

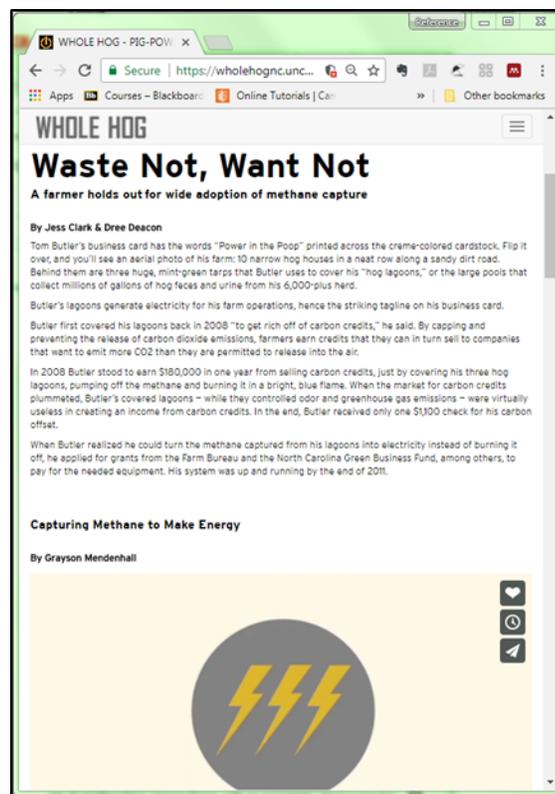
TITLE Waste Not, Want Not; Capturing Methane to Make Energy

FORMAT Web Articles

PUB. DATE 2015

ABSTRACT / KEY DETAILS

This article details the process of converting hog waste into energy by breaking down bacteria in hog waste to create biogas. This fuel is burned to create electricity to power the hog farm, with surplus electricity being sold back to local electric companies. If all hog farms in NC did this, it could power 24,000 homes; however, many farmers are reluctant to convert their farms to this new technology. Conversion to the new technology can be costly to build and maintain, even with the availability of grants. The article also considers how farmer culture can factor into decisions about waste-to-energy systems. Many NC hog growers are ideologically conservative and may be unwilling to apply for government grants. Mike Williams, Director of the Animal and Poultry Waste Management Center at NCSU, explains: "I have had producers tell me, 'If I'm participating in a project that is incentivized by the government at all, that's a hard thing for me to discuss with my family around my dinner table'". Some farmers also fear change in the hog industry that could lead to new growth; currently, the limited supply makes hog farming permits extremely valuable, giving farmers the agency to ask for higher prices if they chose to sell.



AUTHOR CREDENTIALS

Jess Clark is a journalist and master's student at the School of Journalism and Mass Communication at UNC Chapel Hill; Dree Deacon is a rising senior in the UNC School of Journalism and Mass Communication pursuing a BA in Business Journalism with a minor in Social and Economic Justice. The work they did was part of the Whole Hog project, which "aims to shed light on the energy dynamics within the hog industry in North Carolina," exploring the "complex set of relationships among those with an economic, environmental, cultural and political stake in the industry." ("About," Whole Hog)

HOW DID WE FIND IT?

We found this article by doing a Google search for [[hog farm industry north Carolina](#)], where we discovered the Whole Hog webpages, which provide investigative journalism considering multiple aspects of the NC hog farming industry.

CITATION

Clark, Jess and Dree Deacon. "Waste Not, Want Not." *Whole Hog*, 2015, wholehognc.unc.edu/energy.html.

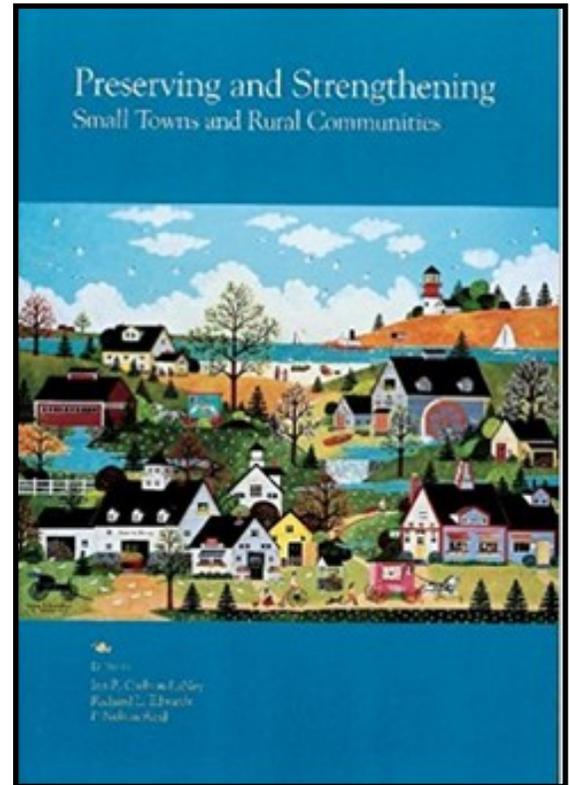
TITLE Preserving and Strengthening Small Towns and Rural Communities

FORMAT Book

PUB. DATE 1999

ABSTRACT / KEY DETAILS

This book defines the specific needs of the small town and rural populations of the United States and Canada from the familial, societal, economic, agency, and empowerment perspectives. It recognizes the diverse range of cultural and ethnic groups, including African Americans, American Indians, and Canadian First Nations People. Addresses the traditional way of life found in rural communities and offers approaches to enhance it. Assembles the research and experiences of leading practitioners in the rural environment. Chapter 5, titled "Squeals and deals : the impact of corporate hog farming on rural communities" deals specifically with hog farming and rural communities.



AUTHOR CREDENTIALS

The authors of this book are, Iris B. Carlton-Laney, Richard L. Edwards , and P. Nelson Reid. Iris Carlton-LaNey currently works at the School of Social Work, University of North Carolina at Chapel Hill. Iris does research in Developmental Psychology, Health Psychology and Clinical Psychology

HOW DID WE FIND IT?

From library homepage (library.campbell.edu) we clicked on the Books & Media tab and did a keyword search for ["hog farming" AND rural]

CITATION

Carlton-LaNey, Iris, Edwards, Richard L. (Vice President for Academic Affairs), and P. N. Reid. *Preserving and Strengthening Small Towns and Rural Communities*. NASW Press, Washington, D.C, 1999.

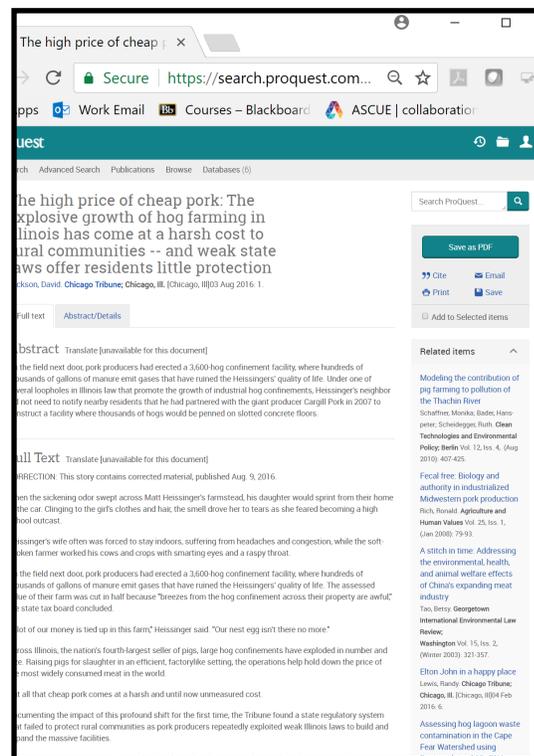
TITLE The high price of cheap pork: The explosive growth of hog farming in Illinois has come at a harsh cost to rural communities -- and weak state laws offer residents little protection.

