

**KEY POINTS SUPPORTING**  
**A PERMANENT MORATORIUM ON HOG CAFOs**  
**IN THE BUFFALO NATIONAL RIVER WATERSHED**

**Evidence Summary**

The Big Creek Research Extension Team's (BCRET) final report show that there is documented water quality impact from one hog concentrated feeding operation (CAFO) in the Buffalo River Watershed after only 5 years of operation. Statements from BCRET report, the data of BCRET study and the conclusions of the expert panel of the BCRET report advise both impact and the potential for impact, thus supporting the need for a permanent moratorium on swine CAFOs in the Buffalo National River watershed.

- **Application of hog waste onto Buffalo River watershed fields has resulted in phosphorous overloading.** (See p. 6 explaining consequences of Legacy Phosphorus and page 2 for graphs from BCRET. )

**BCRET:** "Future additions of any nutrients (i.e., as mineral fertilizer, swine slurry, or poultry litter) to fields, which received slurry from C&H Farms, should be carefully managed, so as not to lead further increases in soil test P . {1}

- **BCRET graphs show :Significant increase in nitrates and phosphorous downstream from C&H BCRET “{2}**
- **Karst geology in the watershed leads to significantly increased radius of contamination transport**

**BCRET:** "The Big Creek Watershed below the C&H Farm and application field locations, lie within a karst hydrologic system of great complexity exhibiting intimate connection of surface-water and groundwater regimes. These characteristics endow the hydrologic system as an important recreational resource locally and regionally, but also render the system vulnerable to contamination." {3}

- **Impaired status of Buffalo River and Big Creek**

Using BCRET and other water sample data, 19 miles of Big Creek and 14 miles of the Buffalo, at the confluence of Big Creek, were declared 303(d) impaired in 2018. {4}

**If only one swine concentrated feeding operation can, after only 5 years of operation, contribute to declining water quality in the Buffalo River watershed what would many or several do? Please support a moratorium of medium and large swine concentrated feeding operations in the Buffalo National River’s watershed.**

## FURTHER POINTS

- More on : Nitrates and Phosphorous

BCRET acknowledges statistically significant changes in nitrates and phosphorus downstream from C&H:

*“Phosphorus and N concentrations in Big Creek were greater downstream than upstream of the C&H Farm. For example, the 5-year mean nitrate-N concentration was 0.13 mg/L at the upstream site and 0.29 mg/L at the downstream site.”*

BCRET illustrates the downstream increase in nitrate very clearly with this graphic in Chapter 7:

