

Immersing students into water research: utilizing over a decade well field data.

K Solomon A Isiorho,
Professor Emeritus of Geology, Biology Department,
Indiana University-Purdue University Ft. Wayne (IPFW),
Ft Wayne, IN 46805

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Chinese Proverb **If you want**

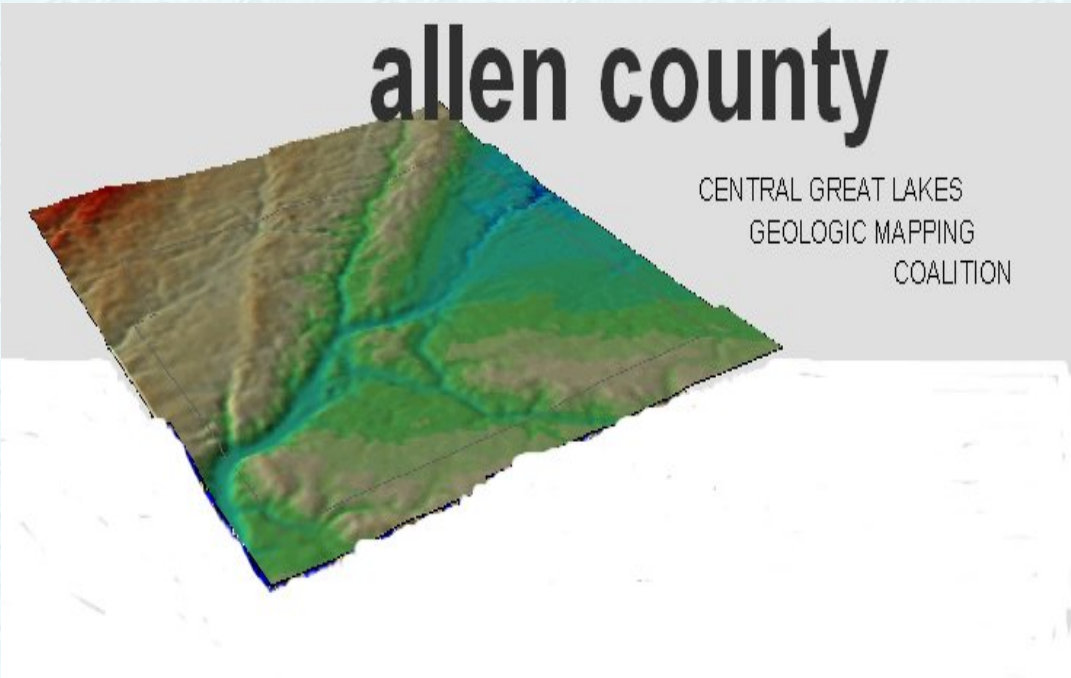
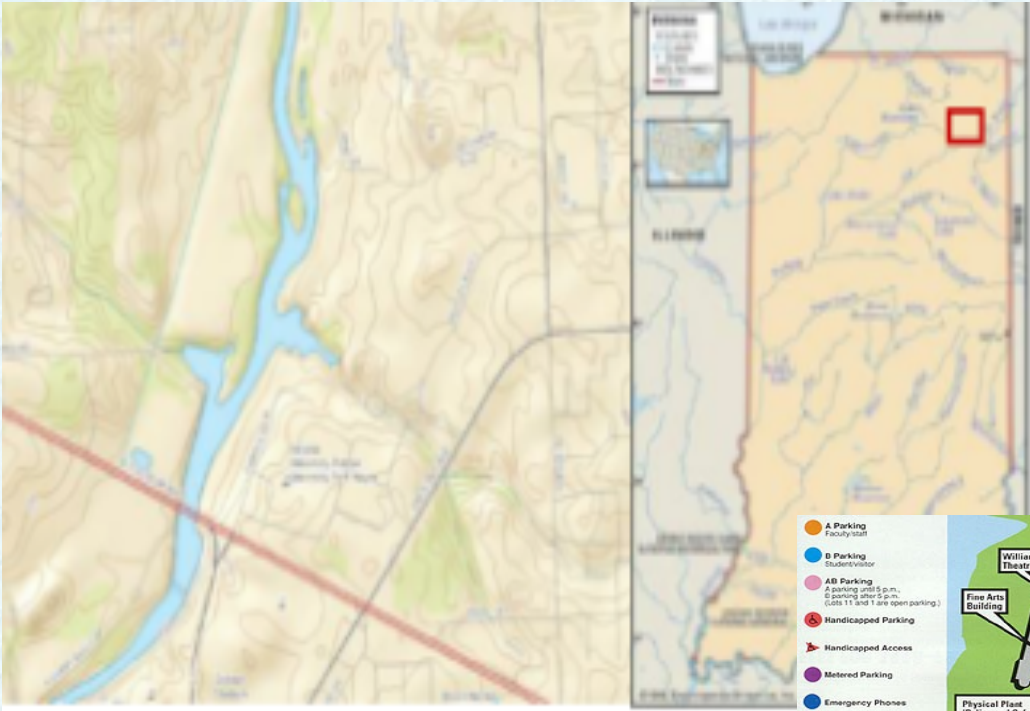
- 1 year of prosperity, grow grain
- 10 years of prosperity, grow trees, and
- 100 years of prosperity, grow people



