

# Developments in Technologies and Methods in GIS In Education

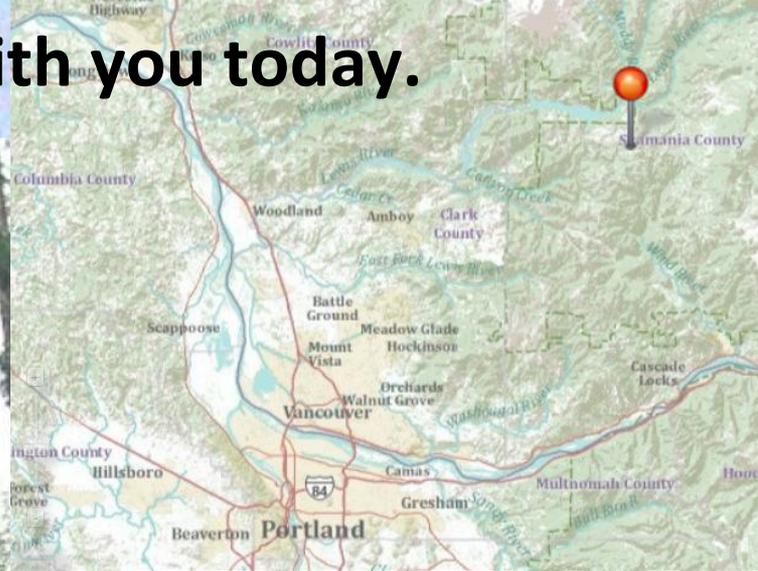
Joseph Kerski, Ph.D  
Education Manager

Esri

[jkerski@esri.com](mailto:jkerski@esri.com)



Greetings! It is an honor to be with you today.



46° N  
122° W



# ESRI Education Program

*Formally begun in 1992; program mirrors corporate purpose*

- Advance geographic thinking/inquiry
- Further use of GIS and related technologies
- Support broadening array of users
- Develop professional GIS workforce
- Foster stewardship (community to global)
- Provide easy access to ESRI tools and support



# Relevance of GIS in Education

**Name some issues of concern in...**

- **Your community**
  - **Your region**
  - **The World**

**All of the key issues of our time have a geographic component and can be better understood and solved with GIS**

# Key Issues of the 21<sup>st</sup> Century

Energy

Sustainable Agriculture

Biodiversity

Natural Hazards

Traffic/Transportation

Crime/political instability

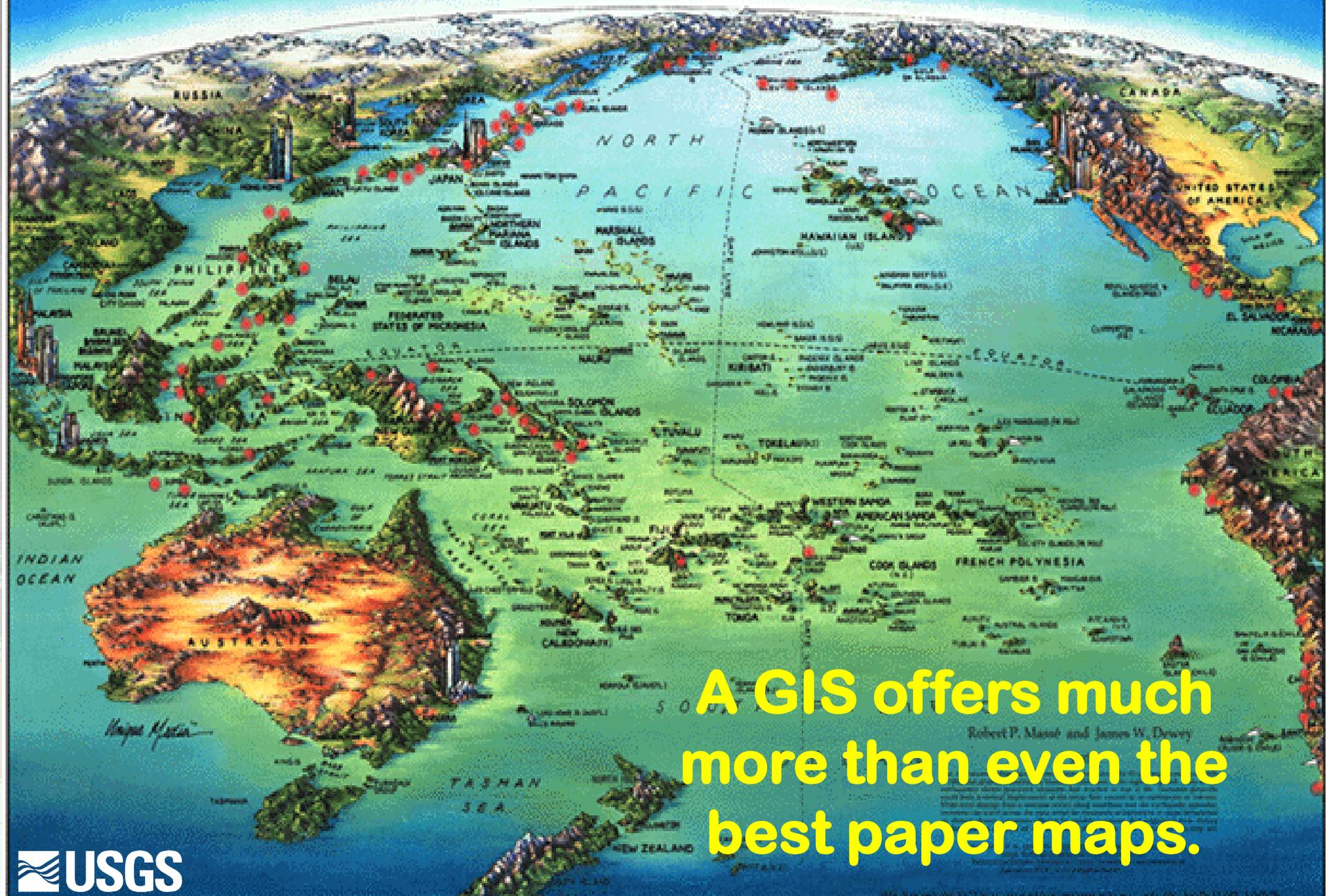
Water quality/availability

Climate change

Migration and Urbanization

# Tsunami-Generating Earthquakes

U.S. DEPARTMENT OF THE INTERIOR  
U.S. GEOLOGICAL SURVEY  
NATIONAL EARTHQUAKE INFORMATION CENTER  
WORLD-WIDE CENTER FOR SEISMOLOGY



