

Dr. Rick Landenberger – WVU Dept. of Geology & Geography
Dr. James Rye – WVU Dept. of Human Resources and Education
Dr. Tim Warner – WVU Dept. of Geology & Geography
Mr. Todd Ensign – NASA IV&V Facility, Fairmont, WV

NSF Award GEO-0807249 - 7/1/08 through 6/30/10
AmericaView Award AV08-WV01 to West Virginia View
Also supported by the NASA IV&V Facility, Fairmont State University

Presentation Outline

- **Why even study West Virginia's watersheds using geospatial technology?**
- **WVWD Project background** – *WVView, WV GLOBE Program, and GLOBE's Watershed Dynamics Project*
- **The two courses** – *GEOG 694 and C&I 694 -- PBL*
- **Examples from the participants PBL's**
- **Questions, comments**

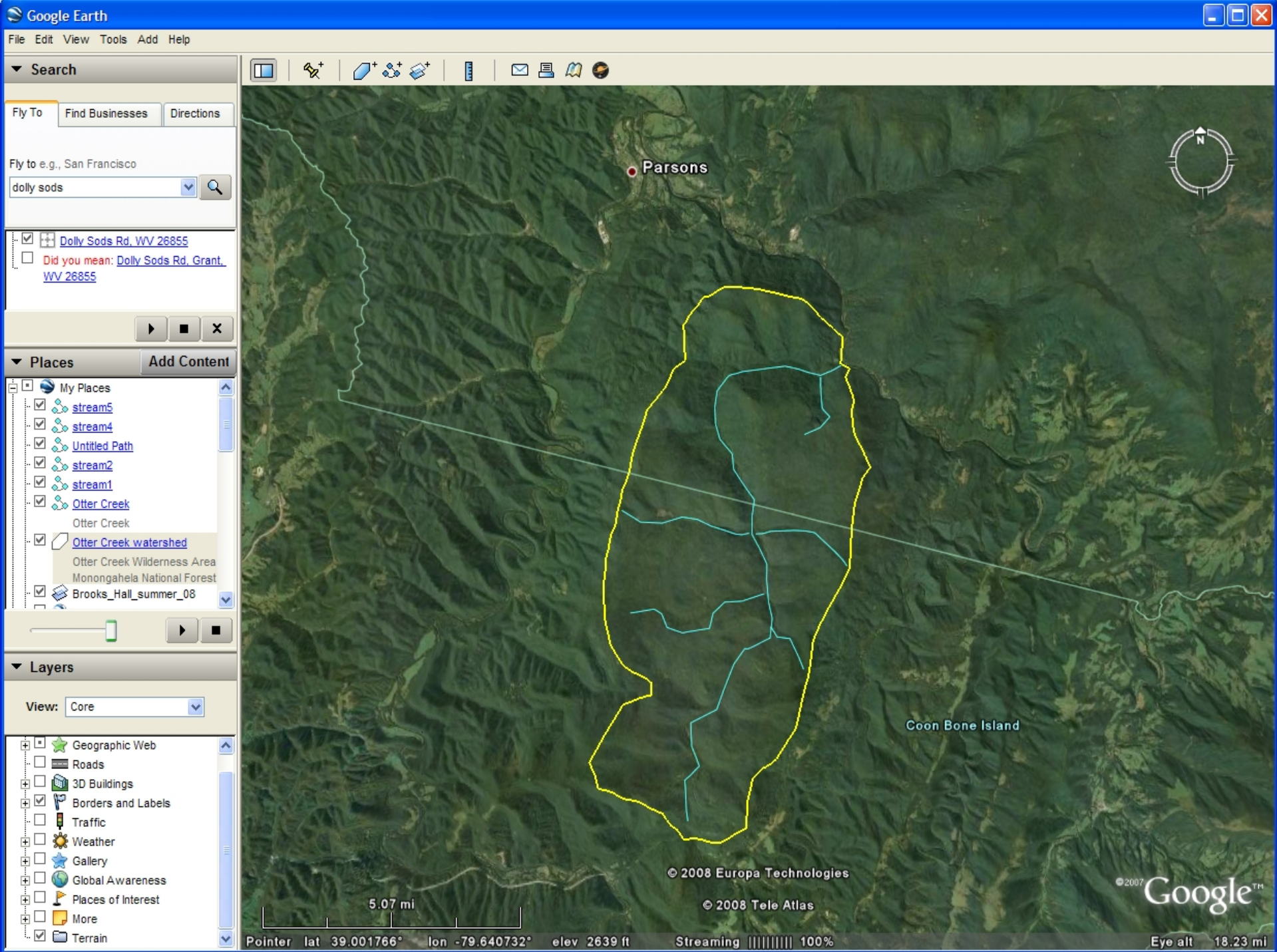
- **Why even study West Virginia's watersheds using geospatial technology?**

- *“This close coupling [spatial thinking and reasoning] is not present during the grades 9-12 experience.”* (NRC, p. 131)

- *“Since it was introduced...there has been very little adaptation of GIS for K-12 education”* (NRC, p.164)

- - National Research Council (NRC) (2006)

- [Learning to Think Spatially](#) Washington, D.C.: National Academy Press



Search

Fly To Find Businesses Directions

Fly to e.g., San Francisco

dolly sods

- [Dolly Sods Rd, WV 26855](#)
- Did you mean: [Dolly Sods Rd, Grant, WV 26855](#)

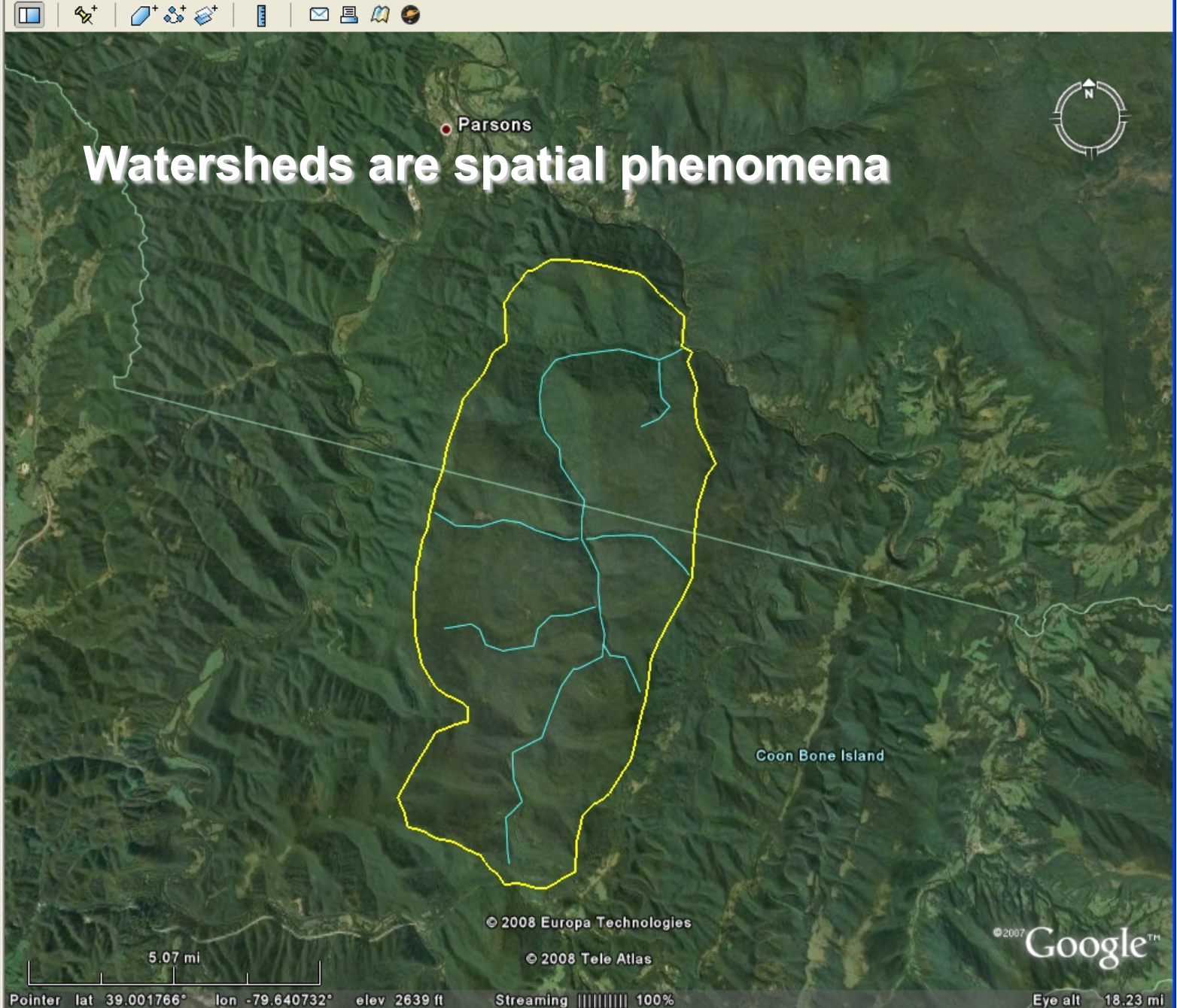
Places Add Content

- My Places
 - stream5
 - stream4
 - Untitled Path
 - stream2
 - stream1
 - Otter Creek
 - Otter Creek
 - Otter Creek watershed
 - Otter Creek Wilderness Area
 - Monongahela National Forest
 - Brooks_Hall_summer_08

Layers

View: Core

- Geographic Web
- Roads
- 3D Buildings
- Borders and Labels
- Traffic
- Weather
- Gallery
- Global Awareness
- Places of Interest
- More
- Terrain