FORMAT Newspaper article

PUB. DATE 2016

ABSTRACT / KEY DETAILS

On the field next door, pork producers had erected a 3,600-hog confinement facility, where hundreds of thousands of gallons of manure emit gases that have ruined the Heissingers' quality of life. Under one of several loopholes in Illinois law that promote the growth of industrial hog confinements, Heissingers' neighbor did not need to notify nearby residents that he had partnered with the giant producer Cargill Pork in 2007 to construct a facility where thousands of hogs would be penned on slotted concrete floors.



AUTHOR CREDENTIALS

David Jackson has been a Chicago Tribune investigative reporter since 1991, except for a year at The Washington Post, where he shared the 1999 Pulitzer Prize for public service for articles about citizens shot by police. At the Tribune, he was a Pulitzer finalist 4 times.

HOW DID WE FIND IT?

From library homepage (library.campbell.edu) we searched OneSearch using the search string ["hog farming" AND water]. From the results screen, we used the filters and chose newspaper as Content Type and chose the last 3 years as our date range.

CITATION

Jackson, David. "The High Price of Cheap Pork." *Chicago Tribune*, Aug 03, 2016, pp. 1, *eLibrary; ProQuest Central*, <http://proxy.campbell.edu/login?url=https://search.proquest.com/docview/1808328155?accountid=9858>.

TITLE Hog & Pig Farming in the US

FORMAT Industry Report

PUB. DATE 2017

ABSTRACT / KEY DETAILS

There has been a dramatic shift from small-scale production toward vertically integrated factory farms or large, single-phase specialized farms. The number of hog farms has declined by more than 70% over the past 15 years. A USDA report states, "Once dominated by small operations that practiced crop and hog farming, the industry has become increasingly concentrated among large operations that produce hogs on several different sites. Further, large operations that specialize in a single phase of production have replaced farrow-to-finish operations that performed all phases of production." Farms with over 5,000 pigs are expected to account for over 88.0% of industry revenue in 2017. IBISWorld forecasts industry concentration to continue through 2022.

Major producers compete on a vastly different basis than independent farmers. Major producers are involved in all points of the production chain, from feed production to farming, processing and retailing. *Independent farmers compete largely on price.* Farmers that become contractors also compete in the proximity of their farms to the major processor they contract with.

It is getting harder to start a small hog farm, or remain independent. Major barriers to entry include: 1) Regulations governing the industry, 2) the ...



... purchase costs of capital equipment and feed, and 3) *the difficulty in securing contracts with downstream processors.* Additionally, the industry has experienced a rise in globalization. Smithfield Foods Inc., was recently acquired by China-based WH Group. The deal, estimated at \$4.7 billion, is *one of the largest Chinese takeovers of a US company.*

Complying with regulations and ordinances currently favor the major producers. The industry is regulated by all levels of government: Environmental Protection Agency (EPA) regulations include water-pollution regulations set out under the 1972 Clean Water Act. *Enforcement of EPA regulations varies among states, and many states only pursue enforcement following citizen complaints.* In most states, the board of health grants piggery permits. For start-up hog farms, county zoning policies also impact location decisions.

Small hog farmers may benefit from American customers pushing back. Animal welfare is increasingly gaining importance for large and independent producers. ... It has also opened the market for smaller farmers to compete with larger operators on the grounds of animal welfare [also non GMO, and no additives]. For example, some smaller producers have turned to organic production ...

AUTHOR CREDENTIALS

Jack Curran is an IBISWorld analyst. He aggregates data from publicly available sources which he supplements with calls on industry contacts and non-public sources, in-house data and economic modeling, and the his knowledge of industry. IBISWorld reports are collected by many university and corporate libraries.

HOW DID WE FIND IT?

From the library homepage (library.campbell.edu) we did a "Databases" search for [[IBISWorld](#)]. On the IBISWorld homepage, we searched for ["[hog farm](#)"] in the IBISWorld search box.

CITATION

Curran, Jack. Hog & Pig Farming in the US. IBISWorld, Feb., 2017. <http://proxy.campbell.edu/login?url=http://www.ibisworld.com>

TITLE Student engagement with local water and watersheds

FORMAT Primary research, straw poll: an unofficial vote that is taken to discover what people think about an idea or problem

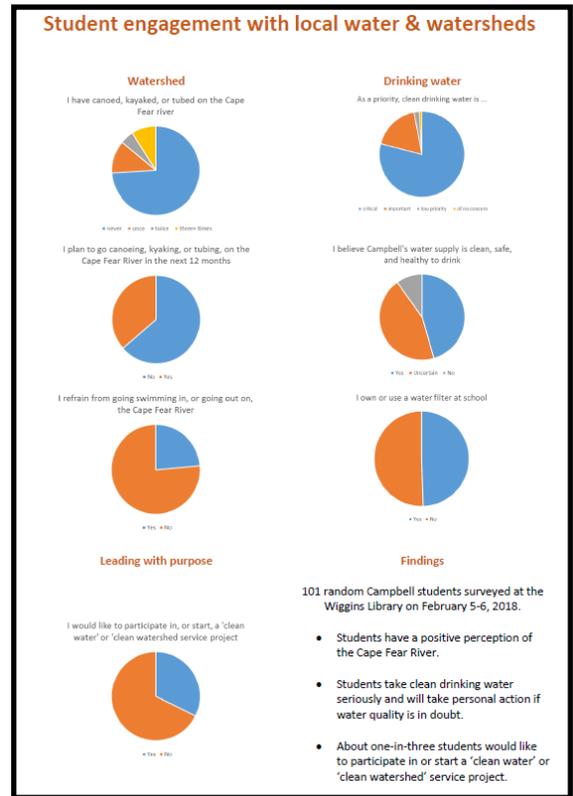
PUB. DATE 2017

ABSTRACT / KEY DETAILS

The purpose of this poll is to ascertain the level of engagement Campbell students' have with the issue of clean drinking water and the care and use of the local watershed that provides water for the campus.

Methodology: Personally request random students selected from every floor and the Starbucks coffee shop at the Wiggins Library to complete a print survey about 'water and watersheds.' The survey was conducted on February 4-5, 2018.

Discussion: The table presents a summary of key data. Interestingly, none of the 'I refrain' comments about swimming in or going out on the Cape Fear River cited water quality. Comments included 'can't swim,' 'scary,' 'don't live near the river,' and 'snakes.'



Paper survey of Campbell students seated in Wiggins Library & Starbucks on 2/5-6/2018	Yes	No
I have canoed, kayaked, or tubed, on the Cape Fear River one or more times	26%	74%
I plan to go canoeing, kayaking, or tubing, on the Cape Fear River in the next 12 months	36%	64%
I refrain from going swimming in, or going out on, the Cape Fear River	24%	76%
As a priority, clean drinking water is critical or important	97%	3%
I believe Campbell's water supply is clean, safe, and healthy to drink	46%	54%
I own or use a water filter at school	49%	51%
I would like to participate in, or start, a 'clean water' or 'clean water shed' service project	32%	68%

Findings:

- Campbell students take water quality seriously and spend the money to filter water they have doubts about.
- Campbell students have a positive perception of the quality of Cape Fear River.
- A large portion of Campbell students would support a service project about 'clean water' or a 'clean watershed.'