**A GIS offers much more than even the best paper maps.**

Robert P. Masó and James W. Dewey



*What we see depends mainly on what we look for.*

**--John Lubbock**



# The Geographic Inquiry Process

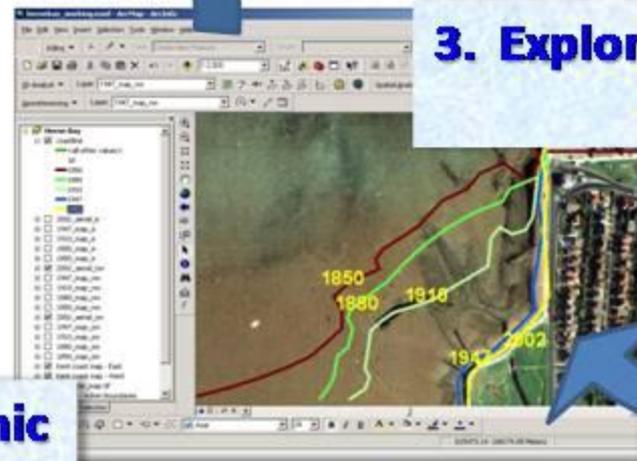
**1. Ask Geographic Questions**



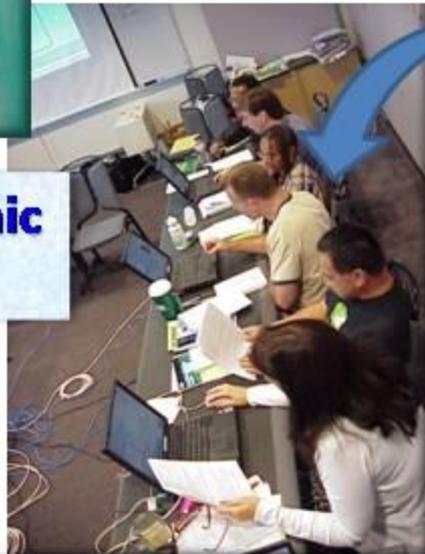
**2. Acquire Geographic Resources**



**3. Explore Geographic Data**



**4. Analyze Geographic Information**



**5. Act on Geographic Knowledge**



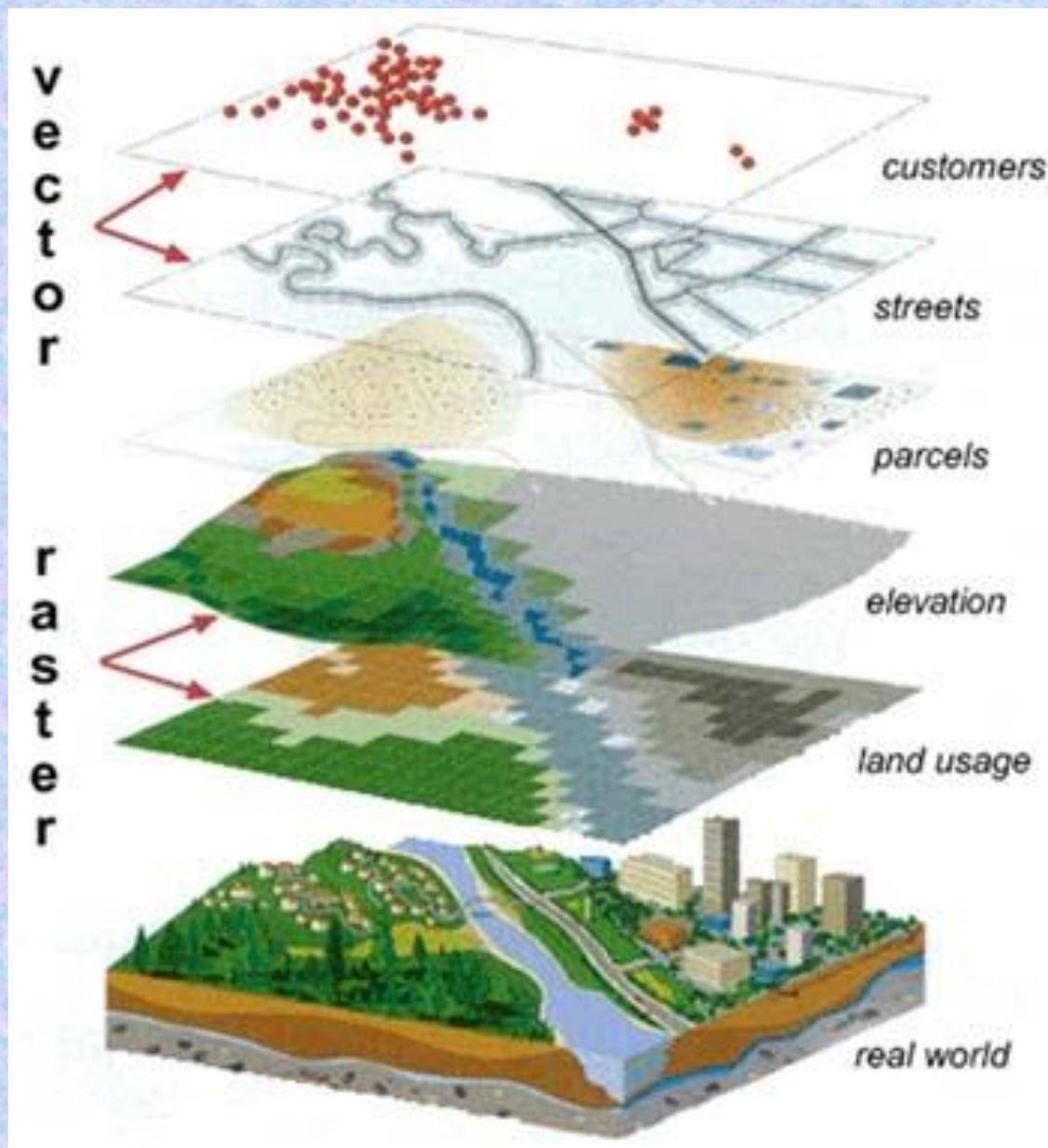
**Repeat?**



**GIS =  
Hardware,  
software,  
data,  
procedures,  
people.**

**GIS = A decision-  
making tool.**

**GIS = Part of  
geotechnologies.**



# Context and Content –

## Location - where is it?

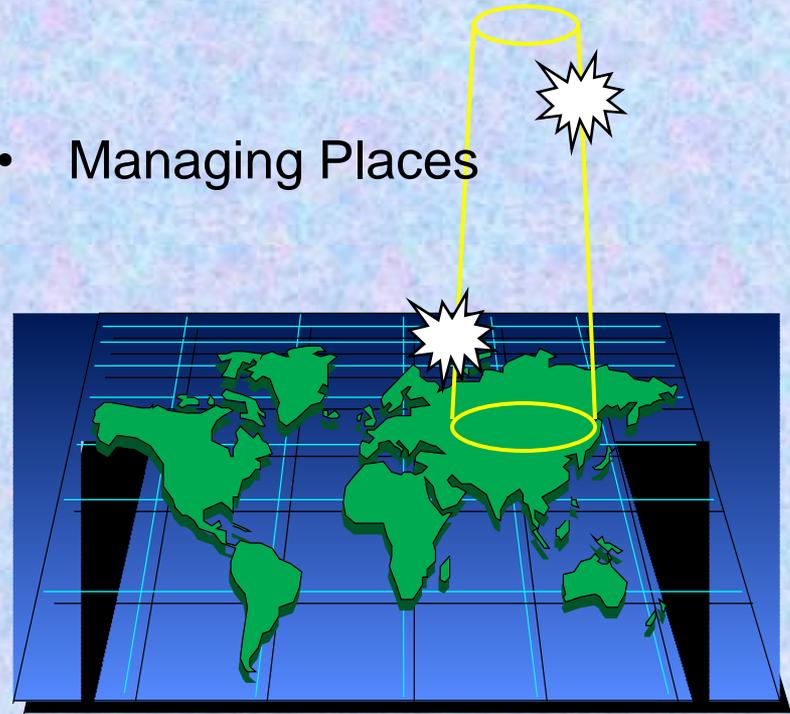
## Place – what is it like?

- Seeing the Whole



- Patterns
- Linkages
- Trends

- Managing Places



- Watersheds
- Communities
- Neighborhoods
- Ecosystems

# GIS in Schools: Why

## Individual

Classroom: Gain spatial, critical thinking, and problem-solving skills

Community: Become active community participants

Career: Gain key 21<sup>st</sup> century workforce skills

## Institution

Improve planning and decision making by school administrators

**Teaching  
*about*  
GeoTech**

**vs.**

**Teaching  
*with*  
GeoTech**

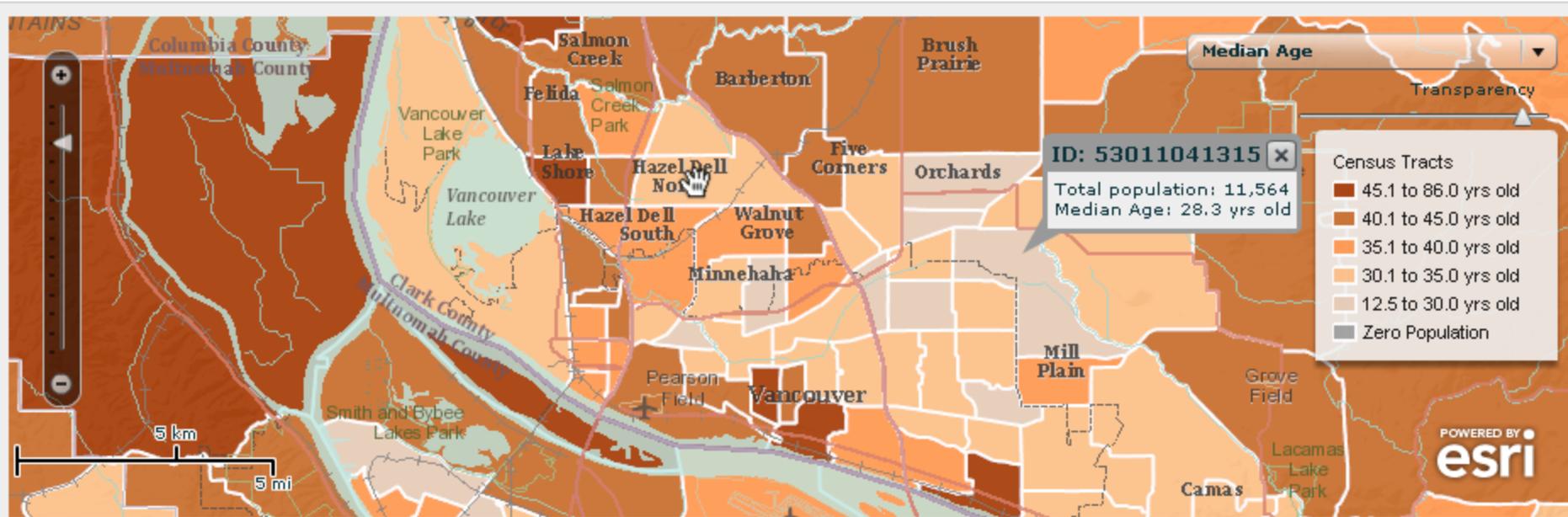
- **GIS**
- **Remote Sensing**
- **Geomatics**
- **Informal Education:  
Clubs, 4H**

