Developing Wildland Fire Risk Index for Texas Using Remote Sensing
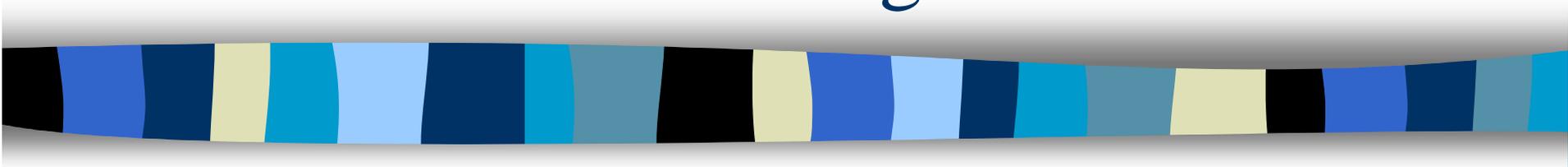
Balaji Narasimhan

Graduate Research Assistant

Texas A&M University
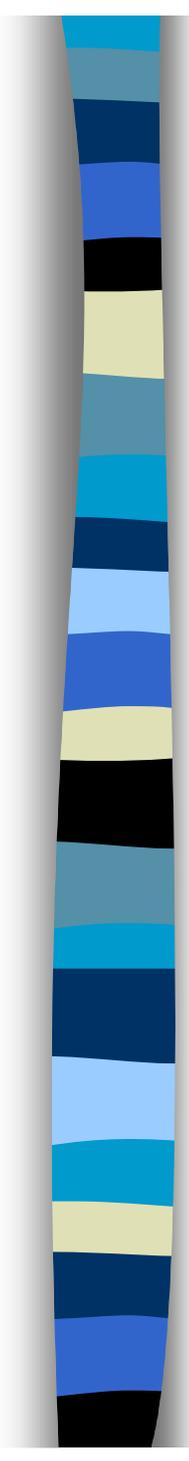
Objective

- To assess wildland fire risk using remotely sensed data from AVHRR and NEXRAD
- To develop a real-time monitoring system
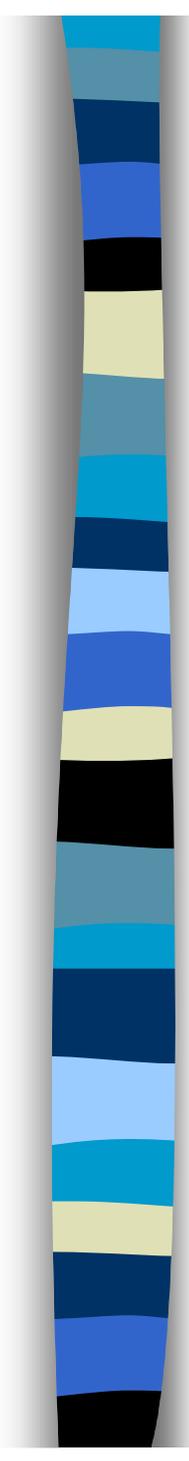
AVHRR and NEXRAD

- AVHRR - Advanced Very High Resolution Radiometer

- It is a sensor aboard NOAA - POES

- NEXRAD - NEXt generation weather RADar

- Ground based radar
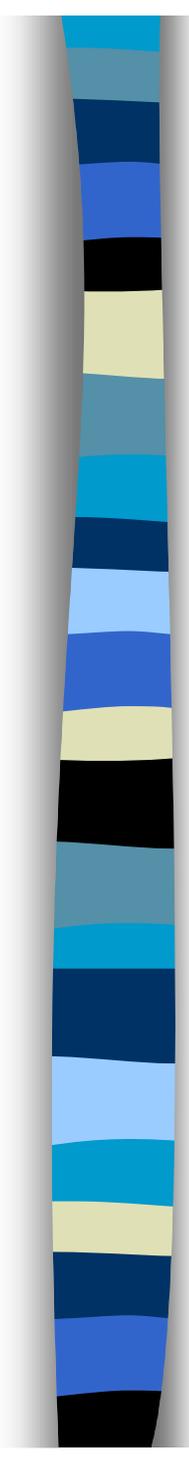
Why use Remote Sensing?

