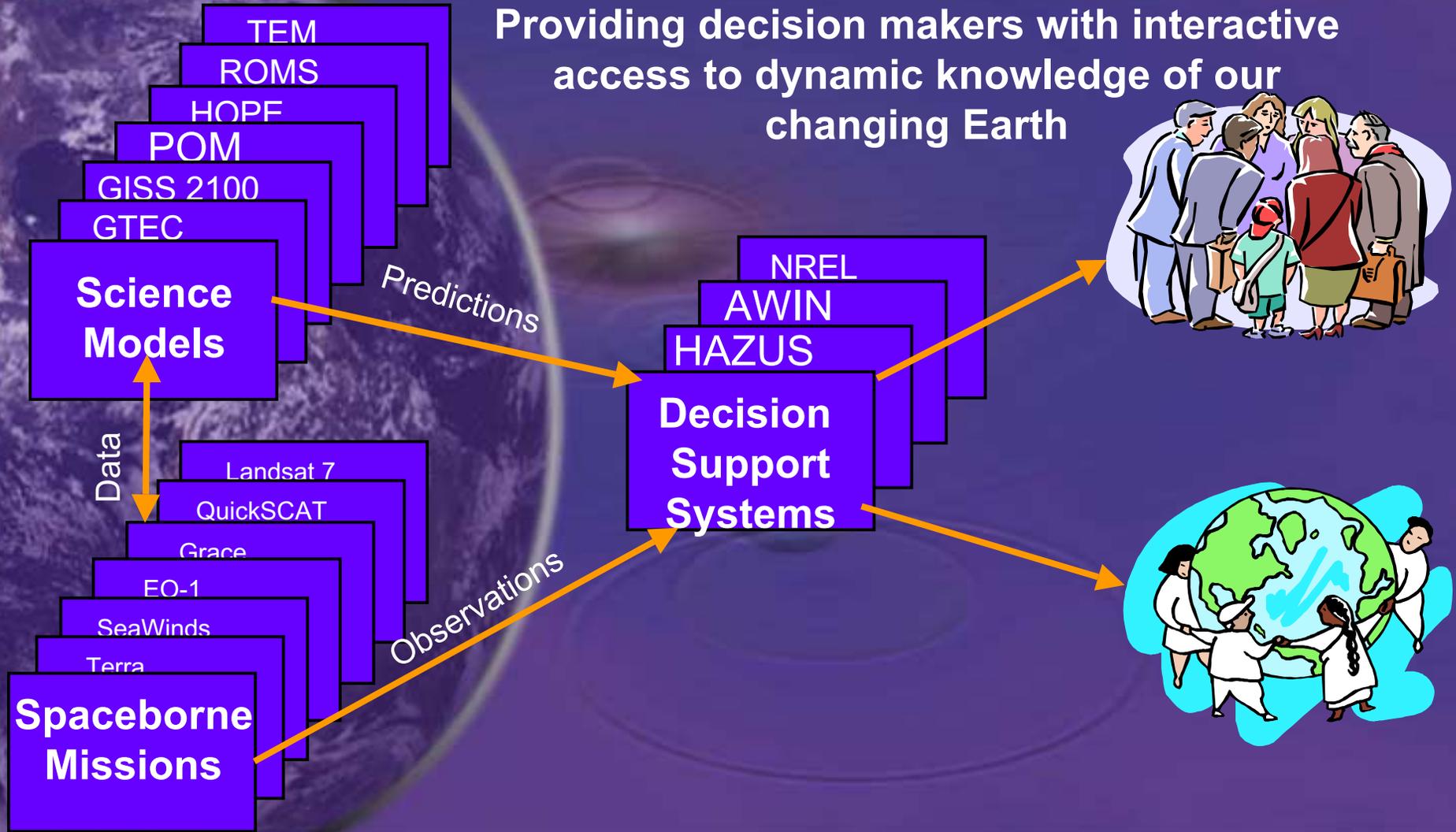




Earth Science Enterprise

# Serving Our Nation & World

Providing decision makers with interactive access to dynamic knowledge of our changing Earth







# ***12 National Applications***

-  **Agricultural Competitiveness**
-  **Air Quality Management**
-  **Aviation Safety**
-  **Carbon Management**
-  **Coastal Management**
-  **Disaster Preparedness**
-  **Community Growth**
-  **Energy Forecasting**
-  **Homeland Security**
-  **National Invasive Species**
-  **Public Health**
-  **Water Management & Conservation**





# Earth Science Enterprise Agricultural Competitiveness

Global Measurements and Models for Agricultural Competitiveness

## Global Measurements Applied to Precision Agriculture

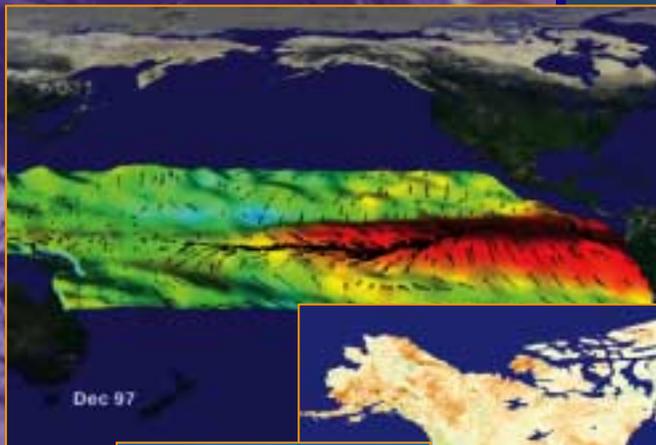
Aura

Landsat 7

NMP-EO1

Terra

Triana



Rienecker, Michele M.; Adamec, David, 2002. Satellite Observations and Seasonal Climate Forecasts for Agricultural Applications, *Earth Observation Magazine*, Vol. 11, No. 8, pp. 12-14.



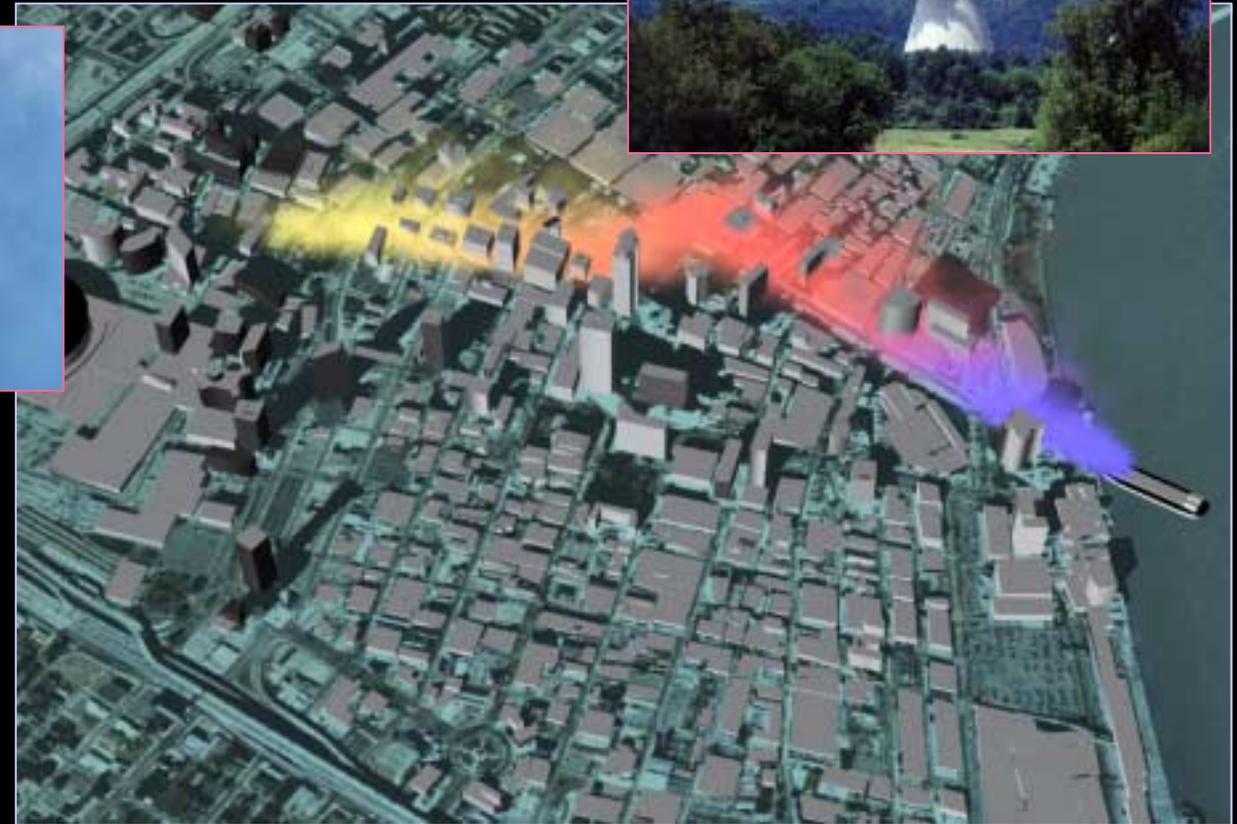


Earth Science Enterprise

# Air Quality Management

Global Measurements and Models for Air Quality Management

## Risk Management Planning for Air Quality



Risk Management Planning, LLC (RMP) specializes in data synthesis and graphic representation of toxic and hazardous chemical releases into the atmosphere.

**Click black area for visualization**





# Earth Science Enterprise Aviation Safety

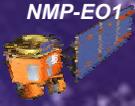
Weather, Climate and Natural Hazards Predictions for Aviation Safety

## Understanding Aviation Weather Requirements

CloudSat



NMP-EO1



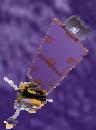
Goes-L



NOAA-M1



Goes-M



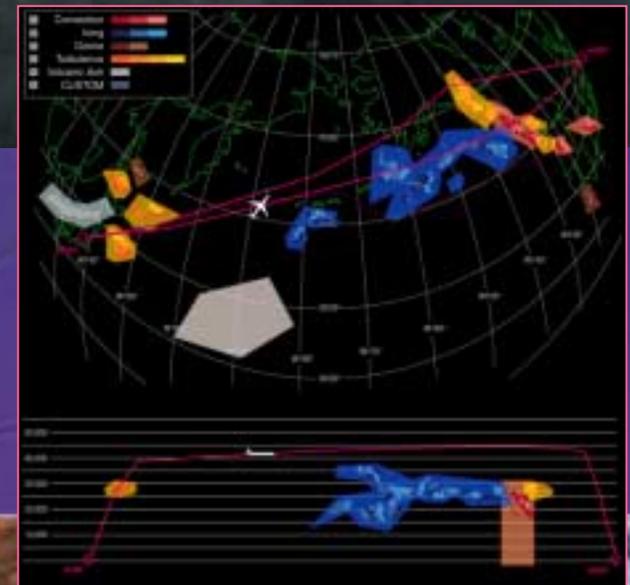
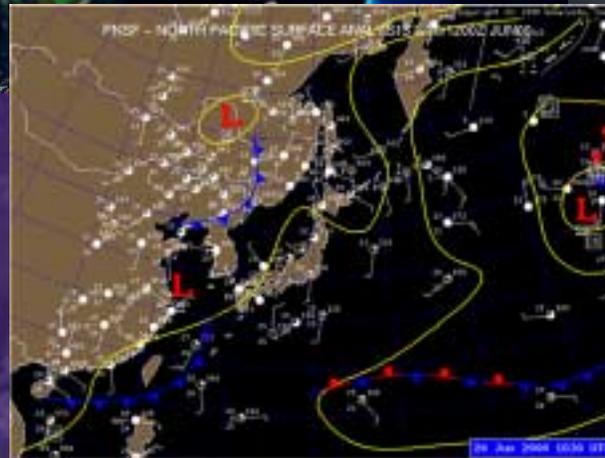
SRTM



Landsat 7



TRMM



Murray, John J., 2002. Aviation Weather Applications of Earth Science Enterprise Data, *Earth Observation Magazine*, Vol. 11, No. 8, pp. 26-30.