AUTHOR CREDENTIALS

The author is an interested person who was curious to discover if his fellow students thought clean drinking water was an important issue and how Campbell students interacted with the local ecosystem that provides the campus water supply.

HOW DID WE FIND IT?

As primary research, the survey was created, collected, and analyzed by the author.

TITLE Hog Hell: CAFO Farming is an Environmental and Public Health Disaster

FORMAT *Sierra* magazine article.
(Sierra Club <http://www.sierraclub.org>)

PUB. DATE 2017

ABSTRACT / KEY DETAILS

The article begins with the author's trip to a concentrated animal feeding operation (CAFO) in Duplin County, NC with Kemp Burdette, a member of the Cape Fear River Alliance. A confrontation with CAFO operators ensues. The industrial takeover of hog farming in NC was engineered by Wendell Murphy, owner of Murphy Family Farms. He was elected to the NC House in 1983, and the NC Senate in 1988. In the late 1980s people became aware of ecological, economic, and human harm done from CAFO's due to high levels of hog waste in ground water and surface water. In 2002 Devon Hall, from Duplin County, founded the Rural Empowerment Association for Community Help (REACH). Hall partnered with Steve Wing, a public health professor from UNC. Wing studied air-quality in neighborhoods within a mile of the CAFOs, later known as the Duplin Health Awareness Project. His tests expanded to water quality and a project with Waterkeeper that was manned by Riverkeepers. Wing made reports to the Department of Environmental Quality (DEQ), and Hall recruited community organizers. Their effort resulted in a moratorium on future hog farms in 2007 by the NC Legislature.



William Tom Butler a CAFO contract farmer who owns Butler Farms {in Harnett County} states that most contract farmers are not pleased with the status quo "We have a contract that's not worth the paper it's printed on." Butler is a very responsible hog farmer, he covers his waste lagoons and captures the gases to produce alternative energy.

In 2003 Dr. Michael Mallin, a biologist from UNCW began studying the impact of CAFOs on the aquifer near Stocking Head Creek in Duplin County and found it to be polluted. "The DEQ admits that there are intakes for municipal water systems on area rivers, which means that even if locals aren't using well water, they can still be bathing in, cooking with, and drinking water tainted with hog waste." DEQs budget has been gutted by anti-regulation legislators. In 2014 REACH, Waterkeeper Alliance, and the NC Environmental Justice Network, supported by Earth Justice filed a Title VI case with EPA's Office of Civil Rights, alleging that the state's lax regulation decimates against people of color.

AUTHOR CREDENTIALS

"Adam Skolnick is an award winning journalist, he lives in Malibu, California. Photographer Lia Barrett is a North Carolina Native.

HOW DID WE FIND IT?

From the library homepage (library.campbell.edu) we did a "Databases" search for [[Academic Search Complete](#)]. On the Academic Search Complete page, we searched for [[cafo AND "North Carolina"](#)].

CITATION

Skolnick, Adam and Barrett, Lia. "Hog Hell." *Sierra*, vol. 102, no. 2, Mar/Apr2017, pp. 28-33. EBSCOhost, proxy.campbell.edu/login?url=http://search.ebscohost.com/login.aspx?direct=true&db=a9h&AN=121448130&site=ehost-live.

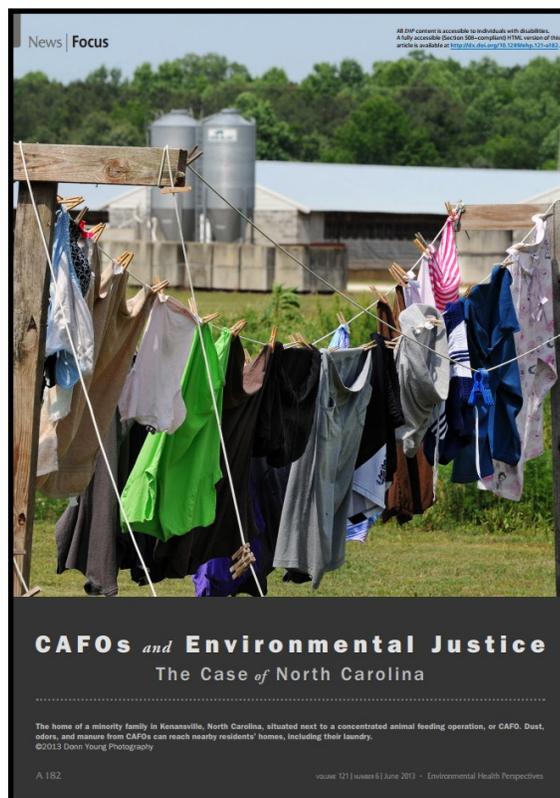
TITLE CAFOs and Environmental Justice: The Case of North Carolina.

FORMAT Journal article. Superintendent of Documents, National Archives and Records Administration, Washington DC
<http://ehp.niehs.nih.gov/>

PUB. DATE 2013

ABSTRACT / KEY DETAILS

The clustering of North Carolina's hog concentrated animal feeding operations (CAFOs) in low-income, minority communities ... has raised concerns of environmental injustice and environmental racism. Several studies show that this may not be intentional discrimination, but a result of following 'the path of least resistance' in choosing sites. This nevertheless results in environmental injustice if minority populations are disproportionately affected, no matter the reason. In 2000 ECU sociology professor Bob Edwards studied Eastern NC counties and found that even when controlling for regional differences, counties with larger minority populations were home to greater concentrations of hog waste. Edwards also reported that large hog operations forced small farmers out of business. For centuries farms were sustainable, the waste from animals helped grow the next year's crops. Then, starting in the 1970s, the hog industry in NC changed rapidly when Wendell Murphy applied the CAFO model. After he was elected to the NC legislature he passed pro CAFO legislation known as "Murphy's Laws." In 1982, all but one NC county had a BOD, and SS concentrations were 534, 77, and 109 mg/L, respectively, from the aerobic unit of the current treatment system. ...



... The following two treatment processes were suggested to meet the swine wastewater discharge limitations (COD: 600 mg/L, BOD: 80 mg/L, SS: 150 mg/L): (1) conventional three-stage treatment scheme followed by the modified FWS wetland (with or without plants) with a 2-day HRT [effluent concentrations for COD, BOD, and SS were 327, 39, and 58 mg/L, respectively (with plants)], and (2) replacement of the aerobic unit in the current treatment scheme with the modified FWS wetland with a 7-day HRT (effluent concentrations for COD, BOD, and SS were 227, 67, and 30 mg/L, respectively).

AUTHOR CREDENTIALS

Wendee Nicole, based in Houston, TX has written for *Nature*, *Scientific American*, *National Wildlife*, and other magazines.

HOW DID WE FIND IT?

From the library homepage (library.campbell.edu) we did a "Databases" search for [[Academic Search Complete](#)]. On the Academic Search Complete page, we searched for [[cafo AND "North Carolina"](#)].