- Better spatial resolution (1km X 1km)
- Better temporal resolution (Daily/weekly)
- Large area monitoring
- A good decision support system
- Wise use of resources
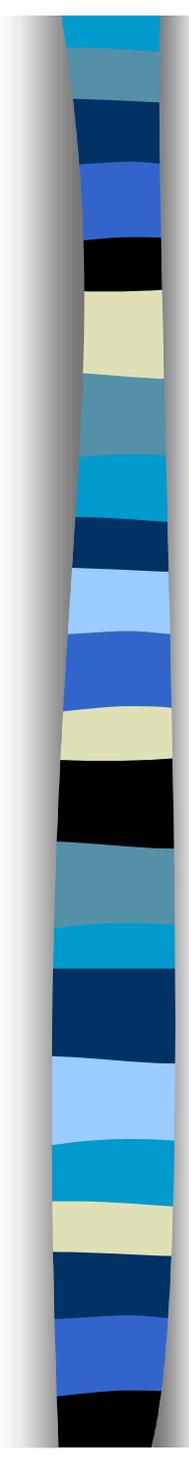
Keetch-Byram Drought Index (KBDI)

- Simple Water Balance Model
  - precipitation - adds water
  - evaporation removes water from soil
  - the water stress is expressed as a drought index
- Scale
  - 0 to 800 (Low risk to high risk)
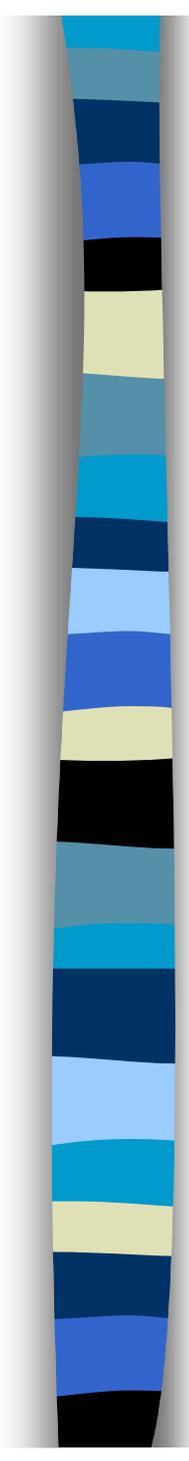
Climatological parameters

- Daily maximum temperature - AHVRR

- 24hr rainfall - NEXRAD

- Cumulative moisture deficiency
  - previous KBDI

- Annual average precipitation

Land Surface Temperature

- Temperature from satellite is called Land Surface Temperature (LST)
- LST is different from air temperature, T_a

