Environmental Literacy and Inquiry: A Geospatial Curriculum to Support Middle School Teachers and Students

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Environmental Literacy and Inquiry Group

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Matt Diltz – Computer Science and Web interactivities

Jeff Remling and Scott Rutzmoser – Web GIS

Farah Vallera– Data management

Middle school science teachers

ELI middle school curriculum

- Energy (40 days)
- Climate Change (21 days)
- Land Use Change (20 days)
- Tectonics (6 Web GIS investigations forthcoming)

ELI middle school curriculum

- Geospatial curriculum approach:
  - Curriculum framework
  - Design principles
  - Instructional model for the development of learning activities with GT
  - Educative materials to support teacher enactment
- Align instructional materials and assessments with science and environmental literacy learning goals.
- Use geospatial technology as a tool for learners to explore and investigate problems.
- Iterative stages of development: Prototype, pilot test, and field test with diverse 8th grade urban classrooms.

Design Principles

1. Design curriculum materials to align with the demand of classroom contexts.
2. Design activities to apply to diverse contexts.
3. Use motivating entry points to engage learners.
4. Provide personally relevant and meaningful examples.
5. Promote spatial thinking skills with easy to use geospatial learning technologies.
6. Design image representations that illustrate visual aspects of scientific knowledge.
7. Develop curriculum materials to better accommodate the learning needs of diverse students.
8. Scaffold students to explain their ideas.

eli Environmental Literacy & Inquiry

Curriculum Research

- Energy Home
- Overview
- Instructional Framework
- Instructional Sequence
  - Energy Introduction
  - Solar Energy
  - Wind Energy
  - Tidal Energy
  - Hydroelectric Energy
  - Nuclear Energy
  - Geothermal Energy
  - Biofuels/ Biomass
  - US Energy Production and Consumption
  - Fossil Fuels
  - Energy Efficiency and Conservation
  - The Isle of Navitas
  - Energy Conclusion
- Student Resources
- Assessments
- Instructional Resources
- Support Materials

Energy Home

Energy is an interdisciplinary technology-supported middle school science inquiry curriculum. This curriculum focuses on the world's energy resources. Students use geospatial information technology (GIT) tools including GIS (My World GIS or Web GIS) and Google Earth, and inquiry-based lab activities to investigate energy sources, production, and consumption. **Energy** is aligned to national science and environmental education standards.

Energy has been field-tested in both urban and non-urban middle schools. Materials best used with the Firefox Web Browser and Google Earth version 5.2 or higher.

ELI is sponsored in part by the Lehigh Environmental Initiative. This material is based upon work supported by the Toyota USA Foundation.

http://www.ei.lehigh.edu/eli/energy/

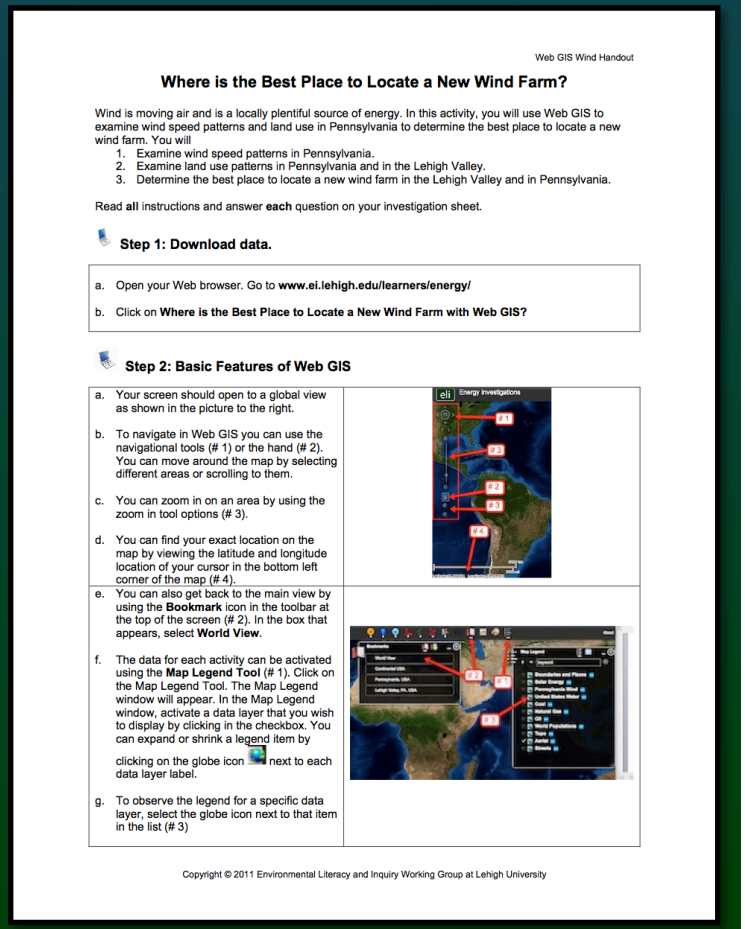
Where is the best place to locate a new wind farm?

