CAFO in Paradise—

Benefits, Risks and the Costs of Ignoring Science

Van Brahana, Joe Nix,
and Carol Bitting

Photo courtesy of Mark Hudson


SEA TO RISING SEA
THE COMING FLOOD INSURANCE DISASTER
Did the War on Microbes Make Us Fat?
I Built an AK-47
Mother Jones
SMART. FEARLESS JOURNALISM
July + August 201
GAGGED BY BIG AG
Pink slime, downer cows, grinding up live animals—and how politicians make sure no one squeals


NO
PIG
POOIE
No Poop!!!
WAKE UP
OR
STILL IN
PIG POOP
HOG

Geoscientist: CAFO a no-no

Mike Masterson

If you were responsible for permitting an industrial hog farm in the Buffalo River watershed along Big Creek, would you ask an expert to analyze what kind of drainage to expect from tons of swine waste applied atop the porous limestone of what geologists know as the Boone Formation?

And what if you didn't do that and later were told the estimated odds of such contamination was 90 percent?

It seems like just prudent due diligence that any state would consult with an expert on groundwater circulation through the karst of the Boone Formation in Newton County before issuing a permit for a concentrated animal feeding operation in such an environmentally sensitive area.

So I wondered why the state's Department of Environmental Quality didn't retain someone like professor John V. "Van" Brahana of the Department of Geosciences at the University of Arkansas, who I'm told does have a phone. Brahana is an expert on the fractured karst that underlies much of Northwest Arkansas. He's more than capable of examining the site of this 630-acre operation at Mount Judea. After all, this place will house 6,500 swine continually generating at least two millions gallons of waste pumped into two lagoons and applied across fields near Big Creek.

And certainly no responsible people would want misinformation spread about what can be expected from this farm's waste output, especially alleged omissions and misinformation of the kind cited in both the Farm Service Agency's environmental assessment report and the Department of Environmental Quality permit's nutrient management plan. Right?

But since the state didn't recruit Brahana to prepare such a study, I asked his thoughts.

Few, if any, geoscientists are more familiar with the distinctive Ozark karst that forms the Boone Formation and how easily and rapidly it carries groundwater pollution. He told me the formation, particularly beneath Newton County, is honeycombed with caves, sinkholes and underground springs.

"Newton County has the single largest number of reported caves for any county in the state," said Brahana, who had performed a cursory review of the C&H Hog Farms site. "The setting of this ... hog farm overlies one of the most intensively karstified rock units in the state. ... The concentration of animal wastes is huge and safely retaining them in the clay-line [lagoons] proposed is highly unlikely."

The professor said if waste should escape this farm, it would likely negatively affect the overall water quality of the Buffalo National River. "Identifying all the subsurface short-circuits that could deliver waste to the river is neither practical or economically feasible. The Buffalo is the major regional drain through which groundwater and tributary surface water (Big Creek) leaves the region and pollutants would ultimately end up in that waterway. Cleanup after the fact is much more expensive than avoiding the problem before it occurs," he said.

Formerly with the U.S. Geological Survey, Brahana has taught for 23 years at the University of Arkansas. The professor's numerous studies include a dry creek bed along the Carroll-Boone County line where poultry waste had contaminated nearby wells and springs. A highway expansion had exposed underlying karst bedrock with interlayers of "horrific-smelling gooey sediment composed of decaying poultry debris and waste and a spring that was proven to be connected to the dry creek bed that was horribly contaminated," he said. On my 51 years of professional groundwater studies, I've never encountered a more contaminated spring anywhere."

The makeup of the karst hydrology along Big Creek adjacent to the hog farm is very similar, he added.

The professor told of another instance along a tributary of Osage Creek where the weight of a pond formed by damming that stream caused it to collapse into a previously undetected cavern. From there the flow traveled subsurface along the stream valley and into Osage Creek. "Big Creek at the CAFO site has nearly identical hydrogeologic properties and settings," he said, further explaining that various contaminants can travel through karst anywhere from feet to a matter of miles in a single day.

I closed my exchange with Brahana by asking on a scale of 1 to 10, 10 being the most likely (and knowing what he has learned of the Cargill-supported and supplied site for this industrial hog farm), what he believes are the odds of our nation's first national river becoming contaminated from the waste the farm generates. "A nine on Big Creek and a nine on the Buffalo," he responded. But of course, our state never asked this expert for a truly scientific opinion before issuing the permit.

Meanwhile, it was interesting to see scores of folks gather Wednesday on the courthouse square in Jasper to protest the hog farm. In what struck me and lots of other Arkansans as a blatant public relations move to build support for the farm, corporate giant Cargill sponsored a lunch for some legislators at the popular Ozark Cafe, also on the Jasper square. Silly me, I wondered why Cargill wasn't also kindly buying lunch for all those potential customers carrying signs across the street.

Mike Masterson's column appears regularly in the Arkansas Democrat-Gazette. Email him at mikemasterson85@hotmail.com. Read his blog at mikemastersonmemoirspot.com.

Acknowledgements

- Local landowners and family farmers
- Environmental Dynamics students Victor Roland and Amie West
- Jo Ann Kvamme, ENDY
- Geosciences students Tyler Wright, Sarah Robertson, and Vanya North

Distinguished Professor Emeritus Dr. Joe Nix, whose lab has made our study possible

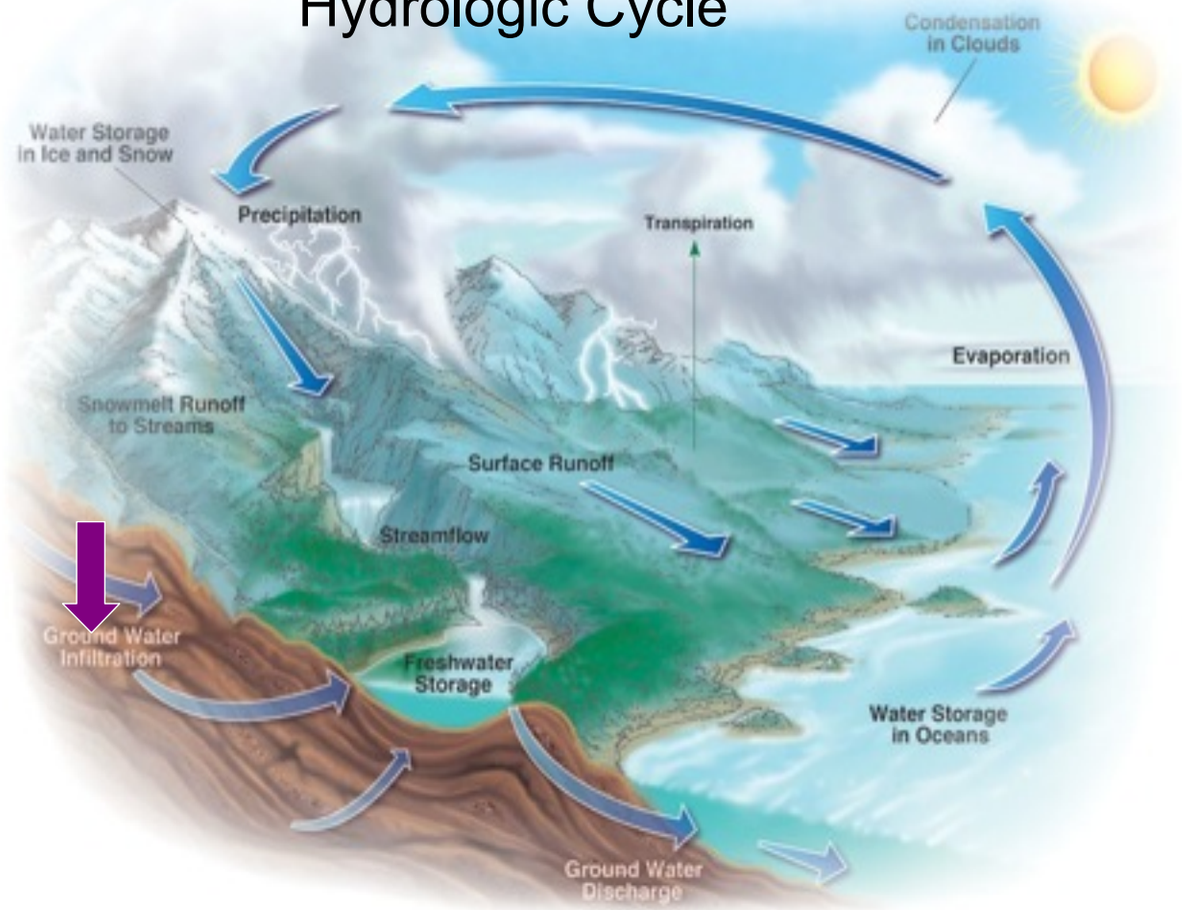
Carol Bitting, our local contact and the real reason that we have been allowed to sample wells and springs on all but one of the landowners we have contacted.