Air mass

T_a

T_s

T_s

T_s

T_s
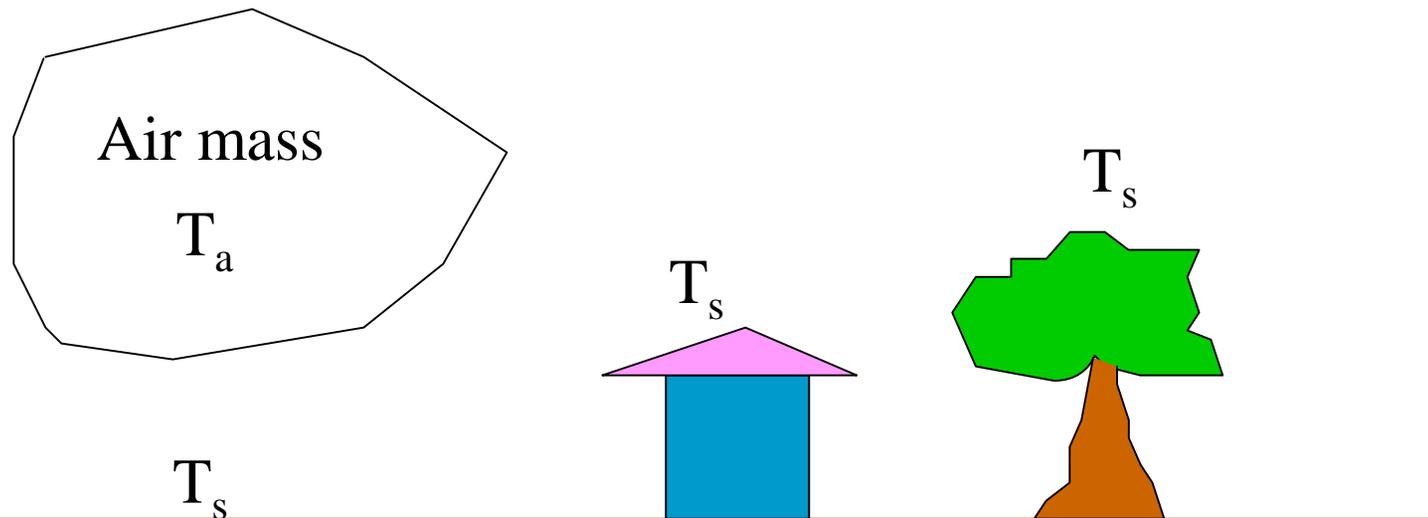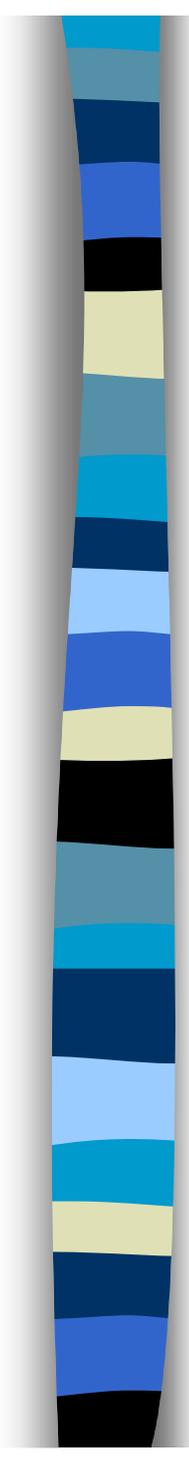
Max. Temp from LST

- $T_a(max)$ and LST are linearly related
- Adopted a linear regression model to derive $T_a(max)$ from LST
- Developed 10 different regression equations for 10 climatic zones of Texas

Texas Climatic Division

Climatic Division
East Texas
Edwards Plateau
High Plains
Low Rolling Plains
Lower Valley
North Central
South Central
Southern
Trans Pecos
Upper Coast