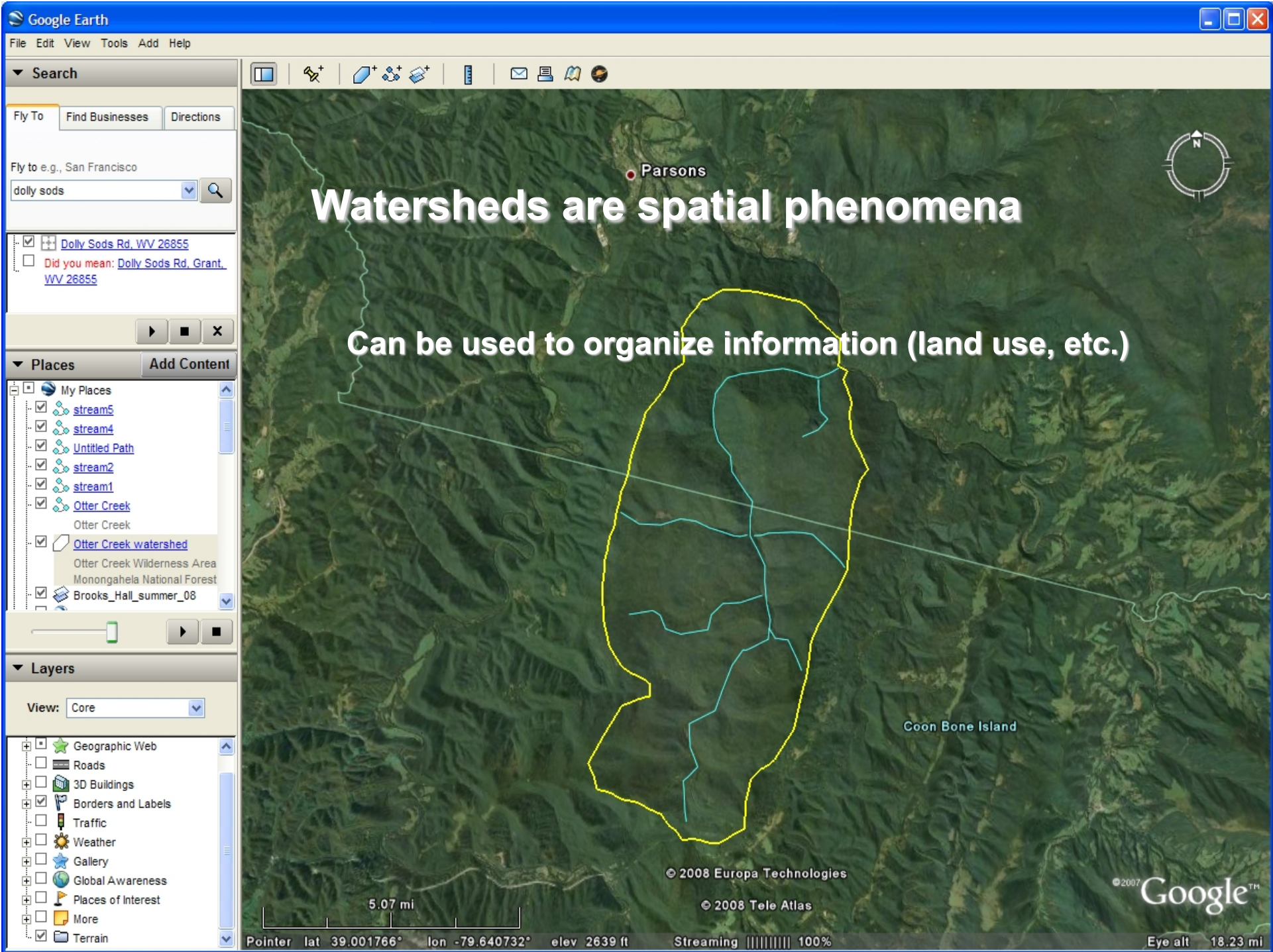


Watersheds are spatial phenomena

Parsons

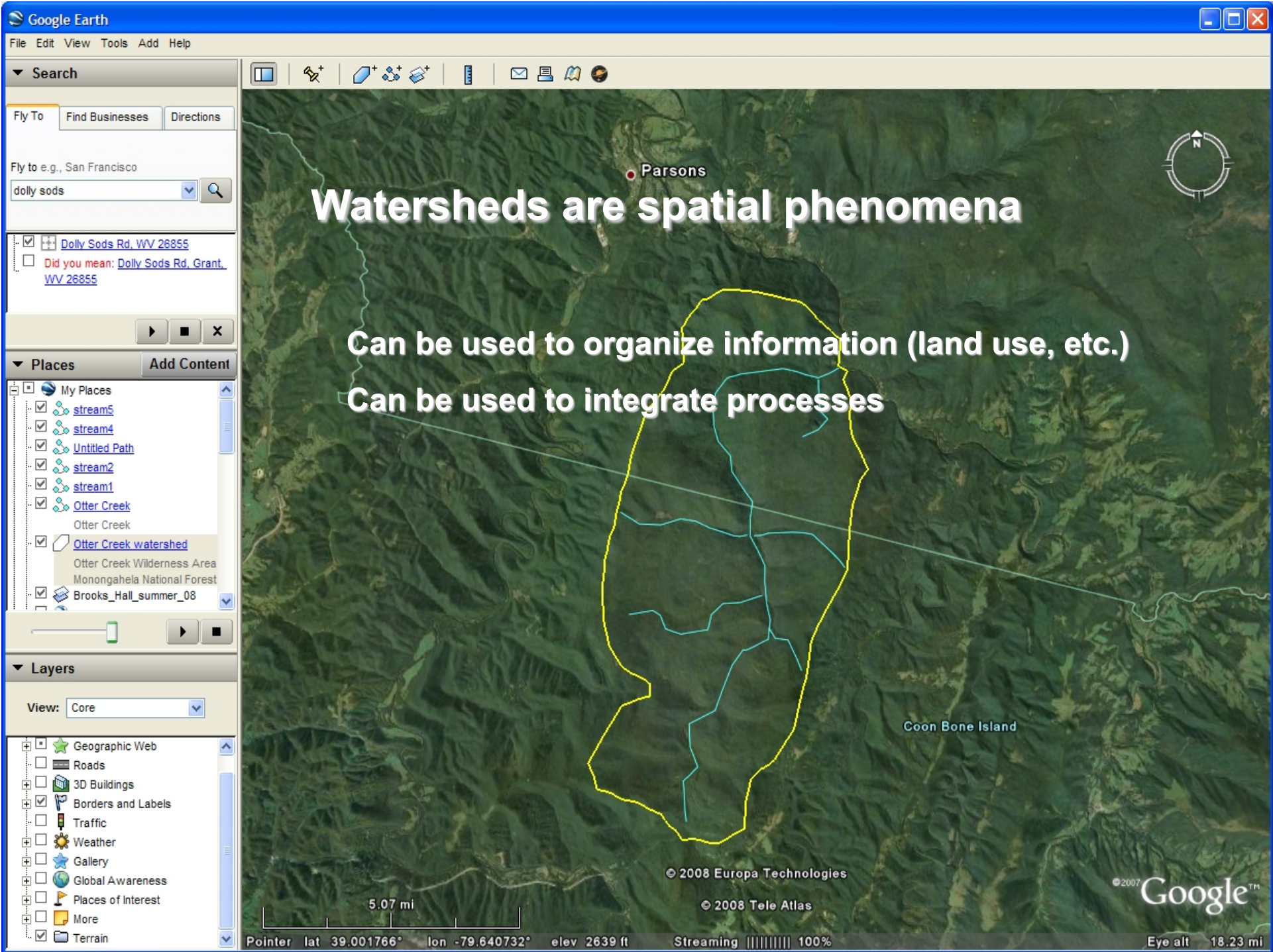
Coon Bone Island

5.07 mi



Watersheds are spatial phenomena

Can be used to organize information (land use, etc.)



Watersheds are spatial phenomena

Can be used to organize information (land use, etc.)

Can be used to integrate processes

Watersheds are spatial phenomena

Can be used to organize information (land use, etc.)

Can be used to integrate processes

We all live in at least one...

Search: Fly To, Find Businesses, Directions
Fly to e.g., San Francisco
dolly sods
Dolly Sods Rd, WV 26855
Did you mean: Dolly Sods Rd, Grant, WV 26855

Places: My Places
stream5
stream4
Untitled Path
stream2
stream1
Otter Creek
Otter Creek watershed
Otter Creek Wilderness Area
Monongahela National Forest
Brooks_Hall_summer_08

Layers: View: Core
Geographic Web
Roads
3D Buildings
Borders and Labels
Traffic
Weather
Gallery
Global Awareness
Places of Interest
More
Terrain

Parsons

Coon Bone Island

© 2008 Europa Technologies
© 2008 Tele Atlas
© 2007 Google™

5.07 mi
Pointer lat 39.001766° lon -79.640732° elev 2639 ft Streaming 100% Eye alt 18.23 mi





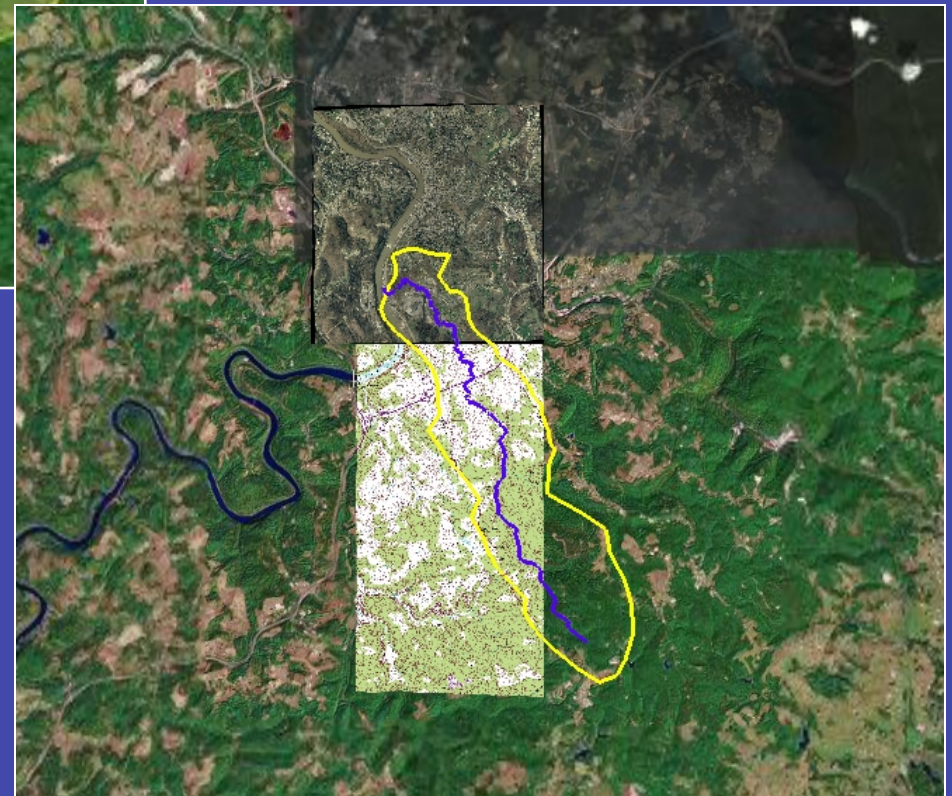




– WVWD Background – Previous K-12 Geospatial Projects

- WVView and WV GLOBE**
- WVView, WV GLOBE, and WVU HRE**
- AmericaView, SATELLITES, and GLOBE**
- GLOBE Watershed Dynamics Project**

WVView and WV GLOBE



WVView, WV GLOBE, HRE

The screenshot displays a GIS application window titled "My World GIS Project 'bike_office_to_3greenwayave_2rtes.m3vz'". The interface includes a menu bar (File, Edit, Project, Layer, Windows, Help) and a toolbar with various GIS tools. On the left, a Layer List panel shows several layers with their respective colors and symbols:

- bikehome_viatrail_wgs84R... (Yellow)
- home_office_milegd_705.s... (Orange)
- home_office_milegd_707_... (Yellow)
- bikehome_viatrail_gscwgs... (Red)
- airport_1183.shp (Green)
- WVBaseMap (Base Map)

The main map area shows a satellite-style view of a region in West Virginia, including Cheat Lake, Morgantown, and Brookhaven. Several colored lines (yellow, orange, red) represent different routes or boundaries overlaid on the map. The status bar at the bottom indicates the cursor location as 79.8546° W, 39.6224° N, the projection as Match WVBaseMap, and the scale as 1:57,596. The Windows taskbar at the bottom shows the Start button and several open applications, including Microsoft Power... and Internet Expl...