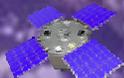


# Earth Science Enterprise Carbon Management

Global Monitoring and Assessments for Carbon Management

## Integrating Satellite Remote Sensing into Forest Inventory and Management

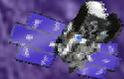
Acrimsat



Aqua



IceSat



Landsat 7



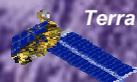
NMP-EO1



SeaWifs



Terra



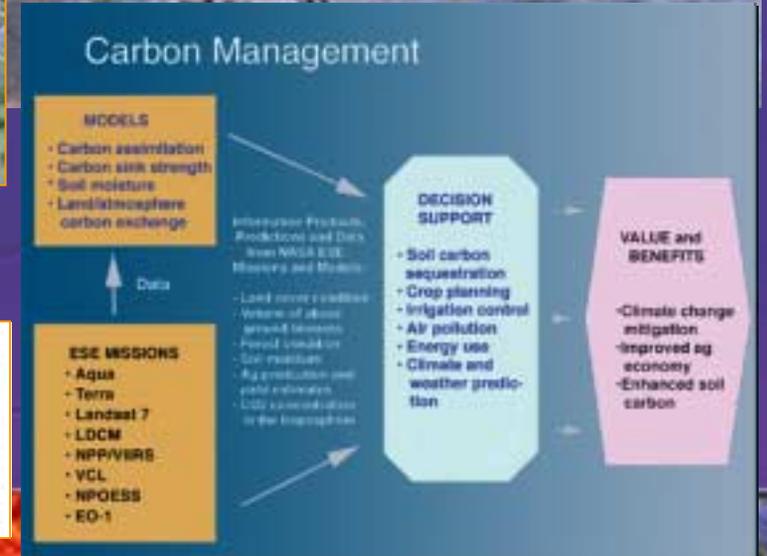
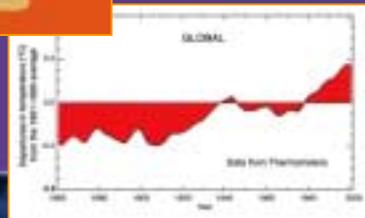
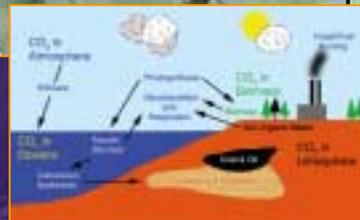
Topex



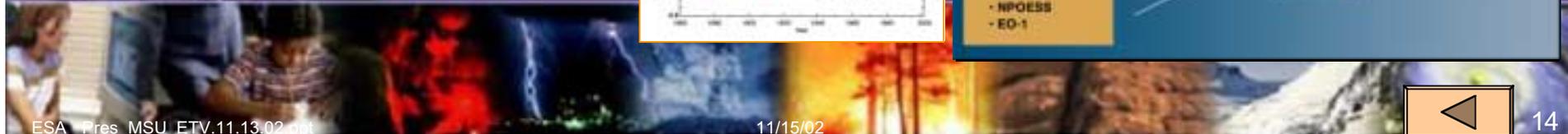
Triana



UARS



Sheffner, Ed; Fladland, Matt, 2002. Toward a Carbon Management Regime, *Earth Observation Magazine*, Vol. 11, No. 8, pp. 22-24.

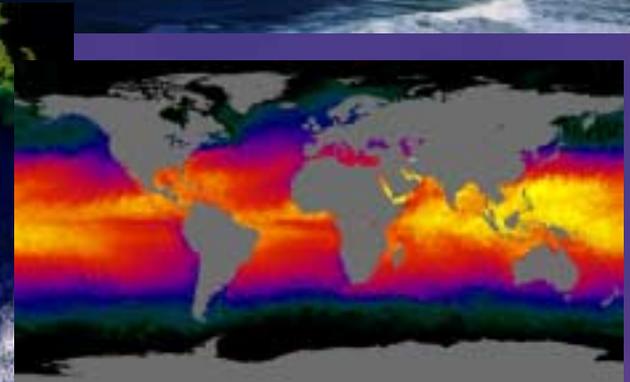
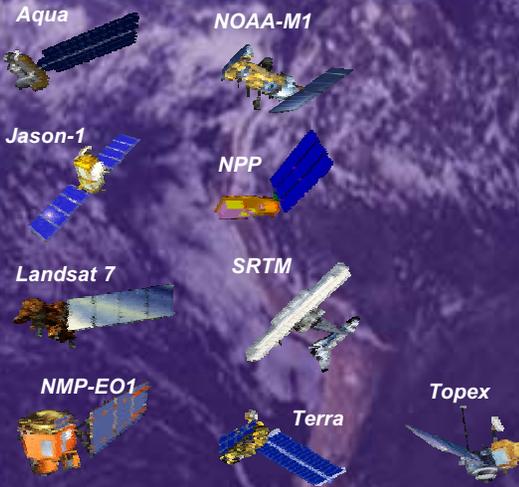




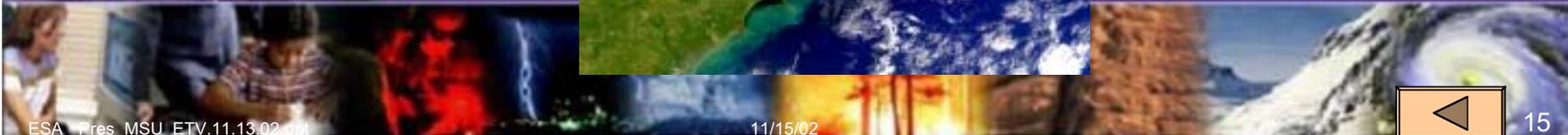
# Earth Science Enterprise Coastal Management

Global Measurements and Predictions for Coastal Management

## Understanding Coastal Resources Using Global Measurements



Herring, David; Weier, John; Gubbels, Timothy, 2002. Environmental Indicators for Coastal Management, *Earth Observation Magazine*, Vol. 11, No. 8, pp. 50-53.





# Earth Science Enterprise Disaster Preparedness

Global Measurements and Predictions for Disaster Management

## NASA Contributes Knowledge and Expertise to Emergency Response Efforts



Champ



Jason-1



CloudSat



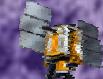
NOAA-M1



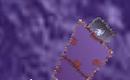
Goes-L



QuikScat



Goes-M



SRTM



Grace



Topex



IceSat



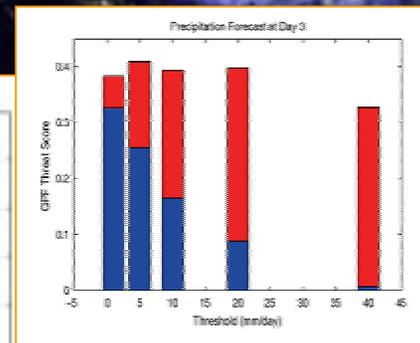
TRMM



[Click this image for visualization](#)

Provided technical support to FEMA on issues raised by response units such as Urban Search and Rescue and FDNY.

Atlas, Robert; Hou, Arthur; Reale, Oreste, 2002. Hurricane and Flood Prediction for Community Disaster Preparedness, *Earth Observation Magazine*, Vol. 11, No. 8, pp. 38-40.





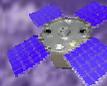
# Earth Science Enterprise Community Growth

Weather, Climate and Natural Hazards Earth Science for Community Growth

## Community Growth for Infrastructure Development

Click black area for visualization

Acrimsat



SRTM



ERBS



UARS



Sage



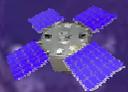


# Earth Science Enterprise Energy Forecasting

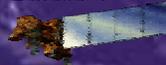
Weather, Climate and Natural Hazards Predictions for Energy Forecasting

Predict Risk and Vulnerability to Natural and Human Influences

Acrimsat



Landsat 7



Sage



NOAA-M1



TRMM



ERBS

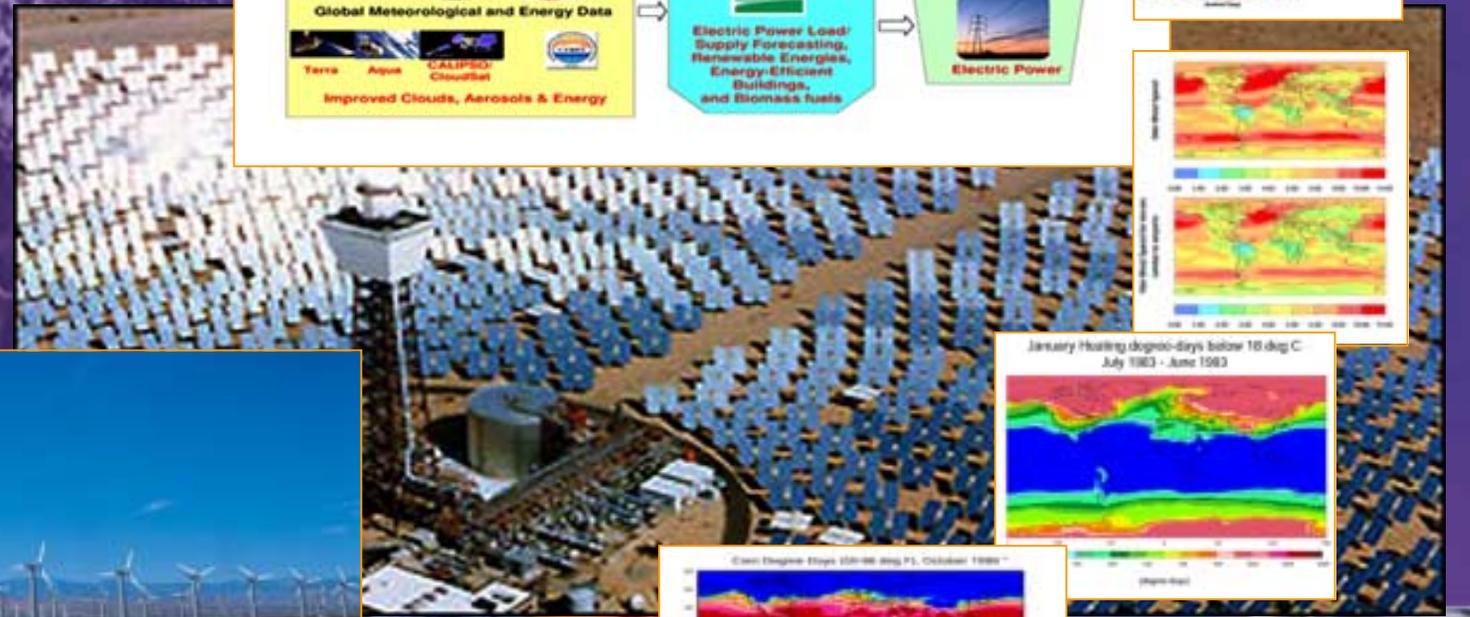
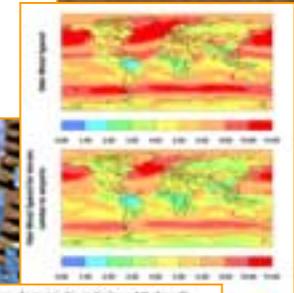
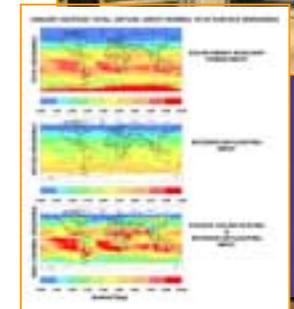
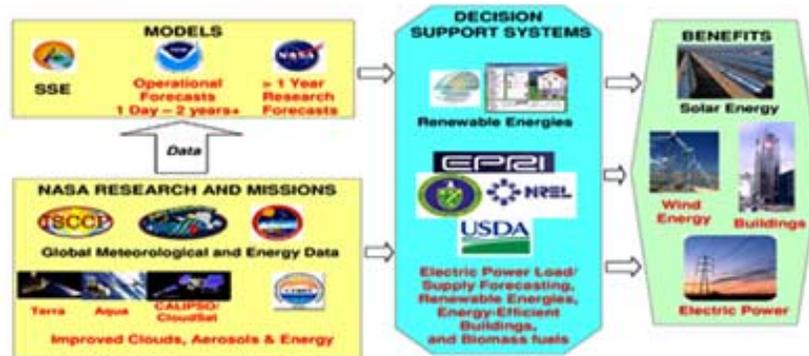


NMP-E01



Stackhouse, Dr. Paul W., Jr.; Whitlock, Dr. Charles H.; DiPasquale, Roberta C.; Brown, Donald E., II; Chandler, William S., 2002. Meeting Energy-Sector Needs with NASA Climate Datasets, *Earth Observation Magazine*, Vol. 11, No. 8, pp. 6-10.