http://gisweb.cc.lehigh.edu/energy/

ArcGIS viewer for Flex

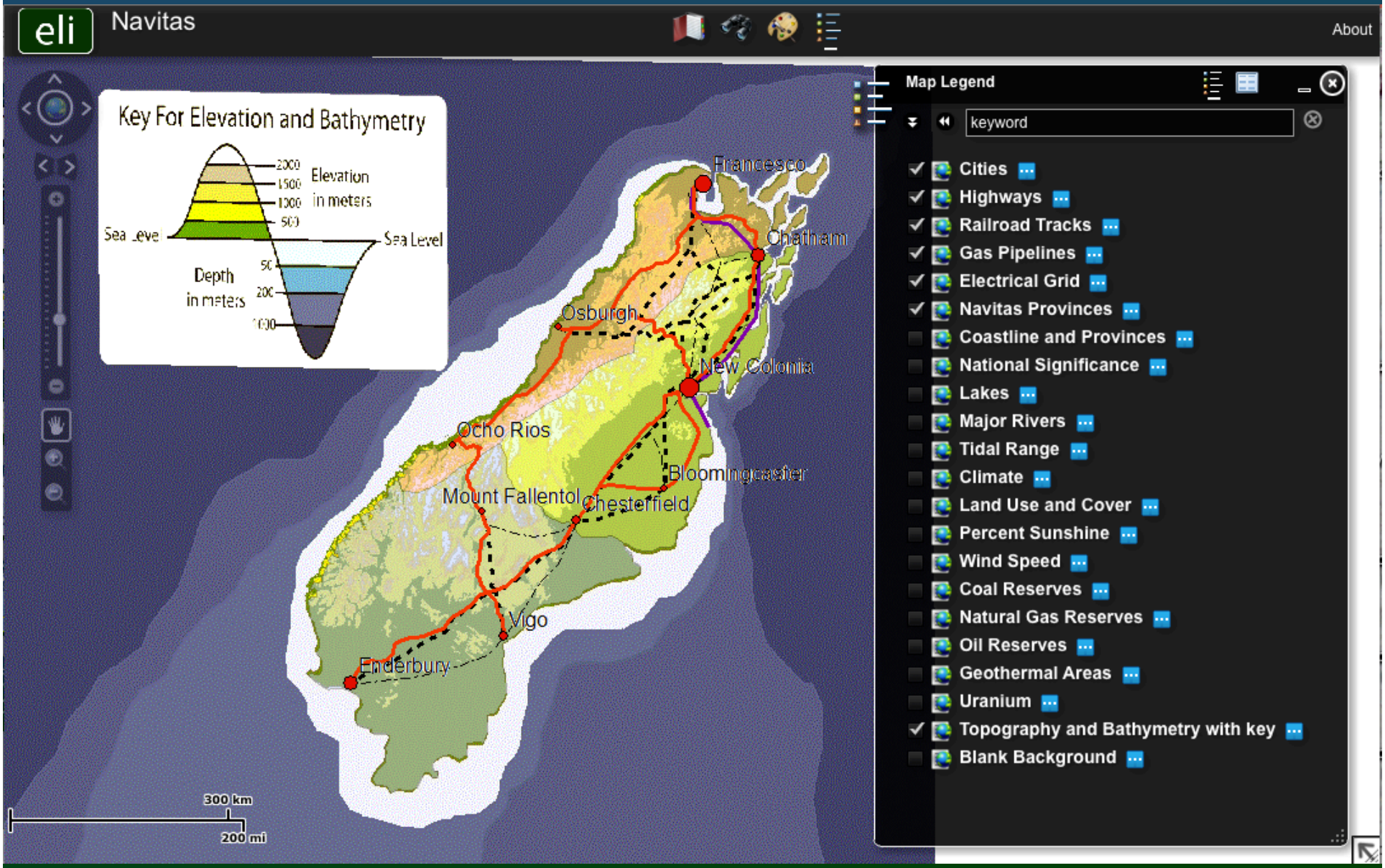
“Educative” Support Materials

- Pedagogical and content support for teachers
- Instructional Web GIS handouts: teacher guide, student handout, investigation sheet, assessment information
- WebGIS video tutorials