OBJECTIVES

1. To explain the hydrogeology of karst—both in general terms, and specific terms relevant to Big Creek Basin;

2. To provide illustrative examples of case studies that facilitate visualizing complex phenomena of animal production—specifically benefits, risks and costs.

Hydrologic Cycle



INFILTRATION

That part of the hydrologic budget that soaks into the ground and into underlying rocks


Solution
Channel

Photo courtesy of Art Palmer

Photo courtesy of Doug Gouzie

MAJOR KARST GROUND-WATER CONCEPTS

- Water flows from high to low energy
- Flow follows the path of least resistance
- Typically fast
- No attenuation of contaminants

Porosity and Permeability

- Porosity-ability to *store* water
- Permeability- ability to *transmit* water

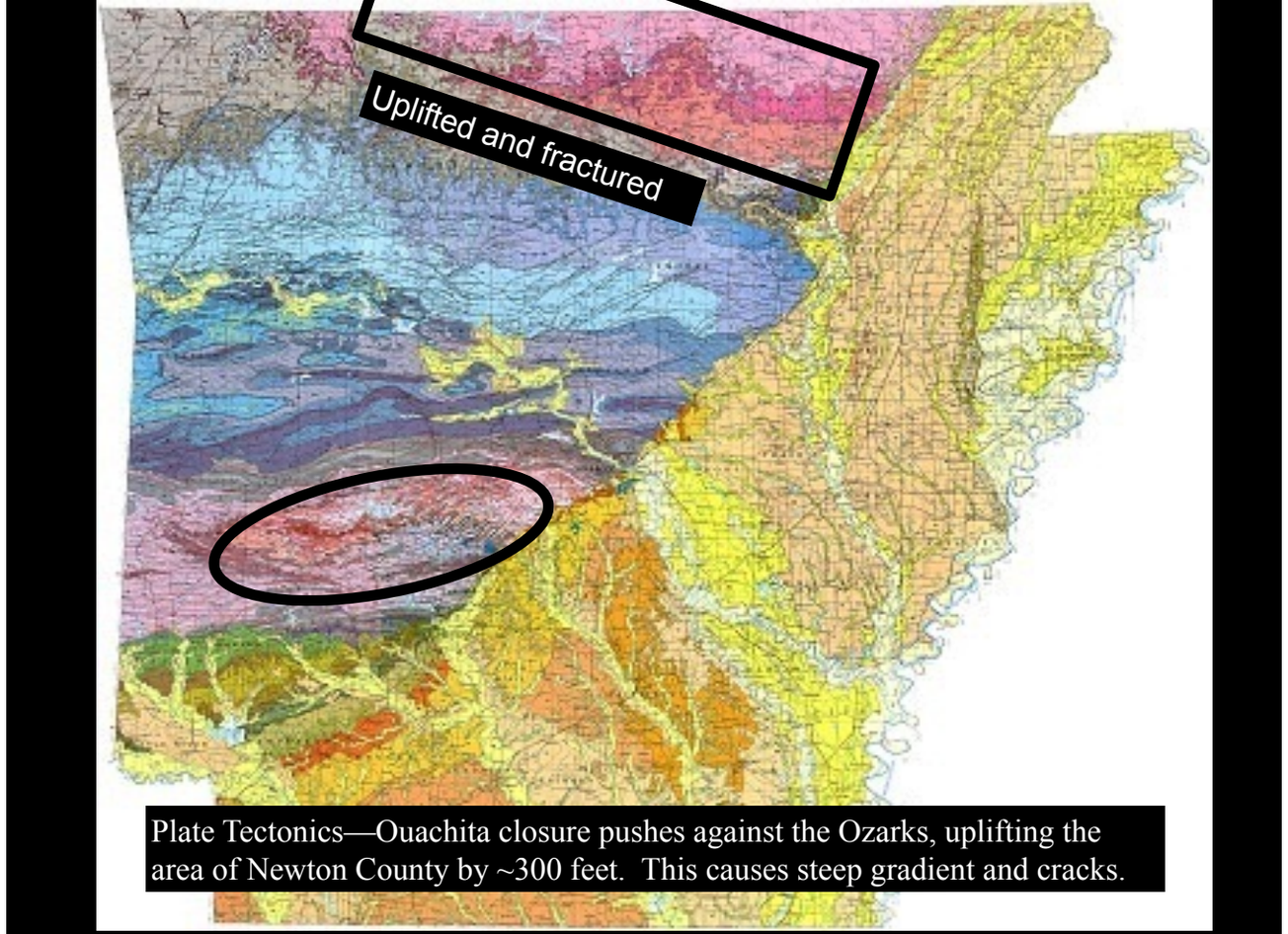
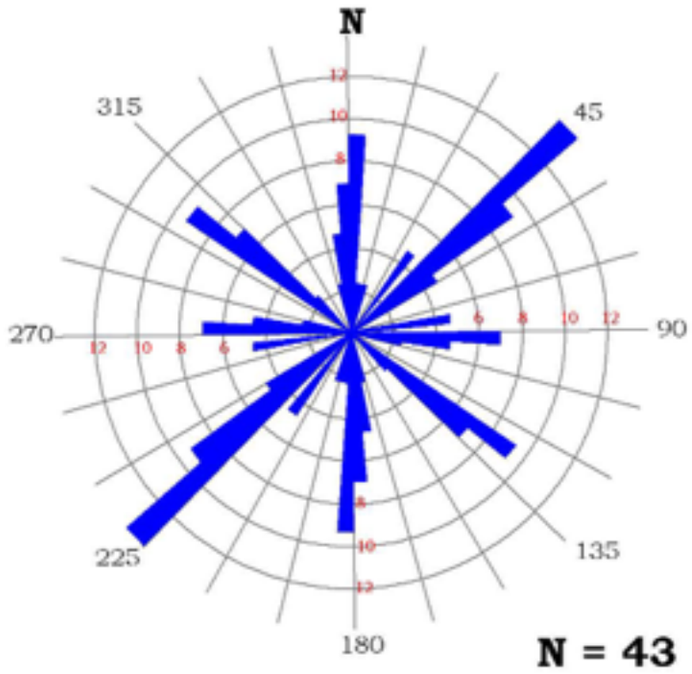


Plate Tectonics—Ouachita closure pushes against the Ozarks, uplifting the area of Newton County by ~300 feet. This causes steep gradient and cracks.