N E S W
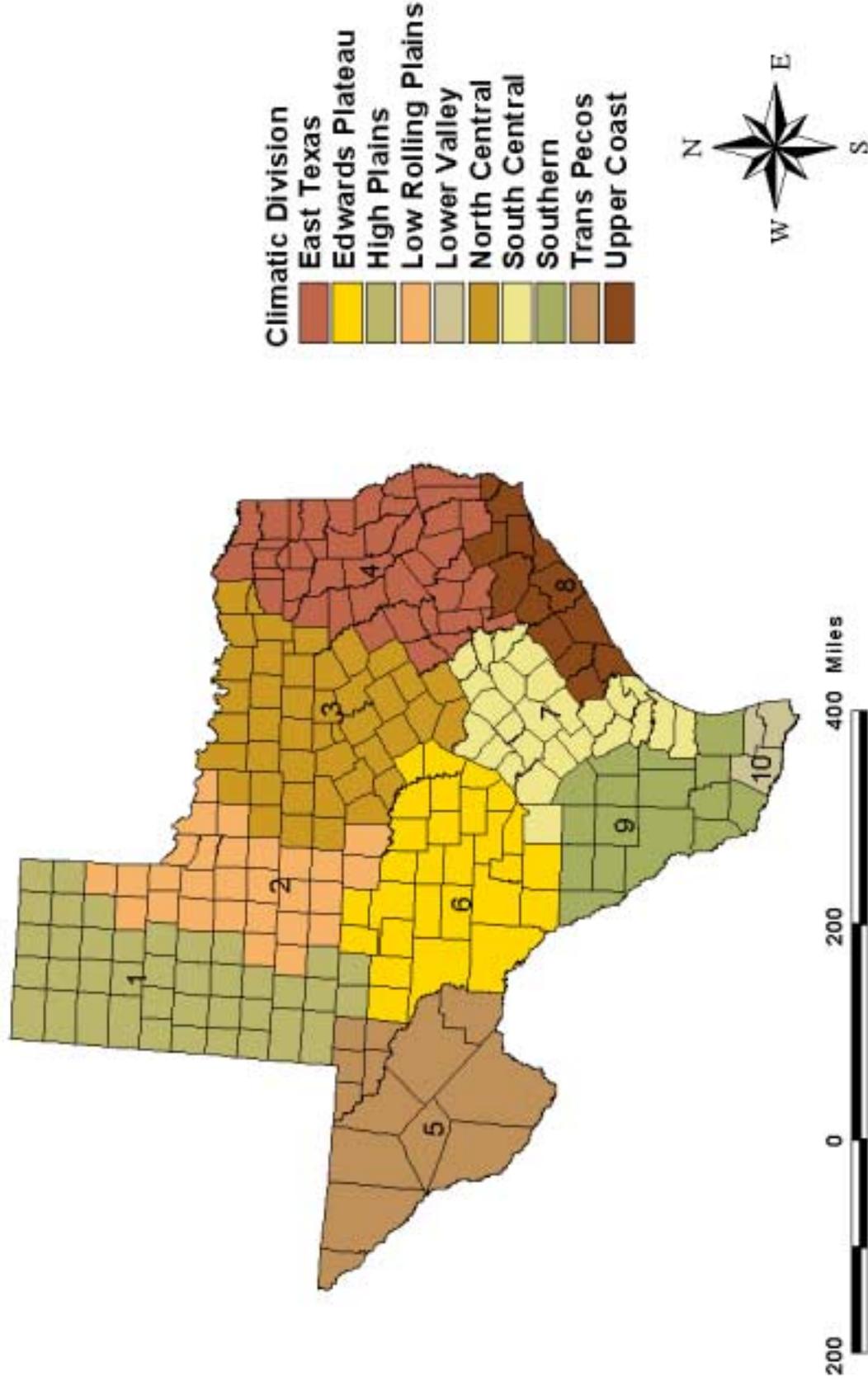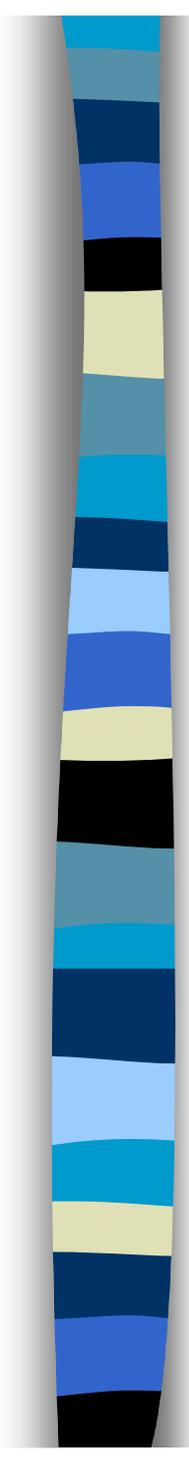
200   0   200   400 Miles

Max. Temp from LST

- Model development - 27 weather stations
- Model Validation - 30 weather stations
  (independent dataset)
- R^2 of 0.86 to 0.95