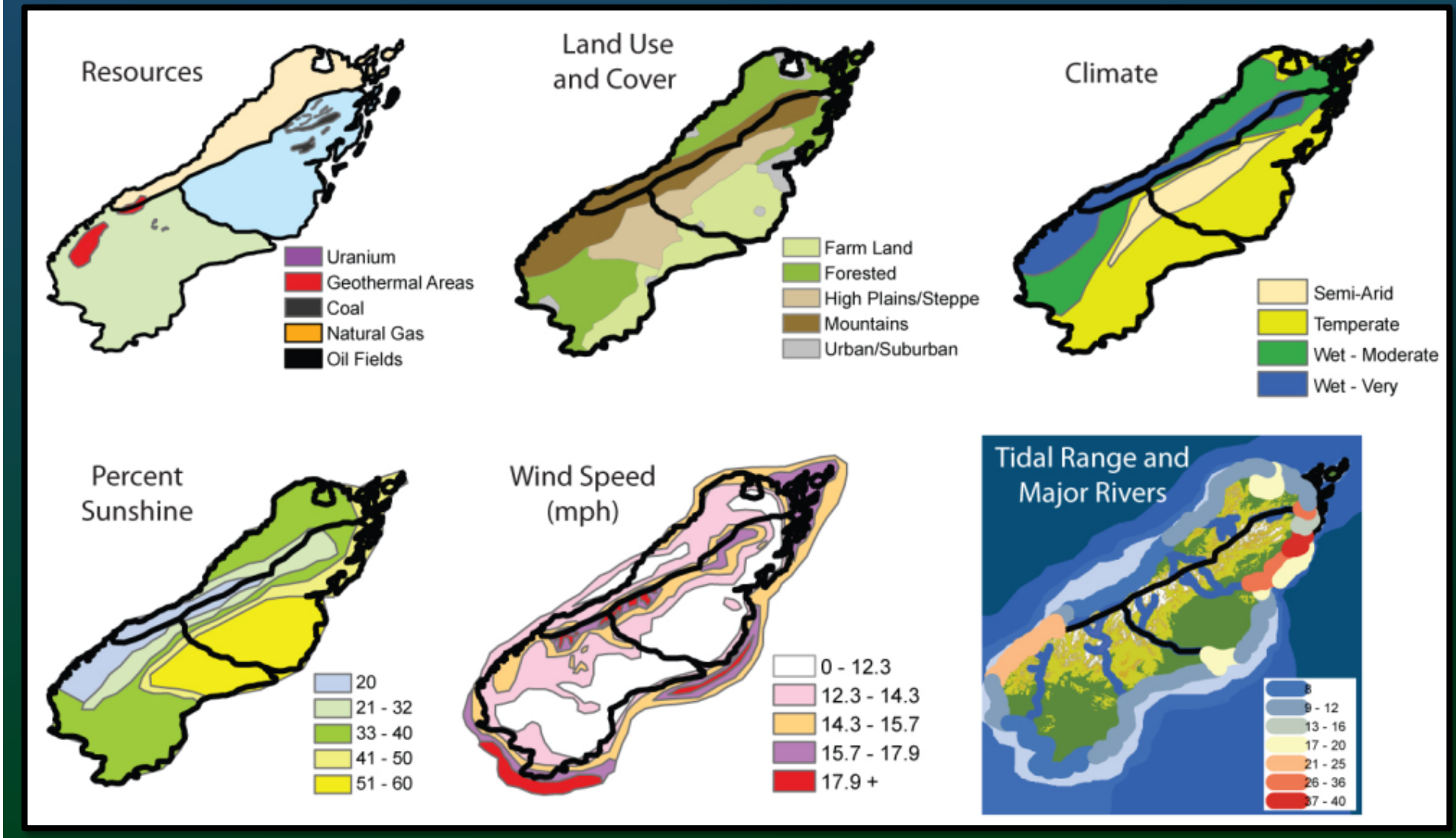
http://www.ei.lehigh.edu/eli/energy/support

