

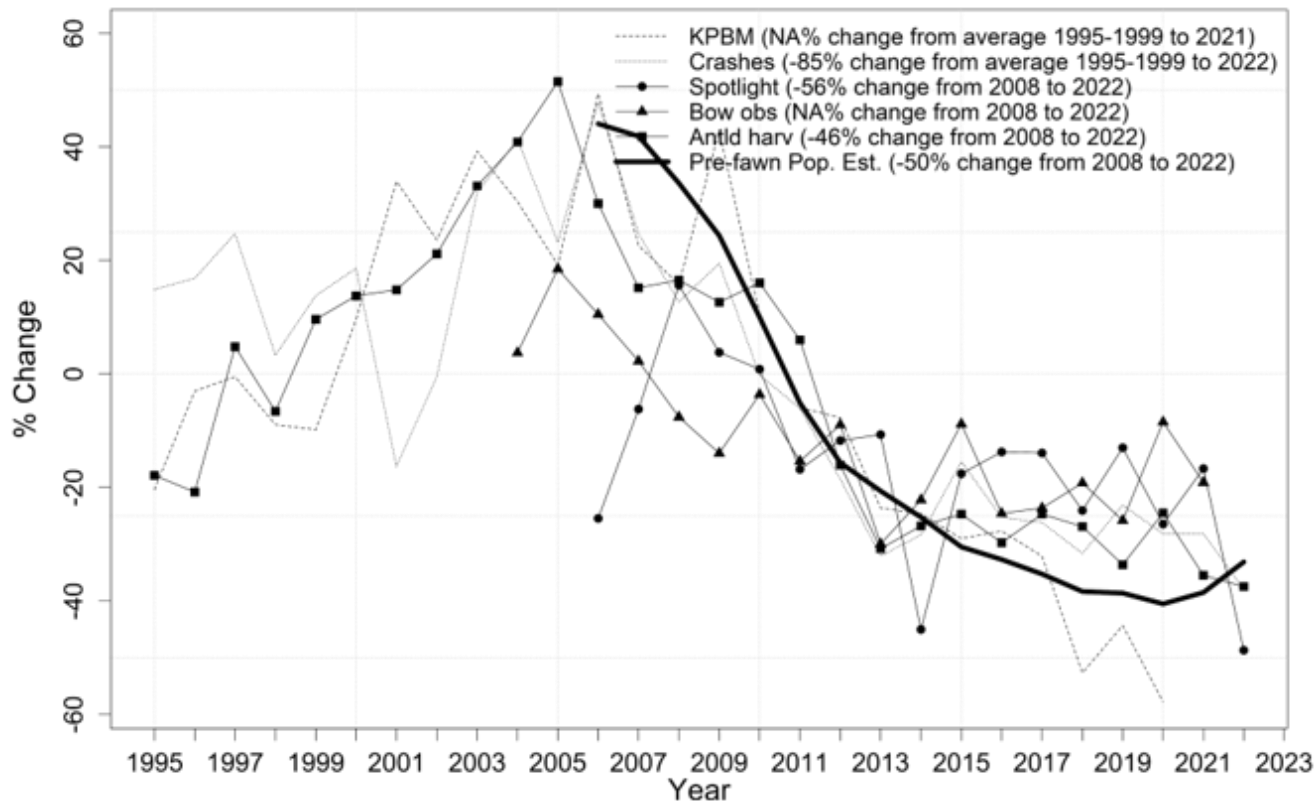
Science in Today's Classrooms

Upper Mississippi Valley River Conference
October 17, 2024



Department of Education

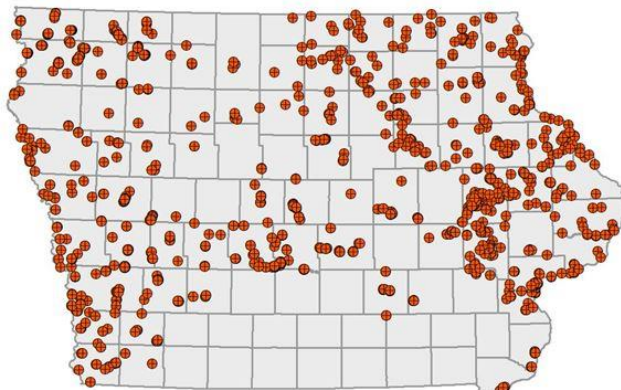
Deer Population Change in Southwest Iowa