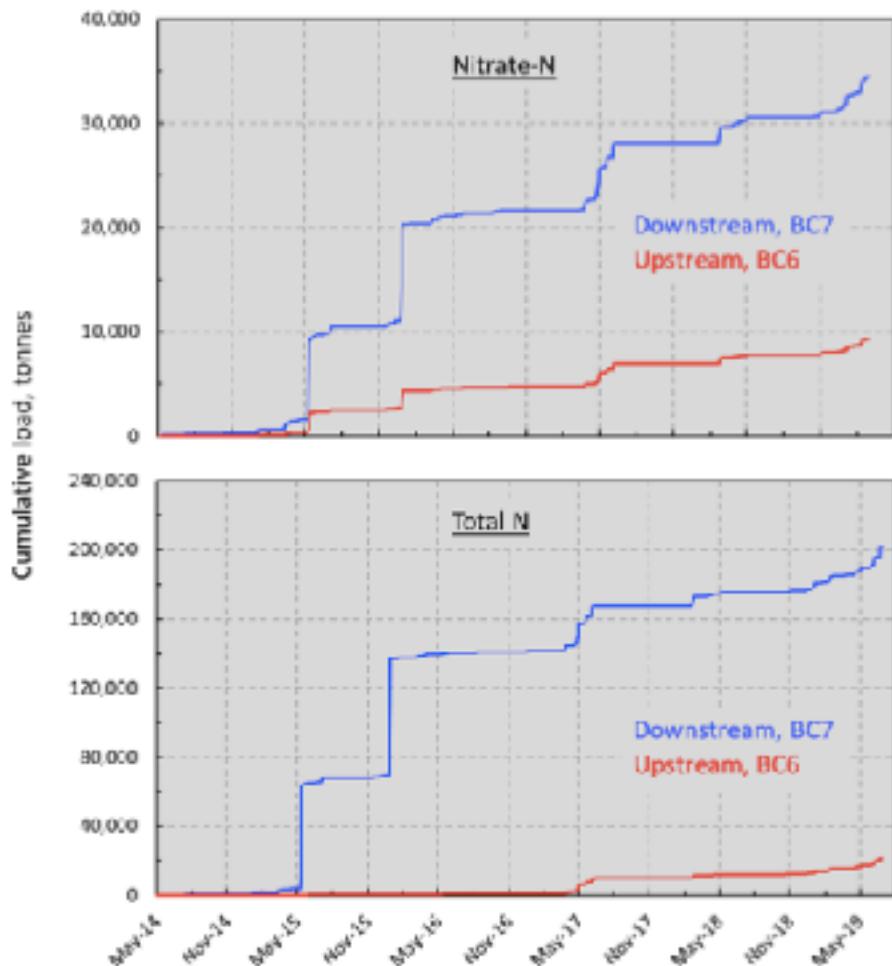


Figure 5.11. Cumulative nitrate-N and total N load up (BC6) and downstream (BC7) of the C&H Farm on Big Creek with extreme May and December 2015 storms included.

BCRET illustrates the downstream increase in phosphorus very clearly with this graphic in Chapter 7:

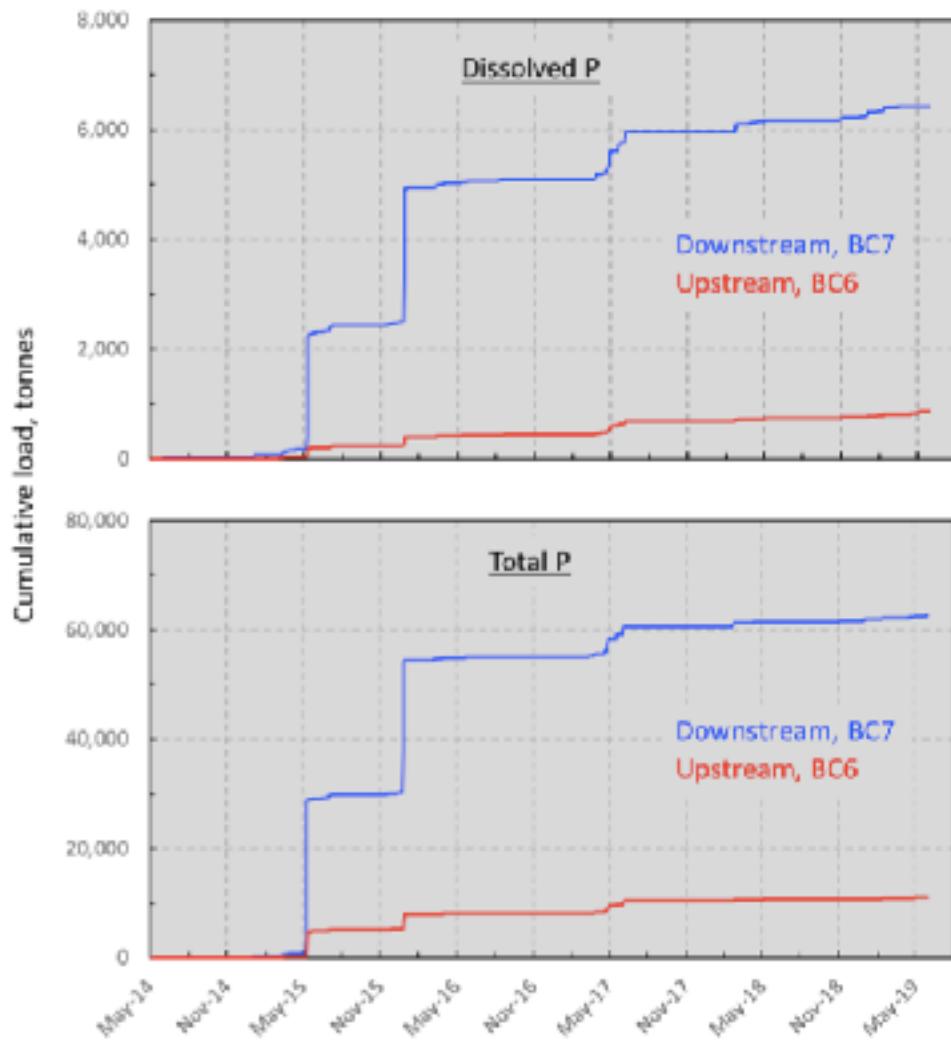


Figure S 10. Cumulative dissolved and total P load up (BC6) and downstream (BC7) of the C&H Farm on Big Creek with extreme May and December 2015 storms included.

- **Impact at sites adjacent to production facility and holding ponds**

BCRET acknowledges that measurements in house well suggest contamination.

*“There was a statistically significant (probability <0.0001) increase in nitrate-N concentrations in well samples ... over the monitoring period (April 2014 to June 2019) ...”*

BCRET acknowledges that measurements in ephemeral stream suggest contamination.