Energy Culminating Investigation: Island of Navitas



http://gisweb.cc.lehigh.edu/navitas/

ArcGIS viewer for Flex



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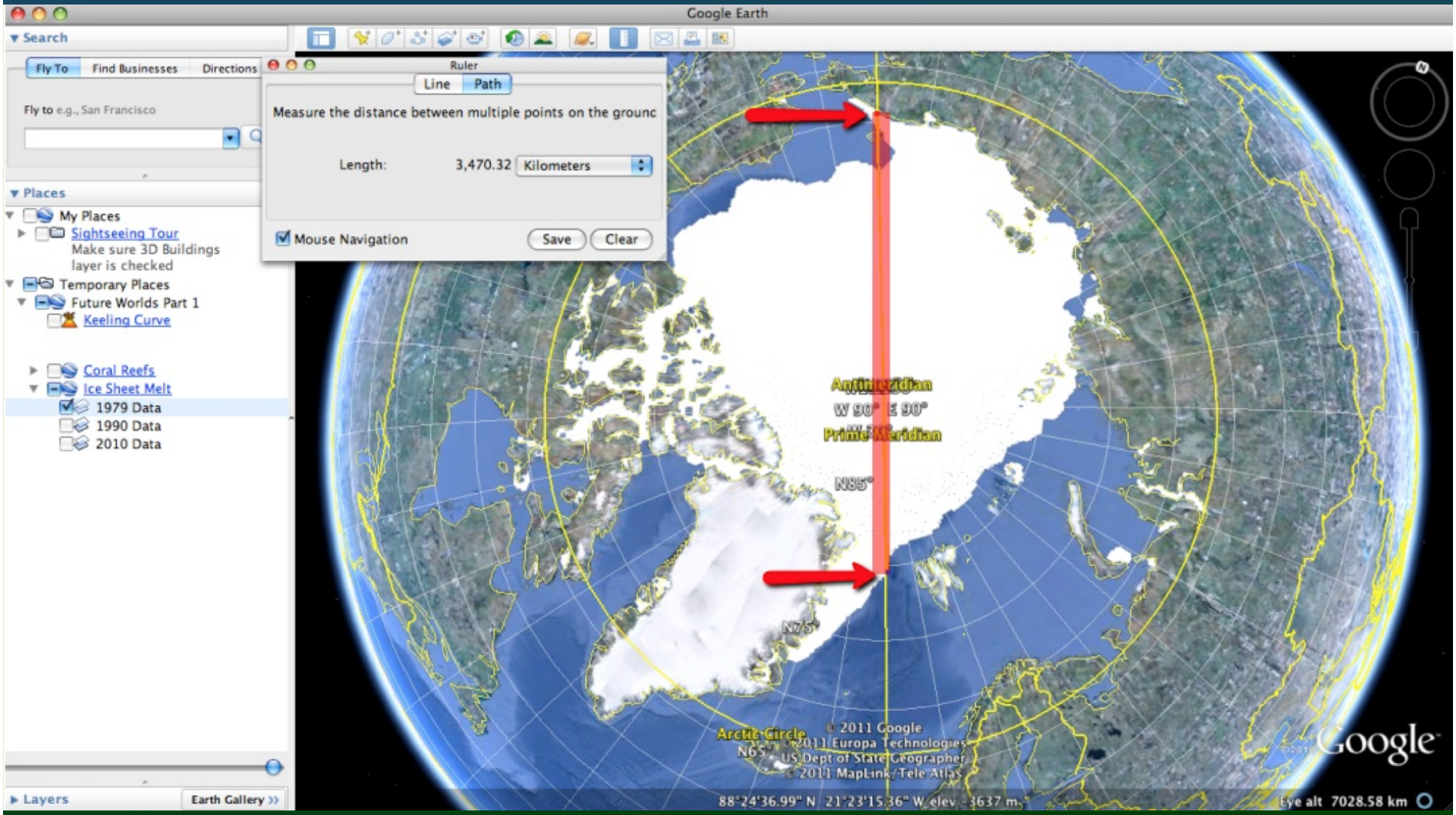
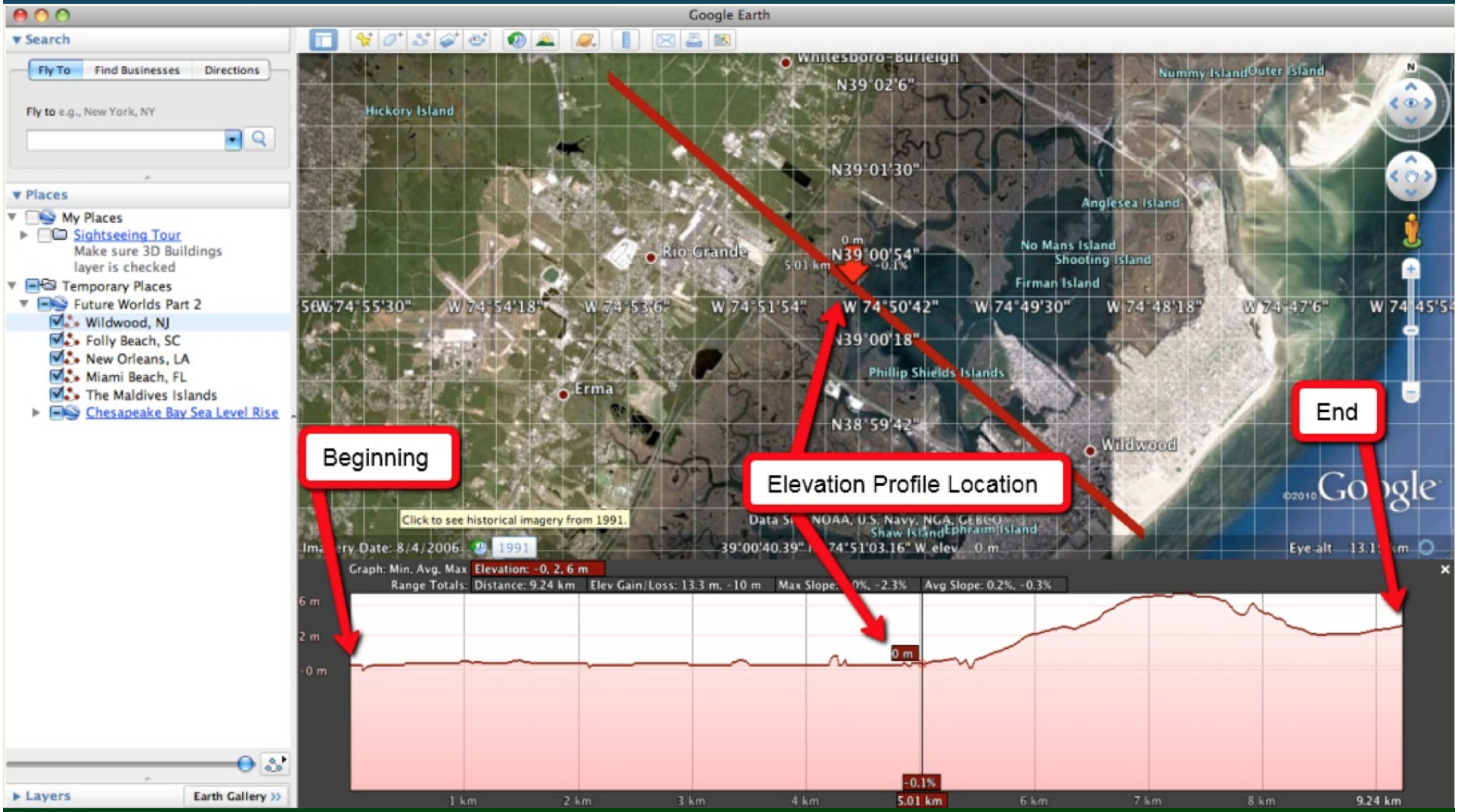
Investigating Future Worlds with Google Earth