## SSE and Beyond into Energy Resource Forecasting

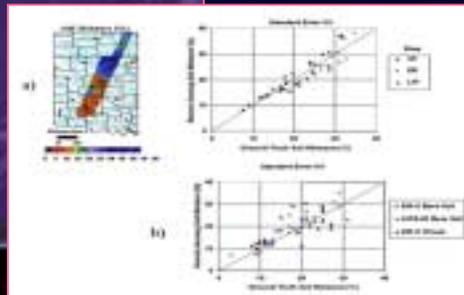
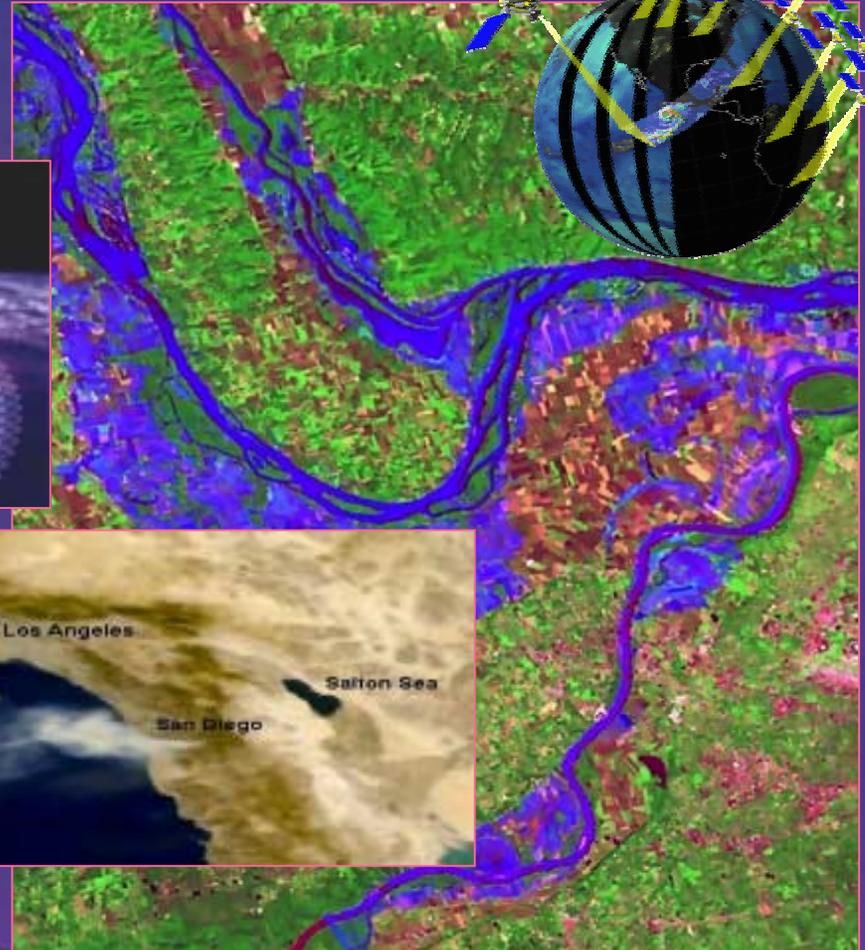
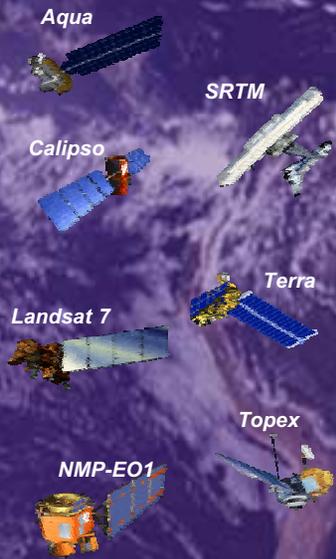
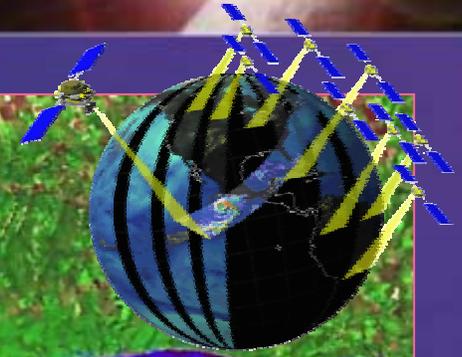




# Earth Science Enterprise Homeland Security

Global Monitoring and Predictions for Homeland Security

## Proposed Hydrospheric State Mission to Observe Soil Moisture and Soil Freezing



Images of fires near San Diego, CA., acquired January 3, 2001 by ORBIMAGE's Sea-viewing Wide Field-of-view Sensor (SeaWiFS).

Houser, Paul R., 2002. Air and Water Monitoring for Homeland Security, *Earth Observation Magazine*, Vol. 11, No. 8, pp. 33-36.



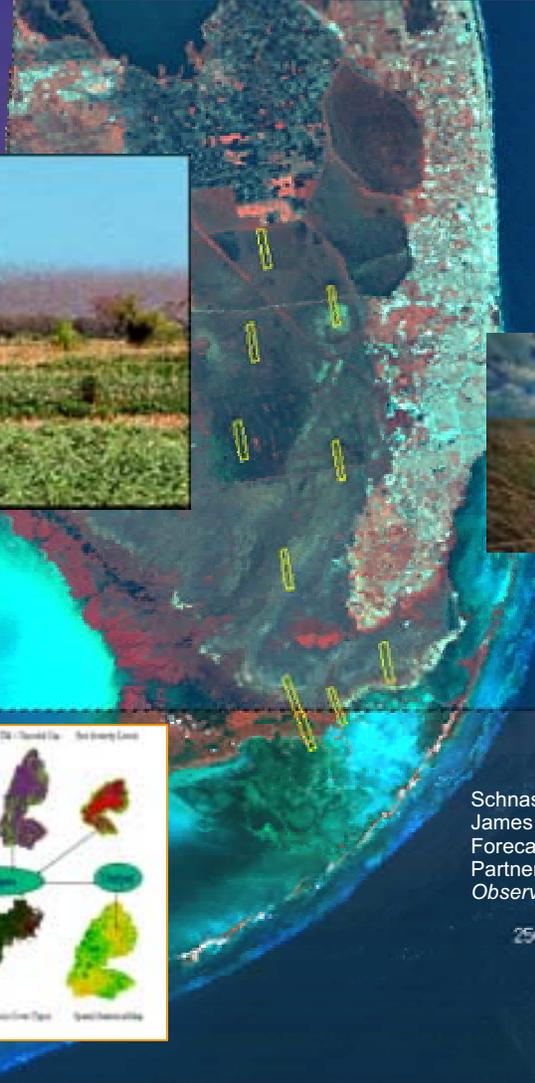


Earth Science Enterprise

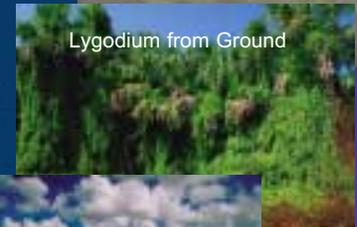
# National Invasive Species

Global Monitoring and Predictions for Invasive Species Such As Diseases, Plant and Animal, etc.

## Global Monitoring and Management for Biological Invasions



Lygodium from Air



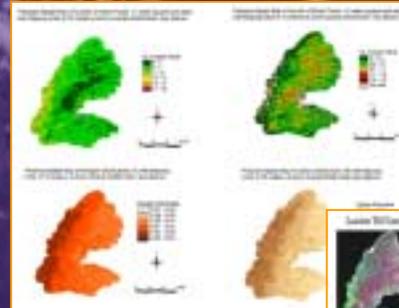
Lygodium from Ground



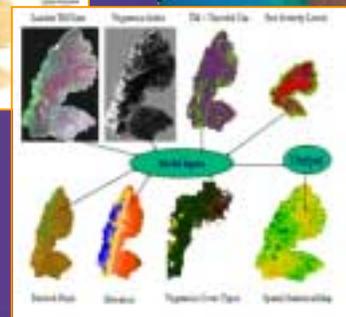
Cattails – "a weed"



Melaleuca



Predicted spatial maps for the native and exotic plant species and for nitrogen and carbon distribution in the Cerro Grande wildfire site near Los Alamos, NM.



Schnase, John L.; Stohlgren, Thomas J.; Smith, James A., 2002. The National Invasive Species Forecasting System: A Strategic NASA/USGS Partnership to Manage Biological Invasions, *Earth Observation Magazine*, Vol. 11, No. 8, pp. 46-49.



Aqua



Calipso



IceSat



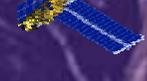
Landsat 7



NMP-E01



Terra



NOAA-M1



TRMM



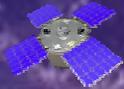


# Earth Science Enterprise Public Health

Global Monitoring and Predictions for Public Health Related to the Environment

## Global Monitoring and Predictions for Public Health

Acirimsat



Sage



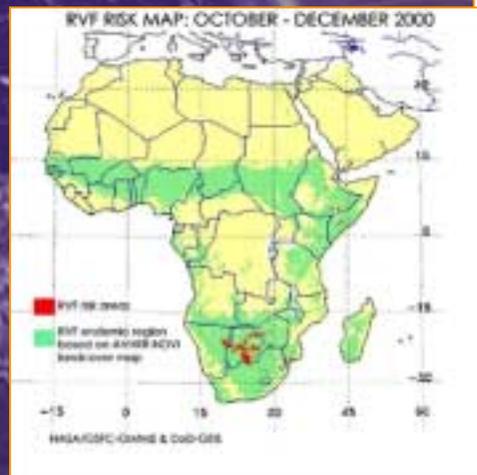
SRTM



Toms-EP



TRMM



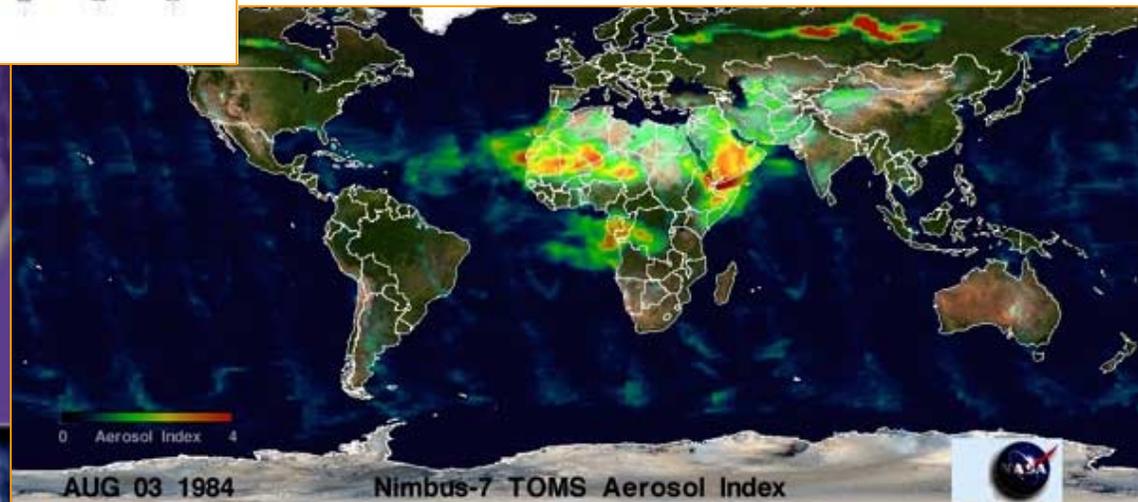
Landsat TM, 11 May 1997



Classification of Landsat TM, 11 May 1997

The land-cover classification for Baltimore City, Md., and vicinity shown at right was derived from the May 1997 Landsat TM image shown at left. These data will be included as part of the spatial database for understanding the relationship between childhood asthma and environmental properties. Image and classification courtesy of Dr. Asad Ullah, Science Systems & Applications Inc.

- Classification Legend
- Open Surface Water
  - Urban/Developed Land
  - Open/Undeveloped Land
  - Roads/Transportation
  - Vegetation/Forested Areas



Maynard, Nancy G., 2002. Remote Sensing for Public Health Surveillance and Response, *Earth Observation Magazine*, Vol. 11, No. 8, pp. 43-45.