CITATION

Nicole, Wendee. "CAFOs and Environmental Justice: The Case of North Carolina". *Environmental Health Perspectives* (Online); Research Triangle Park Vol. 121, Iss. 6, (Jun 2013): A182. <http://dx.doi.org/10.1289/ehp.121-a182> perma link <http://proxy.campbell.edu/login?url=http://search.ebscohost.com/login.aspx?direct=true&db=a9h&AN=88195383&site=ehost-live>

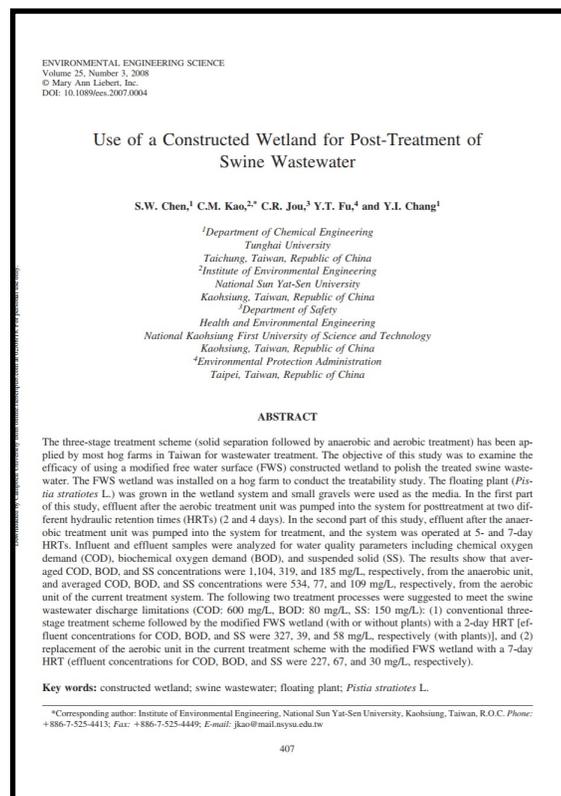
TITLE Use of a Constructed Wetland for Post-Treatment of Swine Wastewater

FORMAT Journal article.

PUB. DATE 2008

ABSTRACT / KEY DETAILS

The three-stage treatment scheme (solid separation followed by anaerobic and aerobic treatment) has been applied by most hog farms in Taiwan for wastewater treatment. The objective of this study was to examine the efficacy of using a modified free water surface (FWS) constructed wetland to polish the treated swine wastewater. The FWS wetland was installed on a hog farm to conduct the treatability study. The floating plant (*Pistia stratiotes* L.) was grown in the wetland system and small gravels were used as the media. In the first part of this study, effluent after the aerobic treatment unit was pumped into the system for posttreatment at two different hydraulic retention times (HRTs) (2 and 4 days). In the second part of this study, effluent after the anaerobic treatment unit was pumped into the system for treatment, and the system was operated at 5- and 7-day HRTs. Influent and effluent samples were analyzed for water quality parameters including chemical oxygen demand (COD), biochemical oxygen demand (BOD), and suspended solid (SS). The results show that averaged COD, BOD, and SS concentrations were 1,104, 319, and 185 mg/L, respectively, from the anaerobic unit, and averaged COD, commercial hog farm, by 1997 95% of NC hog farms were located in the eastern counties of the costa plain. ...



... Lagoons in which the hog waste is stored contains pathogens, antimicrobials, insecticides, and other pharmaceuticals that pollute watersheds across the coastal plain. Even without spills, untreated waste in lagoons can seep into ground water. Emissions also have adverse effects on health and quality of life. UNC professor Steve Wings study "Community Health Effects of Industrial Hog Operations" documented health symptoms associated with hydrogen sulfide produced from hog waste. In 2013 a report by Jillian Fry at the Johns Hopkins Center for a Livable Future found that regulations and laws need to catch up with the rapid development of CAFOs. The [NC] Swine Farm Environmental Performance Standards Act made a moratorium on new hog operations permanent in 2007 and incorporated environmentally superior technologies (ESTs). Super Soil System (now called Tera Blue) is an EST recently developed by Smithfield Foods, Inc., under agreement with the NC Attorney General. ESTs could be the future of hog farming, one project id Google and Duke University partnered with Duke Energy to capture methane from hog waste at Loyd Raye Farms in Yadkin County using an anaerobic digester.

AUTHOR CREDENTIALS

The authors are all researchers interested in environmental protection and environmental and chemical engineering. They work at Tunghai University, National Sun Yat-sen University, and National Kaohsiung First University of Science and Technology.

HOW DID WE FIND IT?

From library homepage (library.campbell.edu) we searched OneSearch using the search string ["hog farms" AND waste AND water]

CITATION

Chang, Y. "Use of a constructed wetland for post-treatment of swine wastewater." *Environmental Engineering Science*, 25.3, 2008, pp. 407-418. <https://doi.org/10.1089/ees.2007.0004>.

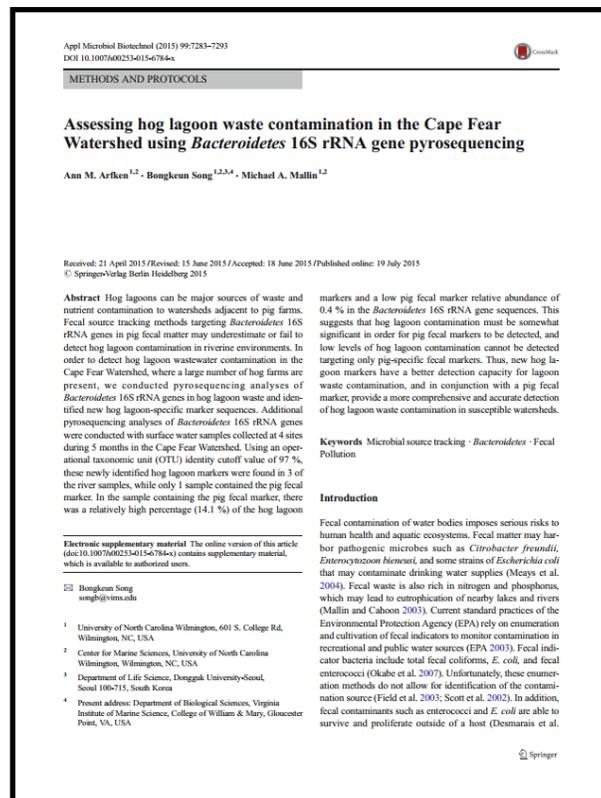
TITLE Assessing hog lagoon waste contamination in the Cape Fear Watershed using *Bacteroidetes* 16S rRNA gene pyrosequencing

FORMAT Journal article.

PUB. DATE 2015

ABSTRACT / KEY DETAILS

Hog lagoons can be major sources of waste and nutrient contamination to watersheds adjacent to pig farms. Fecal source tracking methods targeting *Bacteroidetes* 16S rRNA genes in pig fecal matter may underestimate or fail to detect hog lagoon contamination in riverine environments. In order to detect hog lagoon wastewater contamination in the Cape Fear Watershed, where a large number of hog farms are present, we conducted pyrosequencing analyses of *Bacteroidetes* 16S rRNA genes in hog lagoon waste and identified new hog lagoon-specific marker sequences. Additional pyrosequencing analyses of *Bacteroidetes* 16S rRNA genes were conducted with surface water samples collected at 4 sites during 5 months in the Cape Fear Watershed. Using an operational taxonomic unit (OTU) identity cutoff value of 97 %, these newly identified hog lagoon markers were found in 3 of the river samples, while only 1 sample contained the pig fecal marker. In the sample containing the pig fecal marker, there was a relatively high percentage (14.1 %) of the hog lagoon ...



... markers and a low pig fecal marker relative abundance of 0.4 % in the *Bacteroidetes* 16S rRNA gene sequences. This suggests that hog lagoon contamination must be somewhat significant in order for pig fecal markers to be detected, and low levels of hog lagoon contamination cannot be detected targeting only pig-specific fecal markers. Thus, new hog lagoon markers have a better detection capacity for lagoon waste contamination, and in conjunction with a pig fecal marker, provide a more comprehensive and accurate detection of hog lagoon waste contamination in susceptible watersheds.