*“There was a statistically significant (probability <0.0001) increase in nitrate-N concentrations in ephemeral stream ... over the monitoring period (April 2014 to June 2019) ...”*

- **Clay holding pond leakage - Engineering estimates**

Construction of clay ponds assume leakage. The original engineer (Nathan Pesta) conducted tests and calculations to estimate the leakage.

*Pond 1 calculated seepage rate per acre: 3448 x .4788 acres = 1651 gallons leaked per day*

*Pond 2 calculated seepage rate per acre: 4060 x .8095 acres = 3286 gallons leaked per day*

*Total seepage for 1.288 acres = 4,938 gallons per day.*

- **Runoff**

BCRET acknowledges runoff risk of P and N but notes that without baseline information increases during the study cannot be known.

*“Grazing, slurry, and fertilizer management of Fields 1, 5a, and 12 over the 5 years of monitoring, may have resulted in an increase in the potential loss of P and N to Big Creek.”*

- **Storm Events and runoff**

BCRET notes that over 5 years, C&H experienced two major flooding events with significant run-off

*“During these storm events for instance, the monitored application fields BC5a and BC12 were mostly flooded as Big Creek breached its banks. Thus, the effectiveness of conservation practices such as buffer strips or no-application zones for slurry would have little impact on the conservation of nutrients or limiting their movement to Big Creek, under such extreme flow events.”*

- **Thin soils present subsurface contamination risk**

BCRET tested three fields noting soil depths. Two fields had severe limitations (20' or less in depth) due to thin soils per USDA guidance and the third had moderate limitations (40' or less). All fields underlain with epikarst.

- **More on: Karst significantly increases radius of contamination transport**

BCRET acknowledges the entire area is underlain by karst:

*“The Big Creek Watershed below the C&H Farm and application field locations, lie within a karst hydrologic system of great complexity exhibiting intimate connection of surface-water and groundwater regimes. These characteristics endow the hydrologic system as an important recreational resource locally and regionally, but also render the system vulnerable to contamination.*

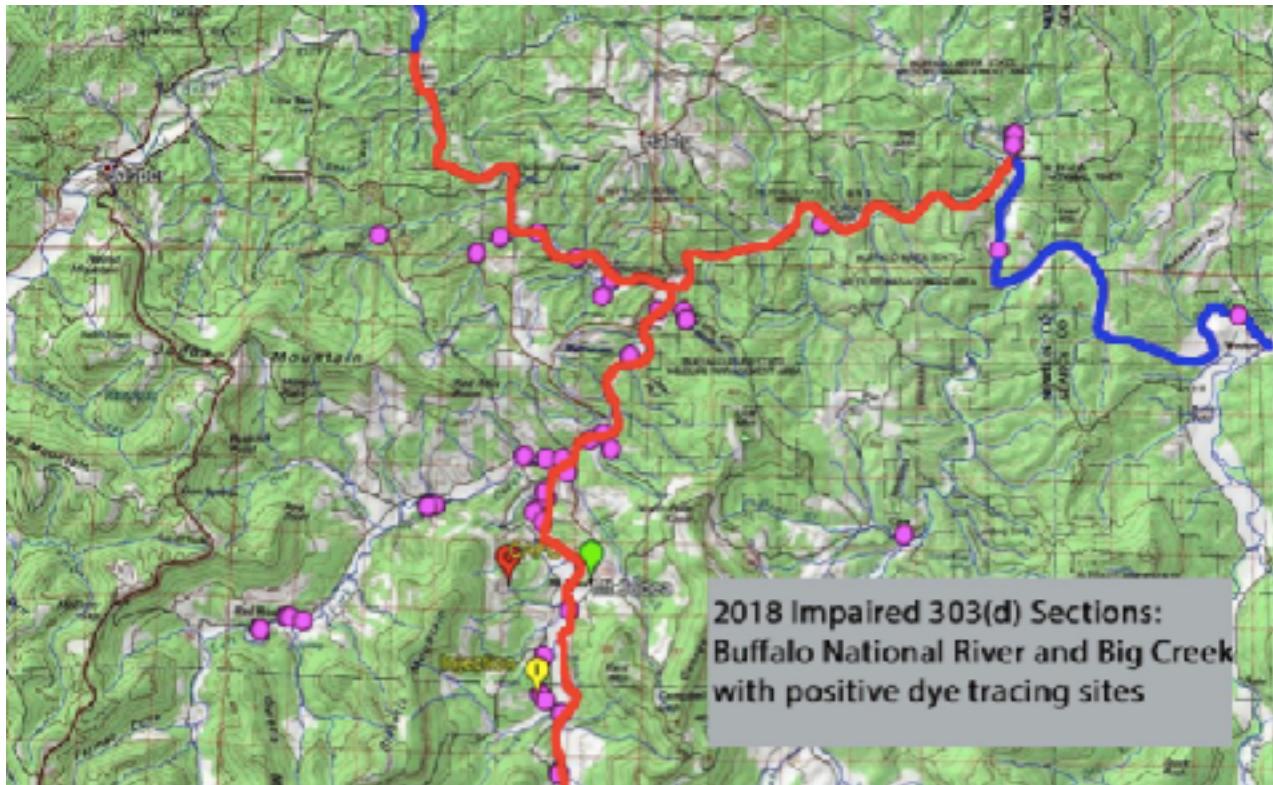
BCRET references work by Kosić demonstrating complexity of karst.