Physical Attributes of Big Creek Basin

- Steep gradient
- Fractured, soluble bedrock
- Well-developed karst
- Very high degree of SW/GW interaction

Joint Frequency



Rose diagram of strike frequency of joints recorded within the Mt. Judea Quadrangle.

Source: Chandler and Ausbrooks, 2003

OBJECTIVES

1. To explain the hydrogeology of karst in Big Creek both in general terms, and specific terms relevant to Big Creek Basin
2. To provide illustrative examples of case studies that facilitate visualizing complex phenomena of industrial animal production—specifically benefits, risks, and costs.

Problems

- Optimum economics requires animal concentration (CAFOs);
- High animal density = lots of waste;
- Typically, CAFO wastes exceed amt. soil can take
- Environmental fears are commonly emotionally based and not necessarily accurate;
- Business decisions commonly based on $, with same fears as environmentalists.

It is very important that we share all our knowledge, and that we communicate respectfully to all stakeholders.

Different Points of View

- ENV—ADEQ granted permit “under the radar”; Hog farm will “hurt perception of BNR”; water quality degraded; public health impared; aesthetics; odors will limit outdoor use;
- Dept. of Agriculture Secretary Tom Vilsack says “meets requirements”;
- FARM BUREAU—Freedom to farm;
- Owners—multigeneration family farm; well-managed; “followed all the rules”
- Me—everything comes at a cost; I love pork; karst hydrogeology is horribly risky at this site.

How is it possible to get justice if we only look at our own point of view?

The Pew Commission on Industrial Farm Animal Production, a project of the private, independent Pew Charitable Trusts, offered this sobering description of CAFOs:

While increasing the speed of production (B1), the intensive confinement production system creates a number of problems. These include contributing to the increase in the pool of antibiotic-resistant bacteria because of the overuse of antibiotics (R1); air-quality problems (C1); the contamination of rivers, streams, and groundwaters with concentrated animal waste (R2); animal welfare problems (R3), mainly as a result of the extremely close quarters in which the animals are housed; and significant shifts in the social structure and economy of many farming regions throughout the country (R4).
- See more at: http://earthdesk.blogs.pace.edu/

The extremely close quarters in which the pigs are confined creates highly concentrated, huge masses of waste. Gas, liquid, and solid from this waste have undesirable properties, and all are easily transportable to the surrounding environment.

Source: CAFO, The Tragedy of Industrial Animal Factories

Photo courtesy of Carol Bitting

Benefits

1. Economics—By concentrating the pigs into a small area, it becomes more cost effective for the factory farm (CAFO) to produce their product [speed the time of getting pigs to market].
2. Consumer prices lower—the cheaper cost of production is partially passed on to us, the consumer.
3. The waste from the pigs is very rich in nutrients (P and N), and is an economically important product (fertilizer).

Photo courtesy of Carol Bitting

Risks

1. contributing to the increase in the pool of antibiotic-resistant bacteria because of the overuse of antibiotics
2. the contamination of rivers, streams, and groundwaters with concentrated animal waste
3. animal welfare problems
4. significant shifts in the social structure and economy of many farming regions throughout the country