<http://www.fotosearch.com/photos-images/grain.html>



Location



Well field

- How many wells? (22) 14 monitored...



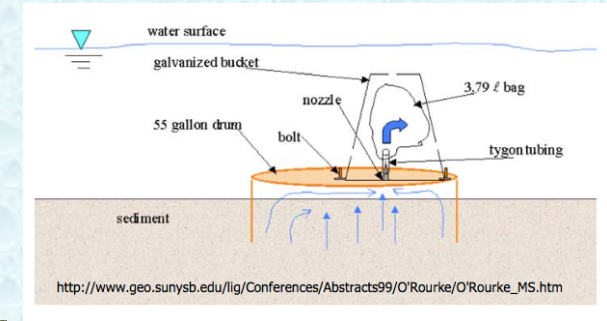
What's being Used for

- Introductory geology lab,
- Wetland studies
- Environmental Conservation to
- Advanced level hydrogeology courses.
- More than ten wells, are used to demonstrate some surface water ground water interactions and have been used to show anthropogenic affect on groundwater quality
- Several field observations and measurements



Methods & Materials

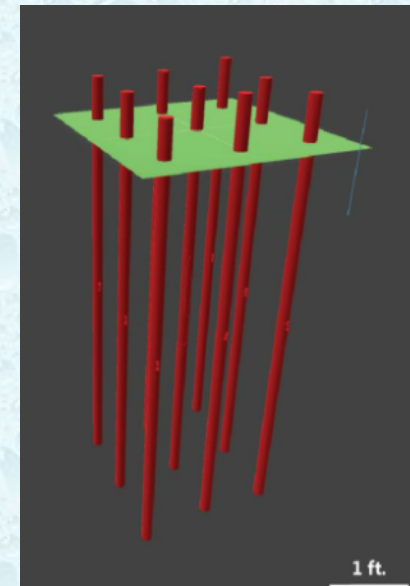
- “Drilling” wells
- Sediment samples
- Sieve analysis
- Water samples
- Analysis of data
- Report and presentations to peers