- **Environmental Studies**
- **Earth Science**
- **Chemistry**
- **Biology**
- **Geography**
- **Computer Programming**
- **History**
- **Mathematics**

# Drivers for Teaching With Geotechnologies

- **Constructivism**
- **Problem-based learning**
- **Authentic Assessment**
- **National Curricula and Educational Standards**
- **National Academy of Sciences:**
  - Learning to Think Spatially*
- **Hardware, software, data advances**
- **New Geospatial Tools**

# Make a Map



### 1 Enter a location

Enter a ZIP Code, address, or place of interest (e.g., Grand Canyon).

### 2 Select a demographics layer

- Hide U.S. demographics.
- Click map for specific demographic data.

### 3 Resize the map

Width  Height

Enter values or drag bottom right corner of map.

- Include scale bar.

Home Display Add-Ins

Start Presentation \* Presentation Edit Presentation Presentation

Find

Directions Route Measure Find

Folder View Link

Create

Point Line Area

Target Circle Rectangle Arrow

Basemap Add Content Analysis Contents Window Map

Manage Layers Copy to Clipboard Zoom To 2D/3D

Measure

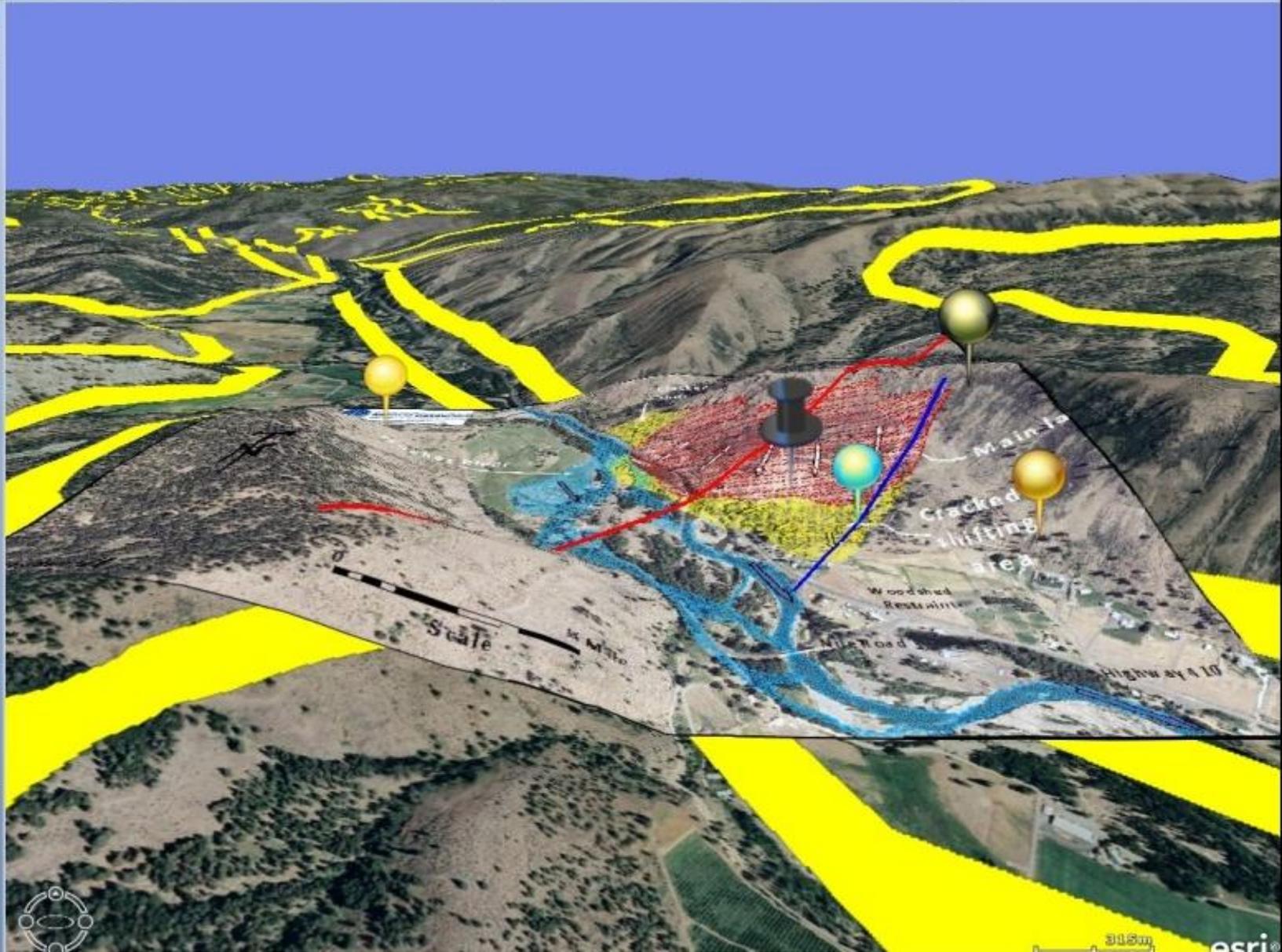
Clear Add to Map

Find

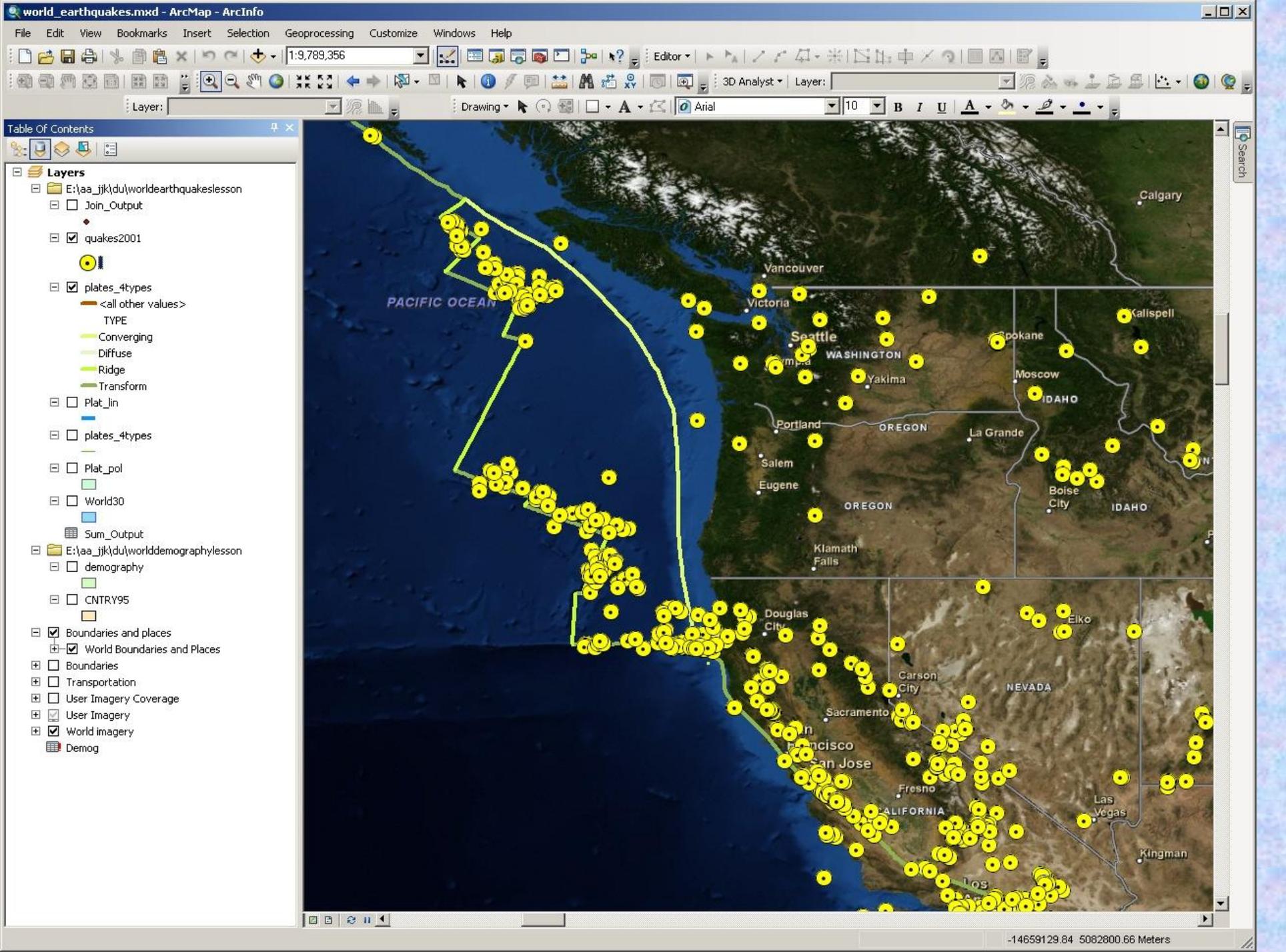
Place address or location

Contents

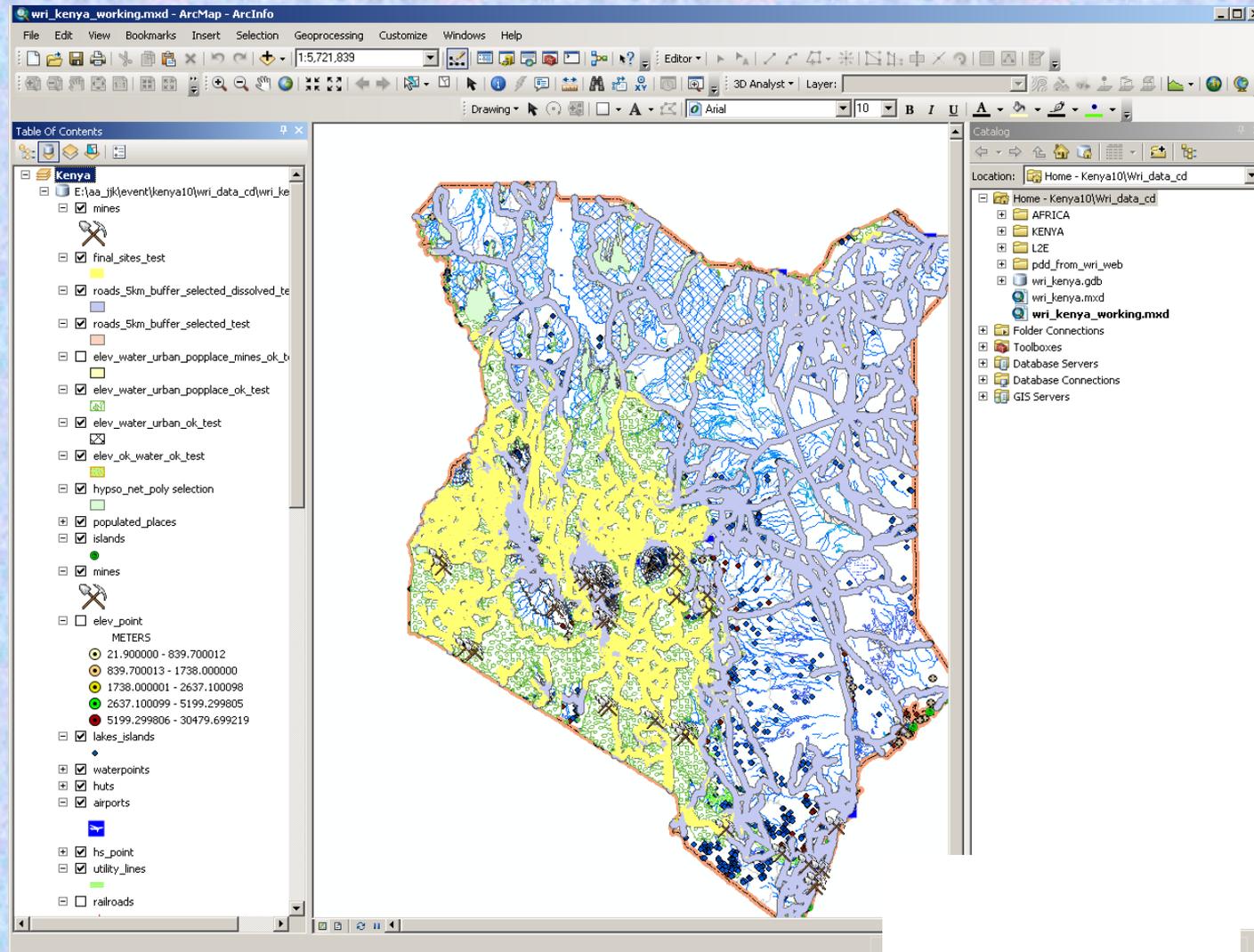
- Cross Section
- Aerial - Oblique 2
- Cracked Ground
- Aerial - Oblique
- Terrain Profile River to Ric
- Terrain Profile Across Vall
- Gravel Pit
- Faults WA 1:500,000
- Landslide Map
- Basemap (Boundaries and Pl







# Sustainable Tea Cultivation--Kenya



# **Geotechnologies can *enhance* instruction because they are:**

- **Multidisciplinary**
- **A real-world technology using real data**
- **Involving authentic tasks and assessments**
- **Encouraging community connections**
- **Used at scales from local to global**
- **Tied to education standards and national curricula**

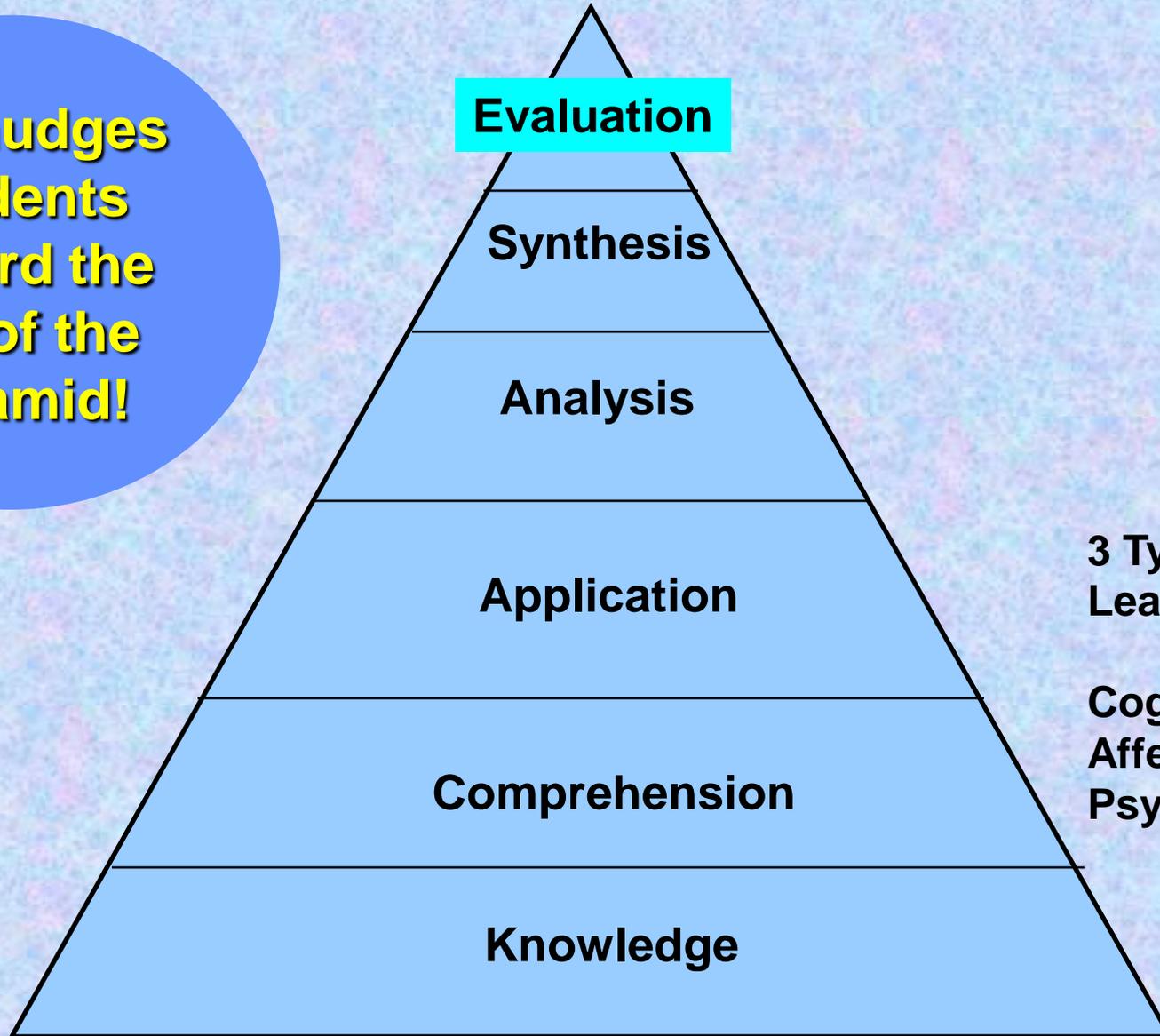
# More reasons why...