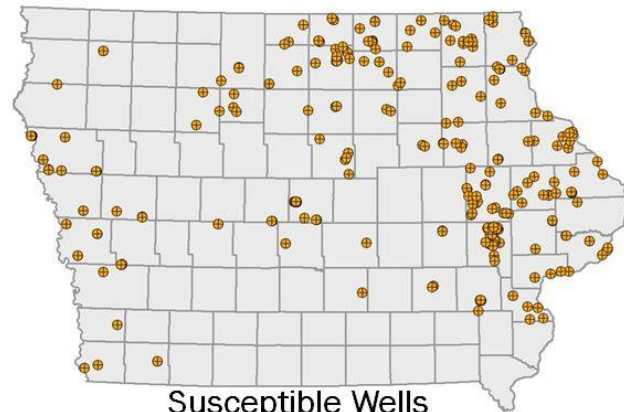
What notices to do you have about this graph?

Model your thoughts.

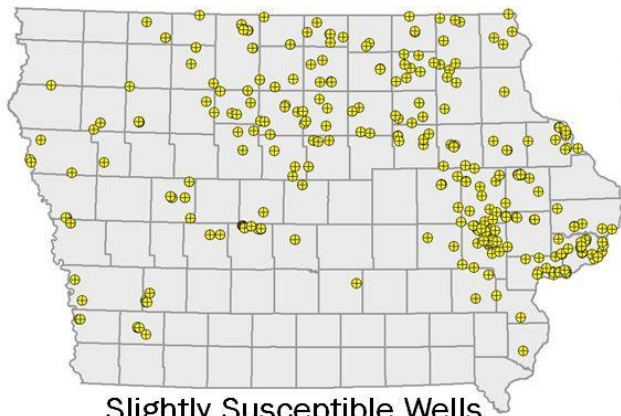
Something a
little closer to
home...