AUTHOR CREDENTIALS

Ann Arfken and BK Song are researchers at the Virginia Institute of Marine Science. Prior to coming to The Virginia Institute of Marine Science Worked at UNC Wilmington. Ann recently defended her PHD in Marine Science.

Michael A. Mallin is a PhD. In Marine and Estuarine Ecology and is interested in land use and how it can contribute to water pollution.

HOW DID WE FIND IT?

From library homepage (library.campbell.edu) we searched OneSearch using the search string [“hog farms” AND waste AND water]

CITATION

Arfken, Ann M. and all. “Assessing hog lagoon waste contamination in the Cape Fear Watershed using *Bacteroidetes* 16SrRNA gene pyrosequencing.” *Applied Microbiology and Biotechnology*, 99.17, 9/2015, pp. 7283-7293, <https://doi.org/10.1007/s00253-015-6784-x> .

TITLE Intensive hog farming operations and self-reported health among nearby rural residents in Ottawa, Canada

FORMAT Scholarly journal article.

PUB. DATE 2009

ABSTRACT / KEY DETAILS

A survey was administered to a random sample of residents from seven rural communities in the eastern part of Ottawa, Canada. The authors analyzed self-reported questionnaire data obtained from 723 adults and 285 children/adolescents. health-related quality of life (HRQOL) was assessed using a survey instrument, while data were also collected for sociodemographic characteristics, the prevalence of selected health conditions, and lifestyle related behaviours (e.g., smoking) of participants. Variations in self-reported health according to the residential distance to the hog farm were evaluated using statistical analysis.

For the most part, the prevalence of selected health conditions among adults and children was not associated with how far they lived from the farm. No associations were observed with migraines, respiratory conditions (asthma, rhinitis, sinusitis, and chronic bronchitis), and allergies. However, a higher prevalence of depression was noted among those who lived within 3 km of the farm relative to those who lived more than 9 km away. Furthermore, individuals who lived closer to the hog farm were more likely to worry about environmental issues such as water quality, outdoor and indoor smells, and air pollution.




Research article Open Access

Intensive hog farming operations and self-reported health among nearby rural residents in Ottawa, Canada
Paul J Villeneuve^{*1}, Amira Ali², Laurel Challacombe¹ and Sophie Hebert²

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Abstract

Background: In 2004, hog farming operations were introduced in the village of Sarsfield in the eastern part of Ottawa, Canada. This study evaluates the health-related quality of life (HRQOL), and the prevalence of respiratory conditions among adults and children who lived in proximity to this farm.

Methods: A cross-sectional survey was administered to a random sample of residents from seven rural communities in the eastern part of Ottawa, Canada. We analyzed self-reported questionnaire data obtained from 723 adults and 285 children/adolescents. HRQOL was assessed using the SF-36 survey instrument, while data were also collected for sociodemographic characteristics, the prevalence of selected health conditions, and lifestyle related behaviours (e.g., smoking) of participants. Variations in self-reported health according to the residential distance to the hog farm were evaluated using logistic regression and analysis of variance methods.

Results: For the most part, the prevalence of selected health conditions among adults and children was not associated with how far they lived from the farm. No associations were observed with migraines, respiratory conditions (asthma, rhinitis, sinusitis, and chronic bronchitis), and allergies. However, a higher prevalence of depression was noted among those who lived within 3 km of the farm relative to those who lived more than 9 km away (odds ratio = 2.01, 95% CI = 1.11, 3.65). Furthermore, individuals who lived closer to the IHF were more likely to worry about environmental issues such as water quality, outdoor and indoor smells, and air pollution. This level of worry also contributed to lower HRQOL scores for individuals who lived closer to the farm. It was also observed that the prevalence of depression was much higher among those who indicated a concern about environmental issues (18.2%) when compared to those who did not (8.0%).

Conclusion: While our findings suggest that living in close proximity to an IHF may adversely affect HRQOL these should be interpreted cautiously due to a lack of direct measures of environmental exposures, and possible biases inherent in the use of self-reported health measures.

Page 1 of 10
(page number not for citation purposes)

This level of worry also contributed to lower HRQOL scores for individuals who lived closer to the farm. It was also observed that the prevalence of depression was much higher among those who indicated a concern about environmental issues (18.2%) when compared to those who did not (8.0%).

AUTHOR CREDENTIALS

Paul Villeneuve has a Ph.D. in Public Health and is an accredited professional statistician. Amira Ali is an epidemiologist in Ottawa, Canada. Laurel Challacombe is a public health researcher.

HOW DID WE FIND IT?

From library homepage (library.campbell.edu) we searched OneSearch using the search string [[“hog farm” AND environment](#)]

CITATION

Villeneuve, Paul J., et al. “Intensive Hog Farming Operations and Self-Reported Health among Nearby Rural Residents in Ottawa, Canada.” *BMC Public Health*, vol. 9, no. 1, 2009, p. 330.

TITLE Surface-water quality in agricultural watersheds of the North Carolina Coastal Plain associated with concentrated animal feeding operations

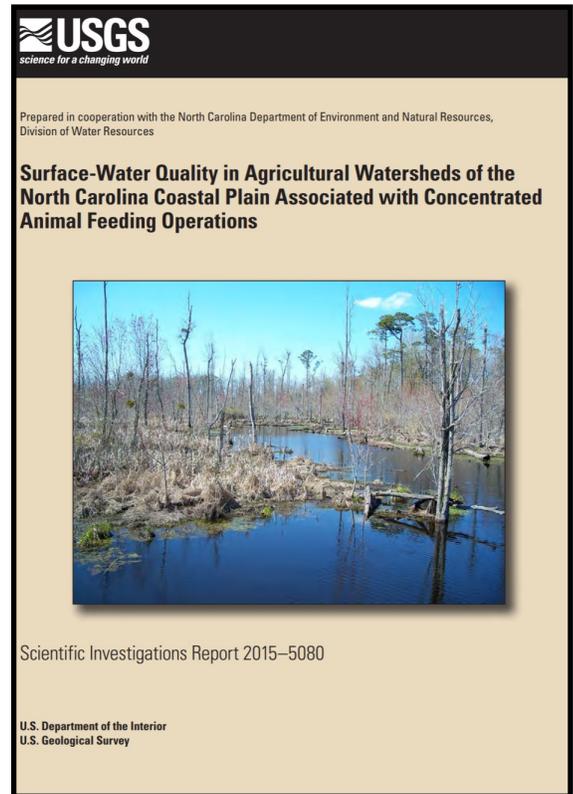
FORMAT Government report

PUB. DATE 2015

ABSTRACT / KEY DETAILS

The effects of concentrated animal feeding operations (CAFOs) on water quality were investigated at 54 agricultural stream sites throughout the North Carolina Coastal Plain during 2012 and 2013. Three general watershed land-use types were examined during the study, including 18 background watersheds with no active CAFOs (BK sites), 18 watersheds with one or more active swine CAFOs but no poultry CAFOs (SW sites), and 18 watersheds with at least one active swine CAFO and one active dry-litter poultry CAFO (SP sites).

Water-quality differences were noted for the SW and SP land-use groups relative to the BK group. Median values of specific conductance, several major ions (magnesium, sodium, potassium, and chloride), and nitrogen fractions (ammonia plus organic nitrogen, ammonia, nitrate plus nitrite, total nitrogen, and $\delta^{15}\text{N}$ of nitrate plus nitrite) were higher for the SW and SP groups compared to the BK group. No significant differences in water temperature, dissolved oxygen, calcium, total organic nitrogen, orthophosphate, total ...