- **Inquiry-based**
- **Team-based**
- **Problem-solving approach**
- **Project-based**
- **Engaging**

***Process is just as important as the product  
(Constructivism)***

# Bloom's Taxonomy

**GIS nudges students toward the top of the pyramid!**



**3 Types of Learning:**

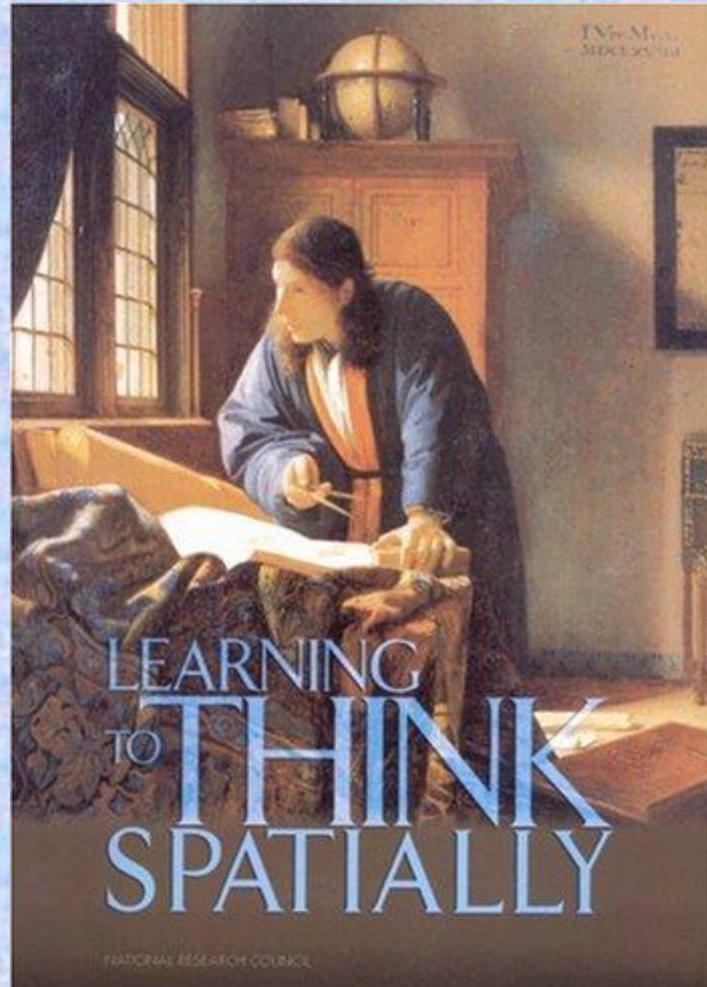
**Cognitive  
Affective  
Psychomotor**

**GeoTechnologies allow students to study local to global phenomena and incorporates fieldwork.**

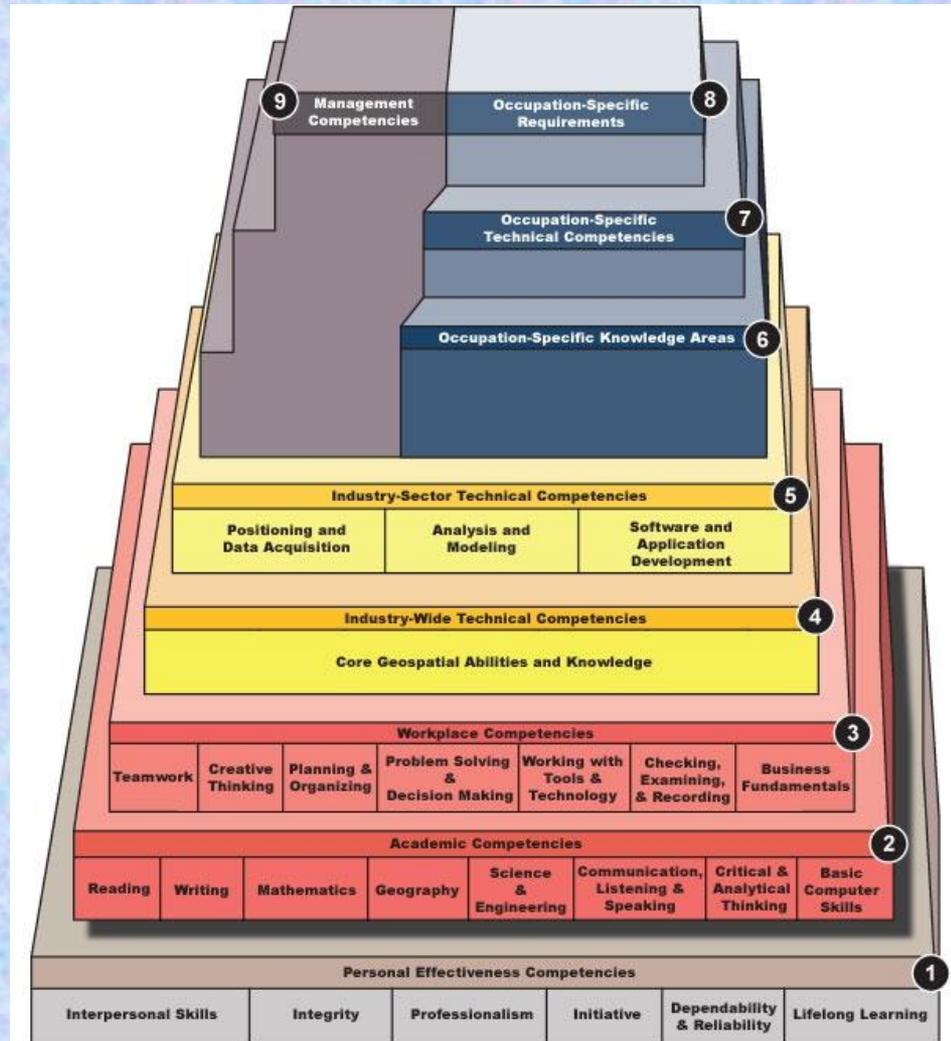
**The importance of getting possible students out in the field as much as and as young as possible has been well documented (*Last Child in the Woods* (Louv), “*No Child Left Inside*”, AGI)**