Loss of waste from a clay-lined lagoon into karst

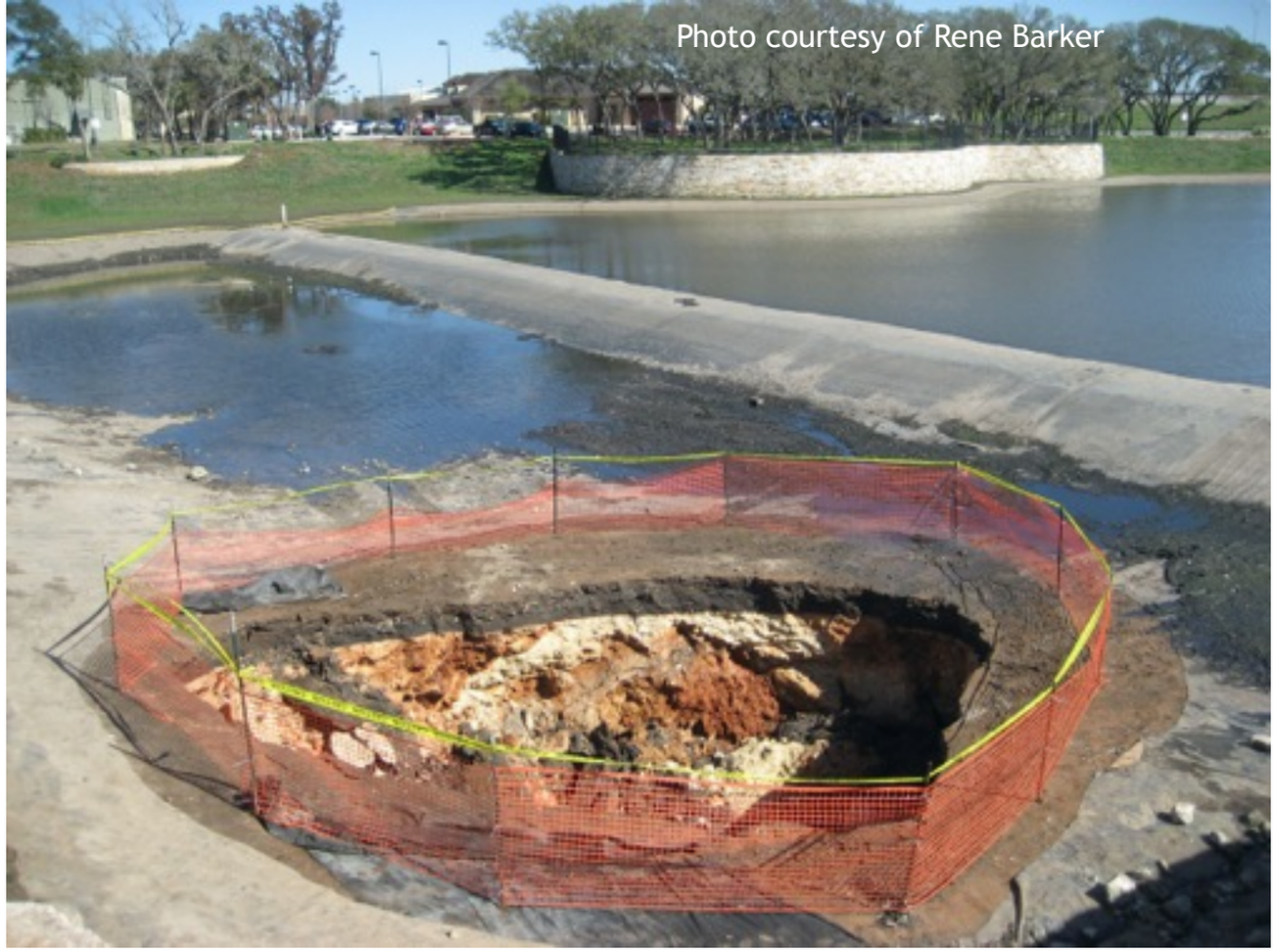