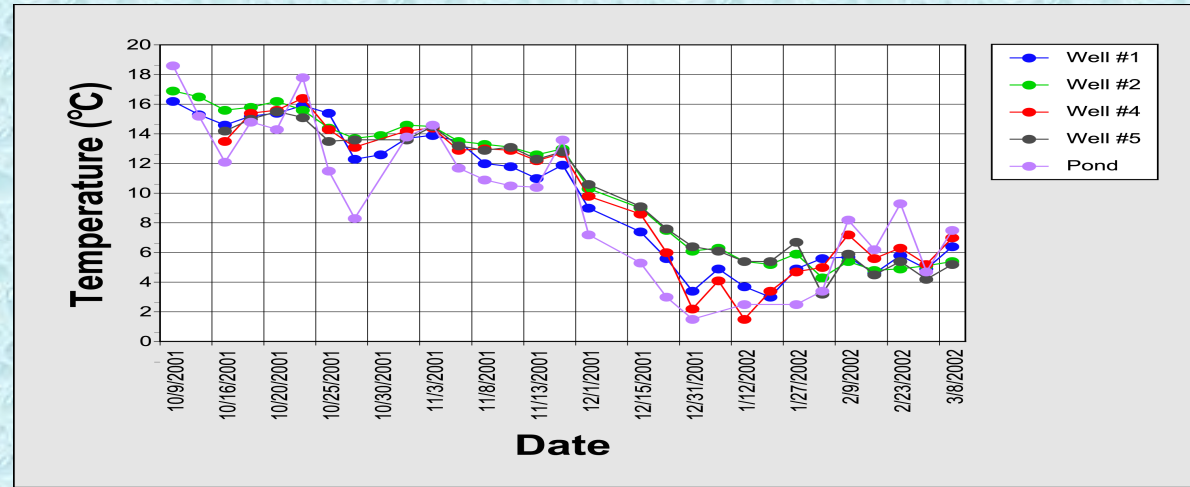
First couple years

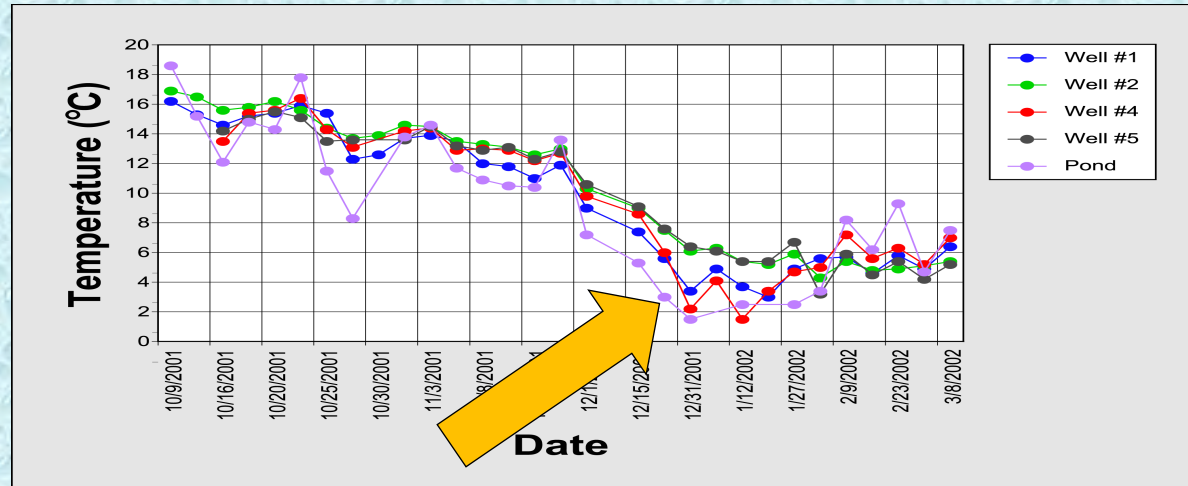
- **depth to groundwater**, groundwater flow direction to temperature and nutrients (nitrates and phosphates) ... measurements made by students in the various classes.