Weather Stations

Weather Stations used for
model development

Weather Stations used for
model validation
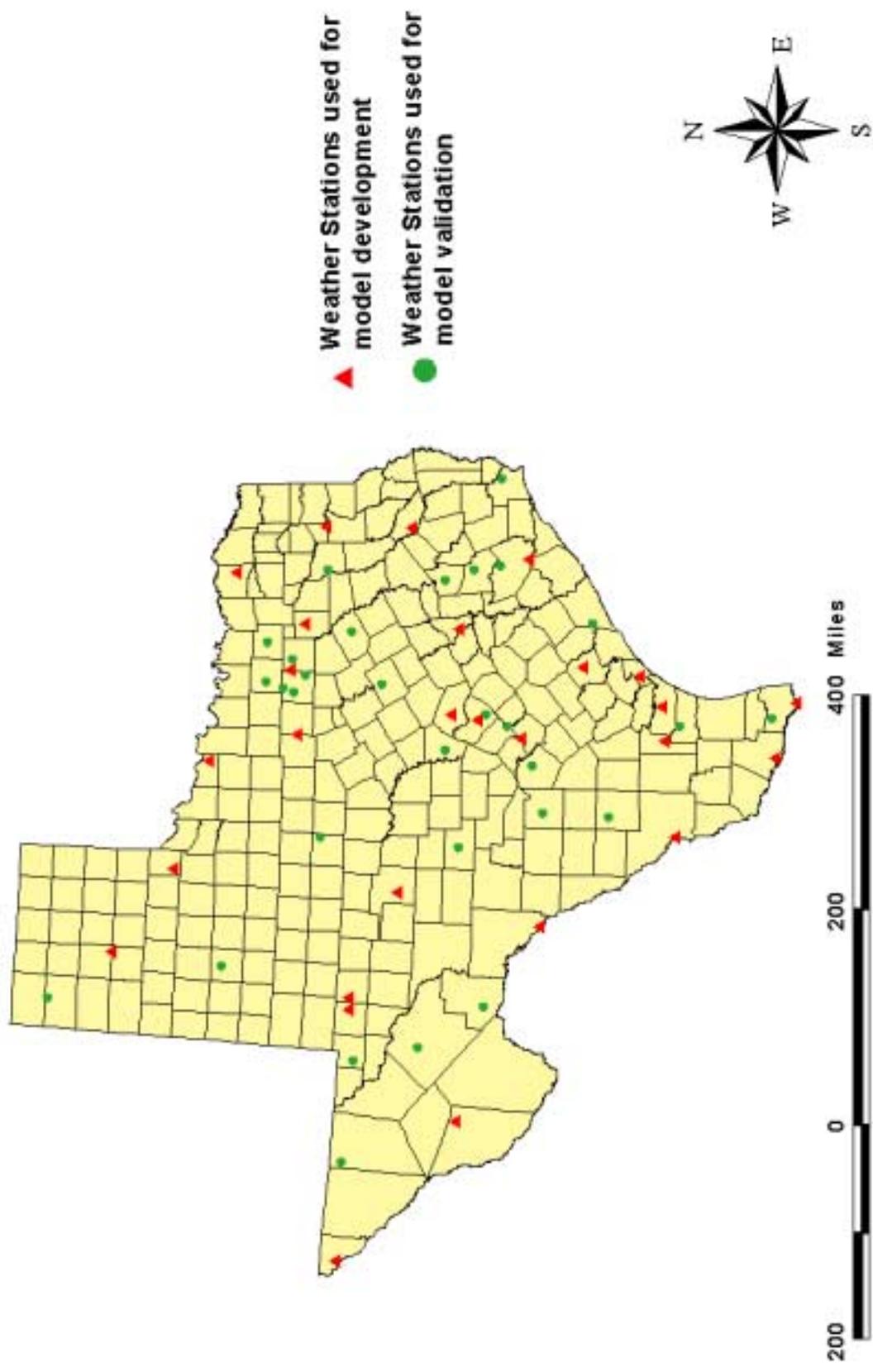
200   0   200   400   Miles