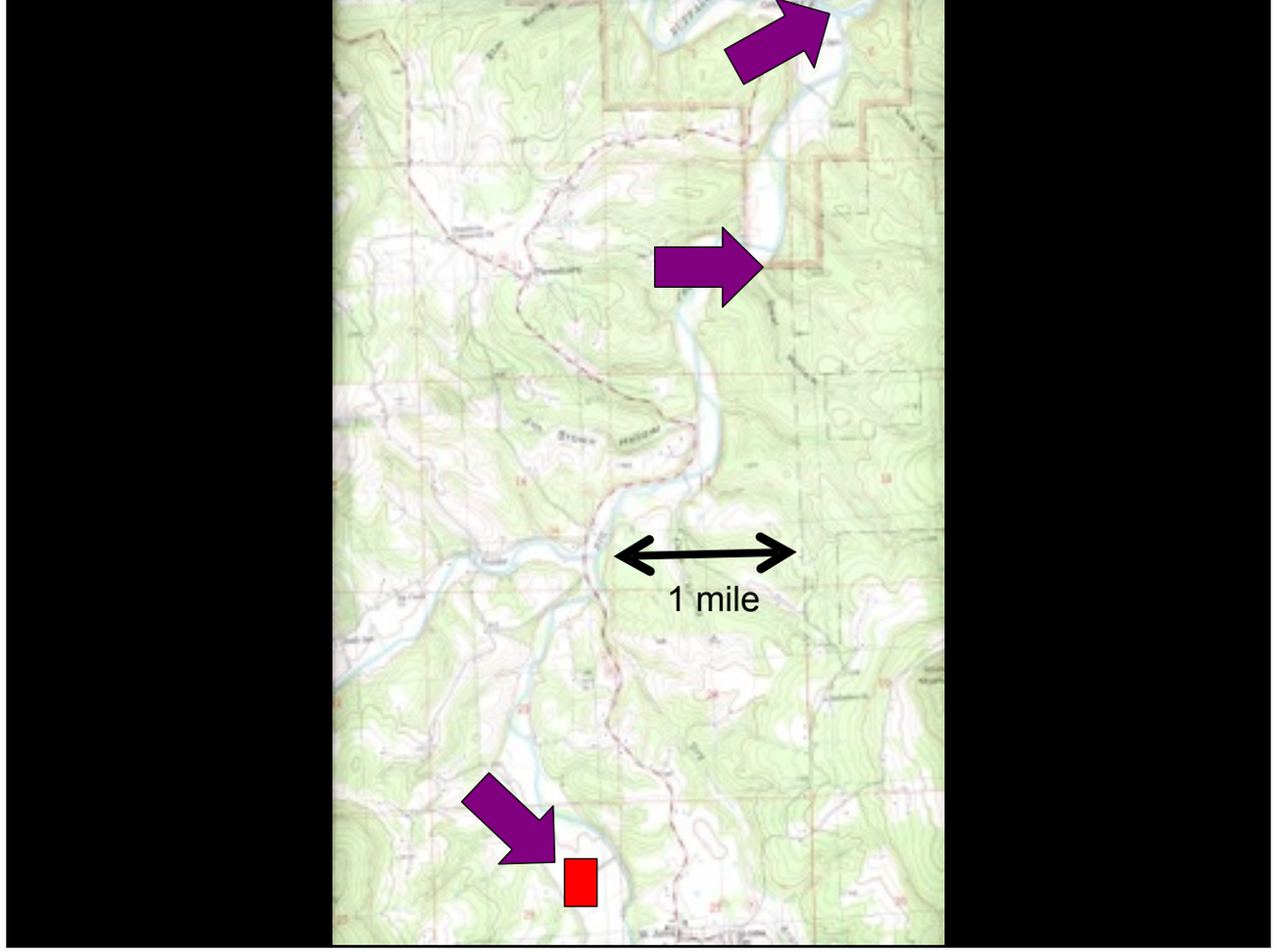
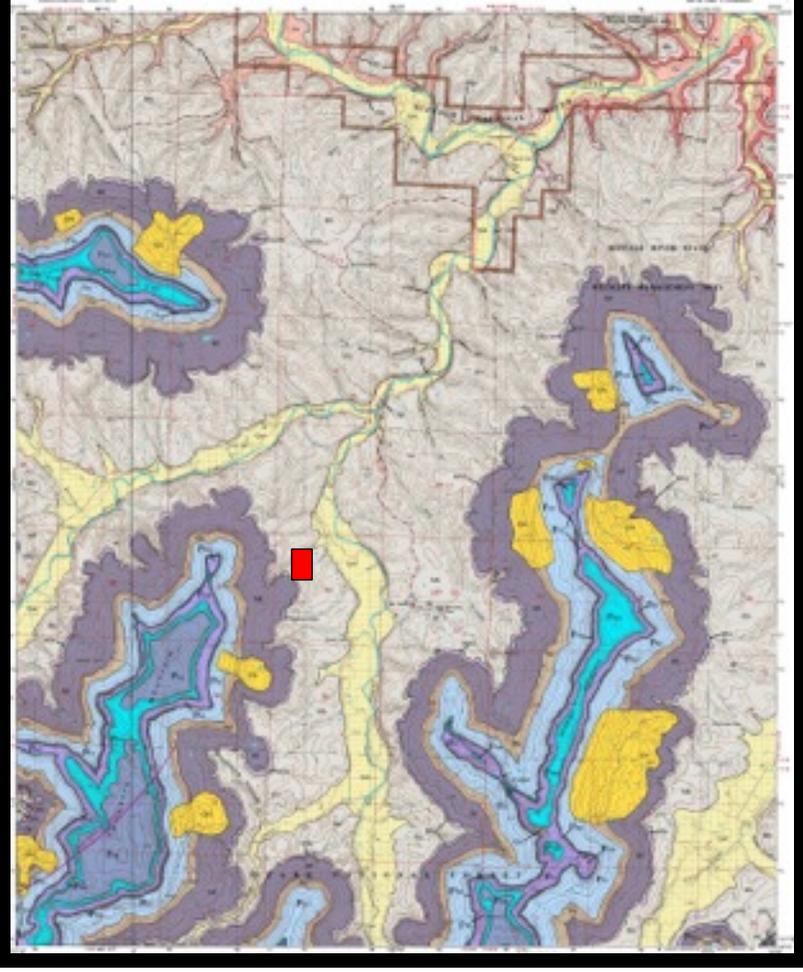
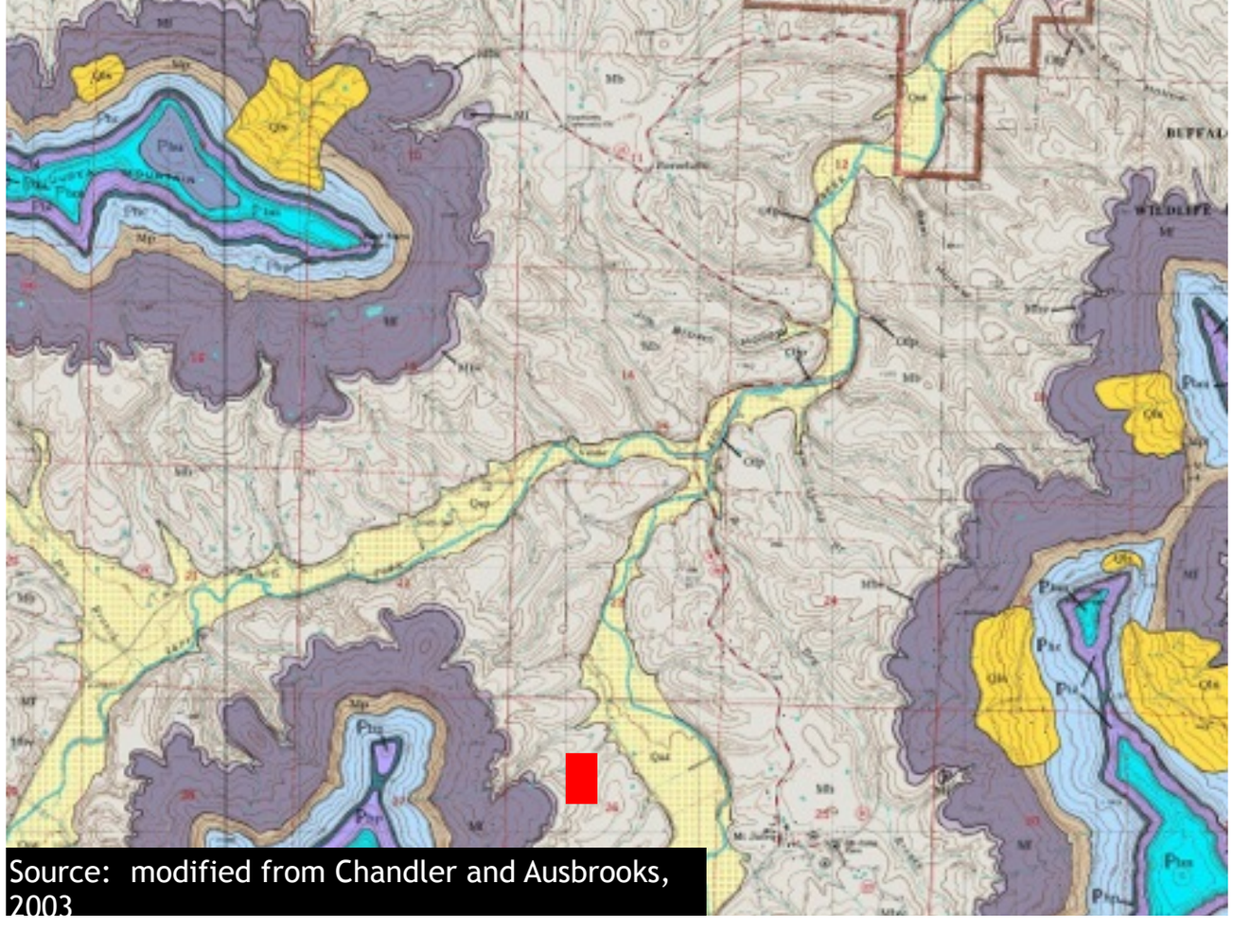