- 2005



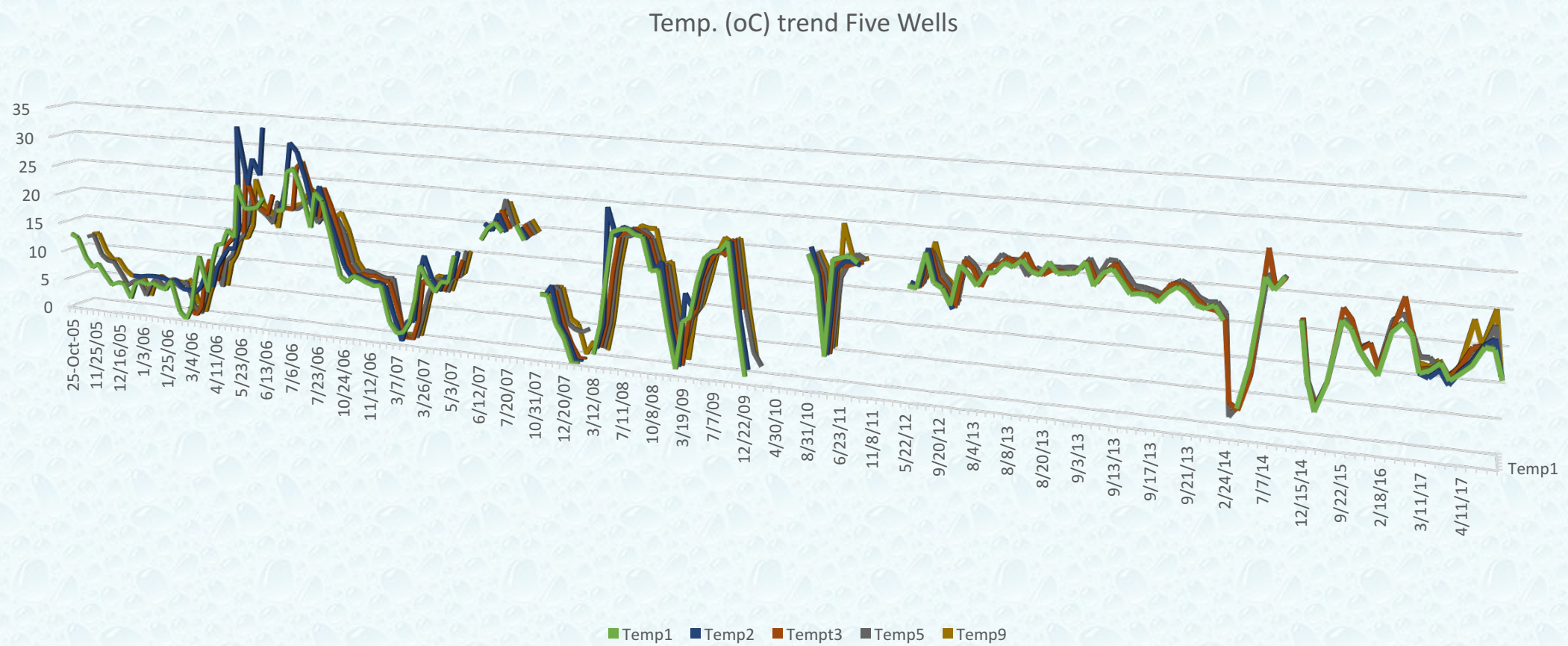
• 2007





- *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*

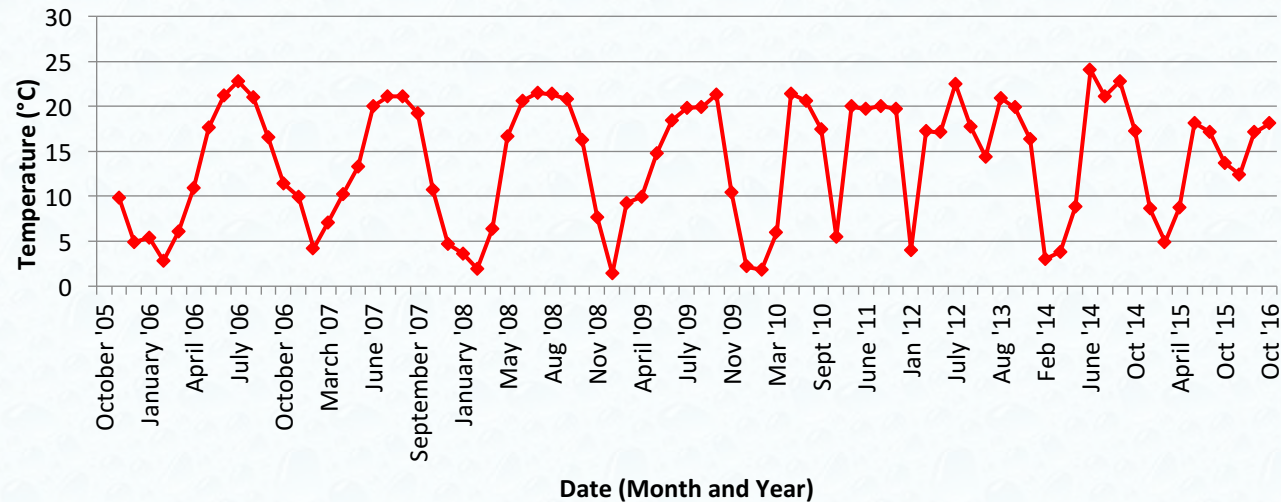
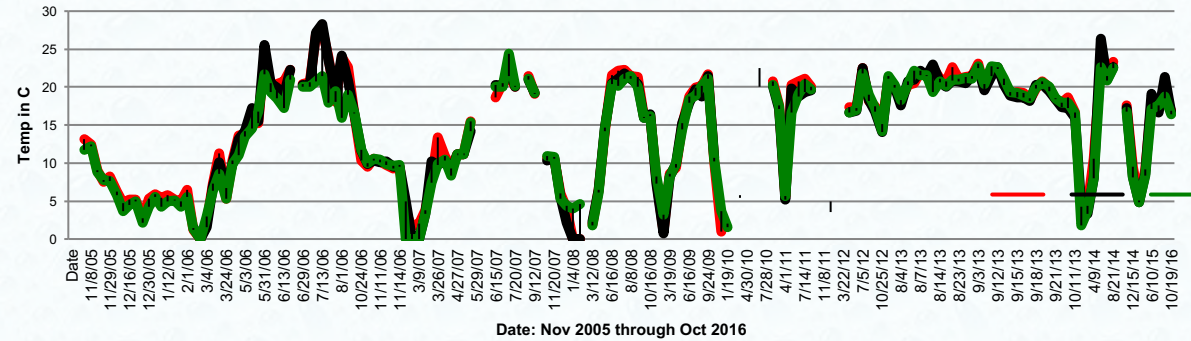
Temperature trend