AV, SATELLITES, GLOBE



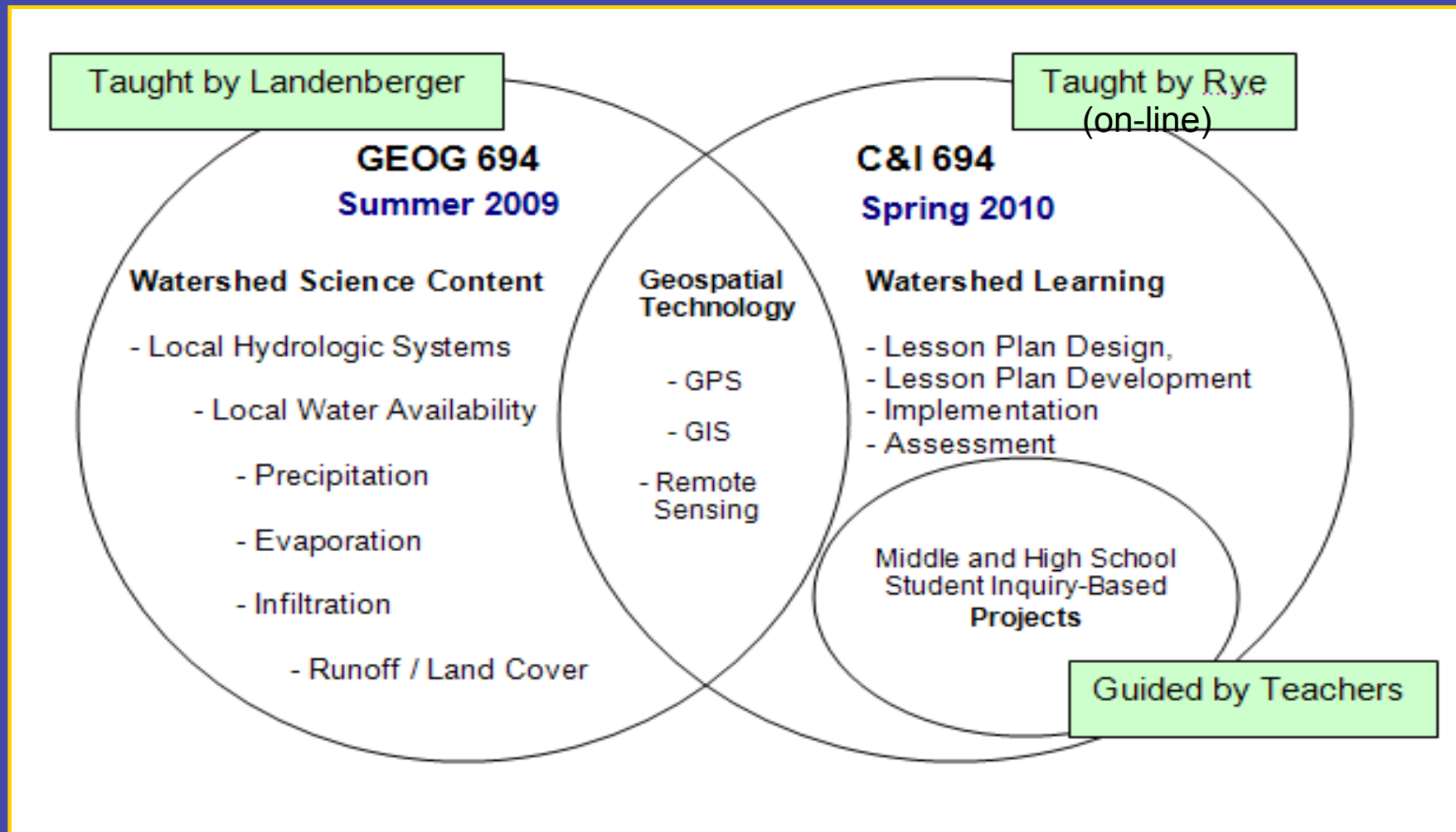


- **One of five new IESSP's**
- **Northwestern University – Geographic Data in Education Initiative**
- **Understanding the hydrologic cycle, watersheds, and people / land use interactions**
- **Uses Netlogo and My World GIS to model runoff and understand how land use effects runoff**

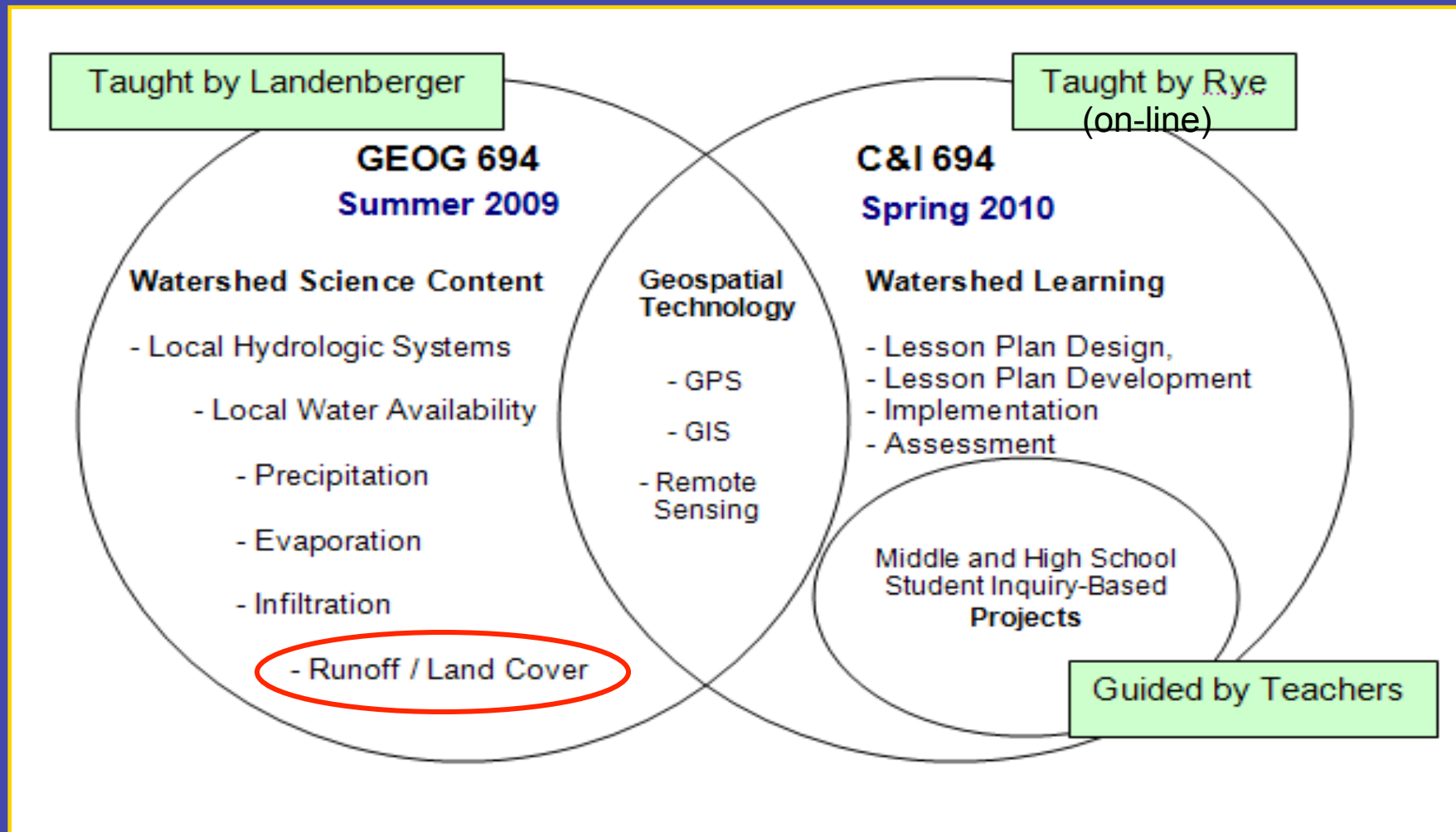
WVWD Target Audience & Need

- **Inservice** teachers in WV (middle and high school)
- Need to Integrate **spatial thinking** skills, tools
- Need for **formal curricula** (pre and inservice) at
West Virginia University

The West Virginia Watershed Dynamics Model



The West Virginia Watershed Dynamics Model



Project Elements

Minimal traditional lecturing, start simply

*Focus on **active learning**, hands on, engaged*

*Several high technology **tools** (GPS first)*

***Project-based Learning** model*

*Continuous on-line and phone **support / reinforcement** throughout the entire project*

Begin simply



Simple models work too



Experimental approach is powerful



Alternate computer sessions with activities, lecture



Alternate computer sessions with activities, lecture

Okay, I'm
ready to move
on...



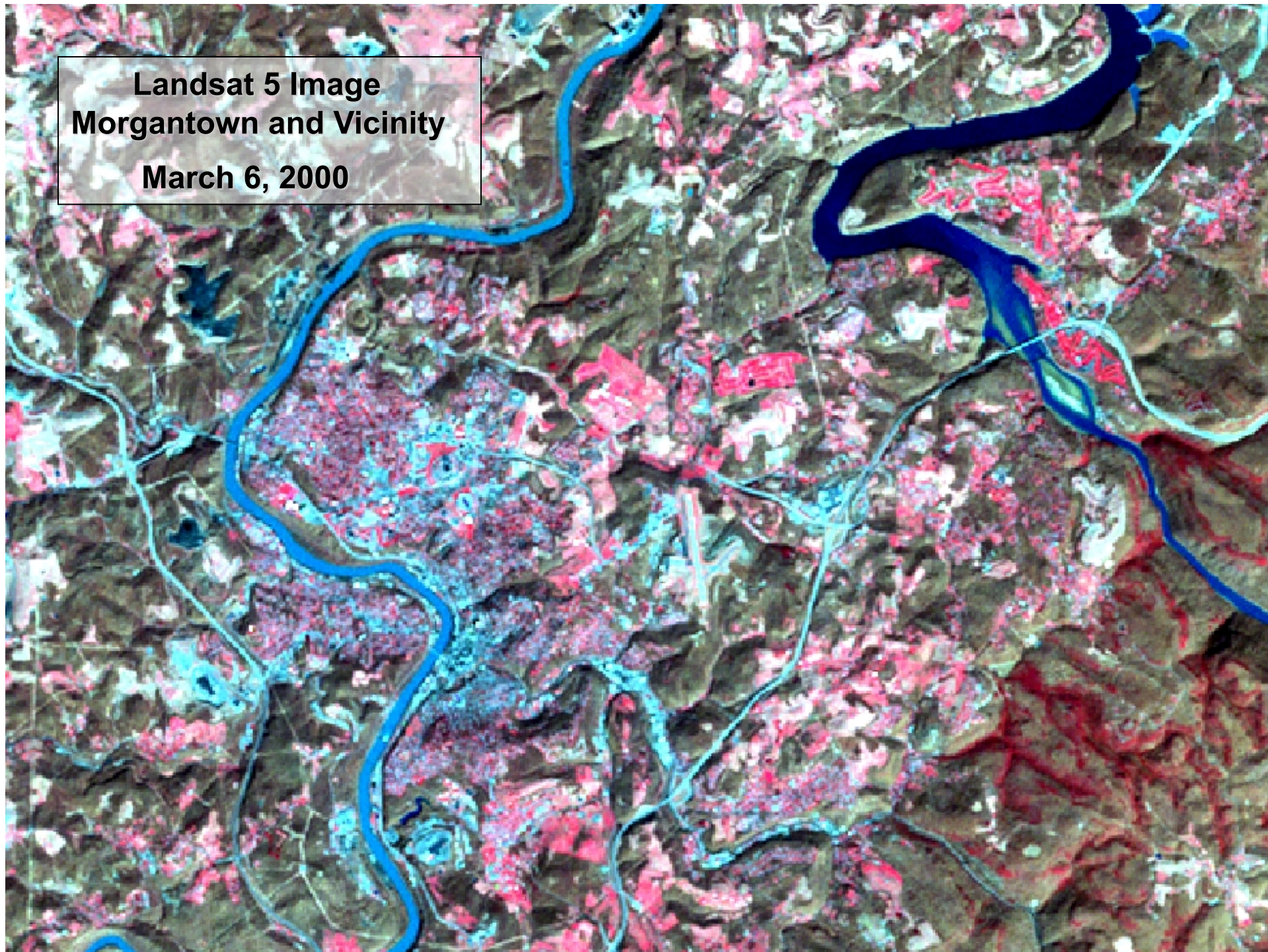
Geospatial Science and Technology Elements