Photo courtesy of Rene Barker


1 mile



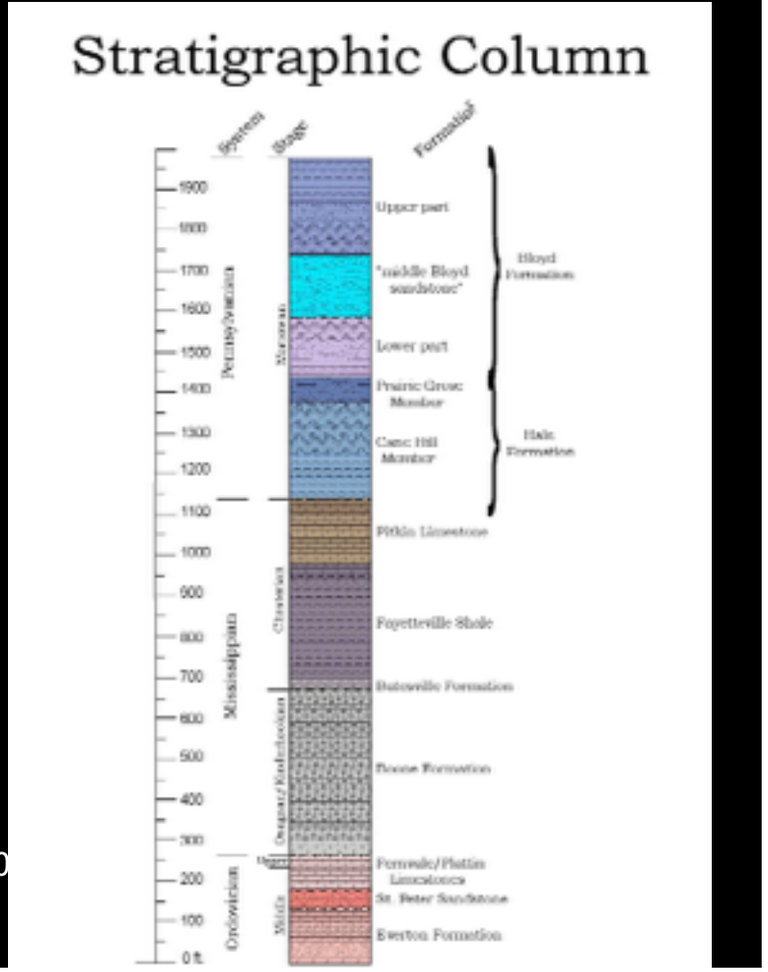
Source: Chandler and Ausbrooks, 2003

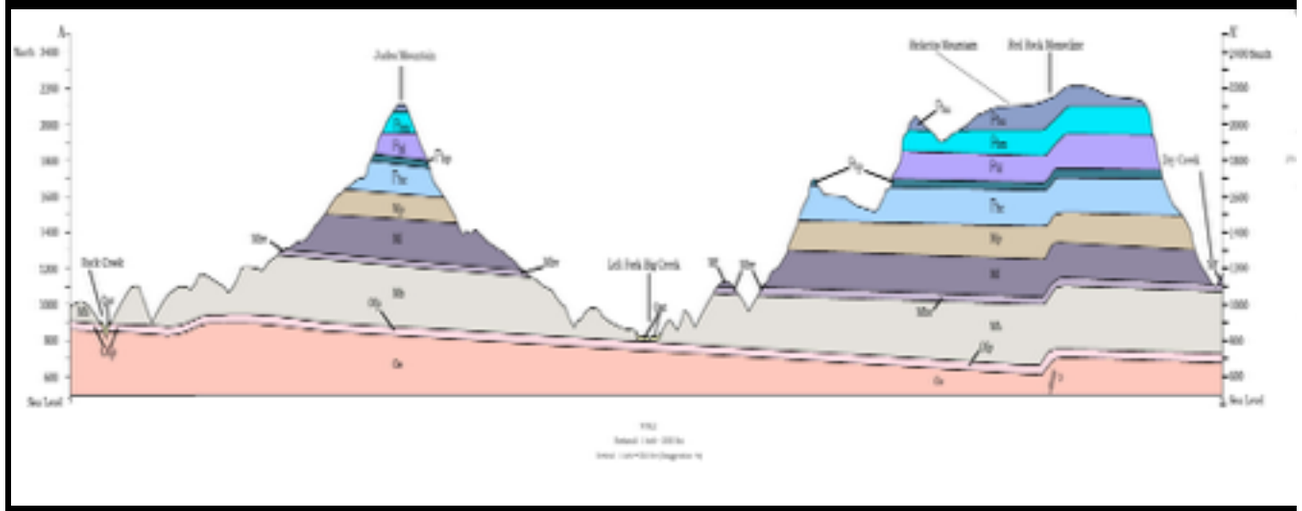


Source: modified from Chandler and Ausbrooks, 2003

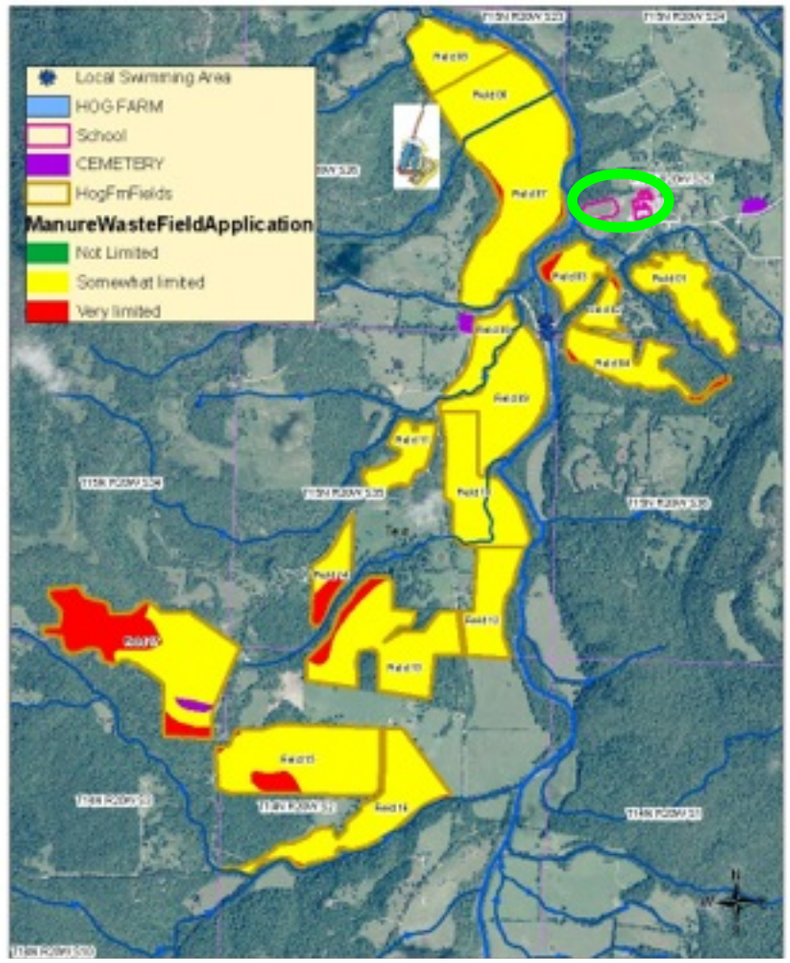
Sedimentary rock layers of Big Creek Basin—nearly flat lyinging, many of which have been eroded away

Source: Chandler and Ausbrooks, 200





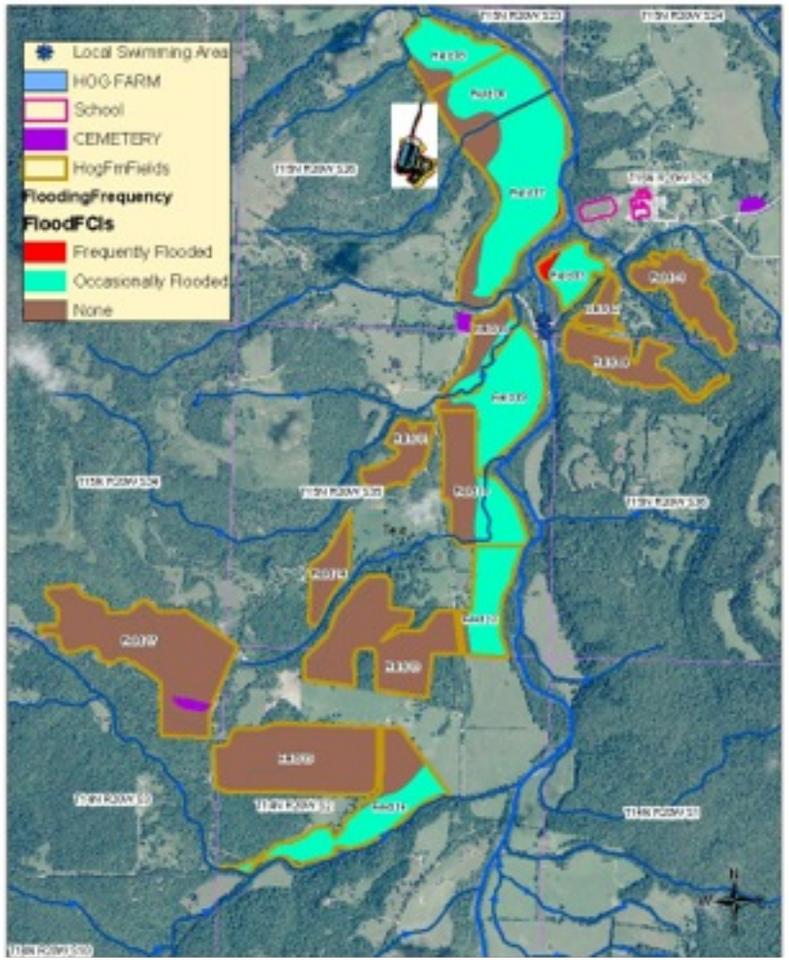
Source: Chandler and Ausbrooks, 2003



Farm Fields Suitability for Hog Farm Manure Application near Mt. Judea

Source: ADEQ and buffaloriveralliance.org

Hog waste being applied to sprayfields near Warsaw, North Carolina. Nutrients, pathogens, heavy metals, and other potentially toxic agents in the waste can make their way into local watersheds, with implications for drinking water and aquatic ecosystems.



Potential for Flooding on Hog Farm Spray Fields

Source: ADEQ and buffaloriveralliance.org

High runoff from an intense summer storm mobilizes sediment

Photo courtesy of Carol

White, evaporative crust (smells like a poultry house) coating dry stream reach. This is indicative of existing impacts on water quality in Big Creek.

More intense, white, evaporative crust (smells like a poultry house) coating dry stream reach. This is indicative of existing impacts on water quality along tributary to Big Creek.