Earth Science Enterprise

# Water Management & Conservation

Global Monitoring of Water Quality, Availability and Conservation

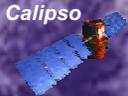
## Monitoring Effluents at the Bonnet Carré Spillway



Aura



Landsat 7



Calipso



NOAA-M1



CloudSat



NMP-E01



Grace



Terra



TRMM



ATLAS color infrared image of Lake Pontchartrain, LA





# *Crosscutting Activities*

- *Systems Engineering*
- *Affiliated Research Centers*
- *Workforce Development*
- *MSCI*





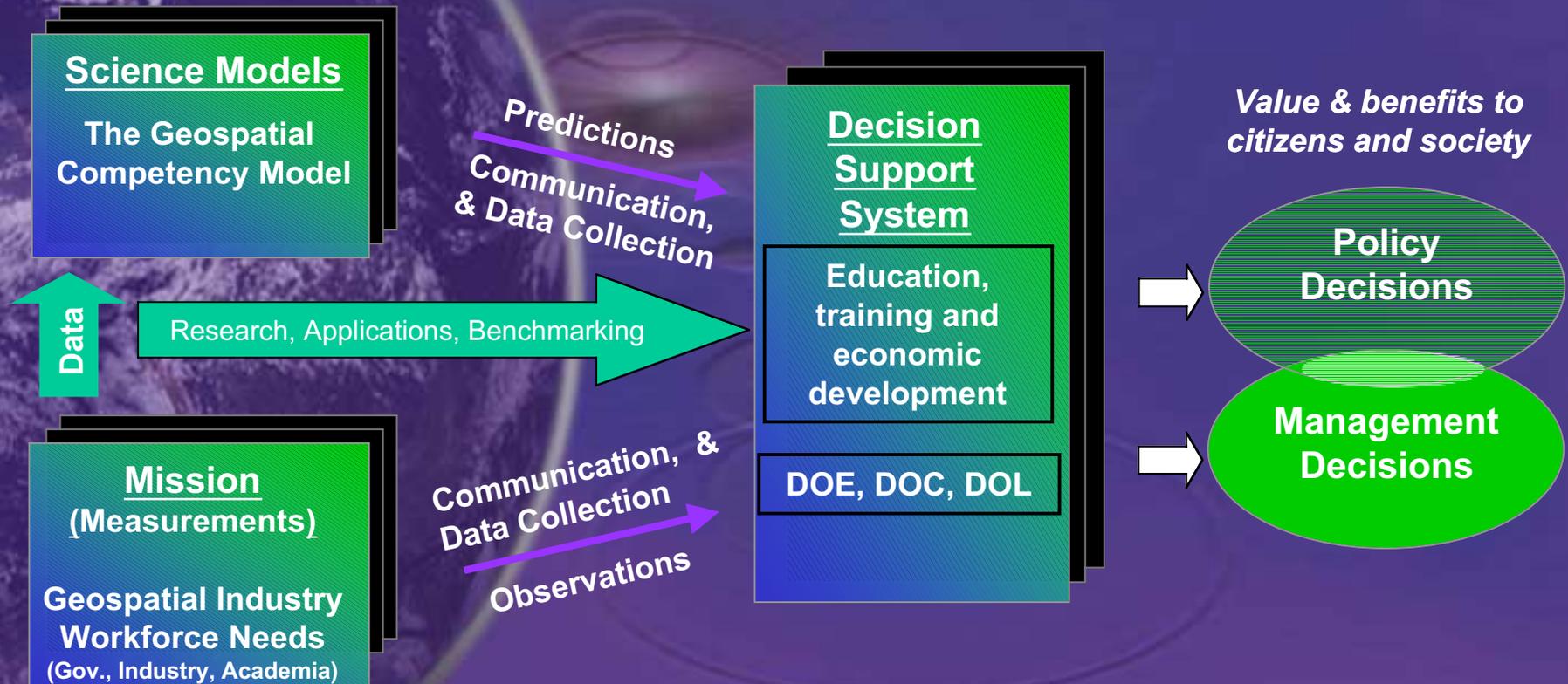
# Affiliated Research Centers





# NWDETI Decision Support Model

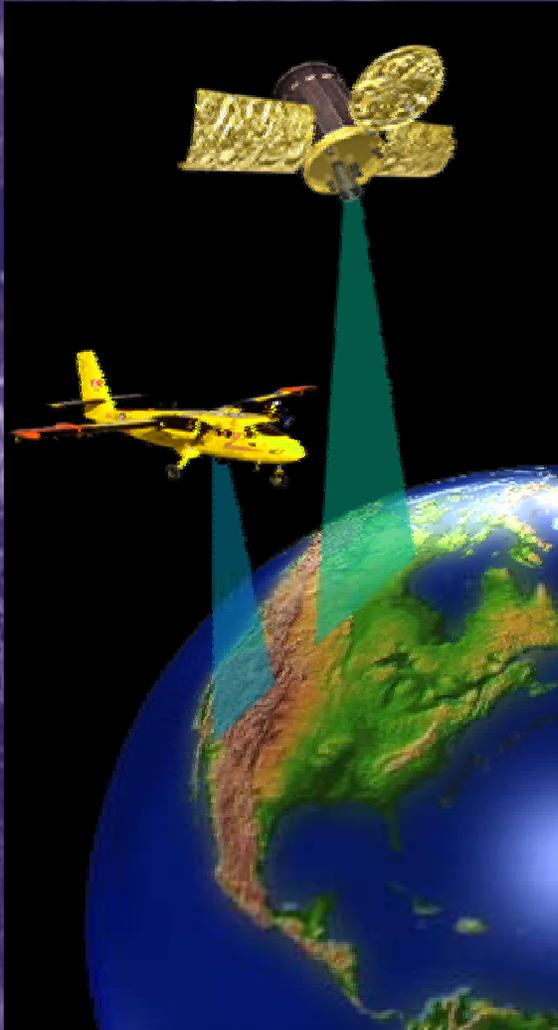
*Applying the NWDETI's system approach and Competency Model results to partner support decision-making tools, predictions and analysis to develop a well-trained geospatial workforce and optimization of Federal resources.*



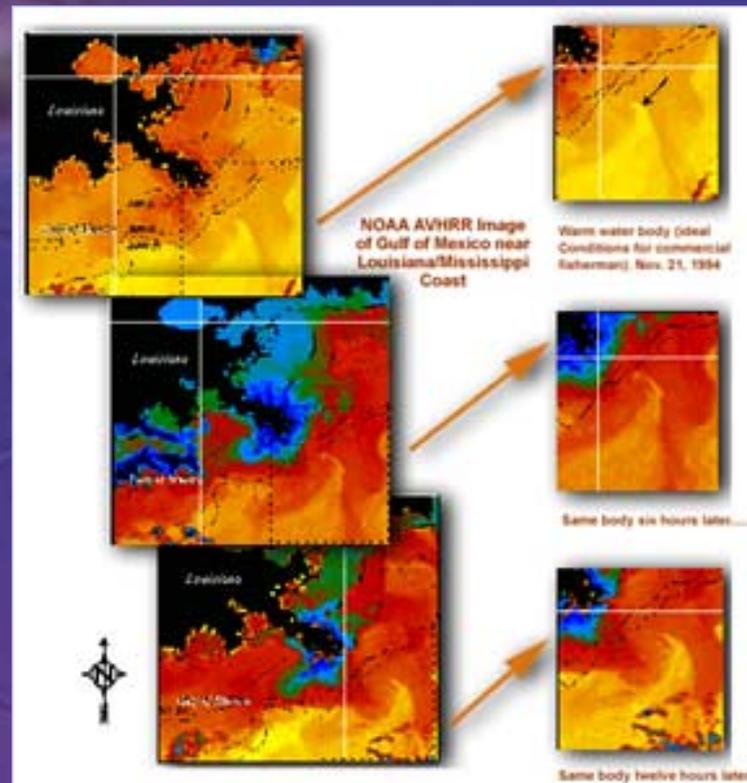


# Definitions

# ✓ Remote Sensing



Remote sensing is the gathering of information over an area using a device not in direct physical contact with the area being studied.

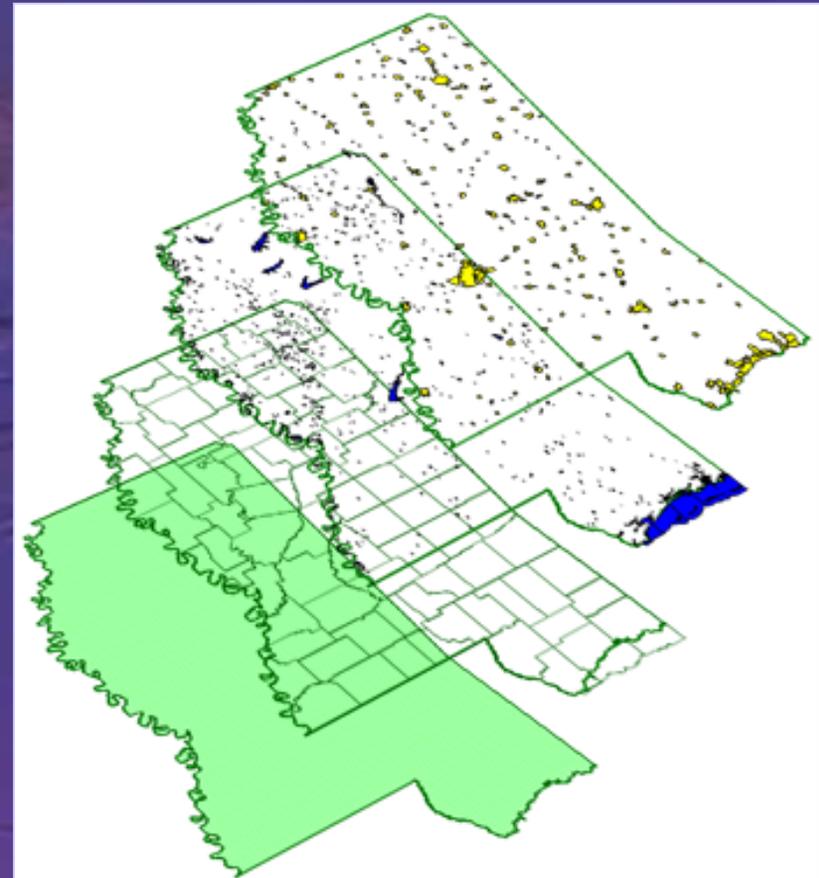
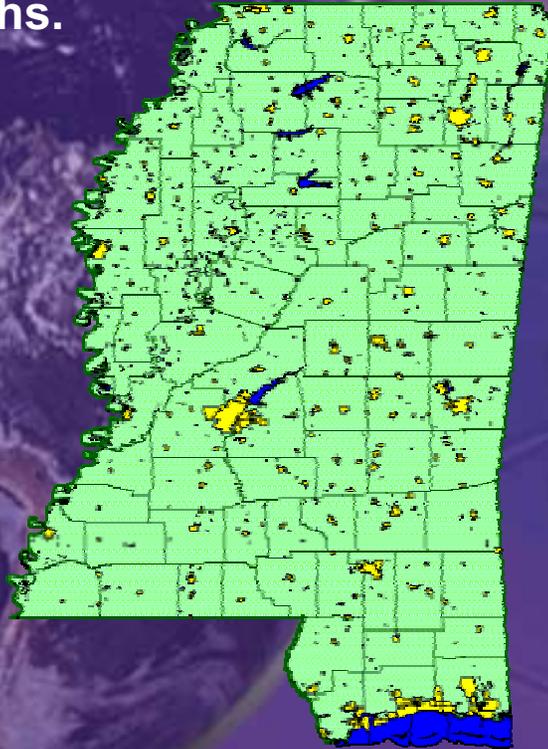




# Definitions

✓ GIS

— Geographic Information Systems (GIS) are software programs which use information databases to analyze data by drawing geometric shapes (points, lines, or polygons). These shapes are often overlaid on maps or aerial photographs.

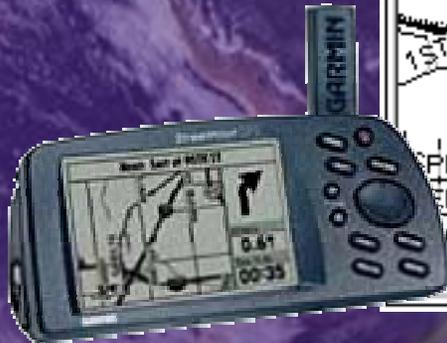




# Definitions

✓ GPS

The Global Positioning System (GPS) is a group of 24 well-spaced Earth-orbiting satellites, maintained by the U.S. Department of Defense. GPS makes it possible to use small, handheld receivers to pinpoint an exact position on the Earth's surface.