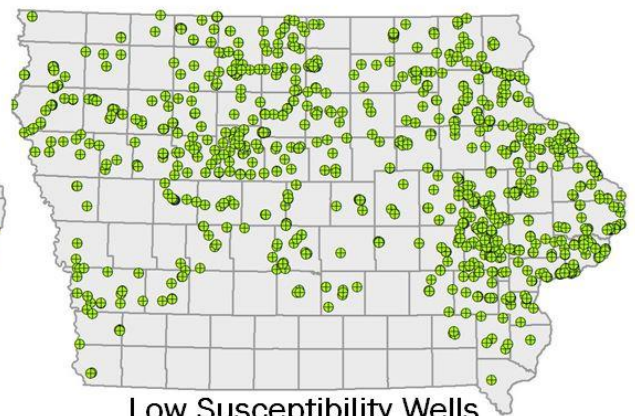
Highly Susceptible Wells



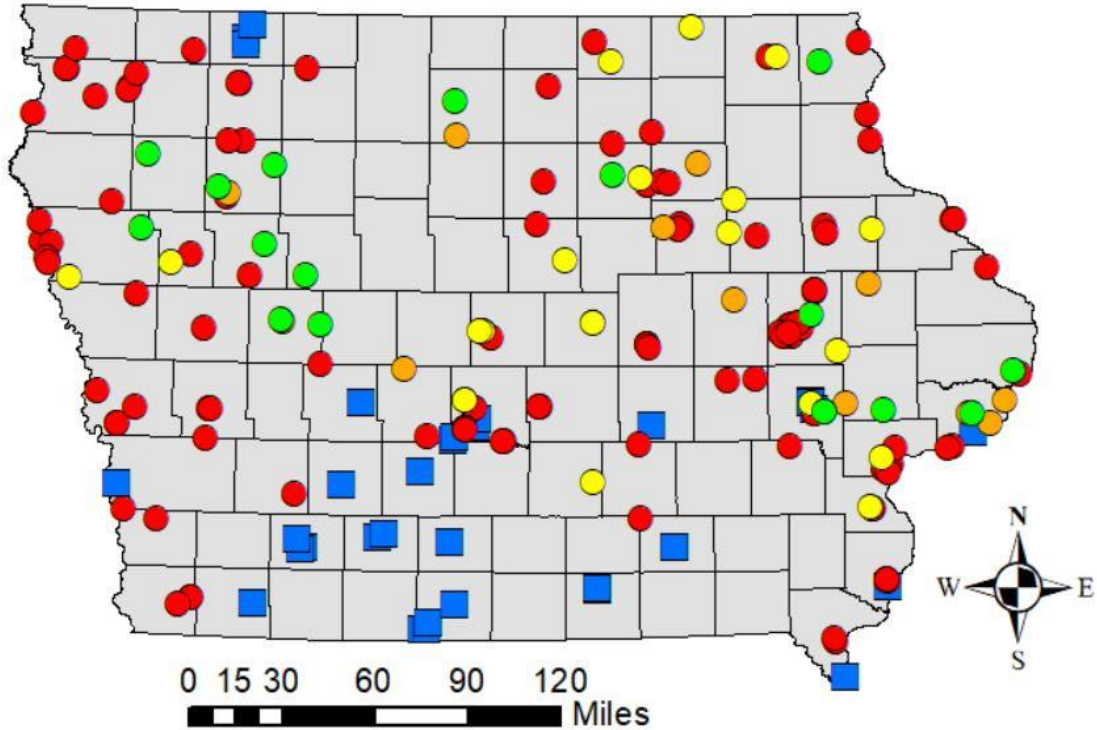
Susceptible Wells



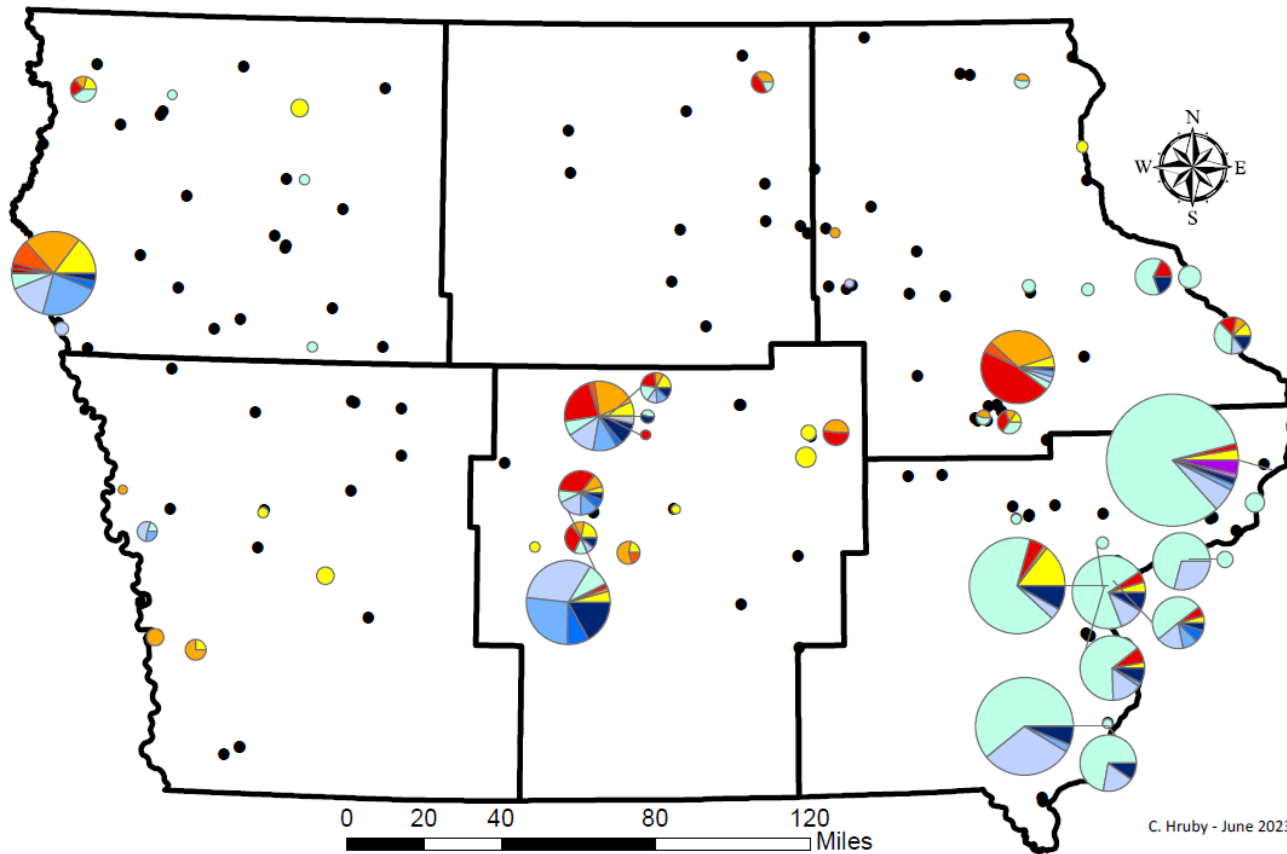
Slightly Susceptible Wells