Elm Spring, Newton County near Big Creek

Sampling unnamed nutrient-rich spring covered in duckweed

Photo courtesy of Carol Bittin

Sampling low-discharge, high-microbial spring near area of spray fields

Photo courtesy of Carol Bitting

Spring with large flow along Left Fork of Big Creek

Photo courtesy of Carol Bitting

Sampling drilled and dug wells in Big Spring Basin

Photo courtesy of Carol Bitting

Low-water bridge overtopped by intense summer runoff

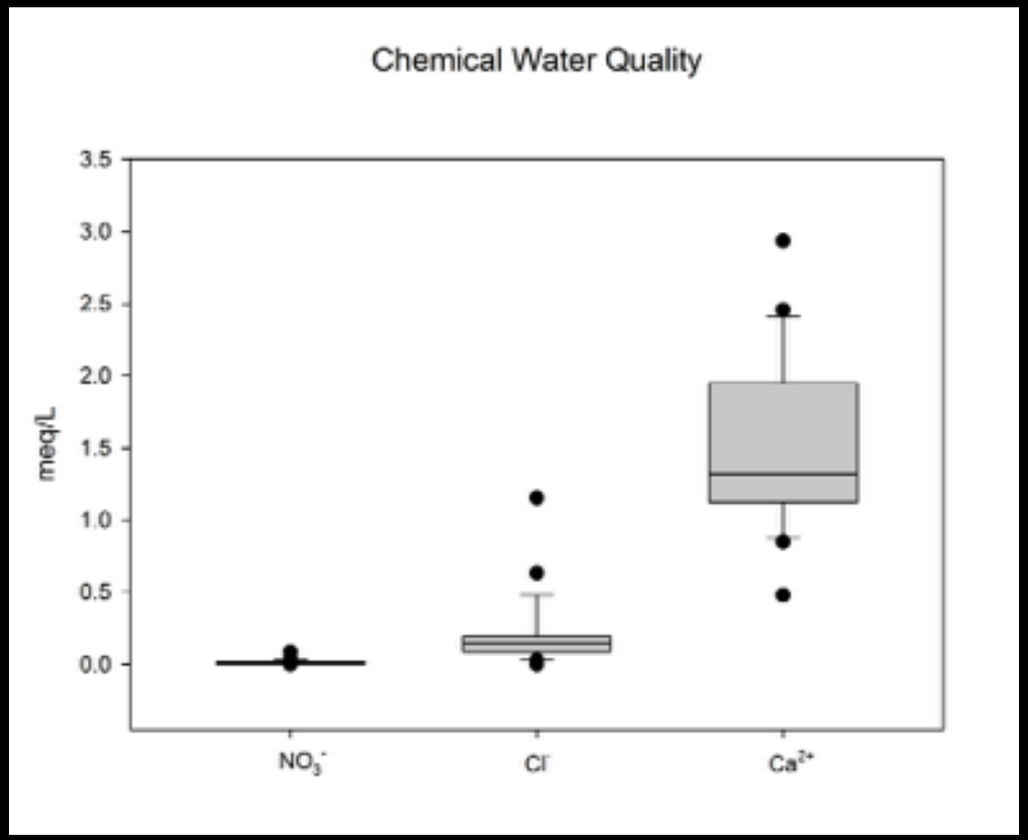
Sampling and filtering in the field

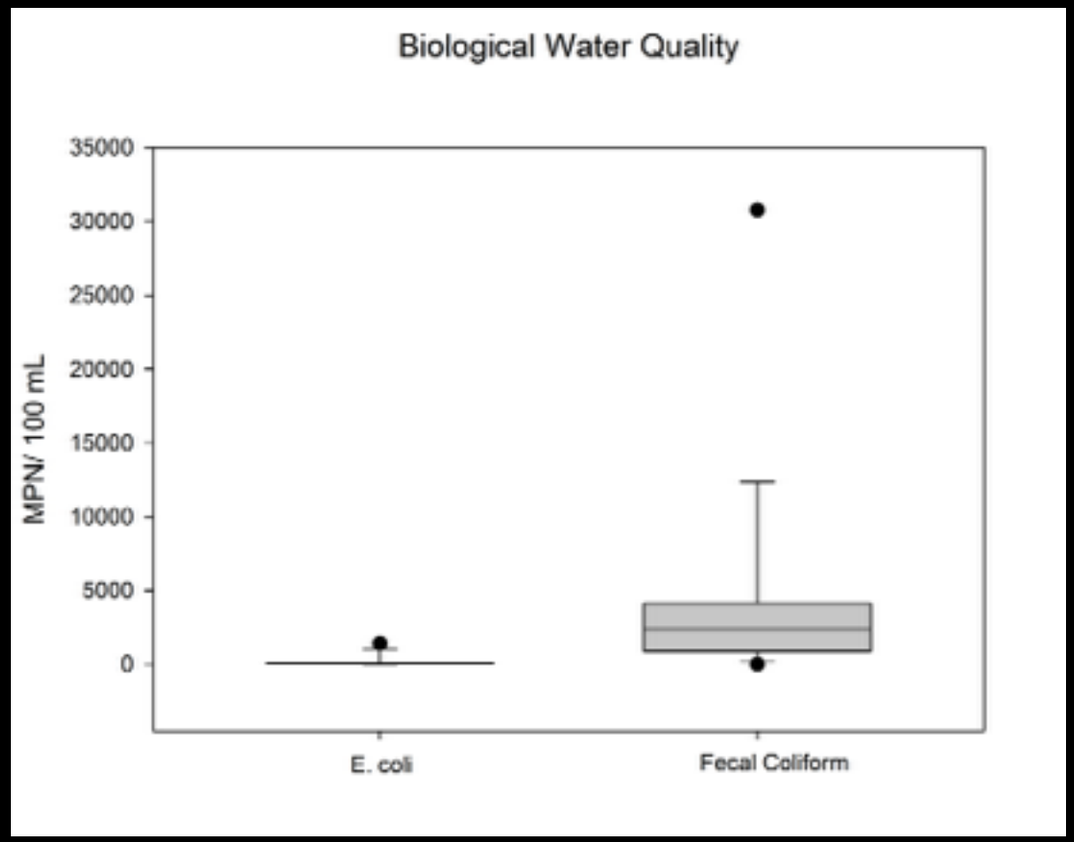
Student volunteers measuring and recording field data

Photo courtesy of Carol Bittin

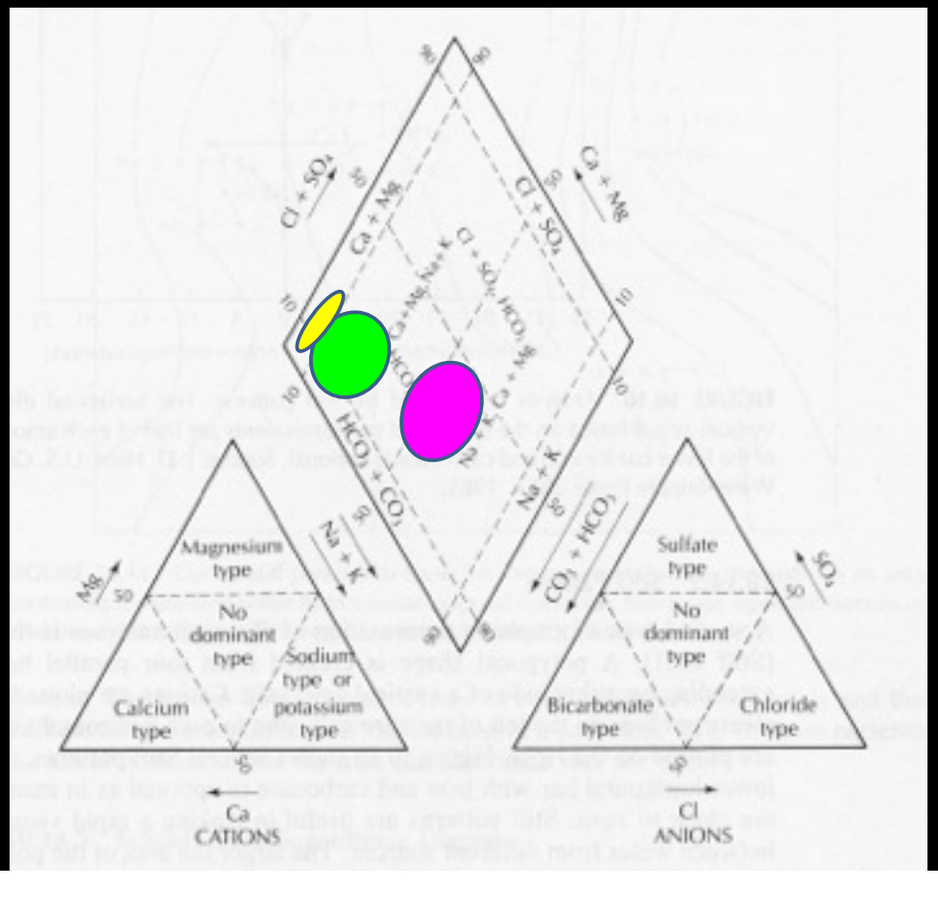
Analyzing samples at Ouachita Baptist University state-approved lab