- Global Positioning System
- Remote Sensing
- Geographic Information Systems

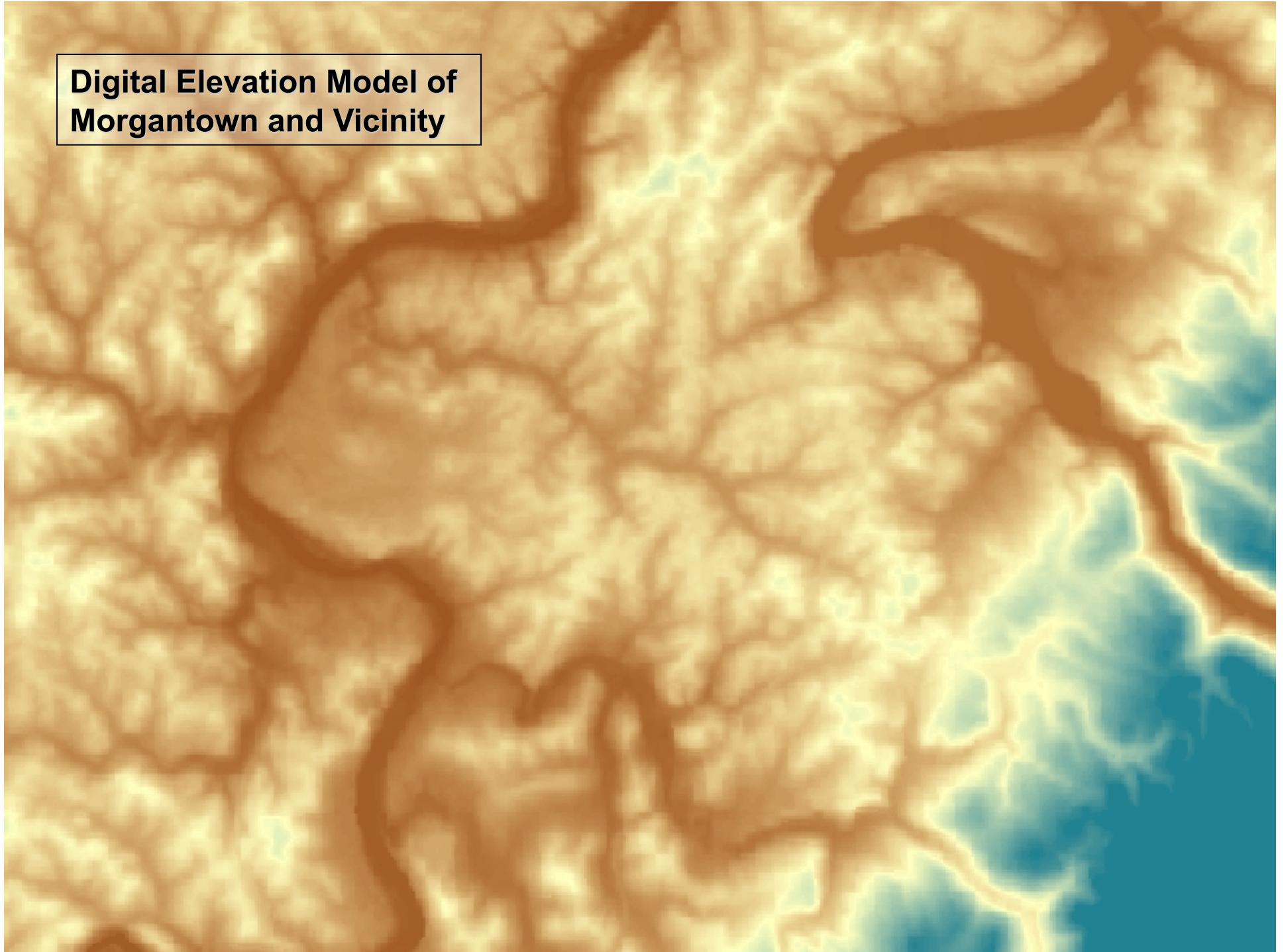
Other Technology and Instructional Elements

- WVU Learning Academy On-line Tools
- IHMC CMap

**Landsat 5 Image
Morgantown and Vicinity
March 6, 2000**



**Digital Elevation Model of
Morgantown and Vicinity**



Geographic Information Systems

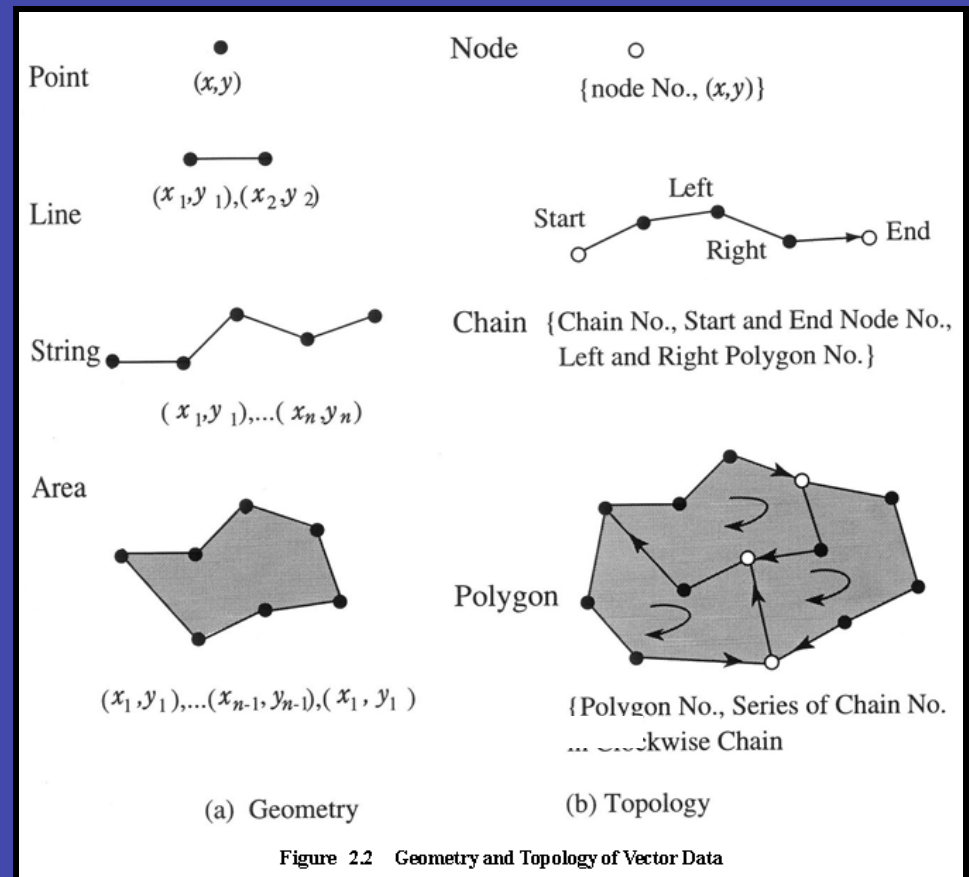


Figure 2.2 Geometry and Topology of Vector Data



-FIND a place- -Toolbox- -Zoom to Major Cities- -Zoom to County- Zoom to Scale 1: 15900 -Help-

Legend Layers

Layer List

- POINT THEMATIC FEATURES
- SAMB Structure
- TRANSPORTATION
- HYDROGRAPHY
 - 100K NHD
 - 24K NHD
 - 24K NHD Waterbody (polygon)
 - 24K NHD River/Stream (line)
- Local Resolution Hydrography
- FEMA
- BOUNDARIES
- HISTORICAL
- ELEVATION
- BASE IMAGERY
 - NGA/USGS Charleston Urban Area (2006, 1-Foot)
 - SAMB Aerial Photography (2003, 2-Foot)
 - NAIP Aerial Photography (2007, 1-Meter)
 - Color Infrared Aerial Photography (1996)
 - SPOT Satellite Imagery
 - USGS Topographic Maps
 - TerraServer DOQ
 - TerraServer DRG

Refresh Map Auto Refresh

Click the "TOC Help" to get the help about the TOC icons.

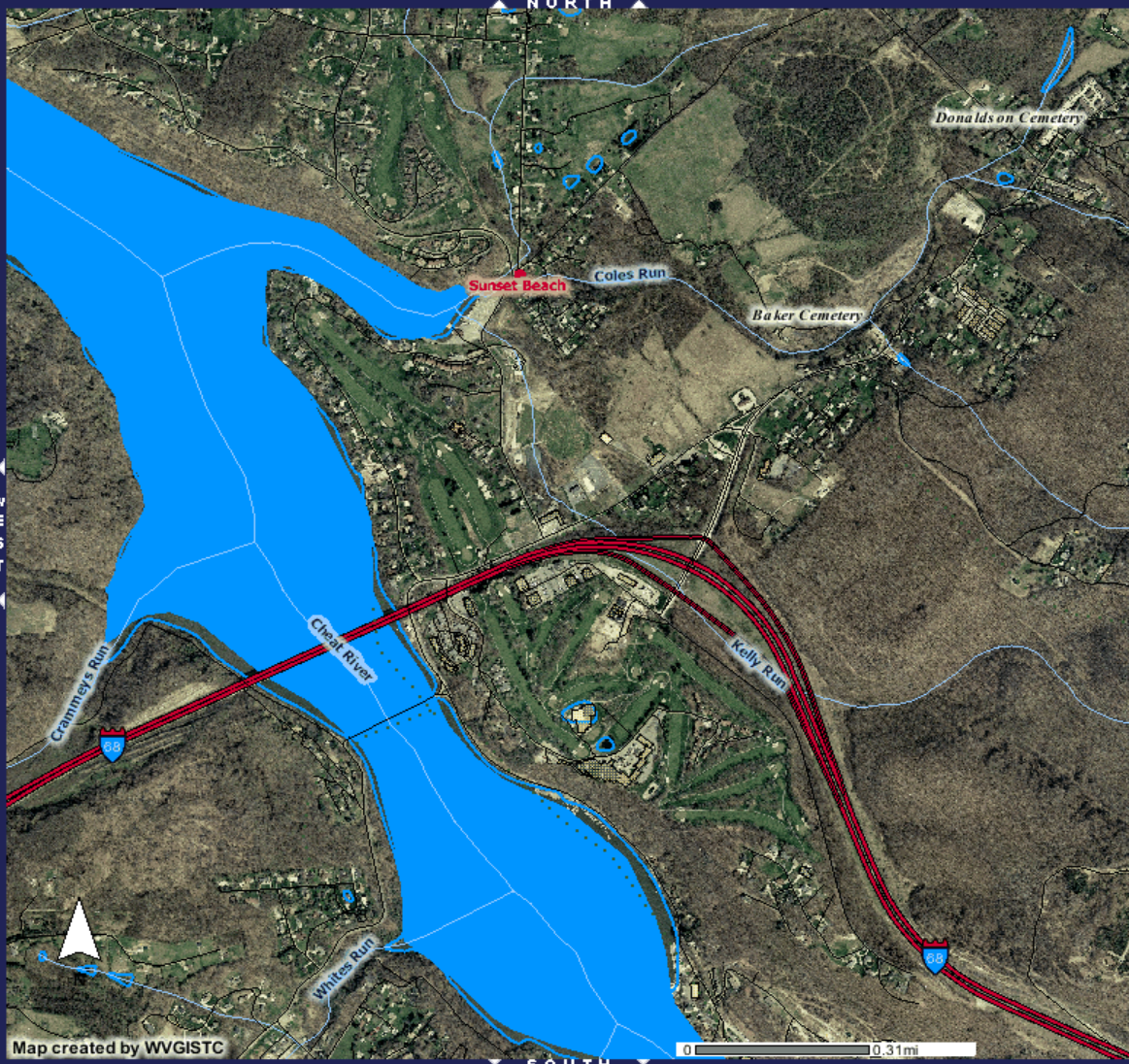
TOC Help

Click "Disclaimer" to get the Disclaimer from WV GIS TC.

Disclaimer

Active Layer: County Boundary (1:24k)

Active Tool: Zoom In Tool Help



Map created by WVGISTC

Lon, Lat: (W 79° 50' 33", N 39° 39' 29"), (-79.84262,39.65829) UTM: 599285.17, 4390472.01

MAP West Virginia

BASE MAP

The Mountain State's Contribution to The National Map

-FIND a place- -Toolbox- -Zoom to Major Cities- -Zoom to County- Zoom to Scale 1: 15900 -Help-

Legend Layers

Layer List

- POINT THEMATIC FEATURES
- SAMB Structure
- TRANSPORTATION
- HYDROGRAPHY
 - 100K NHD
 - 24K NHD
 - 24K NHD Waterbody (polygon)
 - 24K NHD River/Stream (line)
 - Local Resolution Hydrography
 - FEMA
- BOUNDARIES
- HISTORICAL
- ELEVATION
- BASE IMAGERY
 - NGA/USGS Charleston Urban Area (2006, 1-Foot)
 - SAMB Aerial Photography (2003, 2-Foot)
 - NAIP Aerial Photography (2007, 1-Meter)
 - Color Infrared Aerial Photography (1996)
 - SPOT Satellite Imagery
 - USGS Topographic Maps
 - TerraServer DOQ
 - TerraServer DRG

Auto Refresh

Click the "TOC Help" to get the help about the TOC icons.