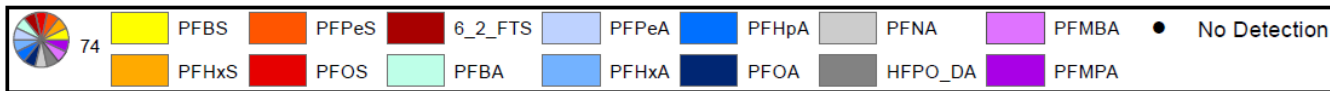
Low Susceptibility Wells



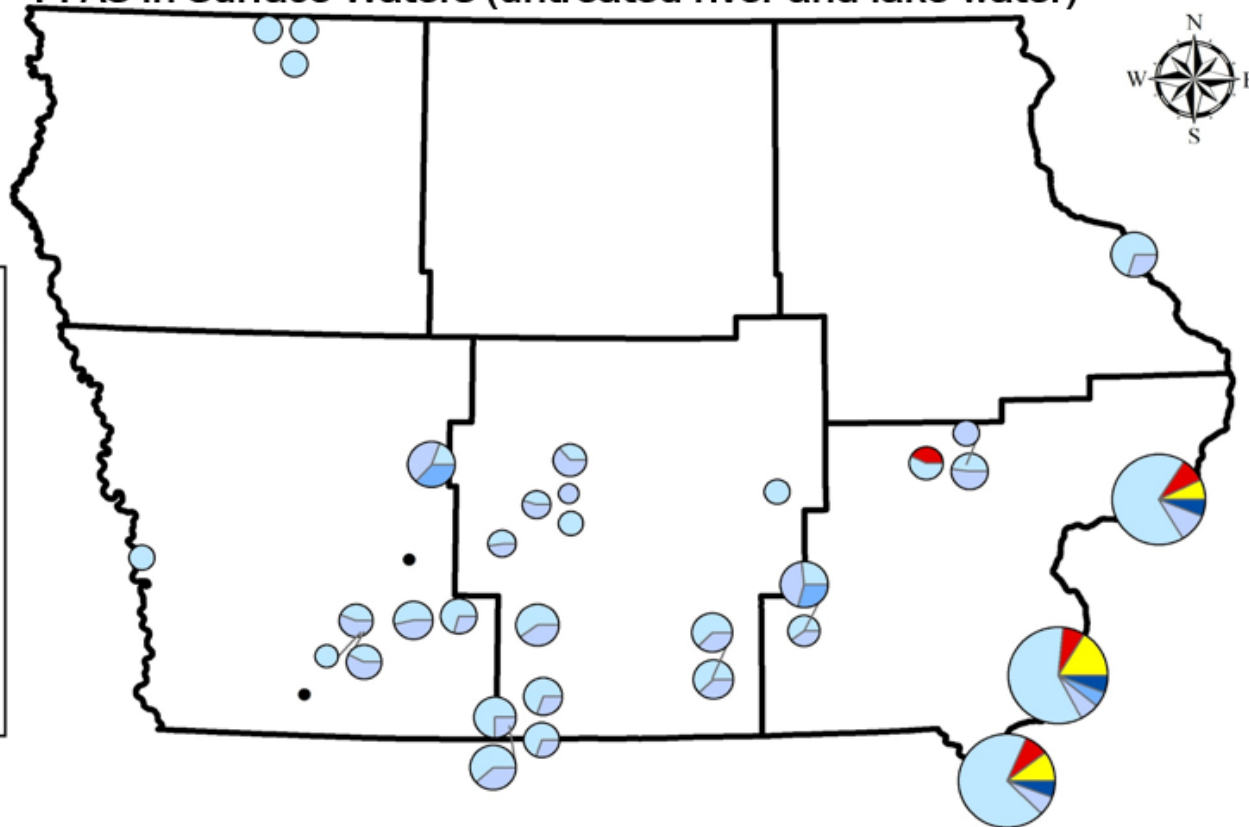
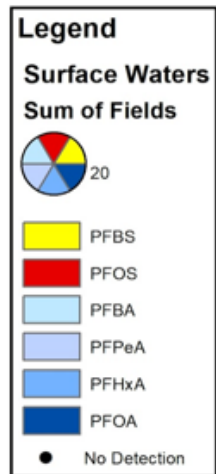
PFAS Compounds in Groundwater Samples (Tiers 1-4)