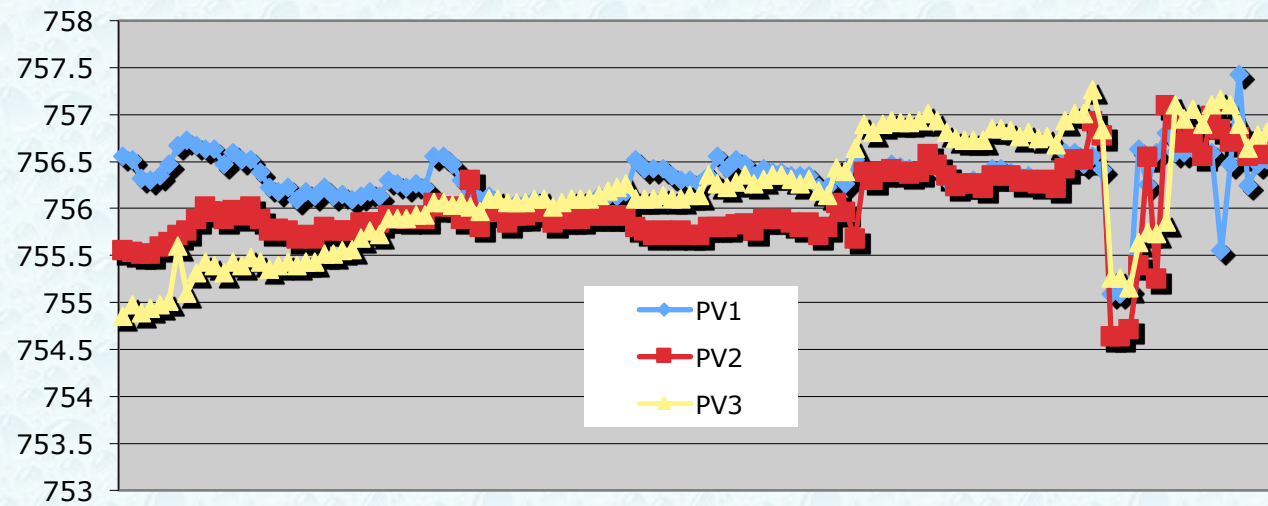
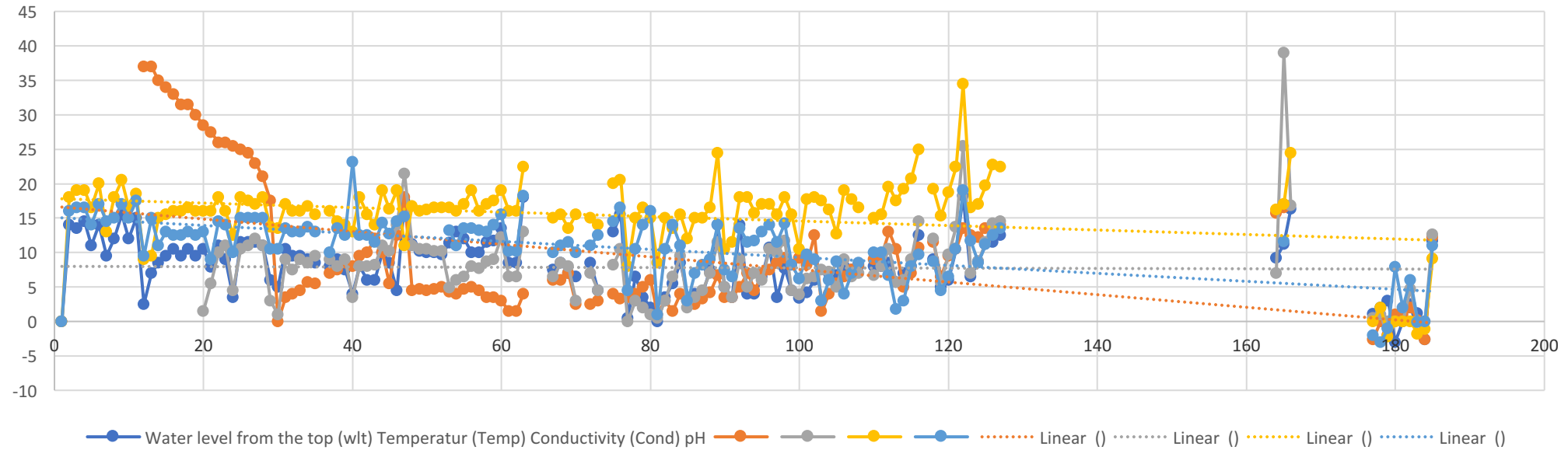
Data: History of well field...after ten years