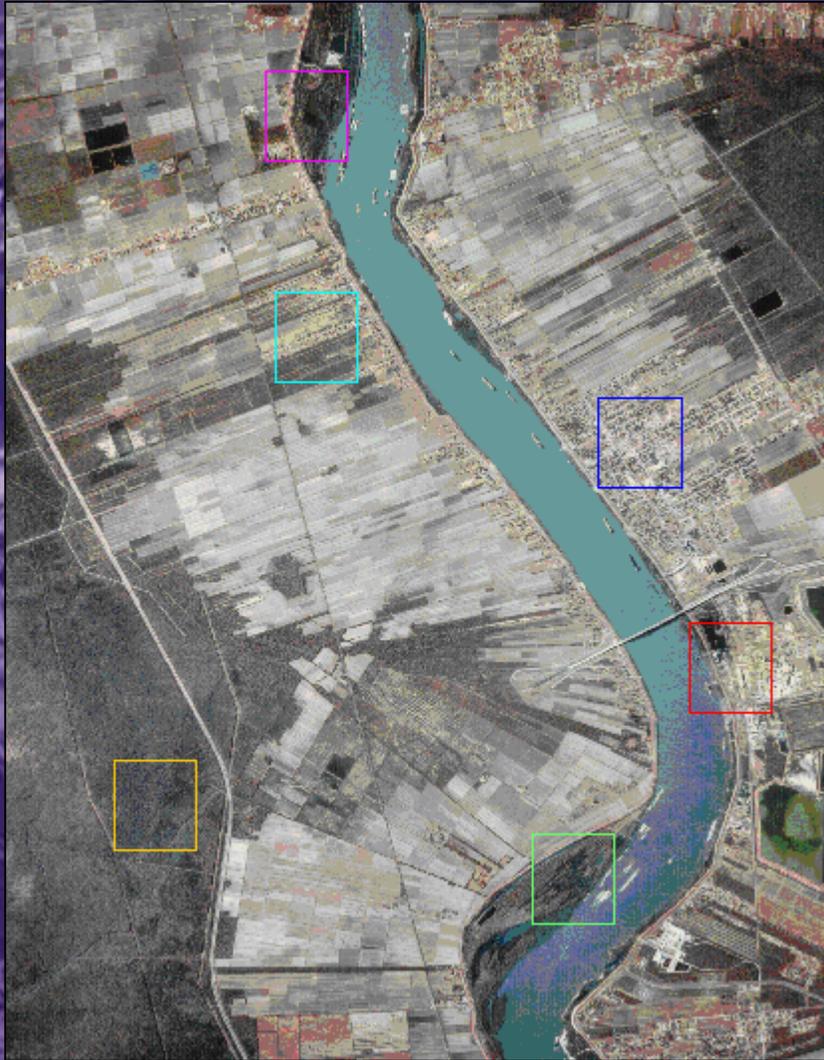
**Driving Southeast near Nederland**

Elevation 8367'	N 39°57.623' W105°30.546'	
Speed		2.4 m/h
Current Time		7:45 PM





# Geospatial Markets



Imagery courtesy of Crowsey Incorporated

## Legal

- Dispute Resolution
- Risk assessment
- Remediation archival

## Urban Mapping

- Urban sprawl
- Road updating
- Pipelines

## Real Estate

- Location
- Available lands
- Travel distance

## Environmental

- Wetlands
- Nonpoint source pollution
- Superfund

## Site Selection

- Location
- Proximity
- Land use

## Natural Resources

- Wetlands
- Forestry
- Agriculture





# Geospatial Markets

- Weather & Ocean Applications
  - Fisheries
  - Shipping
  - Weather
- Land Resource
  - Crop Forecast
  - Extraction
  - Prescription Farming
  - Forestry
- Environmental & Climate Change Detection





# Geospatial Markets

- Environmental Monitoring & Impact Studies
  - Urban Modeling
  - Construction
  - Transportation
  - Waste Disposal
  - Pipeline Monitoring
- Time Sensitive Mapping
- Episodic Events
  - National Security
  - Media
  - Investments





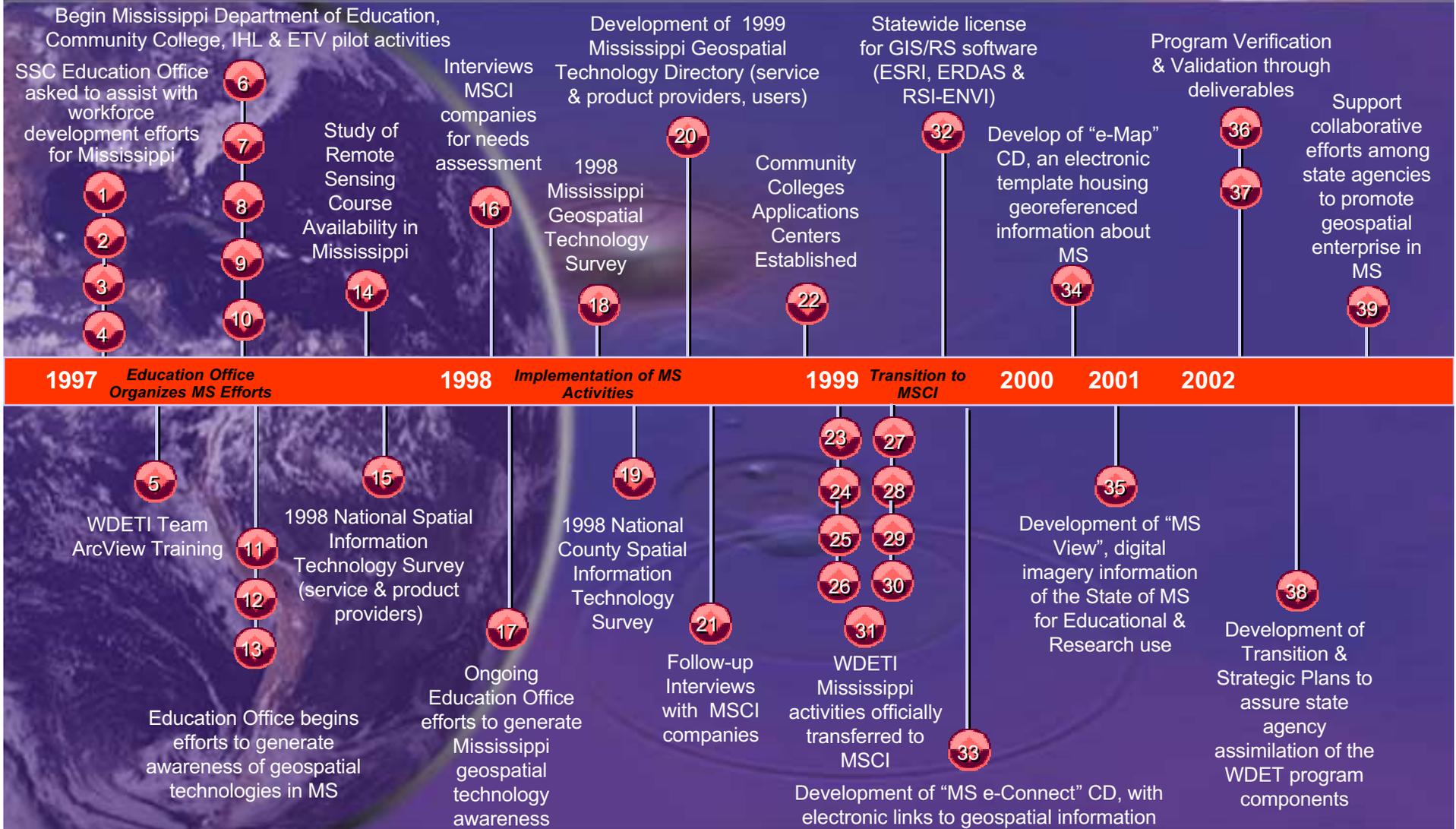
# Geospatial Markets

- Time Insensitive GIS/Digital Mapping
  - Real Estate
  - Utilities
  - Legal
  - Insurance
  - Mapping
  - Simulation
  - Mass Media
  - Education
  - Entertainment





# WDETI Timeline: February 1997 - Present





## *The Early Efforts in Mississippi*

1

# Geospatial Technology Workforce Development:

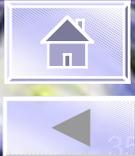
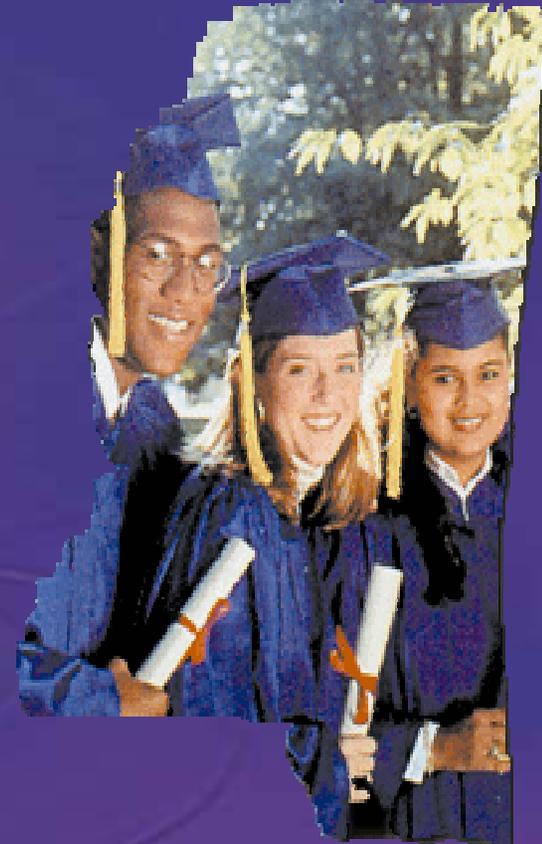
- In 1997 Mississippi's WDETI – Workforce Development Education & Training Initiative – conceived to support CRSP's mission of enhancing U.S. economic competitiveness through development of remote sensing technologies
- *Through*
- Stennis Space Center's Education & University Affairs Office – Utilizing existing education & training infrastructures to develop & prepare a well-trained workforce for the geospatial technology marketplace





# NWDETI National Strategy

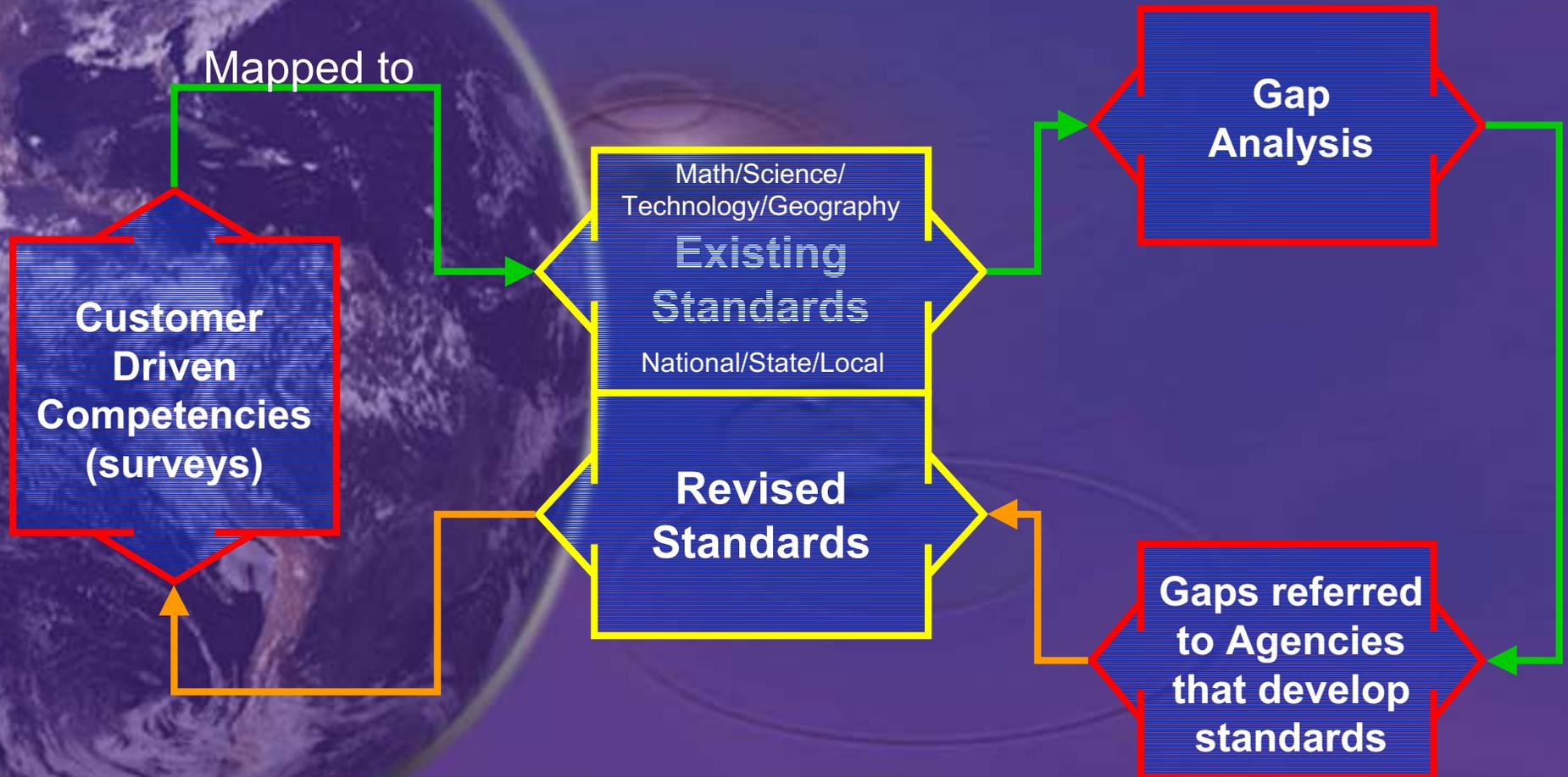
- Be customer driven to meet the needs of the new industry
- Use existing resources and infrastructure
- Create systemic change in the way students and the incumbent workforce are trained and re-trained