C. Hruby - June 2023



PFAS in Surface Waters (untreated river and lake water)



Matt Graesch

Environmental Specialist Senior in Contaminated Sites and Solid Waste.

Matt Graesch received his degrees (BS and MS, Iowa State University) in geology. Historical geology, geomorphology, and hydrogeology significantly impact how our valuable groundwater resources are understood and protected from past and future contamination.

In his time at DNR, he has worked with Leaking Underground Storage Tanks, Solid Waste (landfills), Contaminated Sites, Water Supply, Private Wells, and Fisheries. He uses a combination of stratigraphy, hydrogeology, computer mapping, and data analysis to help others at DNR make informed choices regarding their programs, as well as assist contaminated sites, for which he is responsible, to make the best choices for cleanup and remediation. He also works to ensure that the Statewide Standards used by DNR to assess risk from contaminants in drinking water and in soil are up to date with the latest scientific information on toxicology. Recently, he spent a large part of the last three years working on a state-wide reconnaissance project to understand the presence or absence of per and polyfluoroalkyl substances (PFAS) in aquifers, surface waters, and drinking water of Iowa.

Building Coherence from the Student Perspective



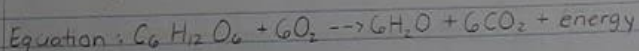
ATP and Energy

ATP: energy in a molecule
No ATP: The cell will die

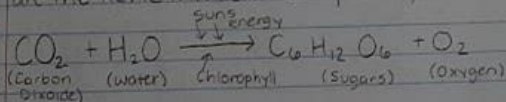
ATP: Adenosine Triphosphate --- The energy storage molecule

Cellular Respiration: an energy (ATP) creating & releasing process:

- Plants: Glucose ($C_6H_{12}O_6$) produced during photosynthesis is broken down to release energy.
- Animals: Glucose ($C_6H_{12}O_6$) is broken down during digestive so energy is released.



- * The WASTE PRODUCTS of cellular respiration, CO_2 and water, are the REACTANTS used in photosynthesis.



- * The PRODUCTS of photosynthesis are glucose ($C_6H_{12}O_6$) and O_2

3 Steps of cellular respiration:

1. Glycolysis
2. Krebs Cycle (Citric Acid cycle)
3. Electron Transport Chain (ETC)

Glycolysis:

- Occurs in the cytoplasm of the cell
- Starting molecule: One molecule of glucose ($C_6H_{12}O_6$)

Aerobic Respiration: Oxygen is present (if there's oxygen)

- IF OXYGEN IS PRESENT, the products of glycolysis ENTER the pathway of aerobic respiration.
- 2 major stages: Krebs cycle and Electron transport chain
- Produces LARGE amounts of ATP