KBDI at 1km x 1km scale
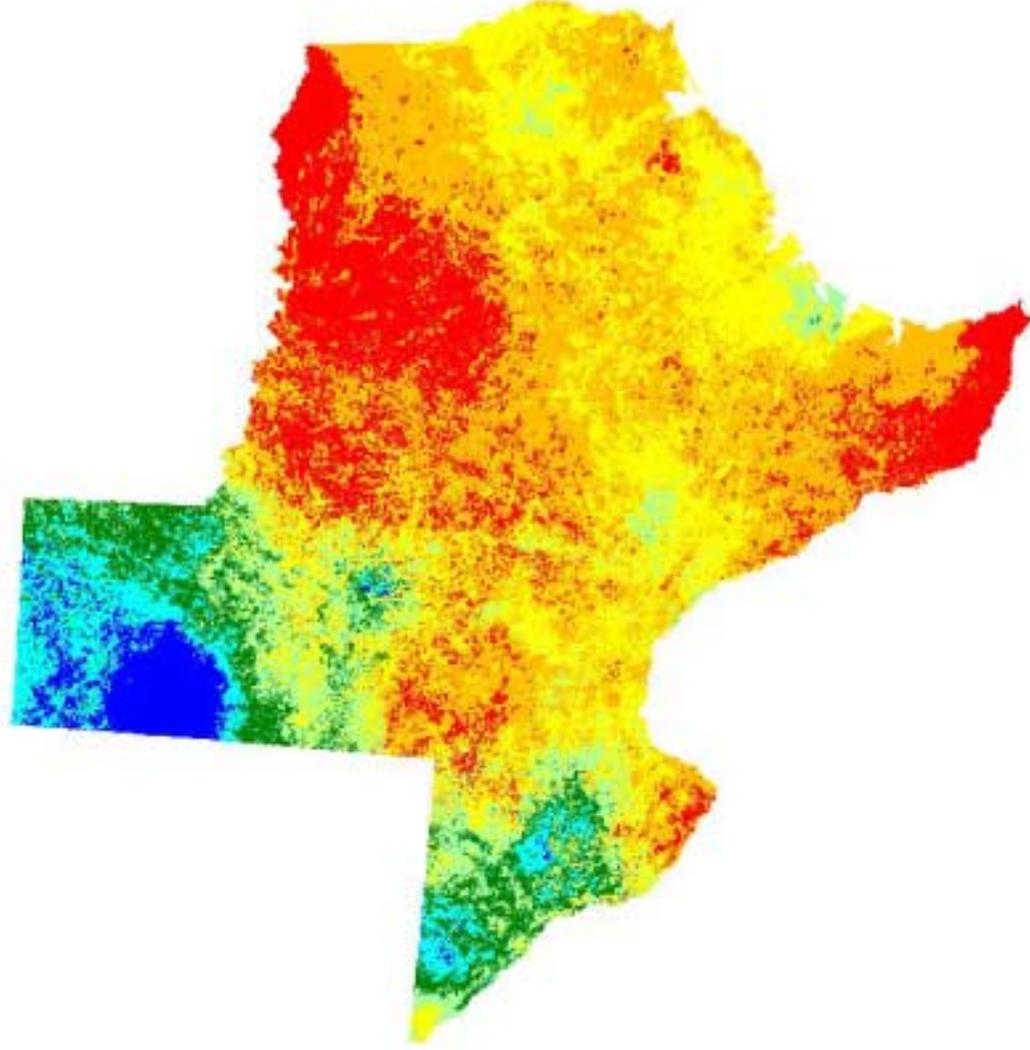
KBDI

- 0-200
- 200-300
- 300-400
- 400-500
- 500-600
- 600-700
- 700-800
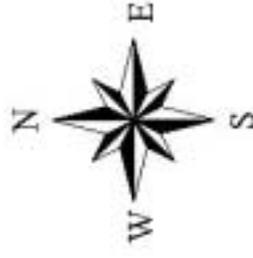
200 0 200 400 Miles

Real-time monitoring system

Clients

Answers

Questions?