... phosphorus, or $\delta^{18}\text{O}$ of nitrate plus nitrite were noted among the land-use groups. When compared on the basis of land-use type, there was an overall measurable effect of CAFO waste manures on stream water quality for the SW and SP watershed groups. Measurable effects of CAFO waste manures on stream water quality were most evident in those SW and SP watersheds having lower percentages of wetlands combined with higher swine barn densities and (or) higher total acres available for applying waste manure at the swine CAFOs.

AUTHOR CREDENTIALS

Stephen L. Harden is a hydrologist at the South Atlantic Water Science Center, and has been an employee of the government's US Geological Survey since 1991.

HOW DID WE FIND IT?

We found this article by doing a Google search for [[government reports hog farming North Carolina](#)].

CITATION

Harden, Stephen L. "Surface-Water Quality in Agricultural Watersheds of the North Carolina Coastal Plain Associated with Concentrated Animal Feeding Operations." pubs.usgs.gov/sir/2015/5080/pdf/sir2015-5080.pdf.

TITLE Farmers Test Ways to Protect Water: Fertilizer Runoff Gets Share of Blame for Algae

FORMAT Newspaper Article

PUB. DATE 2016

ABSTRACT / KEY DETAILS

This newspaper article printed in *The Blade*, an Ohio newspaper, describes the situation of a number of family farms using hog manure to fertilize their fields of corn, soybeans, and wheat. Problematically, phosphorus is washing off of these fields, covered in manure or industrial fertilizer, and is effecting northwest Ohio's water quality. The Staterler farm is one of three in southern and northern Hardin counties to implement new practices designed to reduce nutrient runoff from their fields, including phosphorus which feeds algae growth in nearby Lake Erie. These demonstration farms are part of a larger research project on water runoff led by the U.S. Department of Agriculture. This five year project is an attempt to reduce nutrient erosion and improve water quality. Farmers and activists are both skeptical of the efficacy of the new practices. Soil erosion has been reduced, but to date, levels of dissolved phosphorous running off fields have not. Further research is warranted, but if effective, the hope is that farmers will voluntarily adopt these practices.

Farmers test ways to protect water

NOLAN ROSENKRANS. *The Blade*; Toledo, Ohio [Toledo, Ohio]04 July 2016. A.1.

[ProQuest document link](#)

ABSTRACT

"We don't know all the answers," said Aaron Heilers, the demonstration farm project's manager with the Ohio Farm Bureau Federation. "We thought we figured it out ... we are still unsure of the best direction."
 "We may have to look at some basic philosophical approaches of how we are using the land," said Mike Ferner, founder of Advocates for a Clean Lake Erie. "This isn't just a technical problem."
 [Duane Staterler] will voluntarily be installing field edge monitoring equipment later this summer to measure runoff from his land as a demonstration farm for the Ohio Farm Bureau and the Natural Resources Conservation Service.
 - THE BLADE/KATIE RAUSCH Shane Kellogg climbs into the tractor pulling new equipment he and his father [Bill Kellogg] bought to help make their fertilization application and planting more efficient. The pair have volunteered to change the way to distribute fertilizer for their crops and to serve as a demonstration farm in Dunkirk in Hardin County. - THE BLADE/KATIE RAUSCH Heilers - THE BLADE/KATIE RAUSCH 'My grandkids drink this water.' Duane Staterler said regarding his personal concern about the water quality near the hog farming operation he runs with his son Anthony in McComb. He fertilizes his wheat, corn, and soybeans with manure from his hog operations. - THE BLADE/KATIE RAUSCH

FULL TEXT

MCCOMB, Ohio -Just off a township road, Duane Staterler's home, in the distance across a wheat field, is a front line in the debate about what the agricultural industry must do to save Lake Erie.
 The Staterler family grows corn, soybeans, and wheat on 600 acres. They also have a pair of finishing barns and a nursery barn, and send 16,000 pigs to market each year. Those hogs produce about 2.3 million gallons of manure annually, which the Staterlers spread across their and area farmers' fields.
 The phosphorus that washes off farm fields covered in manure or industrial fertilizer is a key factor in northwest Ohio's water quality. And the fifth-generation farmer said he's as concerned as anyone about what happens when the manure hits his fields.
 "My grandkids drink this water," he said.
 The farmers are building wetland on cropland that has had varying yield levels, hoping to catch nutrients and also provide environment for butterflies and bees. They're experimenting with different cover crops. And Mr. Staterler is trying different manure distribution techniques, including changing the time of year he applies manure. All the while, expensive monitors will measure how much phosphorus is running off his fields.
 The Staterler farm is one of a trio in southern Hancock and northern Hardin counties that are part of a project to demonstrate how farmers can implement new practices to reduce nutrient runoff from their fields. With scientists and government agencies believing that a majority of the phosphorus that runs into Lake Erie and feeds algae is caused by agriculture, changes in farming practices will be needed to improve the health of the lake.
 "We don't know all the answers," said Aaron Heilers, the demonstration farm project's manager with the Ohio Farm Bureau Federation. "We thought we figured it out ... we are still unsure of the best direction."
 The three demonstration farms are meant to collect data and answer a question that has vexed many conservation-minded farmers: How do you do the right thing, without going out of business?

ProQuest

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Page 1 of 4

AUTHOR CREDENTIALS

Nolan Rosenkrans is a 34 year-old staff writer for Toledo *Blade*, a Pulitzer Prize winning publication in 2004. He specializes in education reporting. Rosenkrans is a member of the Toledo Newspaper Guild and is president of the local guild unit and co-chair of the union negotiating team. He studied English and Journalism at Temple University.

HOW DID WE FIND IT?

From library homepage (library.campbell.edu) we searched OneSearch using the search string ["hog farming" AND watersheds]. We used the "newspaper article" limiter and filtered by date (newest to oldest).

CITATION

Rosenkrans, Nolan. "Farmers Test Ways to Protect Water." *The Blade*, Jul 04, 2016, *ProQuest Central*, <http://proxy.campbell.edu/login?url=https://search.proquest.com/docview/1805204370?accountid=9858>.

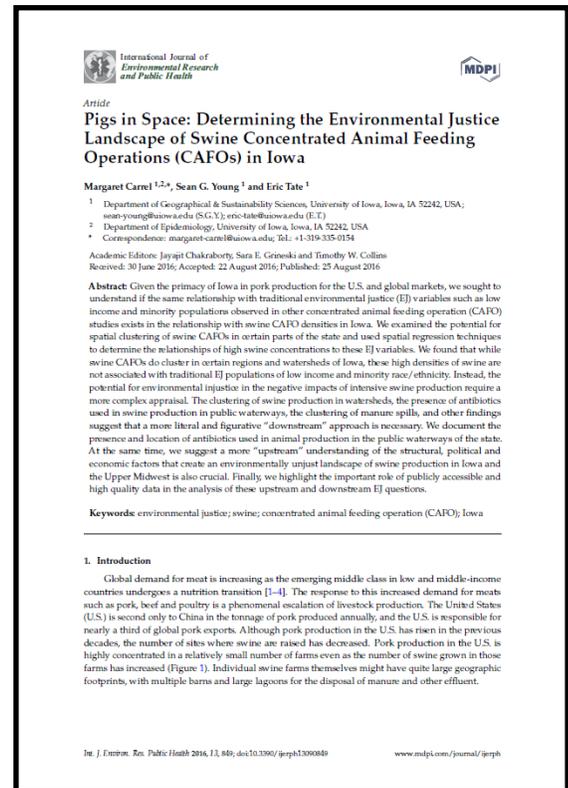
TITLE Pigs in Space: Determining the Environmental Justice Landscape of Swine Concentrated Animal Feeding Operations (CAFOs) in Iowa

FORMAT Journal Article

PUB. DATE 2016

ABSTRACT / KEY DETAILS

The research study described in this journal article was designed to uncover if the same relationship with traditional environmental justice (EJ) variables such as low income and minority populations observed in other concentrated animal feeding operation (CAFO) studies exist with the swine CAFO densities in Iowa. Spatial regression techniques were used to determine the relationships of high swine concentrations to these environmental justice variables. The researchers found that while CAFOs do cluster in certain regions and watersheds of Iowa, these high densities of swine are not associated with traditional EJ populations of low income and minority populations. While this is good, it is the researchers' determination that the negative impacts of intensive swine production require a more complex appraisal. Populations exposed to the risks of swine production "bear the burden" of the environmental injustice of growing pork not only for the United States but also the world.