# K-12 Standards Process

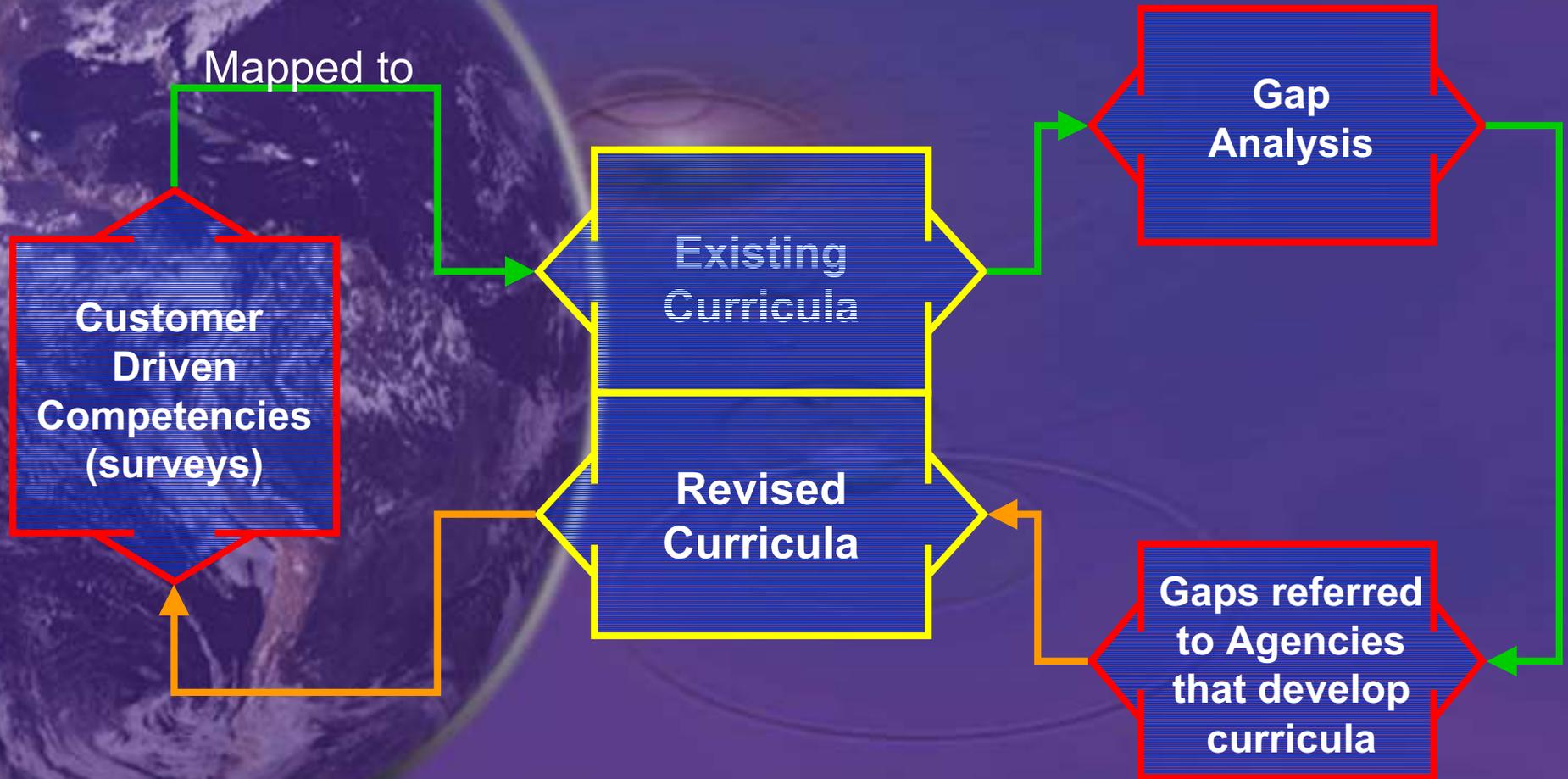
Research and identify geospatial technology workforce requirements





# Curricula for Colleges & Universities

Research and identify geospatial technology workforce requirements





# WDETI Team ArcView Training

The ESRI Virtual Campus offers self-paced GIS (Geographic Information Systems) training on the World Wide Web.

The ESRI Virtual Campus (<http://campus.esri.com>) houses a worldwide learning community whose members share ideas and expertise in a supported environment. Our interactive courses explain GIS concepts, explore real spatial examples and problems, and offer hands-on exercises to help students learn by doing, all from the convenience of the office or home. You can control when, what, where, and how fast courses are taken.

ESRI Virtual Campus: GIS Education and Training on the Web - Microsoft Internet Explorer

File Edit View Favorites Tools Help

Address <http://campus.esri.com/>

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Campus Membership  
Fri, Sep 20, 2002  
**158,837** members  
from **180** countries