# Learning to Think Spatially--NRC



# Geospatial Technology Competency Model



# New Research on GIS in Education

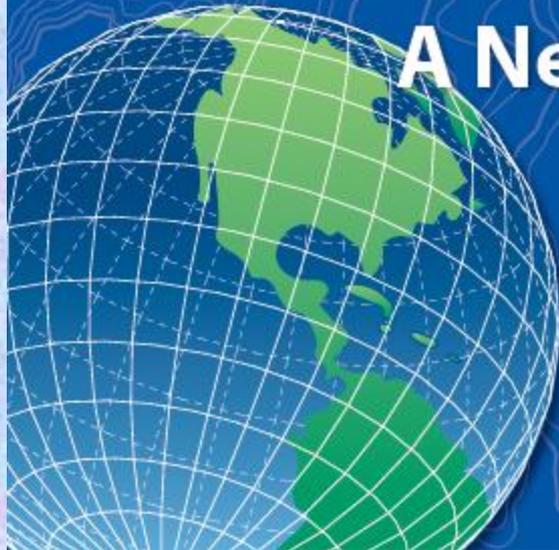
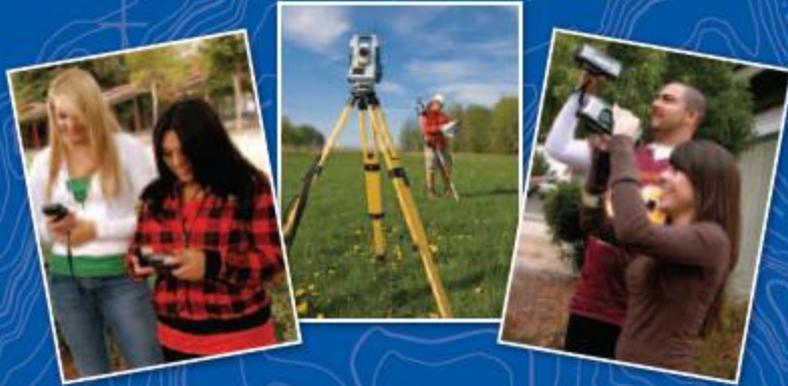
- ◆ GIS Education Research Community
- ◆ GIS Education bibliography: 1,600 entries
- ◆ *International Perspectives in Teaching and Learning with GIS in Secondary Schools* – book to be published in 2011, Springer

# GIS is for more than teaching

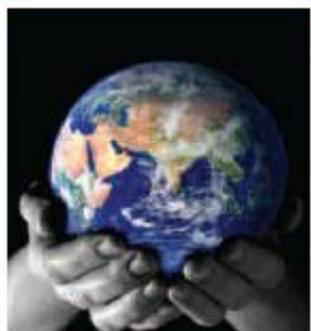


# PHS GTP

Geospatial Technology Pathway  
A Santa Rosa City Schools Career Pathway at Piner High School



## A New Pathway at Piner High School



## What Local Experts are Saying...

"It's the fastest growing industry you've never heard of - geospatial technology"

- *The Press Democrat* 11/12/2007

"Students who invest time into learning how to use GIS software, gain an extremely valuable asset in today's employment market"

- *Tim Pudoff*

*Sonoma County GIS Manager/Information Systems Department*

"GIS/GPS...career opportunities are growing at quantum leaps as environmental issues take on new urgency in this new millennium. ENVIRON International Corporation is pleased to support Piner High School..."

- *Chris Emery*

*Senior Manager, Environ Corp Meteorologist*

"Sonoma State University's Physics & Astronomy Department and SSU's NASA Education and Public Outreach group is excited to support Piner High School...providing opportunities to get students interested in Science, Math and Technology..."

- *Lynn Cominsky*

*Professor and Chair, Physics and Astronomy and Program Director, NASA EPO at SSU*

"Land surveyors, civil engineers, urban planners, municipal public works and utility departments, law enforcement, fire departments and emergency medical responders are a few of the long list of people who utilize GIS...As a Piner Alumni, I am excited to donate time to Mr. Kruger and Ms. Erickson's students"

- *Anthony G. Chiquini P.E.*

*Professional Civil Engineer and Piner High School graduate, Class of 1993*

# Map Your Future!

## Geospatial Technology Pathway at Piner

Welcome and thank you for your interest in Piner High School's Geospatial Technology Pathway. We are excited to bring this unique opportunity to Santa Rosa City School Students. The Geospatial Technology Pathway is led and taught by the same people who created and designed it, Ms. Erickson and Mr. Kruger.

We truly believe that this is an amazing learning opportunity that will motivate students into new career and educational opportunities. Students will experience the latest GIS technology in our new GIS lab along with our GPS field computers, and survey equipment. Students will learn a valuable skill while applying science, math and technology concepts in a supportive, engaging environment that includes fieldwork and authentic projects. Ms. Erickson and I have over 33 years of teaching experience and we look forward to making your educational experience valuable and rewarding.

*Kurt Kruger*

*Program Coordinator/GTP instructor*

*Kristi Erickson*

*GTP instructor*



## Who may participate in the GTP program?

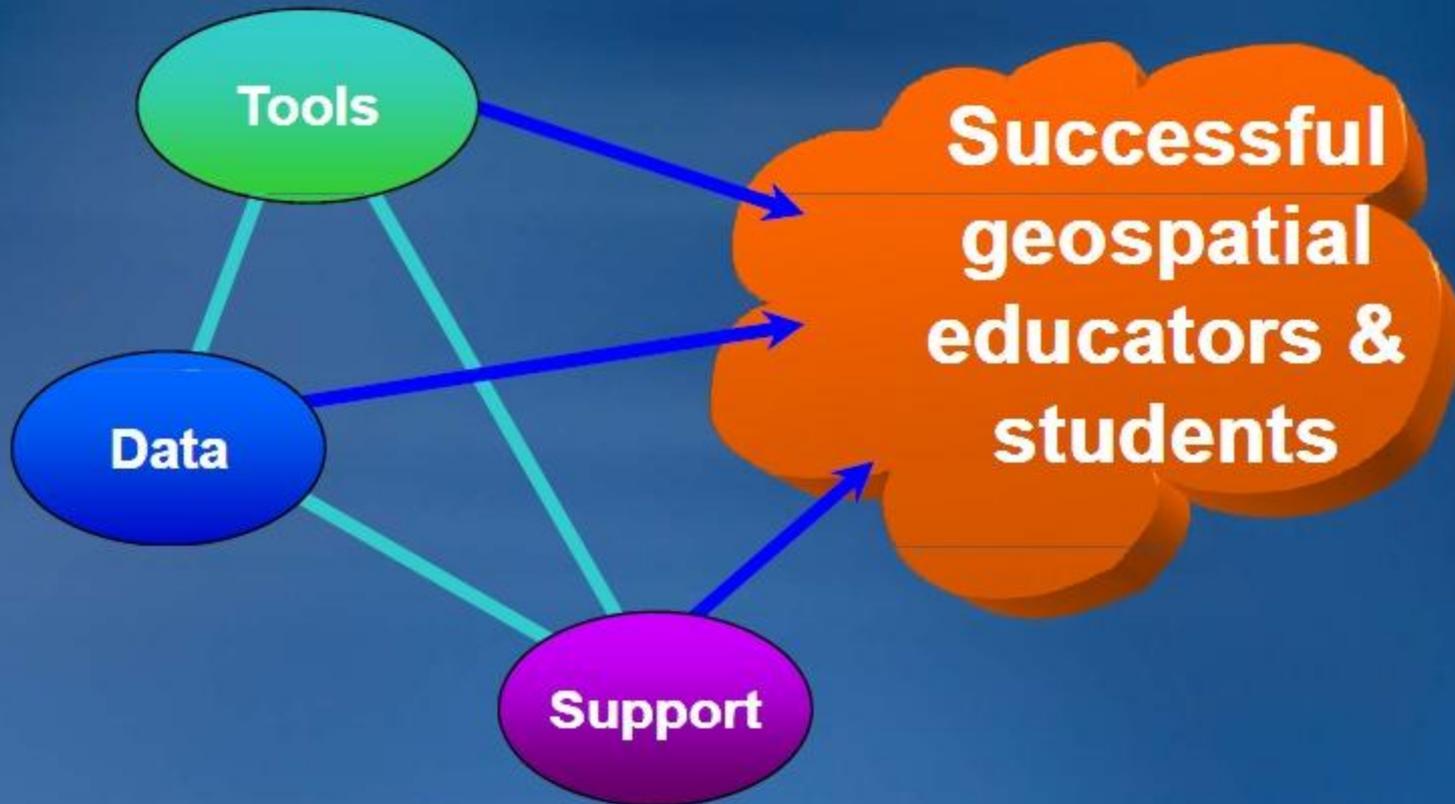
The Geospatial Technology Pathway is aimed at students who are curious, enjoy science, math and technology, are excited about project-based learning and willing to complete a 3 year integrated program. We are looking for a diverse cross-section of Piner's students. You do not have to be a straight "A" student (but can be).