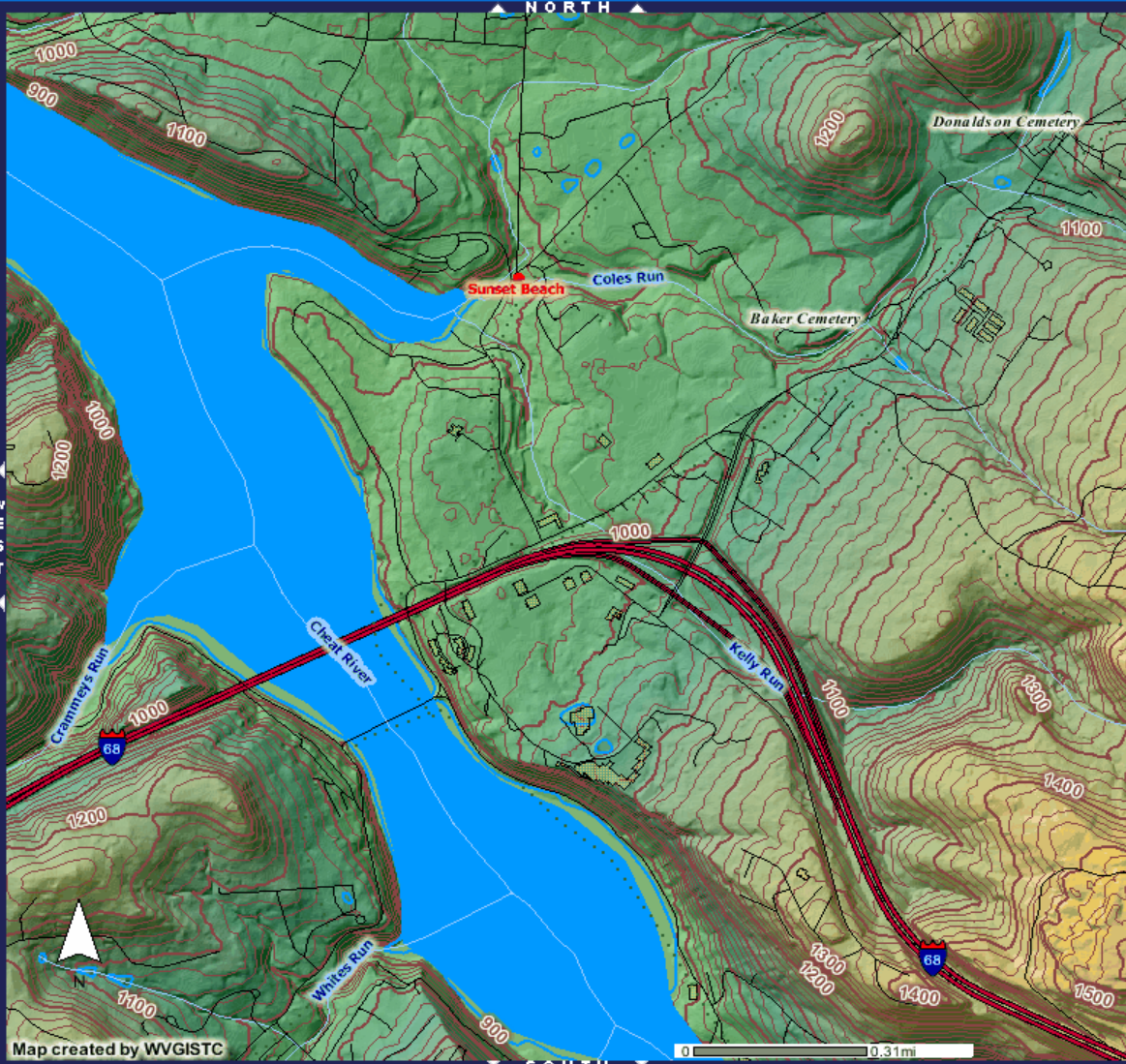
TOC Help

Click "Disclaimer" to get the Disclaimer from WV GIS TC.

Disclaimer

Active Layer: County Boundary (1:24k)

Active Tool: [Zoom In](#) [Tool Help](#)



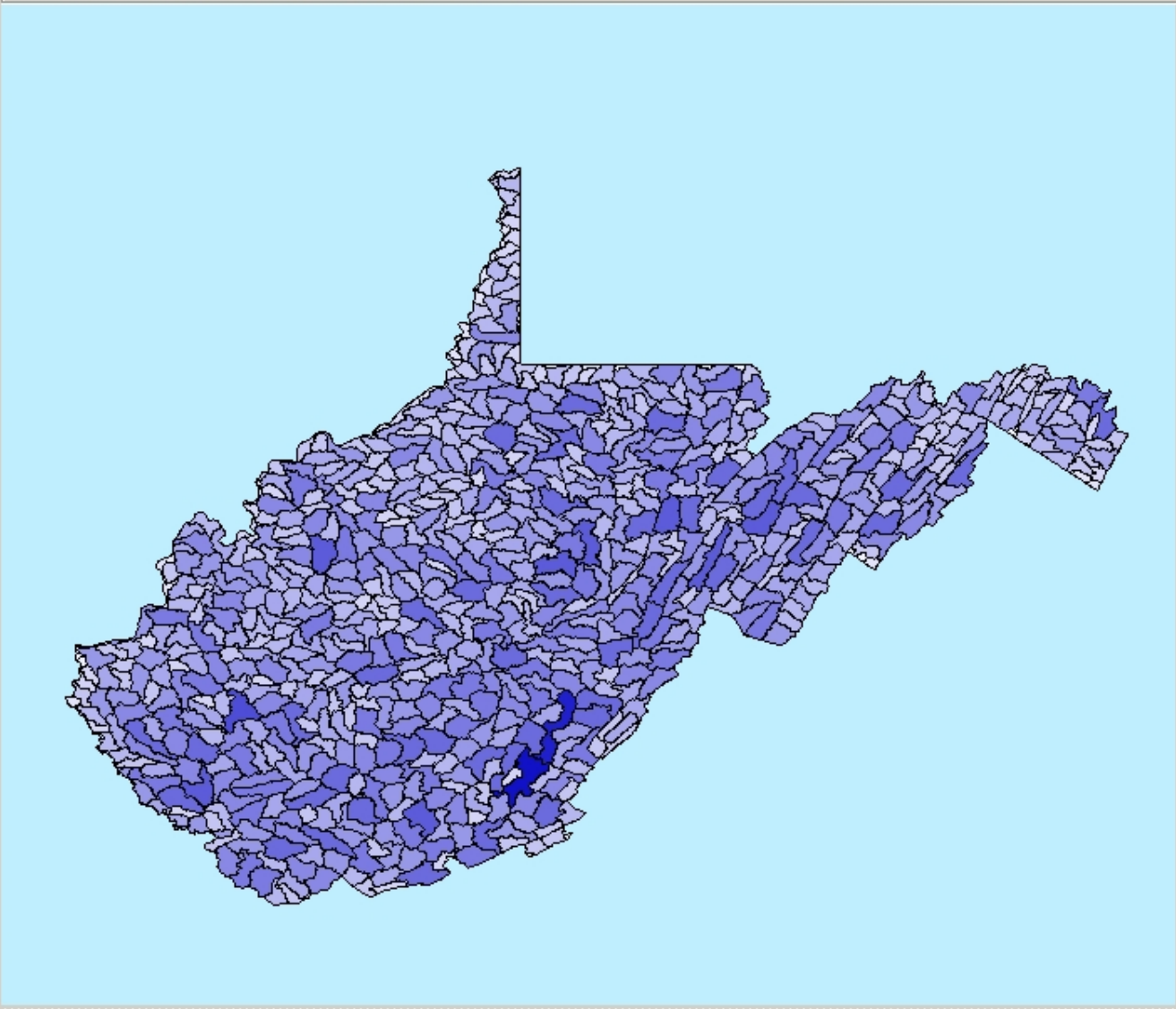


wv_watersheds_unprojected.shp

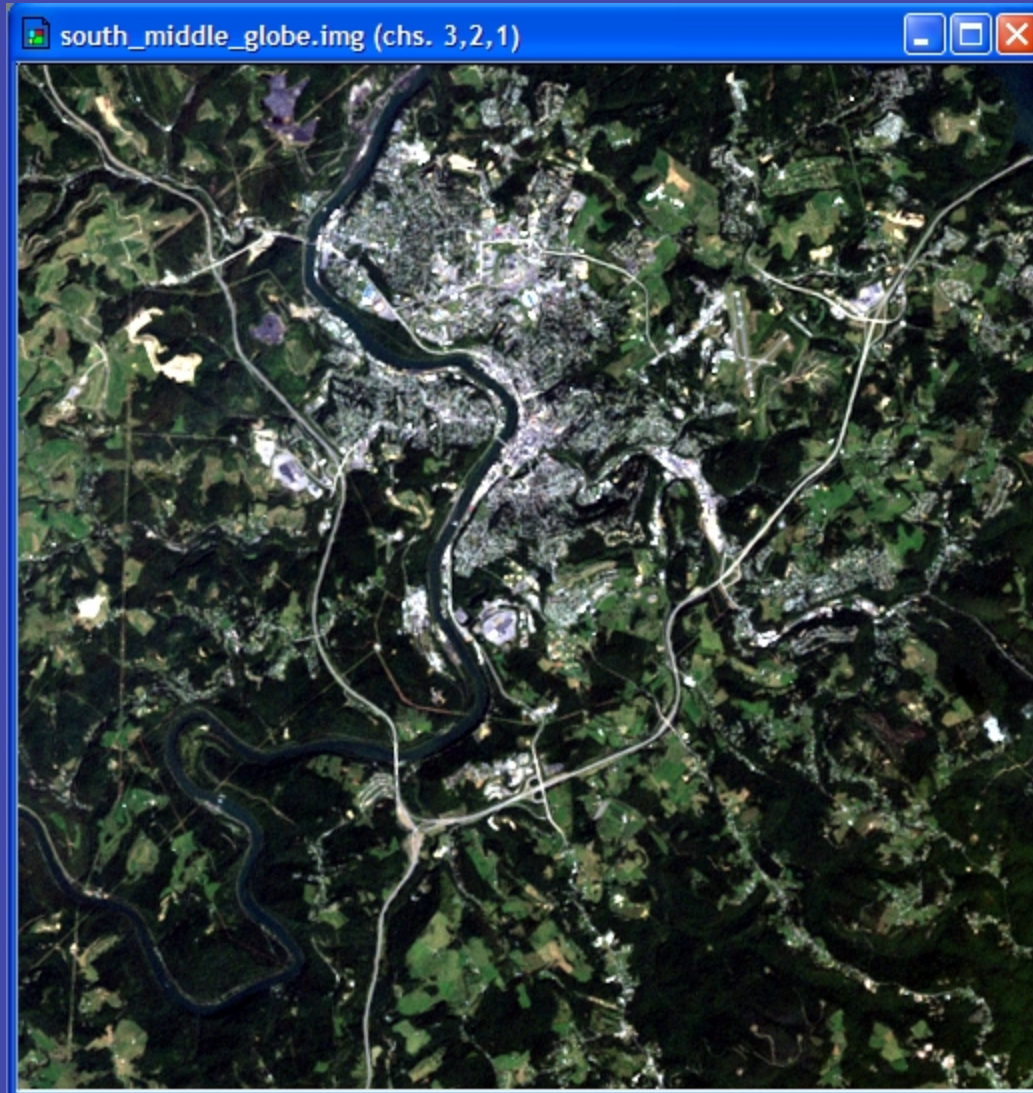
Fill Color: **L** Area (computed) (m²)