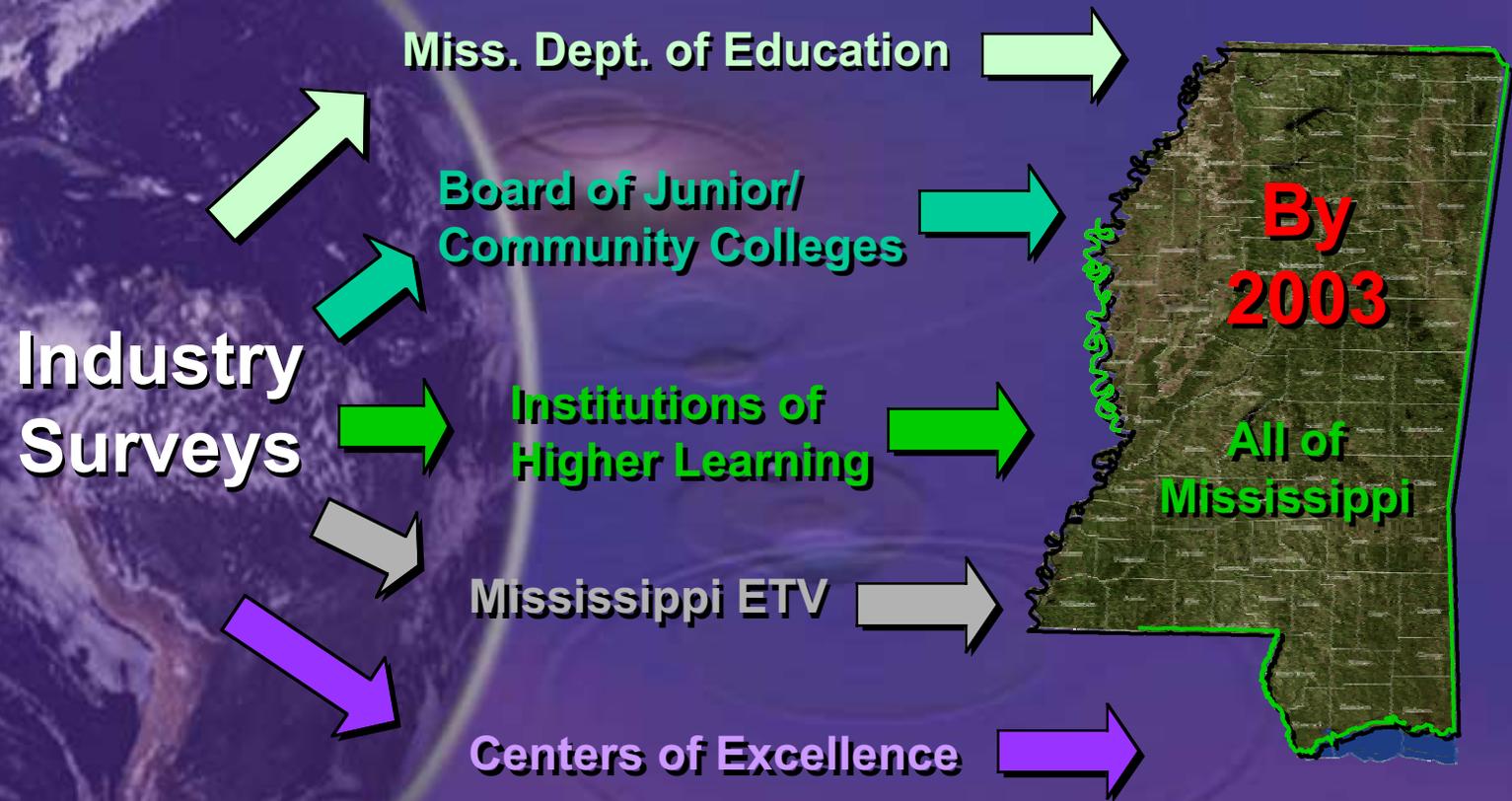
Sponsors

Partners  
Find out how other [organizations](#) use the Virtual Campus





# Use Existing Resources

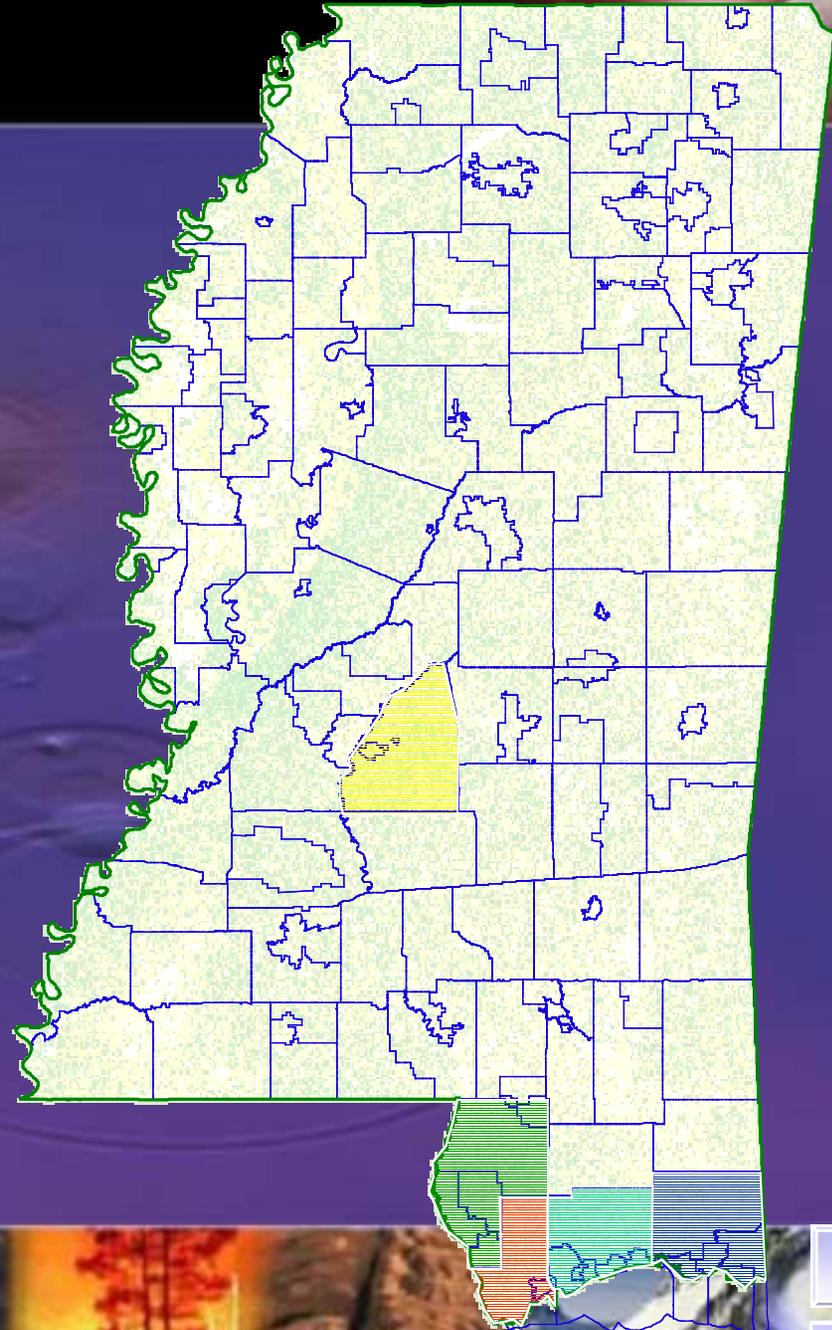




# *In Mississippi*

152 Public  
School  
Districts  
500,000+  
Students

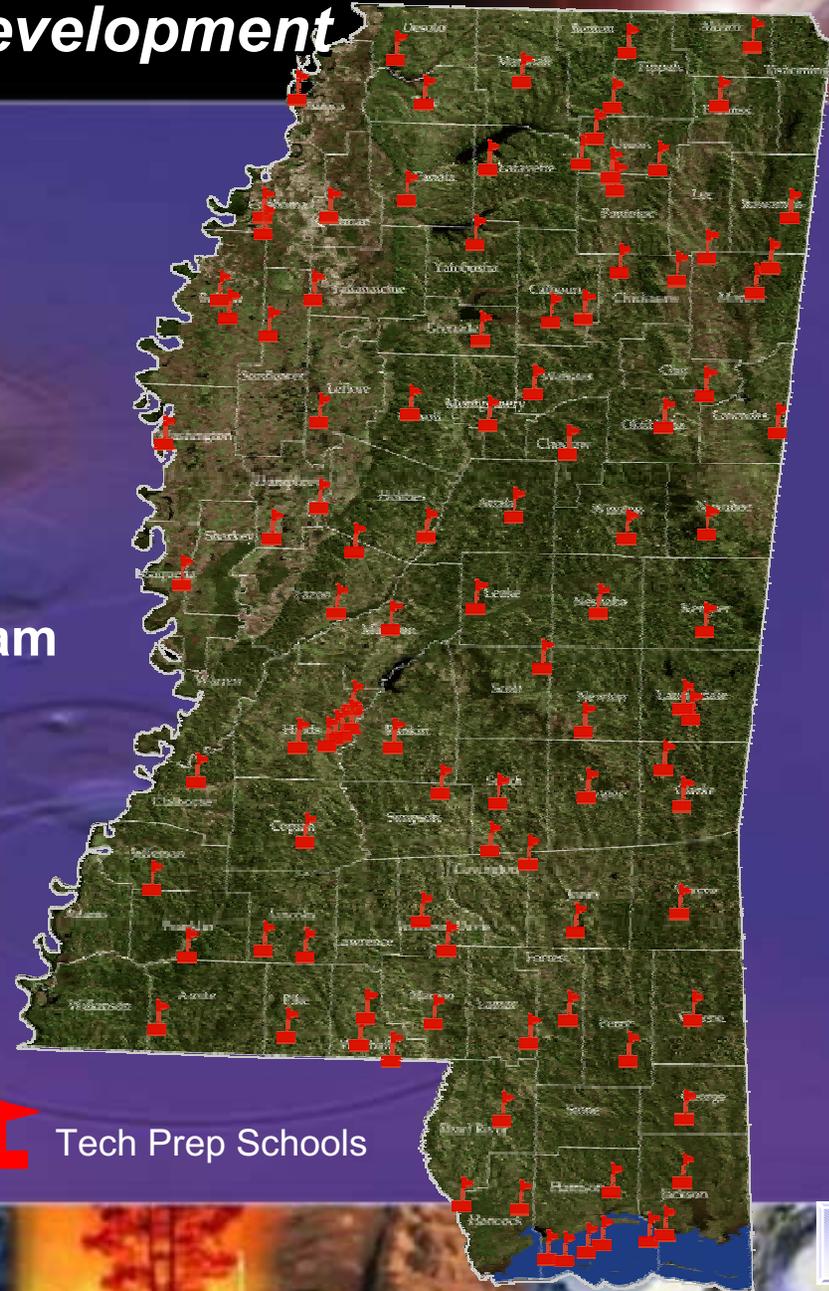
Pilot Programs in Hancock, Harrison,  
Jackson, Pearl River, and Rankin  
Counties





# Mississippi Workforce Development

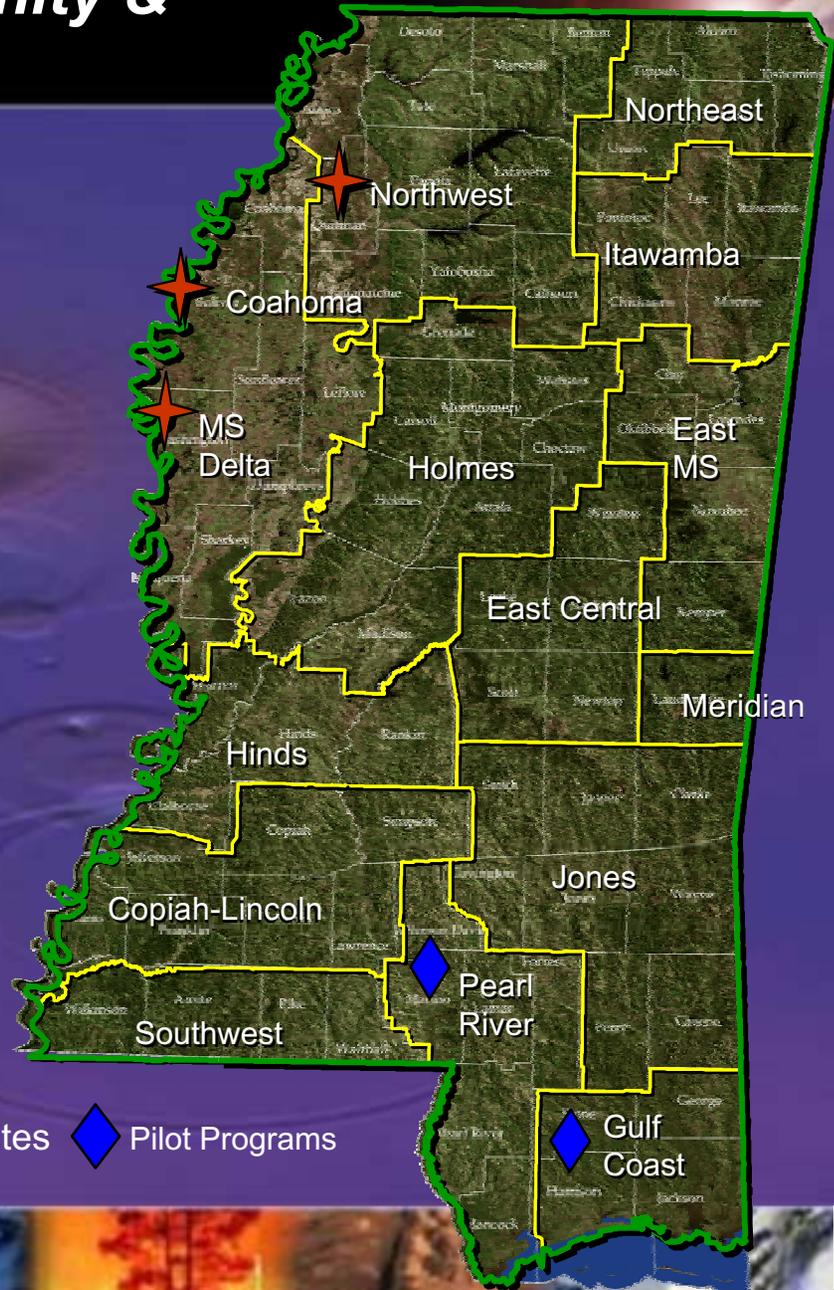
- 341 Ninth grade Technology Discovery Labs in MS
- 260 Labs have Modules
- 52 ArcView Modules in the Technology Application Program - Grades 10, 11, & 12





# State Board of Community & Junior Colleges

## Application Centers At All 15 Community Colleges



★ Beta Sites    ◆ Pilot Programs





# Institutions of Higher Learning

- University of Mississippi
- Mississippi State University
- Delta State University
- Mississippi Valley State University
- Mississippi University for Women
- Jackson State University
- University of Mississippi Medical Center
- Alcorn State University
- University of Southern Mississippi
- SSC Virtual Learning Center



◆ Campus Coordinators at :  
UM, USM, MSU, JSU



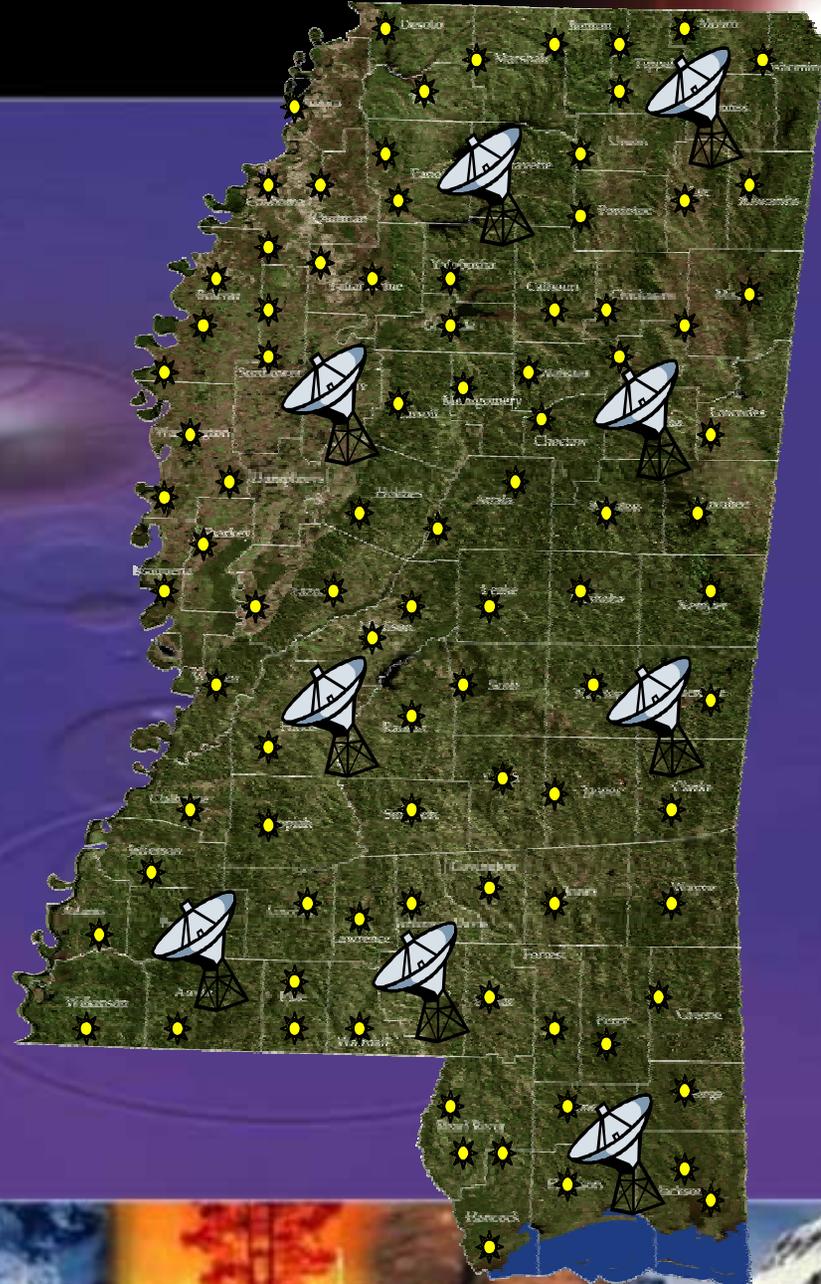


# In Mississippi

## Mississippi ETV Network

### School District Impact

- 150 interactive electronic classroom sites
- 1,000+ downlink sites
- Every ETV viewer in the state (216,000 per week)
- ITV Resource Catalog distributed to 36,000 teachers