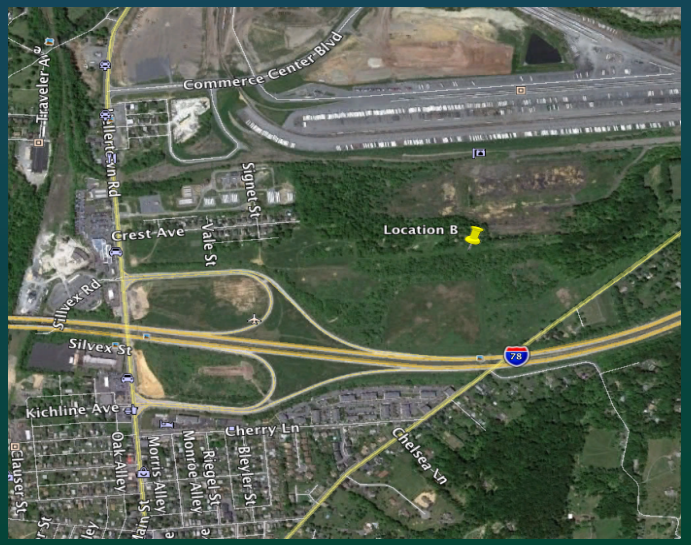
http://www.ei.lehigh.edu/eli/cc/sequence/day18.html

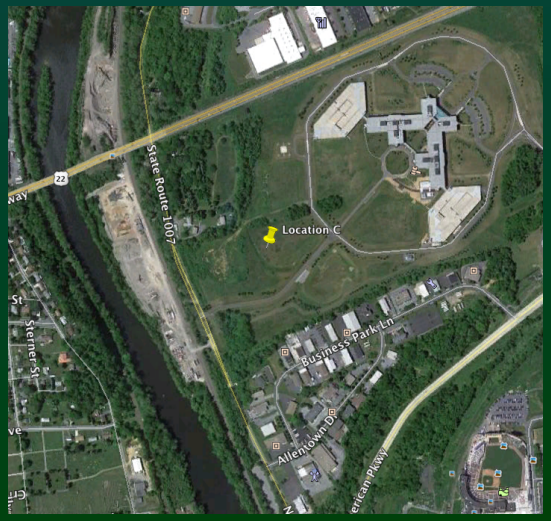
Investigating Future Worlds with Google Earth

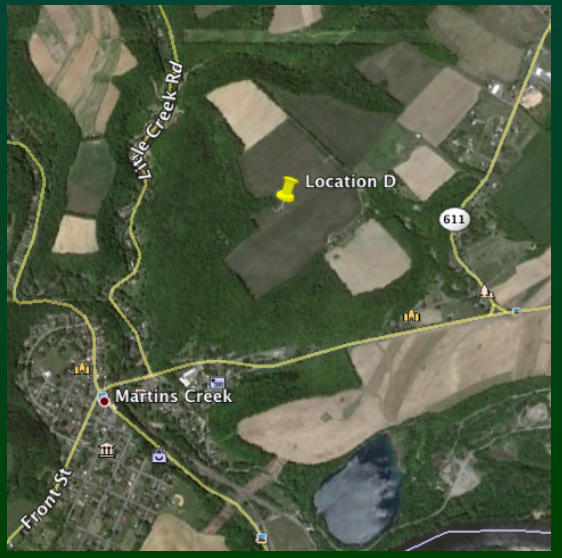


http://www.ei.lehigh.edu/eli/cc/sequence/day19.html

Where is the best place to locate a new Wal-Mart Supercenter in the greater metropolitan Lehigh Valley area that has minimal impact on the environment?







Some Recent Findings

- Increased student geospatial thinking and reasoning skills related to content areas increased (Bodzin, 2011; Bodzin, Fu, & Peffer, 2012)
- Geospatial technologies are more effective than business-as-usual methods at promoting spatial thinking and mastery of content (Bodzin, Fu, & Peffer, 2012).
- Educative curriculum materials are an effective form of support for teaching with a geospatial-integrated curriculum (Bodzin, Peffer, & Kulo, 2012).

Concluding Thoughts

- WebGIS and other geospatial technologies are accessible in today's classrooms.
  - User-friendly interfaces
- Effective curriculum approach for learning with geospatial technologies
- Adopting a new reform-based science curriculum that use geospatial leaning activities is a significant change from the types of classroom learning that typically occurs in science classrooms.

Abstract and research papers available at:

http://www.ei.lehigh.edu/eli/research/pubs.html

ELI curriculum:
http://www.ei.lehigh.edu/eli

To access assessments, use:
Login: eliteacher
Password: 87dja92