- 2016

More than a Decade Temperature Data



Depth to Groundwater (2005-2017)



Publications

- More than 30 students' presentations at professional meetings.
- One examined the water quality across a mid-size Midwest city in USA
The water samples were tested for: chlorine, dissolved oxygen, conductivity, iron, nitrate, nitrite, and pH.
- Most students used data from the well field.

- *Budd Sarah, K., Lafaucial, *Tammy, and Isiorho S. A., 2013, So you measured chemical parameters in a well field and now so what? GSA with programs. Vol. 45, No. 7, p. 585

"Depth of well is inversely related to both temperature and concentration of Nitrates. It is directly related to the pH Conductivity is directly related to temperature and inversely related to Nitrates Temperature is directly related to Nitrates The Sulfates and Phosphates in well 5 are inversely related to the river The Nitrates in the 12' Well are directly related to Wells 1 & 3 The river chemistry varied the most while the 12-foot well varied the least. This implies that the river water and the other shallow wells are greatly affected by what goes on at or close to the land surface."

Date	Well	Depth (cm)	SO ₄ (mg/L)	PO ₄ (mg/L)	NO ₃ (mg/L)
8/6/13	1	38.74	64	0.52	4.7
	3	30.48	97	0.47	6.4
	5	45.40	10	1.68	11.5
	12	0.00	117	0.02	0.0
	River	20.32	69	0.27	3.0
8/14/13	1	29.53	79	4.71	0.0
	3	24.45	102	2.21	0.0
	5	30.48	7	4.99	0.0
	12	2.86	93	0.19	0.0
	River	2.54	67	0.11	7.1
8/20/13	1	46.67	82	7.86	0.0
	3	47.31	85	5.06	0.0
	5	47.31	3	6.35	0.0
	12	21.91	191	0.29	0.0
	River	36.83	101	0.38	2.1