# In Mississippi

## Spatial Technology Education Activity

- **Coahoma Community College**
  - Offered computer-based training in spatial technology

- **Mississippi Delta Community College**

- Developed Associate Degree Program in Precision Agriculture

- **Pearl River Community College**

- Designated as a Certified ESRI Training Site
- Concentrated on training emergency personnel

- **Northwest Mississippi Community College**

- Developed course components modules
- Infused remote sensing into traditional academic classes
- Organized a North Mississippi GIS Users Group

- **Mississippi Gulf Coast Community College**

- Implemented the first Associate Degree in Geographic Information Technology
- Organized a South Mississippi GIS Users Group





# Interactive Video Graduate Course Work

## University of MS:

Master's in Engineering Science (Electrical Engineering and Geology & Geological Engineering Departments)

## Mississippi State University:

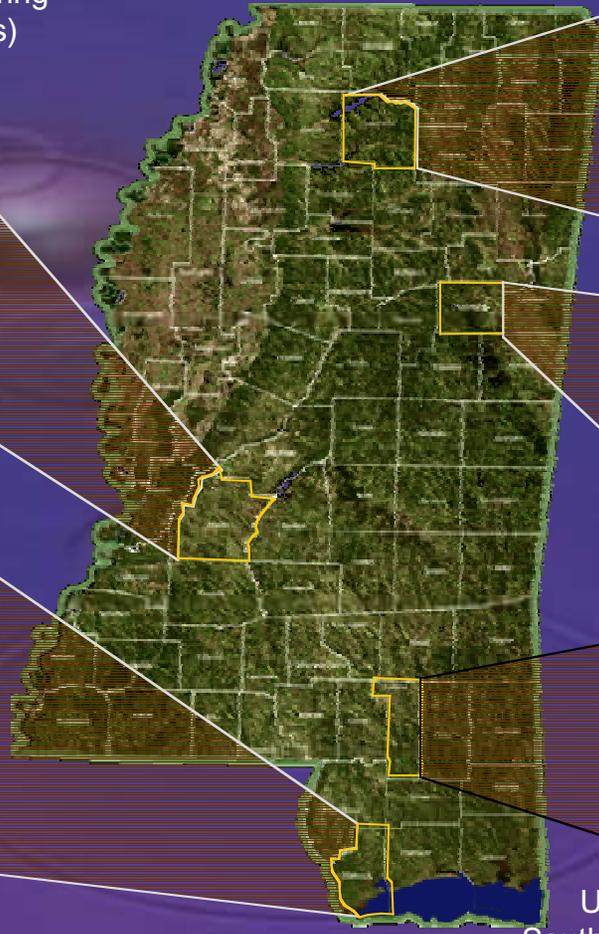
2 Master's of Science Degrees



Jackson State University



NASA Stennis Space Center



University of Mississippi



Mississippi State University



University of Southern Mississippi





# RS Course Availability

*Remote Sensing and Geographic Information  
Systems Course Availability in Mississippi's  
Public Universities and Community Colleges*

*Produced for  
NASA/SSC Commercial Remote Sensing Program  
Workforce Development Education & Training Initiative*

*By  
Social Science Research Center  
Mississippi State University*

*February 1998*



*Project Director: Liesel A. Ritchie  
By: Stephen A. Barlow*





# National Spatial Information Technology Survey

15



**1998**  
***National Spatial Information Technology  
Survey Results***

*Produced for  
NASA/SSC Commercial Remote Sensing Program  
Workforce Development Education & Training Initiative*



*Conducted by  
Social Science Research Center  
Mississippi State University*





# MSCI

## MSCI Membership



GeoData Airborne Mapping & Measurement



MS DEQ





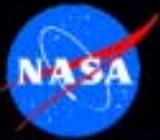
## MS ETV INTERACTIVE VIDEO NETWORK

*A Project of Mississippi Educational Television, the Mississippi Department of Education, and the U.S. Department of Education*



**Tony Franks, Teacher**





# Technology Survey

## 1998 Mississippi Geospatial Technology Survey Results

Produced for:  
NASA/SSC Commercial Remote Sensing Program  
Workforce Development Education &  
Training Initiative

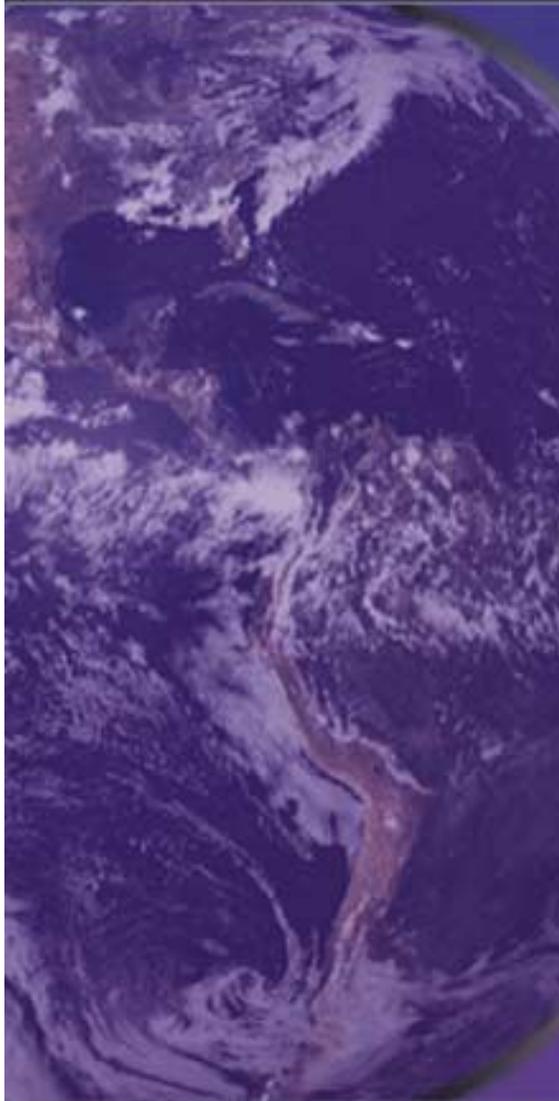


Conducted by  
Social Science Research Center  
Mississippi State University





# 1998 National County Spatial Information Technology Survey



1998 National County  
Spatial Information Technology  
Survey Results

Produced for:  
NASA/SSC Commercial Remote Sensing Program  
Workforce Development Education &  
Training Initiative



Conducted by  
Social Science Research Center  
Mississippi State University





# Mississippi Geospatial Technology Directory

*The Mississippi Geospatial Technology Directory*

is a joint venture of



Funds for this research were provided under  
NASA/SSC Contract Number NAS 13-98033





# Interviews with MSCI Companies

## MSCI Membership



GeoData Airborne Mapping & Measurement



MS DEQ

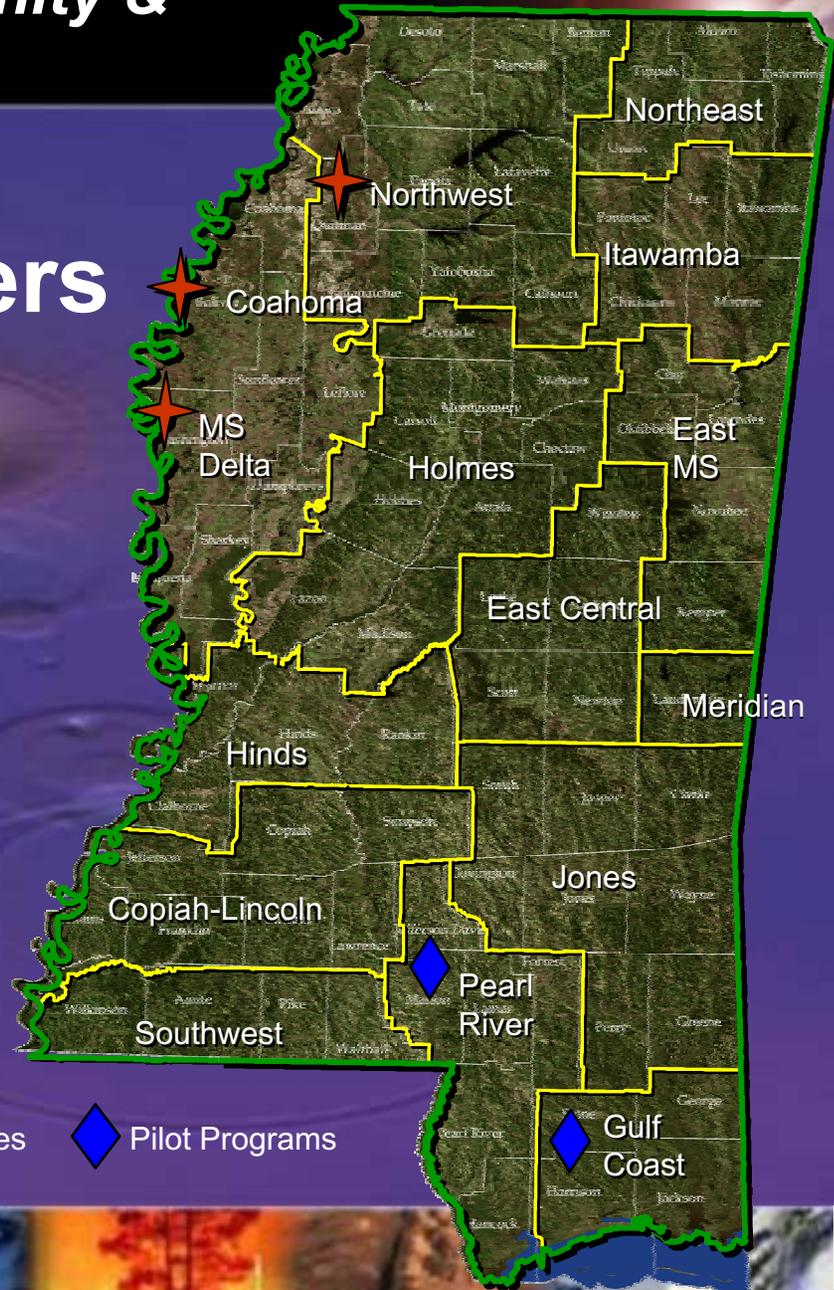
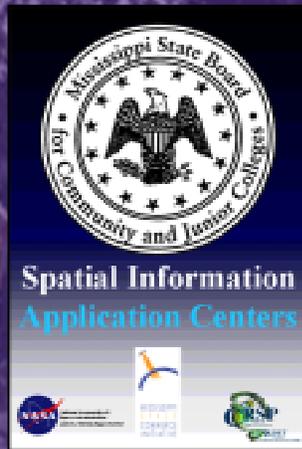




# State Board of Community & Junior Colleges

## Application Centers

At All 15  
Community  
Colleges



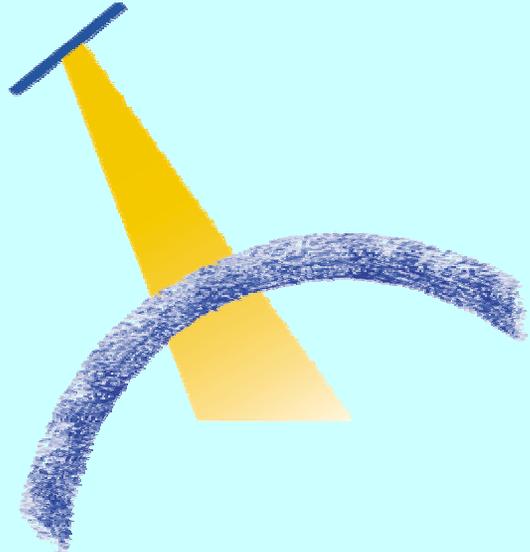
★ Beta Sites    ◆ Pilot Programs





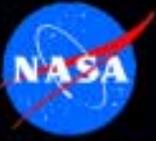
# WDET to MSCI

**Workforce  
Development  
Education &  
Training**



**Mississippi  
Space  
Commerce  
Initiative**





# ***The National Workforce Development Education & Training Initiative (NWDETI)***

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- Beginning in late 1999 Mississippi's WDETI expanded to encompass national level activities – once again with a focus on enhancing U.S. economic competitiveness through development of remote sensing technologies
- *through*
- Stennis Space Center's Education & University Affairs Office – Utilizing existing national level education & training infrastructures to develop & prepare a well-trained workforce for the geospatial technology marketplace





# Earth Science Enterprise

