Courses

• Hydrogeology
• Environmental Geology & Urban Geology
• Environmental Conservation
• “Understanding” Wetlands
• Hydrogeology
• Physical Geology Lab
Area: Glacial Geology & Geomorphology of Allen County, Indiana
Map showing study areas
Teaching Levels (TLs) in ascending order
Samuelowicz & Bain (1992)

*Impart information…teacher centered

**Transmit knowledge…develop competence…skills and conceptual abilities

***Facilitate understanding … to understand subject matter … apply

****Change students’ conceptions … reality … different knowledge … develop conceptual framework …same level , and

*****Support student learning…student centered…more at graduate level

TLs can be used to gauge faculty effectiveness in engaging undergraduates…most faculties are at the first two levels (Akerson et al, 2005).

Getting faculty to be at or near the upper level would require that faculty review and change their teaching methods, injecting some research based or service learning into the curriculum.
Why choose wetlands?

• They are ubiquitous …both natural & artificial
• Within driving distance of most schools
• Varied types
• Depth to groundwater is low in most cases
• Can serve as outdoor labs for various
  courses: Wetlands, Hydrogeology, Environmental Geology, Environmental Conservation, Introduction to Physical Geology Lab, Sedimentology, Geomorphology, Geophysics, etc.
Why use wetlands?

- Disappearance of wetlands
- Students learn methods, use of instruments, develop ideas, design, collect, analyze, report, & get published…
- Importance
  - Location, demise of wetlands, involving stakeholders, and education

[Image of a wetland scene with geese]

[Diagram of a water surface setup with labeled parts]

[Image of wetland equipment diagram]

[Website link: http://www.geo.sunysb.edu/lig/Conferences/Abstracts99/O'Rourke/O'Rourke_MS.htm]
Activities

• Groundwater monitoring well field
• Groundwater levels with time
• Groundwater flow direction calculation
• Making of seepage meter

• Basic water chemistry: oxidation reduction potential (ORP), conductivity, and temperature. Also, Iron, Phosphates, and Nitrate/Nitrogen

• Collection of precipitation data
Activities Contd

• Collection of Soil samples
• Sieve analysis
• Analysis of sediments: mineral/rock composition
• Sedimentology … provenance
• Stratigraphy … using soil cores
• Geophysics…ground penetrating radar
• Surveying of wells
Constructed Wetland
Natural Wetlands (Fox Island)
Allen County Indiana
Water Level Elevations:
Well Elevations

<table>
<thead>
<tr>
<th>Well</th>
<th>Elevation</th>
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<tbody>
<tr>
<td>PV1</td>
<td>756.84</td>
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<tr>
<td>PV2</td>
<td>757.13</td>
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<tr>
<td>PV3</td>
<td>757.43</td>
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<tr>
<td>12&quot;</td>
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<tr>
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<td>9</td>
<td>756.66</td>
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</tbody>
</table>
Activities

• Depth to Groundwater level

• Simulations
Effects of Anthropogenic Activities
Activity

Water Table maps
Groundwater flow direction

Modified from Fleming T., 2001
- Steady state condition
  - Grid used $42 \times 25 \times 3$ representing $19,000 \times 9,500 \times 150$ feet

- Steady state condition
  - Pumping rate $\sim 3$ million gallons per day

Flow direction is now eastwards away from the study area as a result of the quarry operations.
AREA II  IPFW
Activity
Well Field
Activity

• Water level measurements

• Relationships between wells

Relationship between depth of PVC pipe Below Ground Level (BGL) and water level in the pipes

• The deep PVC pipe (31" below ground level (BGL)) had a water level of 56 inches, the intermediate PVC pipe (27" BGL) has 43 inches of water and the shallowest (23" BGL) has 33 inches of water.....upwelling condition & groundwater discharge

• The correlation (r) between the length of PVC BGL and water is very high (r =0.997) and this can be used to model the water level in PVC pipes with the depth. However, the correlation coefficient between the water level in the deepest PVC to the creek's water level is very low (r = 0.114).
Water levels in PVC Pipes

- Correlation between pipes 1 & 2 is \( r = 0.379 \);
- Pipes 1 & 3 is \( r = 0.010 \) &
- Between pipes 2 & 3 is \( r = 0.765 \)
Trend Contd.

Effect of nearby construction

Water Levels

Dates

Water level (in) from PVP Pipe top

PVC#1WL
PVC#2WL
PVC#3WL

4 to 18 below BGL…, i.e., about 2’ BWell field
Summary & Conclusions

- Get urban students excited about science using available resources…make geology relevant

- Can do a lot with WETLANDS

- Wetlands have ecological and societal importance and their demise should be looked into.

- Involve students early as the future of science and our future depend on them
Some recent publications


- Isiorho, S. A. 2007. Showing students the art of presentation: Leading by example. Published in GSA Abstracts with Programs Vol. 39, No. 3, p. 53

- Isiorho, S. A. and *Daughdrill, G F. 2007. Student observes the effect of construction on water levels in a nearby Creek. Published in GSA Abstracts with Programs Vol. 39, No. 3, p. 21

- Isiorho, S. A. 2007. A presentation “Research as a component in Undergraduate Upper Level Curses” at the Role of Departments in preparing Geosciences professional workshop. William and Mary College, Williamsburg. Jan 10-12


• Isiorho, S. A. 2006. Wetlands, the ultimate outdoor laboratory for geology students. Published in GSA Abstracts with programs Vol. 38, No. 4, p. 25

• Isiorho, S. A. 2005. Bringing Geology home to undergraduates using your surrounding. Published in GSA Abstract with Programs Vol. 37, No. 5, p 98

• Isiorho, S. A. 2005. Involving undergraduates in the determination of the relationship between surface water and groundwater. Published in GSA Abstract with Programs Vol. 37, No. 5
