

North Carolina's Hog Farms and Floodplains— Poop, Proximity, Priority

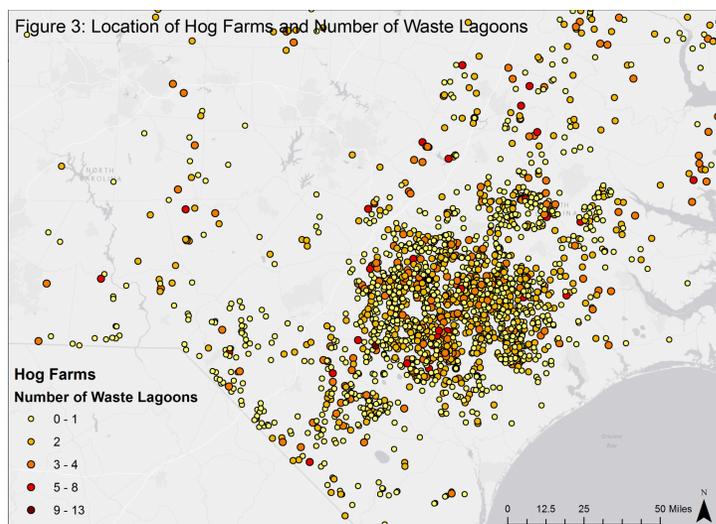
INTRODUCTION

As the country's second largest producer of hogs, North Carolina's hog sales topped \$2 billion in 2012, selling more than 34 million pigs. Waste lagoons from these farms store the animal's fecal matter in open lagoons, which serve as the de facto waste treatment method. The hog industry in North Carolina is concentrated on the eastern seaboard, where effects of climate change are increasingly visible in the frequency and intensity of storms. In the last two decades North Carolina has experienced two so-called "100 year" floods following Hurricane Floyd in 1999 and Hurricane Matthew in 2016.

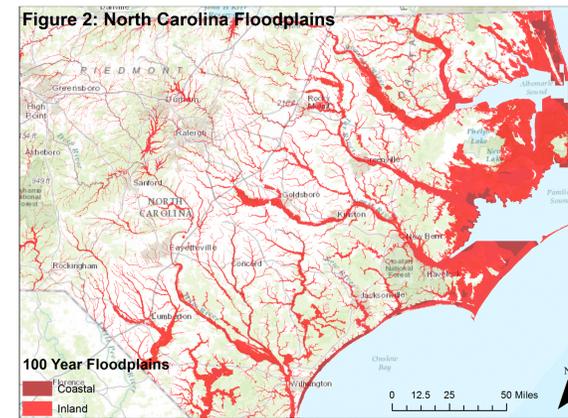
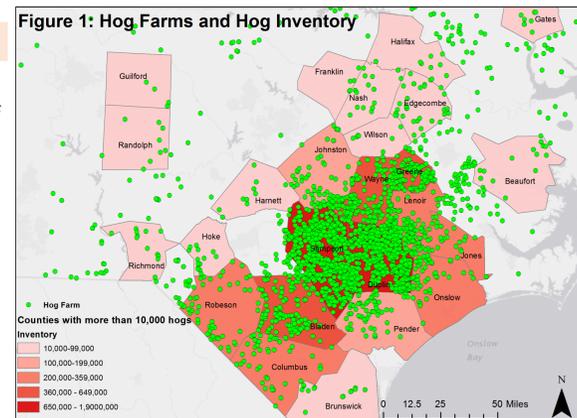
These waste lagoons pose a major ecological and human health threat when breached by flood waters, as documented following Hurricane Floyd. Eutrophication of waters with fecal pig waste can lead to algae blooms, fish die-offs, and contaminated drinking water. This GIS project analyzes locations of industrial scale hog farms in North Carolina's coastal plains and their proximity to floodplains, identifying areas at highest flood risk and subsequent contamination.

METHODOLOGY

Data was gathered from the U.S. Department of Agriculture, the U.S. Census, the North Carolina Department of Public Safety (NCDPS), and the NC Department of Environmental Quality (NCDEQ). Locations of hog facilities obtained from NCDEQ were geocoded, and county level from the USDA data was used to symbolize counties according to number of hogs. The floodplain data layer, obtained from NCDPS, reveals the areas in North Carolina within the 100-year floodplain.



An intersect was performed to reveal the locations of hog facilities with waste lagoons located in floodplains, making them the most at-risk and in need of attention. To find densities of waste lagoons in the state, the Spatial Analyst tool was used to find a point density of the hog facility layer, weighted with number of waste lagoons. Census data was used to find per capita income in each county. I found the lowest income group



in the state, based on five equal interval classes, and selected all counties in that bracket. This layer was used to compare the density of waste lagoons, which aligned almost exactly with three of the lowest income counties.

ANALYSIS

Over 1,800 swine facilities populate the landscape of North Carolina, concentrated primarily in the coastal plain region. Figure 1 shows the location of each hog farm, and the counties with more than 10,000 hogs. The two counties with the highest concentration of pigs are Sampson and Duplin, adjacent counties in the southeast-

ern part of the state. Figure 2 shows North Carolina's 100 year floodplains, which are areas defined as having a 1% chance of flooding each year.

In Figure 3 we see the hog facilities and the number of waste lagoons at each location. These lagoons are used to dispose of billion gallons of waste each year, holding fecal matter until a farmer can use it as fertilizer and spray it on crop fields. Figure 4 reveals the lagoons that are located within the floodplains, making them the most vulnerable to floods and major environmental and health impacts. These locations demand immediate attention and funding to convert to more flood resilient waste storage systems.

The final map reveals the density of waste lagoons compared with per capita income. The lowest income counties are visible in the cross hatch pattern with the waste lagoon density overlaid, revealing a near exact match in three of the lowest income counties.

CONCLUSIONS

As we can see in Fig. 4, there are many facilities located in high-risk areas that require immediate attention. Technologies like methane digesters and other alternative systems will need to be implemented in order to mitigate dangerous effects of flooding in waste lagoons.

Especially as climate change continues to increase the intensity and frequency of storms, state and federal agencies must act swiftly. This project also highlights an important environmental justice issue. Fig. 5 displays that the highest density of waste ponds in North Carolina are located in the lowest income counties, putting those in the most need at the highest risk of contaminated drinking water and other negative effects of flooded waste lagoons.