AUTHOR CREDENTIALS

Dr. Margaret Carrel teaches in the Department of Geographical and Sustainability Sciences at the University of Iowa along with author, Eric Tate. Author Sean Young was an advisee of Dr. Margaret Carrel while earning his PhD at the University of Iowa and has served as an adjunct instructor in the Department of Geographical and Sustainability Sciences at that institution.

HOW DID WE FIND IT?

From library homepage (library.campbell.edu) we searched OneSearch using the search string ["hog farming" AND watersheds]. We limited to "journal articles," selected the limiter "peer-review," and sorted by date (newest to oldest).

CITATION

Carrel, Margaret, Sean G. Young, and Eric Tate. "Pigs in Space: Determining the Environmental Justice Landscape of Swine Concentrated Animal Feeding Operations (CAFOs) in Iowa." *International Journal of Environmental Research and Public Health*, vol. 13, no. 9, 2016, pp. 1-19, *Agricultural & Environmental Science Database; ProQuest Central*, <http://proxy.campbell.edu/login?url=https://search.proquest.com/docview/1817564263?accountid=9858>, doi:<http://dx.doi.org/10.3390/ijerph13090849>.

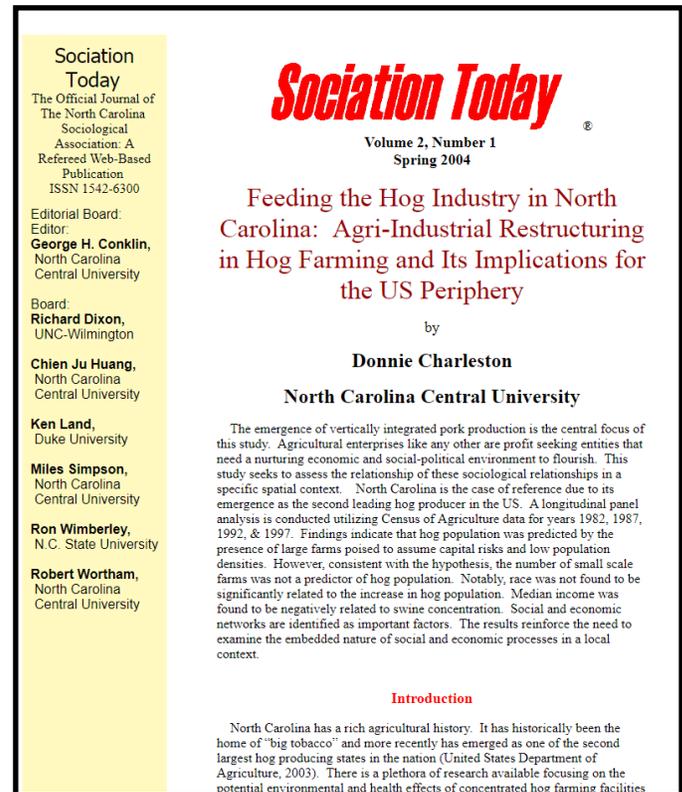
TITLE Feeding the Hog Industry in North Carolina: Agri-Industrial Restructuring in Hog Farming and Its Implications for the US Periphery

FORMAT Research journal article

PUB. DATE 2004

ABSTRACT / KEY DETAILS

NC is the focus of this article, since it is the second leading hog producer in the US. A study was done to see what factors are used to determine the location of large scale Hog farms. This article is both a quantitative and qualitative analysis of the rise of industrial hog farming and its impact on North Carolina's local economies.



AUTHOR CREDENTIALS

Donnie is the Economic Policy Manager at NCSU Institute for Emerging Issues. In his work he collaborates with national, state, and local leaders from industry, government, and nonprofit organizations.

HOW DID WE FIND IT?

From library homepage (library.campbell.edu) we searched OneSearch using the search string ["hog farming" AND "North Carolina"]

CITATION

Charleston, Donnie. "Feeding the Hog Industry in North Carolina: Agri-Industrial Restructuring in Hog Farming and its Implications for the US Periphery." *Sociation Today*, vol. 2, no. 1, 2004. <http://www.ncsociology.org/sociationtoday/v21/hog.htm>. Accessed 19 Dec. 2017.

TITLE Opinion: Hog waste: Nastier than Ever

FORMAT Opinion piece from online NC State University student newspaper

PUB. DATE 2017

ABSTRACT / KEY DETAILS

This article is about the hog waste in NC and how rural NC residents are having to deal with how hog waste disposal is affecting their everyday life as well as their health. This article talks about the recent HB 467 that was passed, which limits the damages residents can collect from hog farmers.

Opinion

TECHNICIAN
PAGE 6 • THURSDAY, MAY 18, 2017

SCOTUS rejection of voter ID repeal shouldn't have been necessary



Alicia Theoharis
Opinion Editor

According to the United States Constitution, the right to vote is our democracy in order to elect our country's leaders. This right is still a debate about access to this right, particularly argued on by the very people who often tout the Constitution when enacting other discriminatory bills and laws, simply to avoid the fact that our country is more easily moving backward, than forward.

On Monday, May 15, the Supreme Court of the United States announced that it rejected the appeal to reinstate North Carolina's rightfully controversial voter identification law, which required all voters to present a state-approved form of ID at the polls, reduced the number of early voting days and eliminated same-day registration. The law, which disproportionately targeted black voters in North Carolina, was initially shot down in July 2016, by the 4th Circuit Court of Appeals. This decision was overturned by former Republican Gov. Pat McCrory, who publicly supported the law when it passed in 2013.

Although the Supreme Court's refusal to hear the appeal to reinstate the law is a nearly positive step toward voter equality and voting rights, North Carolina Republican lawmakers have already stated that the fight is not over. Their continued desire to restrict access to voting is telling of deeper issues within our state legislature. The official reasoning behind the original voter ID law was that the law would ensure thorough protection from in-person voter fraud — a problem that the GOP apparently felt was enough of a threat to their political standing. According to the Washington Post and other publications, however, in-person voter fraud is, in fact, a phantom threat; absentee ballots pose a greater threat of fraudulent votes, and even then, many cases of fraud are often accidental cases.

In February 2016, Logan Graham chronicled his experience of getting an approved, state-issued ID to vote in the

presidential primary election. Graham, originally from Cabarrus County, explained the arduous process of acquiring a valid ID in order to exercise his inalienable right as a citizen to vote. He pointed out that for low-income citizens, and even full-time students, the process of getting an ID could mean the loss of at least an entire day's pay, or missing at least an entire day of classes.