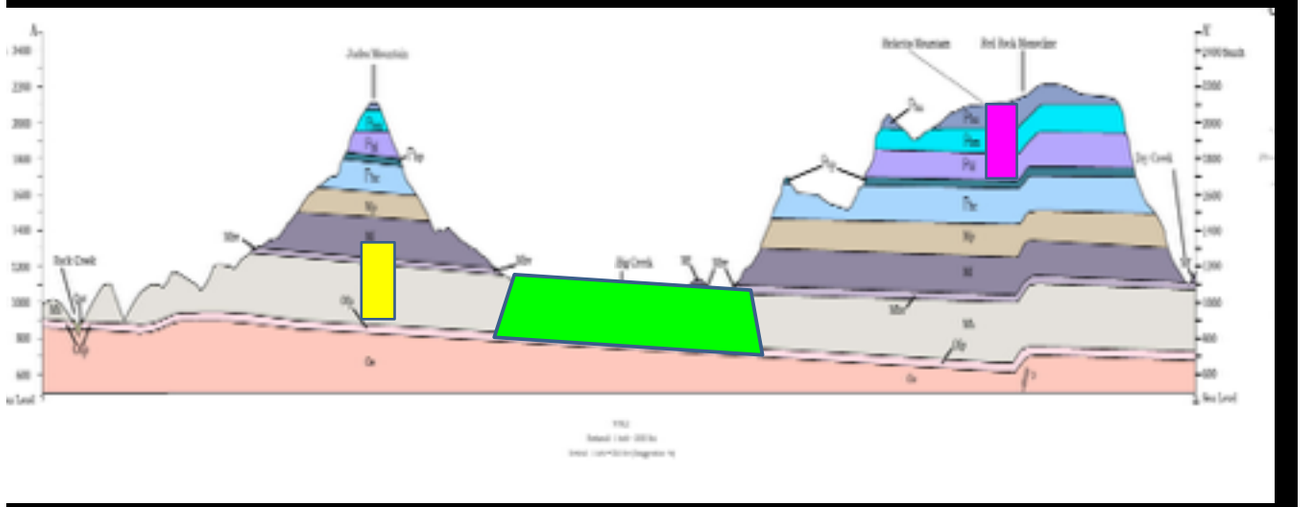
Photo courtesy of Joe Nix


Chemical Water Quality
meq/L
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
NO3-
Cl-
Ca2+

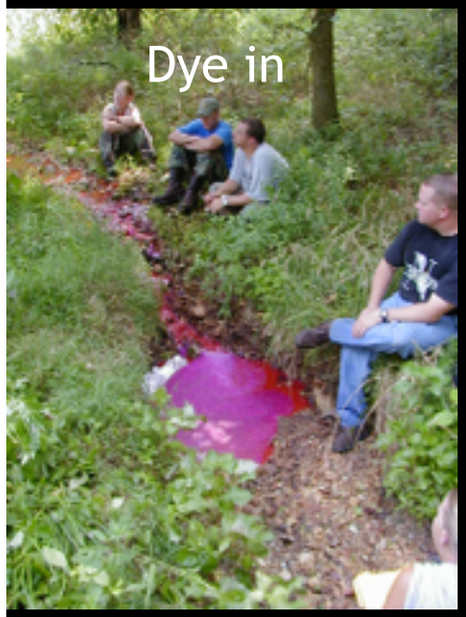

Biological Water Quality
35000
30000
25000
20000
15000
10000
5000
0
MPN/ 100 mL
E. coli
Fecal Coliform

Piper Diagram





Source: Chandler and Ausbrooks, 2003

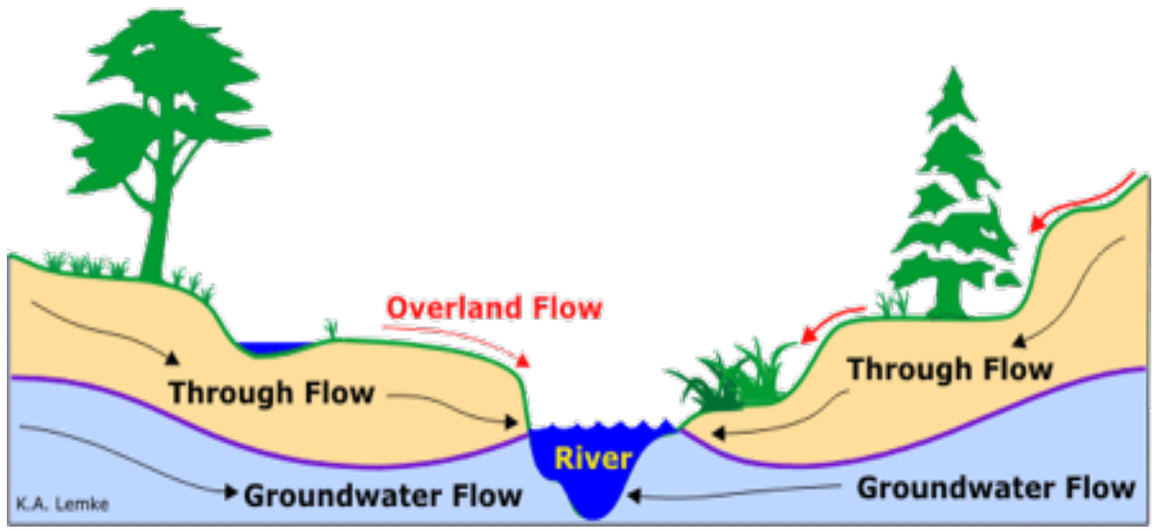

Dye in


Dye out

Costs

1. Air pollution (odor) is already noticeable Yes-gagging
2. the contamination of rivers, streams, and groundwaters with concentrated animal waste— Currently unanswered, but very likely b/c karst
3. animal welfare problems ? Not addressed
4. significant shifts in the social structure and economy of Big Creek Basin Currently unanswered, but tourism very likely to be because of public perception. Farming ?, although elsewhere factory farms dominate
5. Economics for clean-up is huge, seldom borne by Co

Groundwater and surface water
are closely interconnected.
Everybody lives downstream!



Summary

- Big Creek water is continually recycling;
- Water flow is dynamic, and it reacts with rocks through which it flows, and transports;
- These waters are part of an interrelated resource, and numerous family farmers and the BNR are downstream from the factory farm;
- Underground flow is not easy to observe, but it is always there.
- Clean-up costs are huge, & time takes decades

It is very important that we share all our knowledge, and that we communicate candidly, openly, yet respectfully to all stakeholders.