Highlight Mode: Color Selected (Magenta)

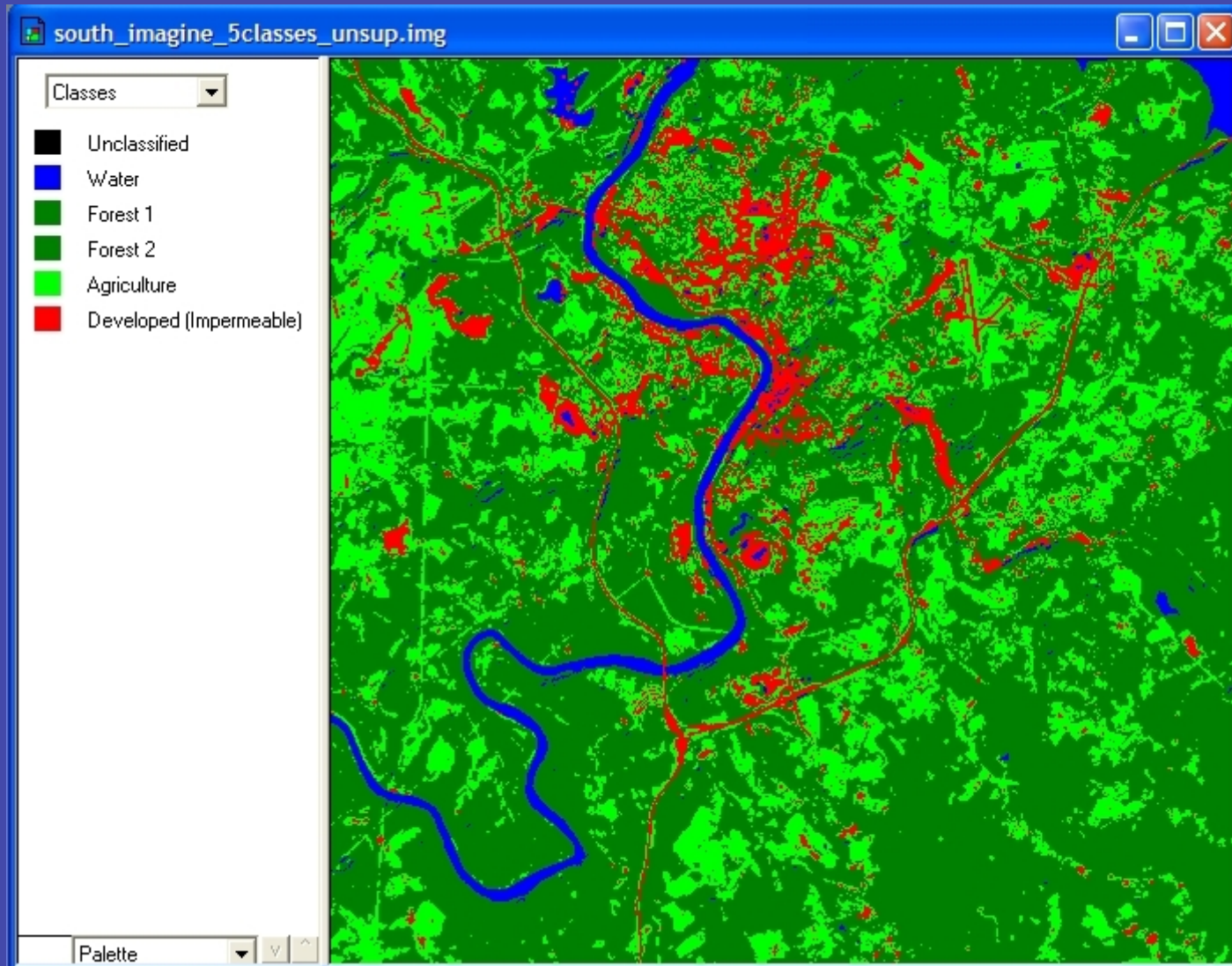
All (highlighting off)

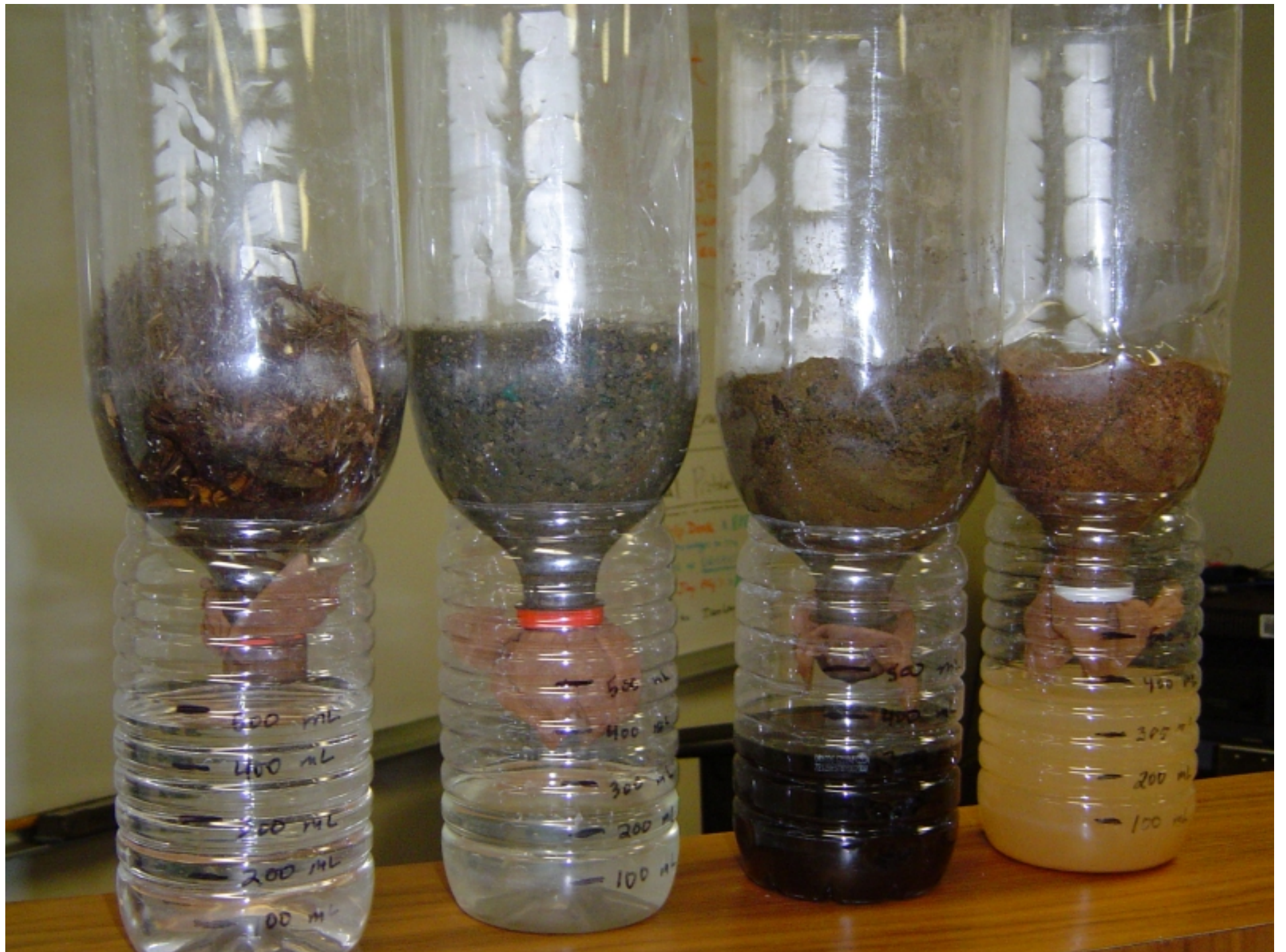


How might *Land Cover* influence *Hydrology*?



How might *Land Cover* influence *Hydrology*?








Flow = AV

Where A = average cross sectional area

V = velocity in ft/sec



GPS says

W 79.3492

N 39.6341

942 ft. ASL

I wonder if development has changed the local hydrology...



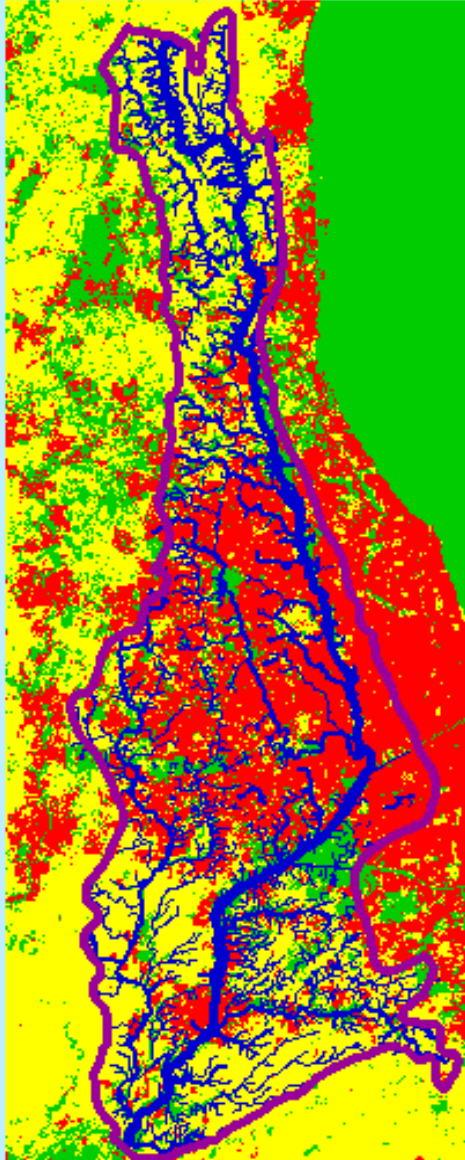
Map Table "1992 vs 2001 Land Cover"