NC State welcomes approximately 10 percent of our students from outside the state, according to College Portraits. That means that approximately 10 percent of our students are from states or U.S. territories other than North Carolina. Do we assume that all of those students are U.S. citizens, but surely many of them are, meaning that they would have re-

quired a state-issued ID in order to vote in that particular primary while awaiting an absentee ballot. As college students, it is our job to educate ourselves and take action within our democracy — our votes decide our own future. A voter ID law, whether it's the one we had, reinstated, or a newly written one, endangers our ability as students, and as citizens, to make decisions about and have a say in our government, and our opportunities as contributing members of society.

The Supreme Court's decision is a positive one, and a big victory in the fight for voting rights, but it does not mean that we can become complacent in the face of other threats to our democracy, and our right to exercise our vote.

Hog waste: It's nastier than ever



Laura Villegas
Contributor

Poop is back on the table. Six months ago, the Technician ran a shocking column on how to deal with hog waste in North Carolina. Accordingly, students expressed the social, environmental and economic challenges concerning the issue of hog farming and hog waste disposal in North Carolina.

Hog farming is a multi-billion-dollar industry in the U.S. and generates millions of dollars in tax revenue that fuel the economy. North Carolina is the second largest hog farming state in the country, and is home to more than 2,500 permitted industrial operations and nearly 10 million animals. We also learned that an industry of this scale not only produces pigs in large scales, it also produces hog waste — lots of it. In fact, poop of it.

Handling such amounts of waste is quite literally a dirty business. A 200-pound pig produces 15 pounds of manure a day. Currently, every year in North Carolina, nearly 10 billion gallons of livestock feces and urine are stored in over 4,000 lagoons — enough of the stuff to fill 13,000 Olympic-sized swimming pools. The containment of these pools to guarantee that they do not overflow or contaminate nearby waterways has proven difficult.

It is not just major storms like Hurricane Matthew that pose a threat for residents of eastern North Carolina, where most hog operations are located. It is a common practice for farm operators to empty their cesspools by spraying the liquid waste as crop fertilizer, according to the late Steve Wing, an associate professor of epidemiology at UNC-Chapel Hill, in an affidavit for a class-action lawsuit against Murphy Brown LLC, a subsidiary of Smithfield Foods, and the state's largest producer of pork.

This practice constitutes a major environmental and health hazard for residents. The odor alone is generally bad enough to keep residents from outdoor activities. But, the threats of disease outbreaks are even more worrisome and are less obvious. The waste can carry E. coli, salmonella, cryptosporidium and other bacteria that can lead to serious illness or death if they spread to humans.

Nearly 600 residents have brought a class-action suit against Murphy Brown LLC, and today, there are over 20 lawsuits before a federal court, challenging the general out-

of living with the stink from North Carolina's hog farms. Obviously, something needs to be done to protect the health of North Carolina residents and the state's environmental resources.

In the original deal issued by the Technician, Aaron Sanchez called for a reduction in farm activity in the name of wider social and environmental health, which I backed more government regulation of current farming activities to promote environmentally sound practices. Sanchez took the position that North Carolina was currently unable to responsibly dispose of hog waste because the state produces too much of it, while I defended state legislation, saying that they already had various alternative means to get a handle on it. That's what NC State students thought. State legislators, however, thought otherwise.

Last week, North Carolina lawmakers overrode Gov. Roy Cooper's veto to pass House Bill 467, a bill that limits the damages residents can collect from hog farms. You read correctly. State legislators, who are supposed to represent and protect the well-being of the common people, chose to represent and protect the special interests of a small but more powerful group: hog farm operators.

HB 467 prevents people from recovering damages like those for health care bills and pain and suffering. It effectively legalizes the discrimination against residents on the basis of their choice of residency, an idea that not only lacks logic, but is fundamentally corrupt as it assumes people have full freedom of mobility — a myth about the American dream that has long been busted. The Technician published the stance of NC State students on this issue. Despite differences in their opinions on how to approach the conflict, students showed a desire for progress in their work. Students were united in their advocacy for social rights, environmental rights and community development while balancing economic growth. North Carolina legislators seem to be living in a parallel universe.

Students, I invite you to get involved. Even if you think the issue of hog waste does not intersect to your daily life, even in a remote fashion, the truth is that the passing of HB 467 poses the disconnect between legislature and what NC State students think, want and work hard for. Turn to social media, to student organizations, and to local movements to express your political stance. Let's get loud and demand representation, for us and for those we care about helping.

AUTHOR CREDENTIALS

Laura Villegas is a PhD candidate at NC State University for Agriculture and Resource Economics

HOW DID WE FIND IT?

We found this article by doing a Google search for [[NC Hog Farmers Opinion](#)]

CITATION

Villegas, Laura. "Hog waste: Nastier than ever." *Technician, NC State University*, May 18, 2017. Retrieved from http://www.technicianonline.com/opinion/article_e134971a-3bdc-11e7-a32e-e368cf8828c0.html. Accessed 19 Dec. 2017.

TITLE Exposing Fields of Filth: Landmark Report Maps Feces-Laden Hog and Chicken Operations in North Carolina

FORMAT Web Document, Article

PUB. DATE 2016

ABSTRACT / KEY DETAILS

The EWG report on hog farming provides statistical information about the scope of hog farming waste in NC and its human impact, such as the infographic below. They also provide information about their data collection and methodology.



EXPOSING FIELDS OF FILTH
Landmark Report Maps Feces-Laden Hog and Chicken Operations in North Carolina

TUESDAY, JUNE 21, 2016

EXPOSING FIELDS OF FILTH

Landmark Report Maps Feces-Laden Hog and Chicken Operations in North Carolina

North Carolina boasts the nation's second biggest hog farming industry, worth \$3 billion in hog and pig sales in 2012 alone, according to the U.S. Department of Agriculture. It ranks third among the states for poultry production.

Over two decades alone, North Carolina's swine population has nearly doubled, from 5.1 million in 1992 to 9.5 million by 2012, according to the USDA Census of Agriculture. During the same period, the state's broiler chicken production increased by 60 million, to 1.48 billion animals.

This boom in production has delivered financial benefits, but also dire environmental consequences to North Carolina's verdant backcountry and the people who live in it.

Simply put, the more animals you have, the more waste you have to deal with.

10 BILLION Gallons Of Wet Animal Waste Produced Each Year In North Carolina

15,000 OLYMPIC-SIZE

AUTHOR CREDENTIALS

According to their website, the Environmental Working Group is a "non-profit, non-partisan organization dedicated to protecting human health and the environment." (About Us, www.ewg.org/about-us). EWG conducts research related to public and environmental health and educates consumers through reports, online databases, mobile apps, and communications campaigns (About Us, www.ewg.org/about-us). The group is transparent about funding and post annual reports online.

HOW DID WE FIND IT?

We found this article by doing a Google search for [[NC hog farming social justice](#)], where we found a link to the North Carolina Environmental Justice Network. From this page, we discovered key advocacy groups, such as Waterkeeper Alliance and Cape Fear River Watch. Having learned these key players, we were able to find this report by Waterkeeper Alliance, in collaboration with the Environmental Working Group.

CITATION

"Exposing Fields of Filth: Landmark Report Maps Feces-Laden Hog and Chicken Operations in North Carolina." *Environmental Working Group*, June 21, 2016. Retrieved from <https://www.ewg.org/research/exposing-fields-filth#.Wny3Ba5KuUk>. Accessed 19 Dec. 2017.