Most important is that you are inquisitive, have a good work ethic and possess a passion and excitement for exploration and hands on learning. You will not only learn Science, Math and Technology, but gain skills that will take you into the workforce, certificate programs or further College/University education. Your experience begins in the GIS lab; moves out into the community for data collection and applied independent projects, and finally a third year internship.

## GTP Goals:

- ◆ To make Science, Technology, Engineering and Mathematics (STEM) relevant and approachable to students by linking the standards based content to real world application and/or vocations.
- ◆ Encourage students to participate in the scientific process by providing real, authentic, community based GIS, Astronomical, Meteorological and Seismological research projects which link directly with a variety of vocational and/or educational opportunities.
- ◆ To provide students with the tools necessary to integrate science, math and technology so they may perform authentic research.
- ◆ Prepare students for both a career and/or higher education in Science, Math and Technology. Provide a collaboration and integration between science, technology, students, parents, teachers, school, and community

## GIS in Schools: What's Needed



# Esri Education User Conference

- San Diego, July 2011
- >500 people, multiple sessions and events



# National Conference on Geography Education

CALENDAR



**NCGE National Council for Geographic Education**

[HOME](#) [NCGE](#) [MEMBERSHIP](#) [CONFERENCE](#) [BLOG](#) [PUBLICATIONS](#) [AWARDS](#) [RESOURCES](#) [PROF DEVELOPMENT](#)

**2010  
Conference**

**2011  
Conference**

**Hotel and  
Travel  
Information**

## 2011 Conference

[home](#) > [conference](#) > [2011 conference](#)



**PORTLAND, OREGON  
SUMMER MEETING!**

**August 1st - August 7th, 2011**

[Hotel and Travel Information](#)



# edcommunity.esri.com

- Portal dedicated to educators

The screenshot shows the ESRI GIS Education Community website in a Windows Internet Explorer browser window. The address bar shows the URL <http://edcommunity.esri.com/>. The page features the ESRI logo and the title "ESRI GIS Education Community". A navigation menu includes links for Home, Communities, Software, Data, Instructional Materials, GeoMentor, and About GIS. A main banner area titled "Think Spatially with GIS" includes a photo of four people and a list of resources: Web mapping, Free mapping tools like AEJEE for Mac or PC or ArcGIS Explorer, Complete mapping with ArcGIS, and Learn with ArcLessons. Below the banner, a welcome message states: "Welcome to the ESRI Education Community - a living environment for the exchange of ideas and experiences, curriculum, software, and data between GIS educators around the globe." Social media links for Facebook and Twitter are provided. A "New at the Community Blog" section lists three recent posts: "Getting the Most Out of the 2010 ESRI User Conference (#esriEdUC)", "Got Questions about ArcGIS 10?", and "Exploring Growth of the World's Major Cities, 1950-2050 Using GIS". A "What's New" section lists "Resources for Math Teachers", "Video: Teaching GIS in Higher Education", and "Svfr Visits ESRI Campus". An "ESRI Education Programs" section mentions access to ESRI GIS through site licenses or centers and includes a "Learn more" link. The browser's status bar at the bottom shows "Done", "Local intranet", and "100%" zoom.

# GIS Education Support

- ArcLessons: Free GIS teaching materials and data
- iGETT: <http://igett.delmar.edu>
- GeoTech Center:  
<http://www.geotechcenter.org>

# Curricular Example: Crime Mapping

ESRI Education Community :: ArcLessons - Search Results - Windows Internet Explorer

http://edcommunity.esri.com/arcllessons/lesson.cfm?id=86

File Edit View Favorites Tools Help

ESRI GIS Education Commu... Twitter Web Slice Gallery

ESRI Events ESRI Education Communi...

ESRI GIS Education Community

Home Communities Software Data Instructional Materials GeoMentor About GIS

Instructional Materials

ArcLessons

Home | Submit Your Lesson | Help

## Crime Analysis and Mapping Module

☆☆☆☆☆ (0.00 stars from 0 reviews)

**Download Now**

File Size:  
9.80 MB

File Type:  
ZIP (compressed file)

Topic:  
GIS Software Skills

GIS Level:  
Beginning

Target Audience:  
College-University Undergraduate

Geographic Scale:  
Local

Location:  
NC

Description:  
Project found in CAAM.zip  
Contains Abstract.rtf, GISAccess-CAAM (Power Point), Readme.txt, and 3 exercise folders: Crime Queries, Map Design & Layout, and Crime Project. Within each exercise folder is the exercise.rtf, instructor.rtf, readme.txt and a data folder containing arcview format data. Only the crimeproject\data folder contains several other folders, each with the data.dbf, methodology.rtf and readme.txt.

Software:  
ArcView 3.x

Time Required:  
4 hours

Language:  
English

Date Posted:  
4/30/01

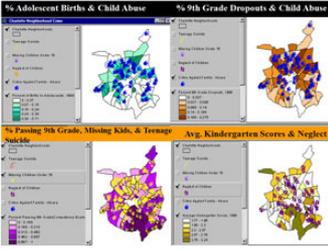
Focus:  
Content

Style:  
Step-by-Step

Author:  
Laurie Garo

Organization:  
University of North Carolina-Charlotte

Contact Info:  
Charlotte NC  
28223-0001 USA  
(704)687-4263  
lagaro@email.uncc.edu



# ArcGIS Online

## http://www.arcgis.com

The screenshot shows a Windows Internet Explorer browser window displaying the ArcGIS Online search results page. The address bar shows the URL: <http://www.arcgis.com/home/search.html?q=ispublic:true&t=groups&sortField=created&sortOrder=desc>. The search results are for the query 'ispublic:true' and show 1141 results. The results are sorted by Relevance, Title, Owner, and Date. The first result is 'Zuni Mt Test' created by annalar16 on June 29, 2010. The second result is 'Working with Tables' created by esrikmarten on June 29, 2010. The third result is 'Mississippi State University' created by jhc471 on June 29, 2010. The fourth result is 'esriMK' created by matt2425 on June 29, 2010. The page also includes a 'More Information' section with links for 'What types of items can I find here?', 'Advanced search options', and 'Finding items that work in ArcGIS Desktop'. The ArcGIS logo and navigation menu (GALLERY, MAP, GROUPS, MY CONTENT) are visible at the top of the page.

ArcGIS - Search results for 'ispublic:true' - Windows Internet Explorer

http://www.arcgis.com/home/search.html?q=ispublic:true&t=groups&sortField=created&sortOrder=desc

File Edit View Favorites Tools Help Convert Select Links

Home - Education VT ArcGIS - Search results f... Page Tools

Resource Center Show: Web Content Only Help Sign In

ArcGIS GALLERY MAP GROUPS MY CONTENT ispublic:true

### Search Results

Show 1141 results for 'ispublic:true'

Relevance Title Owner Date

**Zuni Mt Test**  
created by annalar16 on June 29, 2010  
Details

**Working with Tables**  
Tools for working with Tables  
created by esrikmarten on June 29, 2010  
Details

**Mississippi State University**  
created by jhc471 on June 29, 2010  
Details

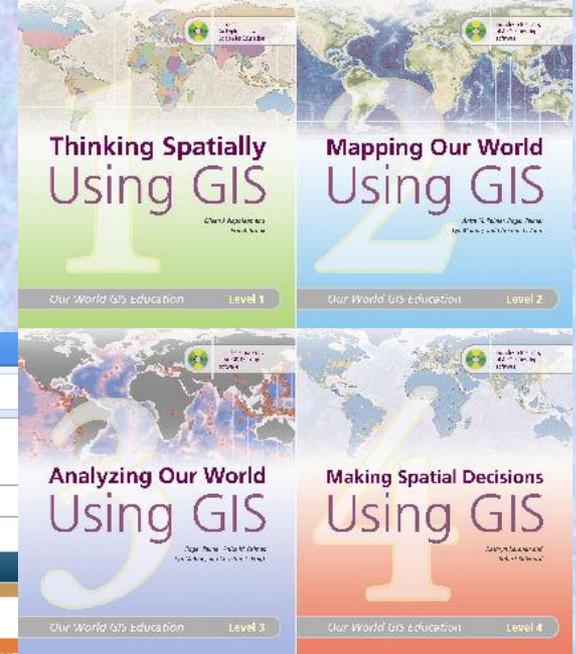
**esriMK**  
Matt Kennedy's ArcGIS.com group  
created by matt2425 on June 29, 2010