*“The dye-trace studies of Kosić (2019) and Kosić et al. (2015) demonstrate the high velocity with which groundwater flows can occur in the Boone karst setting of Big Creek Watershed (Table 1 and Figures 4, 5, and 6). It was evident from the eosin-dye injection that subsurface flows traversed surface drainage basins, with detects from the field adjacent to BC12 occurring in Left Fork sub watershed (Figure 6). The overall conclusions of the dye-*

*trace studies of Kosić (2019) demonstrate the complexity of subsurface flows in the karst system in this area of the Boone formation.* Dr. Van Brahana produced a peer reviewed report (in press 2017) entitled: “Utilizing Fluorescent Dyes to Identify Meaningful Water-Quality Sampling Locations and Enhance Understanding of Groundwater Flow Near a Hog CAFO on Mantled Karst—Buffalo National River, Southern Ozarks”. Dr.

**Shown below:**

**Buffalo River segments and Big Creek, impaired streams on 303d list, correlate with the dye trace conducted by Dr. Van Brahana** Dye injected at Mt Judea, in close vicinity to the C&H spreading fields, makes its way into the Buffalo, not just at the mouth of Big Creek, but a considerable distance both upstream and downstream as well. This shows the possibility that a single waste source of a large size in a karst location, such as C&H Hog Farms, could very well impair waters throughout the impacted area.



## Q/A

### What is BCRET?

On September 5, 2013, in a Memorandum of Agreement (MOA) between the University of Arkansas and ADEQ, the University agreed to “Undertake and complete a study of the potential for water quality impacts within the Buffalo River watershed from animal wastes produced by the permitted CAFO, C&H Hog Farm and its operations within the watershed.” The University formed the **Big Creek Research Team (BCRT)**, which later became the **Big Creek Research and Extension Team (BCRET)** to implement Governor Bebee’s mandate.

The project ran for five years and was funded by the Arkansas Legislature.

### What is Legacy Phosphorous ?

Legacy Phosphorus is the phenomenon whereby excess phosphorus is stored in the soil profile and is released to waterbodies, including groundwater, slowly over long periods of time.

Since 2013, raw swine sewage has been stored in two waste ponds, with 2.5 million gallons of it spread each year onto fields in the Buffalo National River watershed. Fields have received far more nutrients than the vegetation could possibly use, and the soil has become heavily saturated with stored phosphorous. After the CAFO is closed and the spraying stops, this “legacy phosphorous” will continue to leach into the underlying karst. It contaminates groundwater and comes back to the surface in seeps and springs that feed Big Creek and the Buffalo River. Too much phosphorous causes algae blooms. The dye trace study cited in the BCRET Final Report shows how far and how quickly water can travel underground. Cleaning up what is left behind will take many years and require persistence and monitoring.

In a 2013 article co-authored by the principle investigator of BCRET, Andrew Sharpley the seriousness of legacy phosphorous is stated:

“... we face unprecedented challenges in meeting water quality targets, given that P legacies from past land management may continue to impair future water quality, over time scales of decades, and perhaps longer.” {5}

## REFERENCES

1. *BCRET Final Report, October 24, 2019 Executive Summary pp. 6 & 7. C&H 2018 Hog Farm Annual Report..*
2. *BCRET Final Report, October 24, 2019. Chapter 7, pp. 30-31.*
3. BCRET Final Report, October 24, 2019, Chapter 2, p.2
4. *Arkansas's Final/ Draft Impaired Waterbodies – 303(d) list, 2018.*
5. *Water Quality Remediation Faces Unprecedented Challenges from “Legacy Phosphorus”, Helen P. Jarvie, Andrew N. Sharpley, Bryan Spears, Anthony R. Buda, Linda May, Peter J. A. Kleinman, Environmental Science & Technology 2013, 47, 16, 8997-8998(Viewpoint)Publication Date (Web):August 9, 2013*

