Geographic Information Science
… making a difference

Most Information has a spatial or geographic component

GIS show Context and Content
Seeing the Whole
- Patterns
- Linkages
- Trends
Managing Places
- Watersheds
- Communities
- Neighborhoods
- Ecosystems

Geographic Information Systems
- Social Factors
- Biodiversity
- Engineering
- Land Use
- Environmental Considerations

…allowing us to see the “whole”

GIScience:
Tracking and Preventing Crime

Crime incidents in Charlotte, NC and Identification of Hot Spots

Crime Hot Spot: Spatial Concentration
GIScience: Protecting the Environment

GIS provides a Framework for Studying Complex Systems

Visualizations: Planning Hiking Trails

Line of Site Assessments and Profiles
Chesapeake Bay: Community Group Tracking of Nitrogen Levels

- 156 Metropolitan Areas
- Real-Time Environmental Data for Decision-making
- Partnering of US EPA and EMPACT Grantees

Chesapeake Bay Nitrogen
• pollution distribution in space and time

Sediment Transport:
• analyzing erosion risk
• designing controls

Tracking Boll Weevil Infestations
Jackson State Community College

Remote Sensing - detecting damage from the hemlock wooly adelgid...

Classifying land cover to improve hydrodynamic modeling

Mapping and Tracking Air Quality
Tracking Species Migrations
- data from thousands of sources

GIScience:
Community Planning

Library Service Areas
- improving services to patrons

Aiding the welfare-to-work process …
enhancing accessibility to jobs, daycare and training

Growth Models
- incorporate hazard, risk, and environmental factors through GIScience methods

Regional Conservation Planning...
Identifying and protecting diverse wildlife habitat and outdoor recreation reserves.
Hazardous Wastes
- managing remediation and cleanup

Managing City Street and Utility Improvement Projects

Risk Factor Identification from Contaminants

GIS & Political Redistricting

GIScience:
Tracking and Controlling Urban Growth

Reasoned Decision-making:
- Constitutional criteria
- Geographic criteria
- Political-Geographic criteria
- Political criteria

Source: American Scientist, November-December 1996
http://www.amsci.org/amsci/issues/Comsci96/comsci96-11.html
Urban Geographic Analysis

Tracking Urban Growth
Washington DC and Vicinity
1792 - 1992

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Monitoring Traffic
Managing Traffic

Urban Dynamics Research

GIScience:
Addressing Health Problems
How many cardiovascular patients have a cardiologist within 5 miles?

Epidemiological Studies - Disease Tracking

Geographic Analysis of Disease Risk
- Where are the potential areas of disease?
- Who are the populations at risk now and in the future?

Landscape Epidemiology
By knowing the ecological conditions necessary for maintenance of specific pathogens, one may use those conditions to ascertain the spatial and temporal distributions of disease risk.

LaCrosse Encephalitis
Pattern at Different Spatial Scales

LaCrosse Encephalitis Cases and Sites over Land Cover
Location Correlation with Patient Conditions

The Washington Post

West Nile Virus Is ‘Here to Stay’
Illness Predicted to Spread Across Country Within Three Years

Spread of West Nile Virus 2000
(avian mortality)
30 June
13 October

West Nile Virus Surveillance Mapping
... linking environment and human risk

Loma Linda Hospital - Facilities Management
GIScience: Responding to Emergencies

Oil Spill Response System
- Florida Department of Environmental Protection
  - Oil Spill Contingency Planning
  - Integration of GIS and Environmental Sensitivity Index Data
  - Oil Spill Response Decision Support

Predicting Locations of Power Outages

Dispatching and Routing Repair Crews

Simulated Radioisotope Release in Washington D.C.
5000 Ci of Cesium, 100% aerosolized by a conventional explosion
Pup 360,000
Housing: 220,000
Contamination
2 Hospitals
31 miles of local streets
1 mile railroad
- 0.1 - 0.5
- 0.5 - 2.0
- 2.0 - 5.0
- 5.0 - 30
- >30 REM

GIScience: Educating Children
Where to plant trees around all of our schools?

In which libraries should we put books for which age children?

Exploring watershed factors in our town

GIScience: Supporting Business and Industry

Guiding Customers to Services
  - Where are all the ATMs near my present location?

Defining Territories and Optimizing Customer Routes
Crop Harvest Factor Assessment using Remote Imagery

Dispatching delivery vans, taxis, or repair trucks

Precision Agriculture
Allowing farmers to plant and fertilize more efficiently, increasing yields...

Electric Power Infrastructure and Power Flow Analysis
- Electric-power infrastructure (EPI) consists of generating plants, transmission lines, substations, and distribution networks
- EPI of continental USA has four interconnections
- LA part of WSCC
- Power flow analysis after removing substations with extensive or complete damage states using Monte Carlo method

GIScience: Disaster Response and Damage Assessment

Urban Disaster Planning and Management
Real-time data for disaster response

Hurricane Andrew: Projections, Response and Damage Assessment

Wild Fire Tracking: Direct read and fast display of imagery

Mapping Earthquakes - Ground Motion Parameters

Hurricanes / Tropical Storms
Aug 93 to Present
>25 storms

Earthquake Mapping
Northridge, Kobe

- Hurricane Bonnie
damage bands

GIScience:
Visualizations for Managing Scientific Data
GIS is a Visual Language

Three-dimensional analysis to evaluate urban land use...

Location Correlation: Store Sales and Customer Densities

Three-dimensional analysis to assess green space strategies...

Disaggregate Analysis

Earthquake Mapping
Slide Credits
Thanks and appreciation are extended to the following for supplying graphics, slides or movies:

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GE Smallworld
US Geological Survey

...plus numerous professors and research scientists from across the nation

UCGIS Congressional Breakfast Slideshow

Hosts:
Congressman Paul Kanjorski (D-Pennsylvania)
Congressman Jerry Lewis (R-California)

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Senator Pete Domenici (R-New Mexico)
Senator John Glenn (D-Ohio)
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