Windows



1992 LC



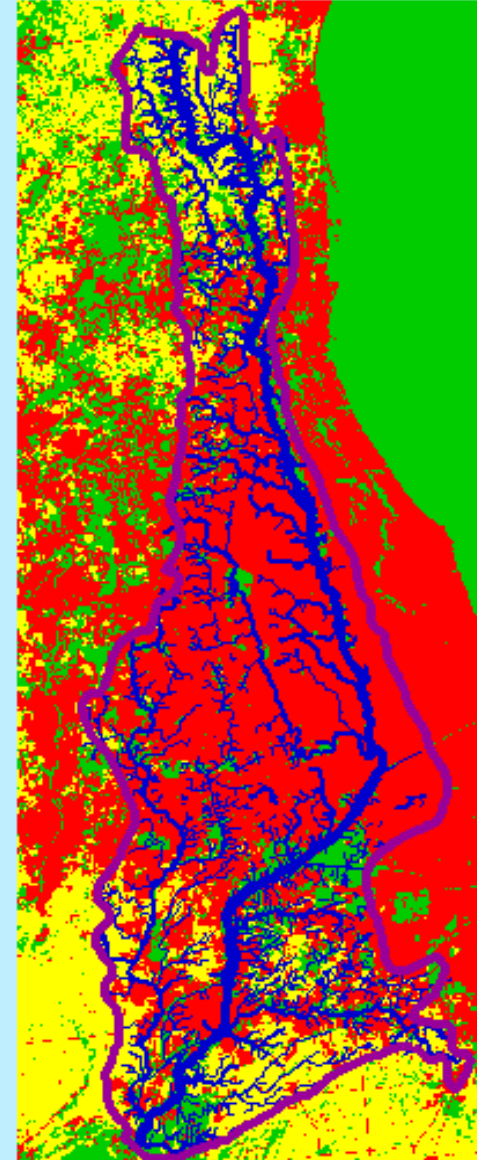
National Landcover 1992
Landcover

- Agriculture
- Developed
- Undisturbed

National Landcover 2001
Landcover

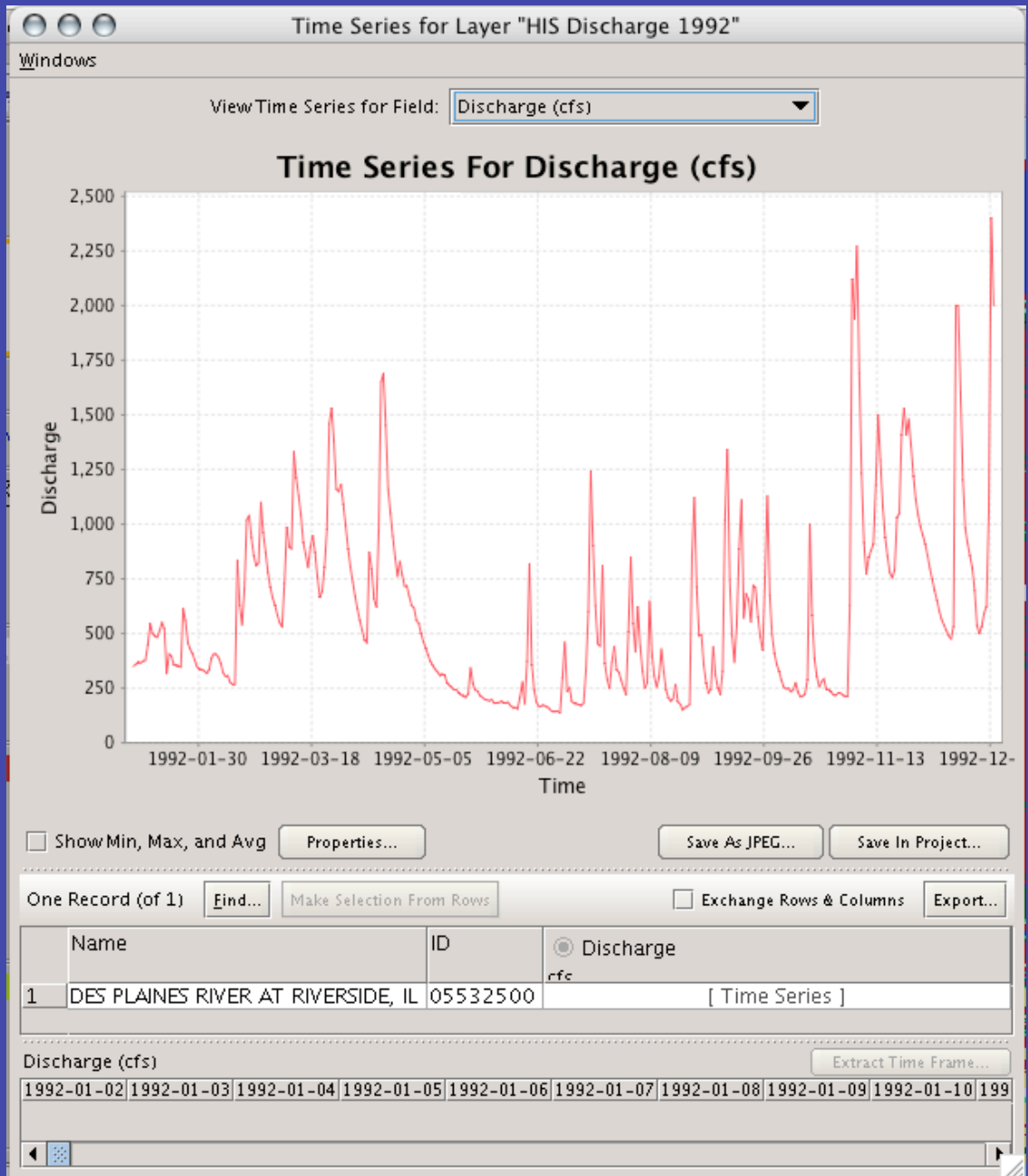
- Agriculture
- Developed
- Undisturbed

2001 LC



National Landcover 2001
Landcover

- Agriculture
- Developed
- Undisturbed

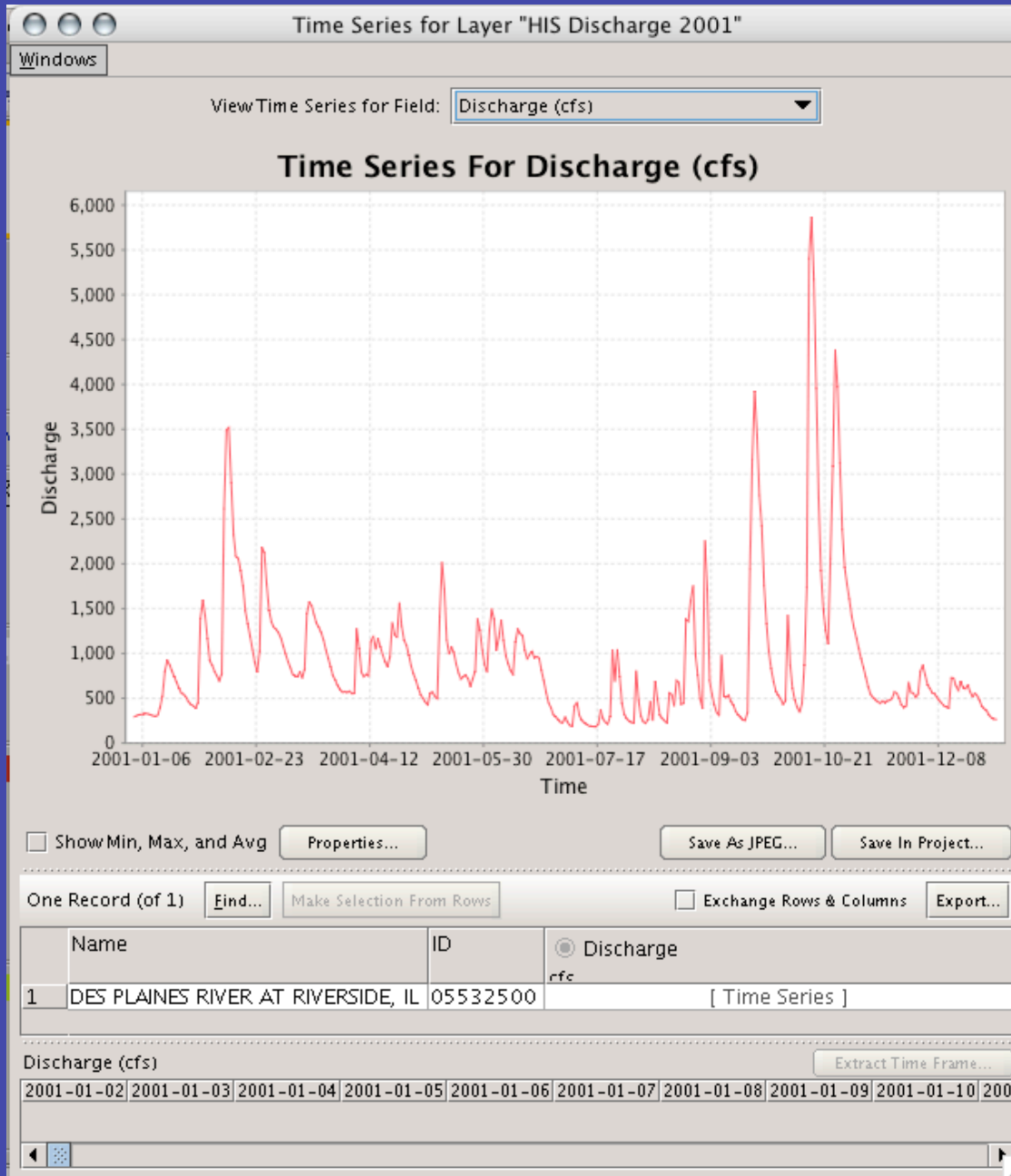


1992 Hydrograph

Base flow (cfs) - 139

Mean flow (cfs) - 591

Peak flow (cfs) - 2,400



2001 Hydrograph

Base flow (cfs) - 182

Mean flow (cfs) - 930

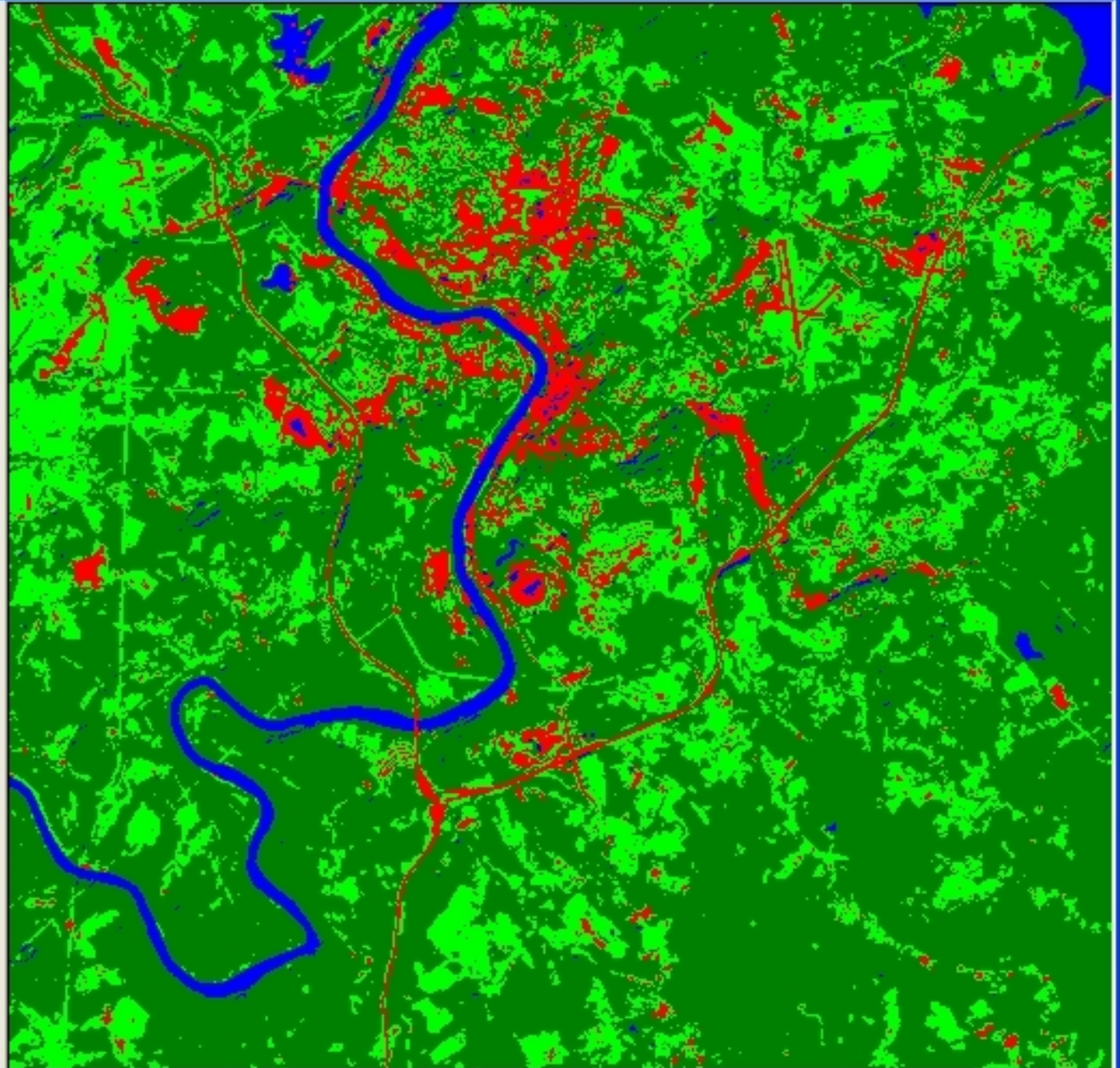
Peak flow (cfs) - 5,700

south_imagine_5classes_unsup.img



Classes

- Unclassified
- Water
- Forest 1
- Forest 2
- Agriculture
- Developed (Impermeable)



Palette

Fall and Spring On-Line Course

- **Project-based Learning model**
 - *Driving Question* and sub-questions
 - Content, lessons, activities *tied to questions*
 - Entire process is *organized and managed*
- “Entry event”
- Weekly on-line discussions
- Weekly reading assignments
- Concept map development
- private journaling

Fall and Spring On-Line Course

- **Project-based model**
 - *Driving Question* and sub-questions

How would a housing development impact our local watershed?