WWW and GIS

Satellite corrections and cloud detection

Estimate KBDI
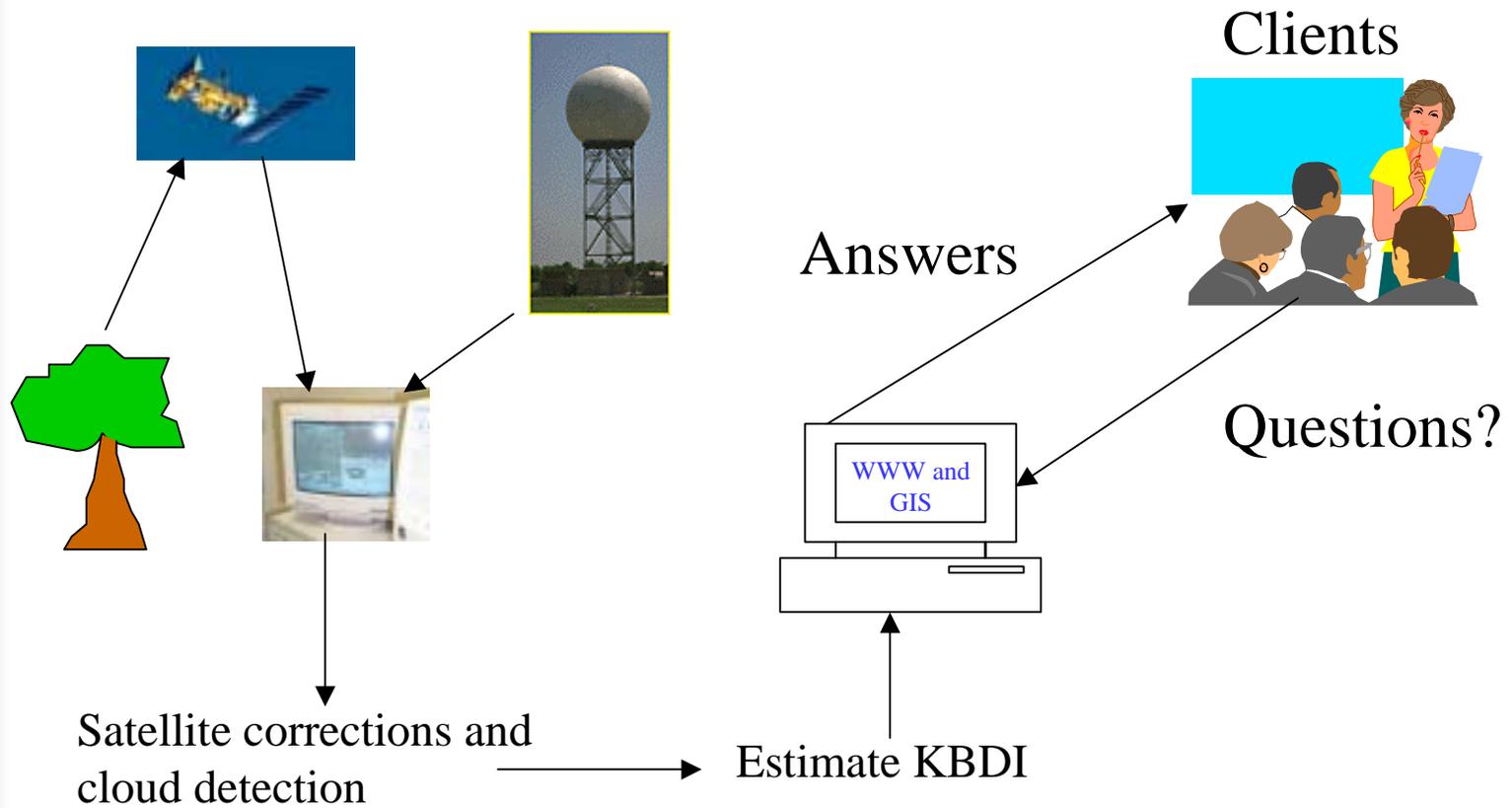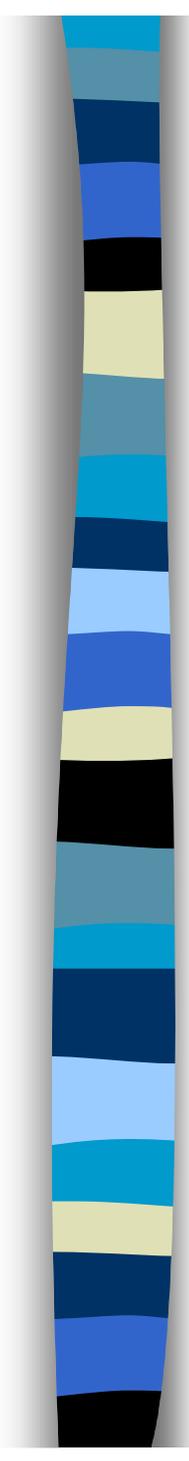
What in Future?

- **Fire Risk Index (FRI)**
  - NDVI - represent greenness $\longrightarrow$ fuel load
  - KBDI - represent dryness/wetness
  - FRI will be a combination of Greenness and Dryness

Questions??