**More Information**  
[What types of items can I find here?](#)  
[Advanced search options](#)  
[Finding items that work in ArcGIS Desktop](#)

Related Searches

Internet 100%

# Esri Press



ESRI Press | GIS Books & T... x +

http://esripress.esri.com/display/index.cfm?CFID=3589704&CFTOKEN=31977107

**ESRI** | GIS Software that Gives You **THE GEOGRAPHIC ADVANTAGE**

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**GO**

**Latest Titles**

- ESRI Map Book, Volume 24
- GIS Tutorial II
- GIS Tutorial for Health, Third Edition

**Coming Soon**

- GIS for Building and Managing Infrastructure
- Children Map the World, Volume 2
- Land Administration for Sustainable Development

**GIS Bestsellers**

- GIS Tutorial, Third Edition
- Getting to Know ArcGIS Desktop, Second Edition, Updated for ArcGIS 9.3
- A to Z GIS
- Designing Better Maps
- Designing Geodatabases
- The ESRI Guide to GIS Analysis, Volume 1

**Resources**

- Request a desk copy of an ESRI Press book
- Request a printed ESRI Press catalog

## ESRI Press News

**Our World GIS Education book series receives award**  
The National Council for Geographic Education (NCGE) presented the 2008 Geography Excellence in Media Awards to [Our World GIS Education](#). This award is given to recipients based on the quality and impact of the production in advancing the learning and teaching of geography at any level and for any age group. [Learn more.](#)

### Thinking About GIS by Dr. Roger Tomlinson is now available in Spanish

The first Spanish language publication from ESRI Press, *Pensando en el SIG: Planificación del Sistema de Información Geográfica Dirigida a Gerentes*, brings Tomlinson's methodology for GIS planning to a wider audience. [Learn more.](#)

### Listen to a Podcast

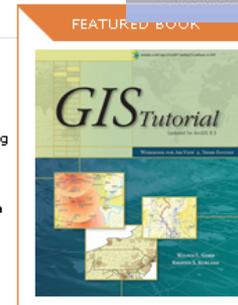
*Building a GIS* details a time-tested and proven system design process that will help organizations plan the necessary infrastructure to sustain a GIS. [Listen](#) to an interview with author Dave Peters as he discusses his new book.

## ESRI Press Catalog

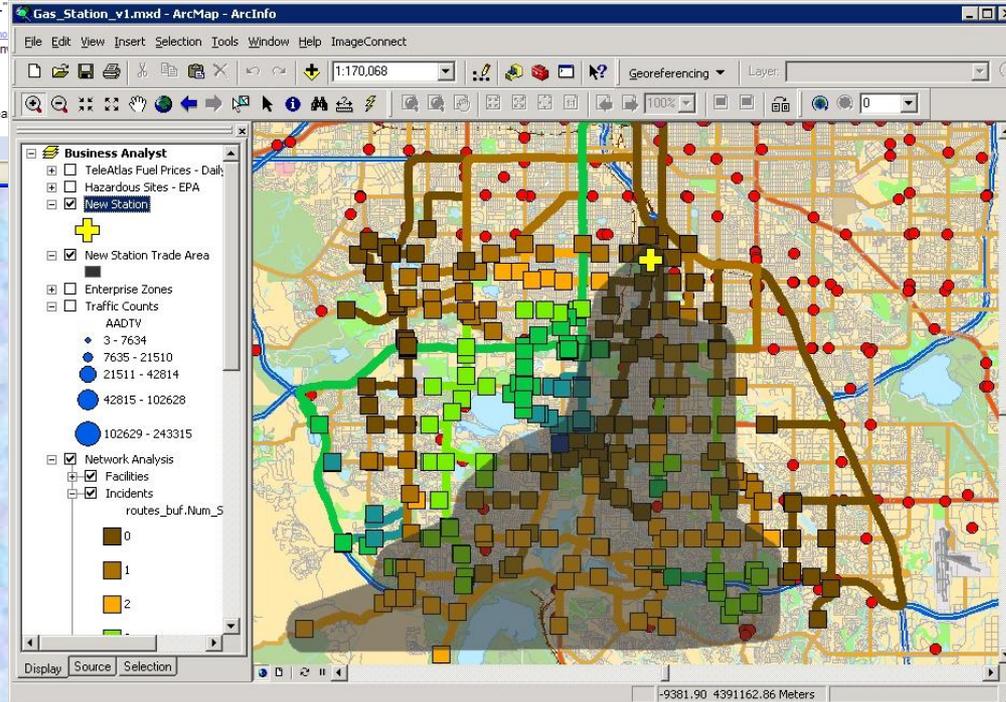
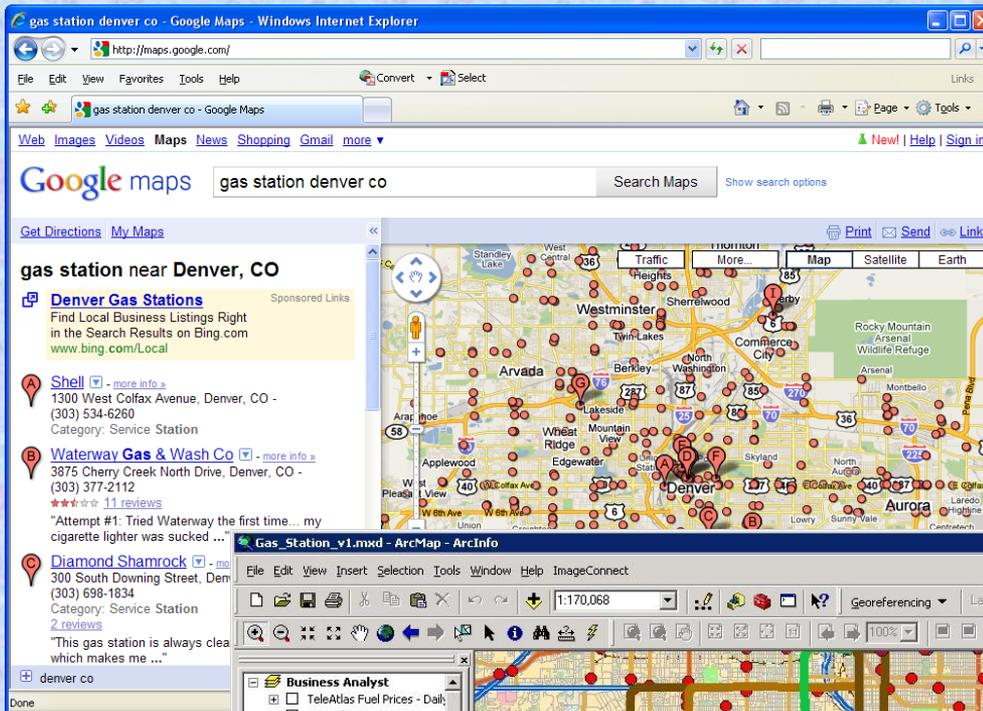
ESRI Press publishes books on GIS, cartography, and the application of spatial analysis to public and private endeavor including land-use planning, health care, education, business, government, and science, among others. View all of the publications currently available from ESRI Press in the [2009 ESRI Press Catalog](#).

## Browse Books By Category

- [GIScience](#) - Learn the theory of GIS.
- [The Case Studies Series](#) - See GIS at work in your field.
- [ESRI Software Workbooks](#) - Step-by-step exercises teach basic GIS tasks.
- [ESRI Software Documentation](#) - ArcGIS 9 books and more.
- [Atlases - New Category](#)



# From Visualization to Analysis



*...Dig deeper; Think Geographically*

***Now more than ever, we need people  
who think broadly and who understand systems,  
connections, patterns, and root causes...  
how to think in whole systems, how to find  
connections,  
how to ask big questions, and how to separate  
the trivial from the important.***

***--David W. Orr, *Earth In Mind:  
On Education, Environment, and the Human  
Prospect, 1994****

# Think of the Consequences:

**If future societies do not know how to think critically and spatially.**



# Developments in Technologies and Methods in GIS in Education

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