What is the health of Tomlinson Run South Fork at Tomlinson Run State Park?

What are the effects of the school farm on the water quality of the local watershed?

How does the Mill Creek watershed compare to the Big Run watershed?

Fall and Spring On-Line Course

- Weekly reading and on-line discussions

“I very much appreciated The Driving Question Board article. I have had some experience in the past with developing “essential questions” ... and “driving questions” for a PBL... To answer the driving [question], subsequent questions have to be answered... The key is to have the driving question that spurs the students to ask the other essential questions needed to complete the project successfully. I would think one could utilize the C-MAP software [as a Question Board] and organize the students’ questions in a spider map.”

“The second article is The Driving Question Board for creating visual organizers for PBL. I have one of the largest number of special needs students this semester and their success is critical....This [Driving Question Board] is consistent with the CMap as it helps provide connections between various activities and context. I can use it as well as part of instruction. This is great for the visual learners! ”

Fall and Spring On-Line Course

- Concept map development

“I am becoming a reluctant convert to cmaps. One of my students insisted on using them to organize his thoughts before completing his power-point.... I plan to have the kids map out their ideas first in cmaps before working on projects! Now all we need is for the cmap software to load in a timely manner in the computer lab. Fortunately, _____ is working on that! She can be very tenacious.”

“What I got out of the concept mapping was a clear appreciation that many of the students simply did not really understand the vocabulary. Concept mapping helped them visualize relationships as they built and revised their concept maps. I am definitely convinced that concept mapping improves cognitive skills and understanding of the content.”

Fall and Spring On-Line Course

- Entry event
Numerous videos, and very limited field trips



Fall and Spring On-Line Course

- Private journaling

“My first experience with My World was very frustrating. The computers in the computer lab had considerable difficulty... the program worked excessively slow. It was so slow that the frustration level of my 32 students increased to the point that the majority of the class simply lost interest...”

The second time I used My World I had a smaller class of 20 students. Without changing anything, the program worked faster and at least half of the class was able to construct a map mostly as per the activity requirements.”

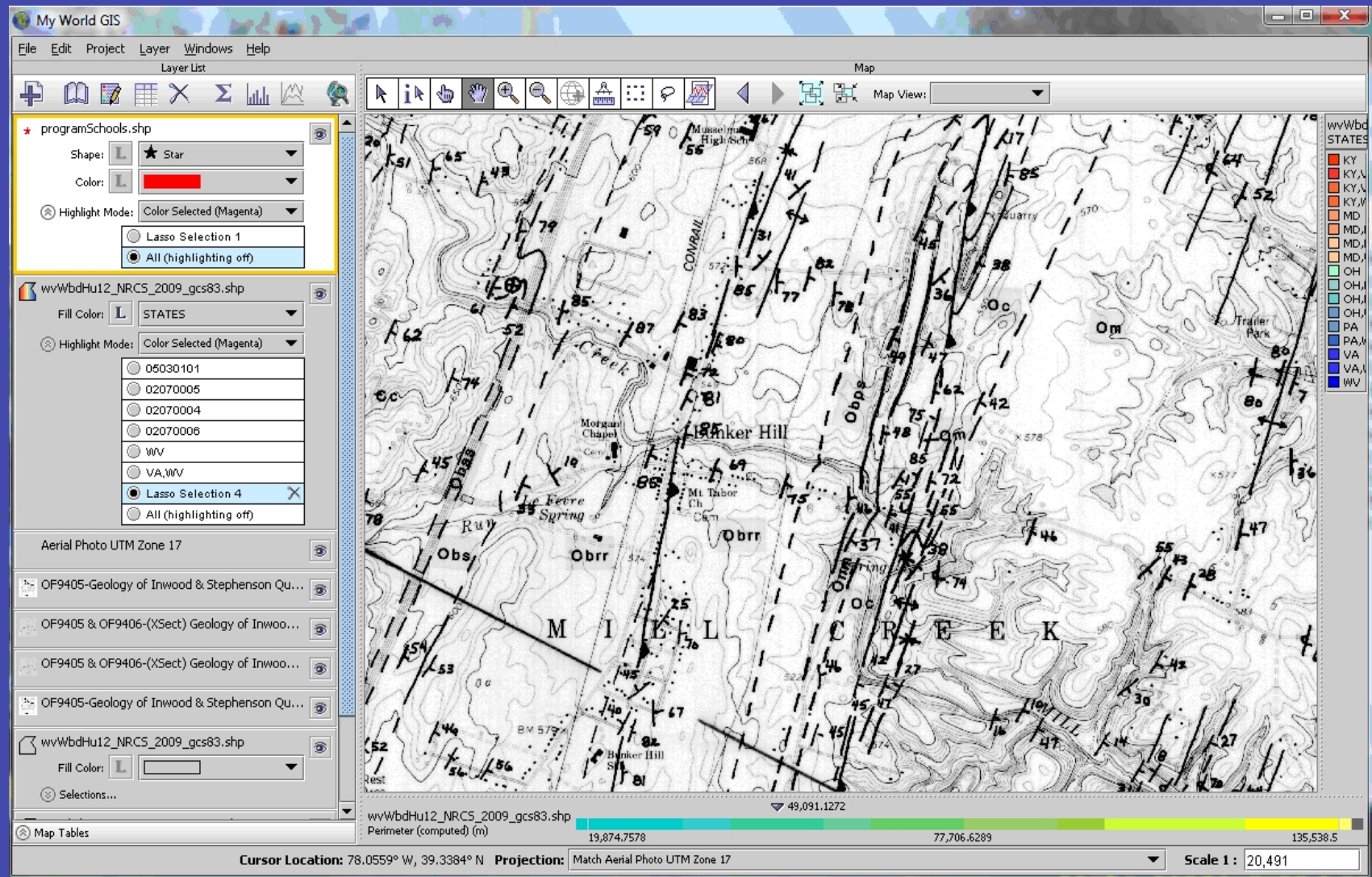
Fall and Spring On-Line Course

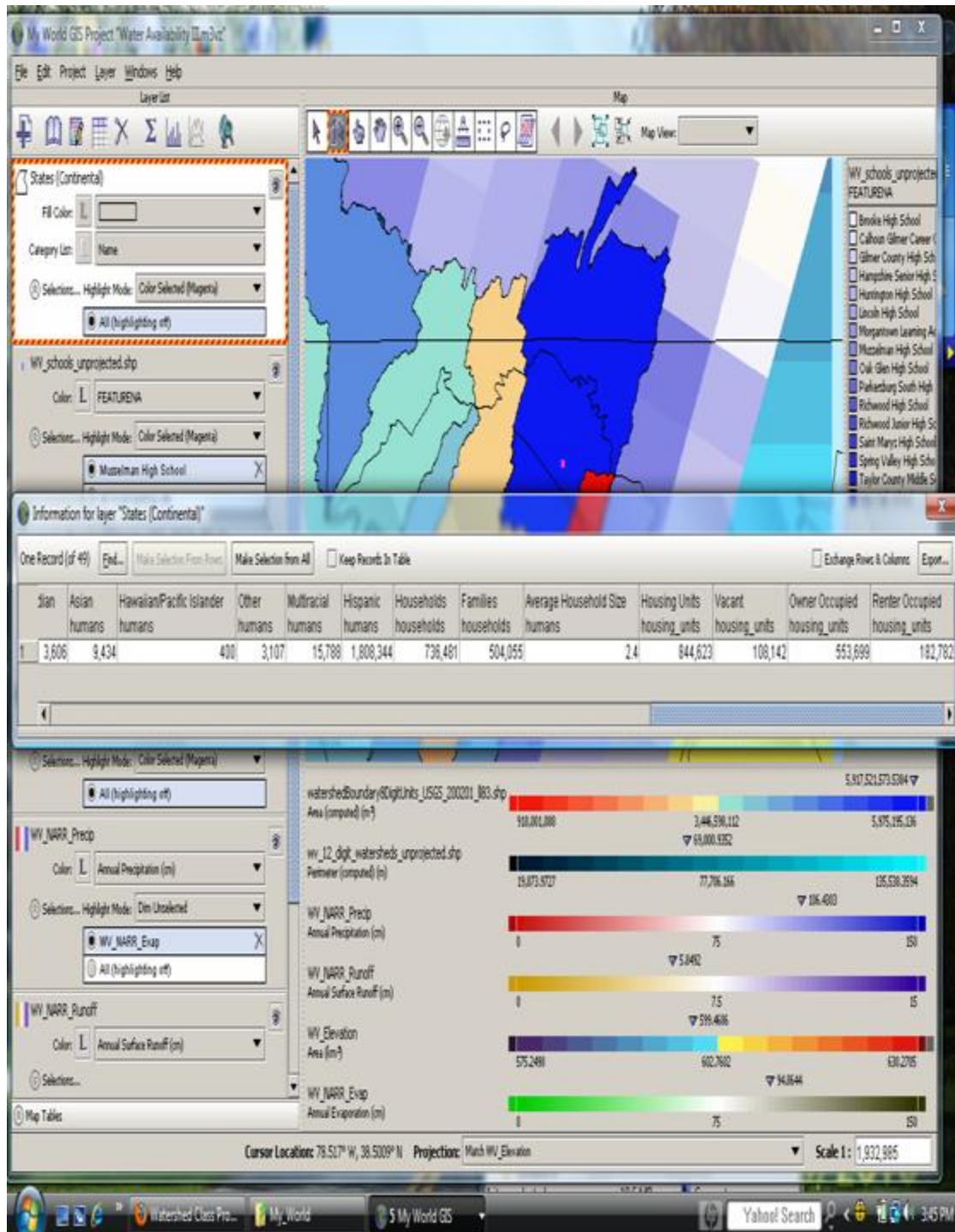
- Private journaling

“For my classes, the most effective tools were the hands-on activities. These were the GPS Lab; the Watershed in 3D Lab, where we used stream trays, sand, tarps, and cinder blocks; the Water Infiltration Lab; and the Outdoor Stream Site Lab. I truly believe that my intended objectives and goals were accomplished during these activities. The kids were definitely on-task and participative...”

“The WIMBA live chat was really cool this evening!! The technology involved is just fascinating! I do enjoy learning to use new technology, though it does get frustrating at the school level to try to get anything new set up!”

Fall and Spring On-Line Course





In this My World document, it shows different types of housing data. It shows the number of housing units for different types of people and different types of homes. It tells us that the total number of household units in the Mill Creek watershed area is 844,623. 108,142 of these units are vacant homes, 553,699 are owner households, and 182,782 of the units are rental households. We believe that the type of owner's of the units may affect how well the property is taken care of physically. The conditions of the property can affect local watersheds. For example, we believe that rental owners are not as considerate of their property as people who own their property.

Barriers to Implementation

1.) **Lack of Administrative Support**

Don't see the merit

Don't see the connection(s) to CSO's

2.) **Imperfect Technology**

Comp labs outdated, or poor IT support

Internet connections problematic (firewalls, etc.)

Use of software itself can be a problem

3.) **Content and Skills**

Spatial Thinking (Geographic mindset) isn't natural

Digital Natives? Not! (at least not majority)

4.) **Teachers don't have the time; they're overwhelmed**

5.) **Snow days** (some schools lost over two weeks of school)

Opportunities - Keys to Success

- 1.) **Quality training** that's enjoyable
- 2.) **Be realistic**, start with simple lessons
- 3.) Make **support** easily available
- 4.) Foster **cooperation** *between* teachers
- 5.) **Persevere**