Aerobic Respiration Processes: (step 2)

- * Krebs Cycle (Citric Acid Cycle - CTA)
- Occurs in the mitochondrial Matrix (center of the mitochondria folds)
- Starting molecules: 2 pyruvates and oxygen
- Produces: NADH and $FADH_2$ and CO_2 and ATP molecules
- Each Pyruvate goes through the cycle to give 2 ATP total

Aerobic Respiration Processes: (step 3)

- * Electron Transport Chain (ETC)
- Occurs in the inner membrane of the mitochondria
- Starting molecules: NADH and $FADH_2$ and oxygen
- Uses the NADH and $FADH_2$ from the Krebs cycle and another NADH from Glycolysis
- Produces: water and 32 ATP's
- $FADH_2$ and NADH, release H^+ so they can attach to oxygen and produce water.
- Energy (ATP) is made when hydrogens are pumped back through the ATP Synthase Protein!

Importance of Aerobic Respiration:

- To transfer chemical energy (glucose) to a form of energy that is useable by cells (ATP)
- Total net gain of ATP molecules per 1 glucose = 36 ATP's - if really efficient - 38 ATP
- 2 from glycolysis, 2 from Krebs, and 32-34 from the ETC

Anaerobic Respiration: NO OXYGEN IS PRESENT

- Occurs AFTER glycolysis, only if NO oxygen is present
- No additional ATP is created after the 2 ATP's from glycolysis!

Anaerobic Respiration 2 types: Alcoholic Fermentation and Lactic Acid Fermentation



IOWA

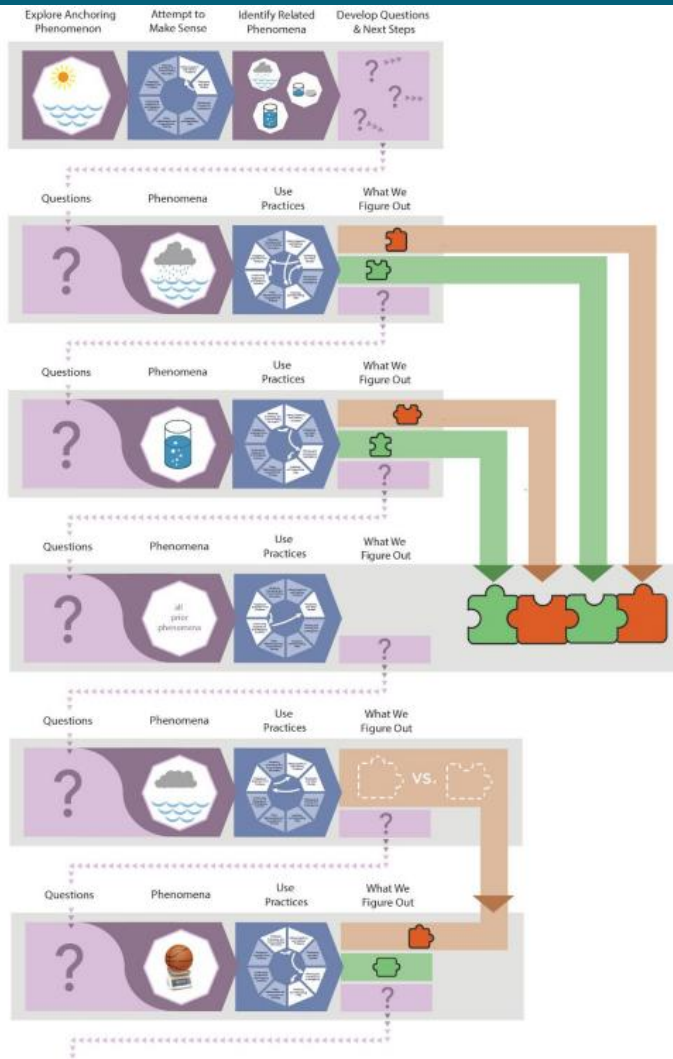


Science PHENOMENA

[Iowa Science Phenomena](#)



Anchoring
Phenomenon



What does this look like
in a classroom?

Thank You!!

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Science Program Consultant
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