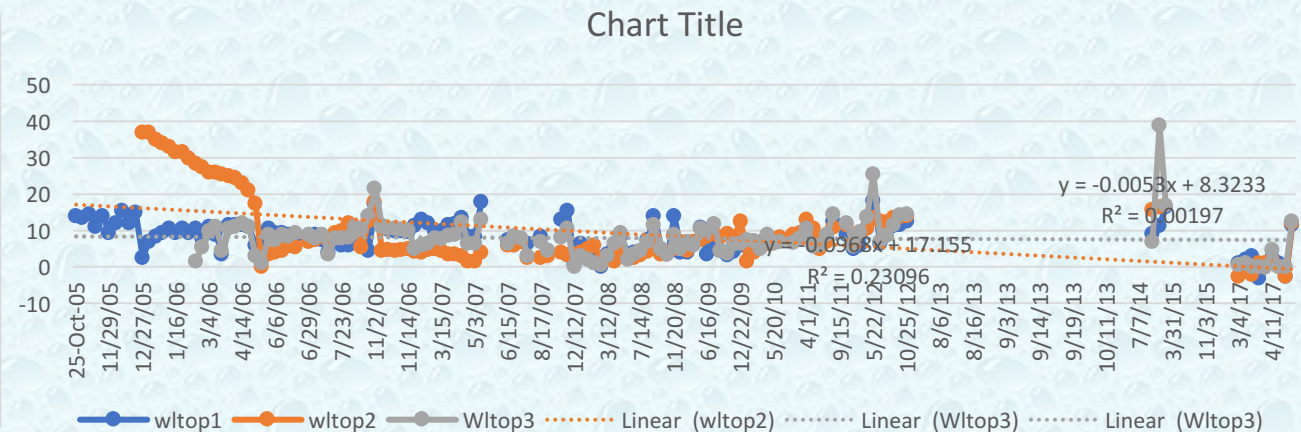
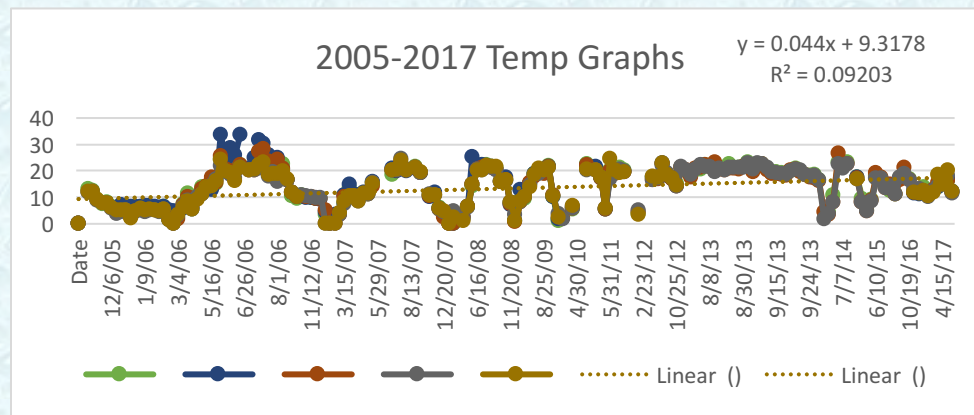


- *Matthews T., Budd Sarah, K., and Isiorho S. A., 2014, Determining the water quality at Indiana University-Purdue University Fort Wayne (IPFW) using well data. In *GS6 Abstracts with Programs*. Vol. 45, No. 6, p. 531 Water is fit to drink ☺
- *Yeaters Ross, and Isiorho S., 2016, Monitoring groundwater properties in a wetland on the IPFW campus. Indiana Academy of Science Abstract: 131st Annual Academy Meeting - Mar 26, 2016 - Mar 26, 2016. p 54 Hazen method for K-value of soil. Measure nitrite, nitrate, TDS, Temp, Cond, DO, elevation head..+ve correlation btn head & DO, GW flow direction is NE, nearby stream is an influent stream
- *Cole, David, and Isiorho, Solomon, 2017, Monitoring changes in IPFW well field along St. Joe River. Poster presentation at the 20th Annual Student Research and Creative Symposium, IPFW, March 29, 2017 "The wetland is a recharge zone in the fall and a discharge zone in the Winter. The 12 foot well is believed to be an artesian aquifer. Conducting a sieve analysis could prove beneficial for soil analysis. No immediate threat of flooding to the surrounding area"

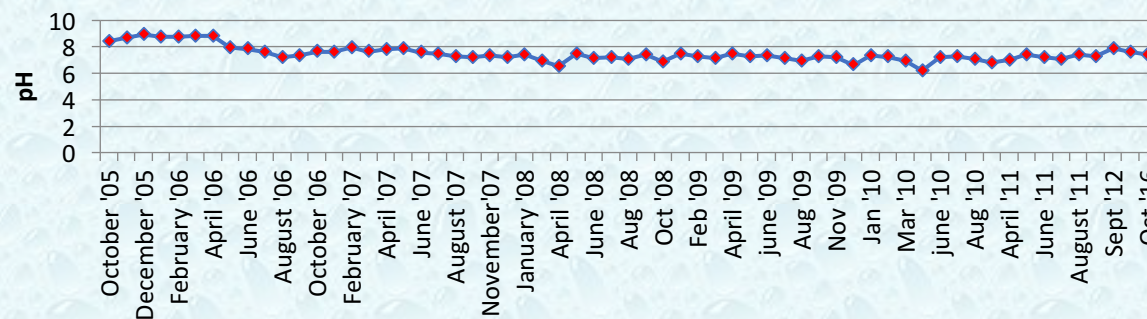


Findings

- The current data from 2004 through May of 2017 shows
 - increase in groundwater temperature within the well field,
 - rise in water levels, &
 - water becomes slightly acidic with time.



pH of Well Field



Conclusions:

Well field served as a convenient outdoor lab

Got students involved &

Students learned about their water source



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