

# Confined Animal Feeding Operation Classification System

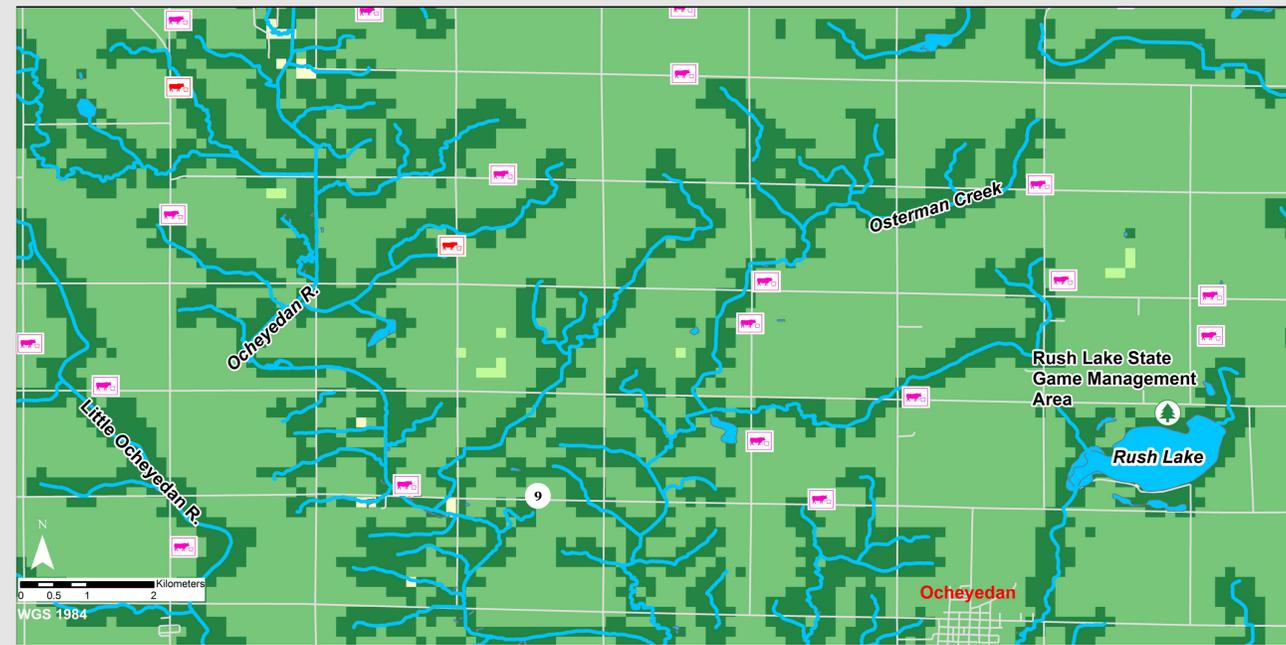
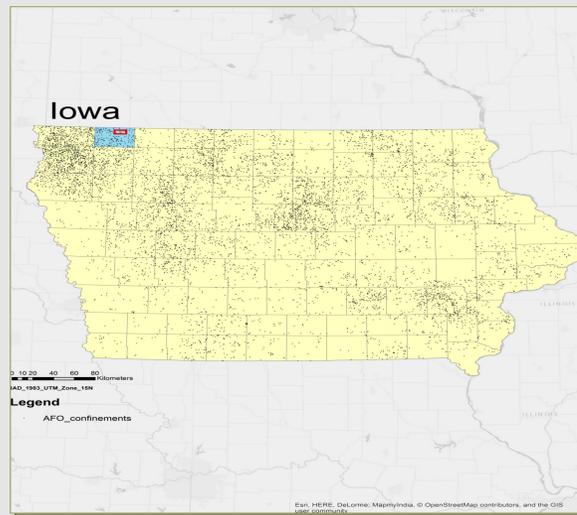
## Introduction

Concentrated Animal Feeding Operations (CAFOs) are facilities where large numbers of animals are confined for at least 45 days in a year with no vegetation. The distinction between an Animal Feeding Operation (AFO) and a CAFO is based on the animal units (number of animals multiplied by an animal unit factor specific for the type of animal).

Wastewater from CAFOs has the potential to negatively impact nearby water bodies and cause serious water quality risks, including eutrophication of surface water, contamination of drinking water supplies and fish deaths from nitrogen and phosphorus, pathogens like E coli, growth hormones, or antibiotics.

The Environmental Quality Incentives Program (EQIP) offers voluntary financial payments to (CAFOs) who implement Comprehensive Nutrient Management Plans (CNMPs). The plans include a group of conservation practices and management activities, which when implemented as part of a conservation system, will help ensure that both production and natural resource protection goals are achieved. EQIP uses a variety of metrics including (interviews, worksheets, and surveys) to construct site-specific CNMPs on CAFOs applying to receive funding.

The study seeks to create a preliminary priority ranking system for CAFOs. The study will use GIS analysis to create a suitability investigation of a site's runoff potential and compare the results of that analysis with the established locations of CAFOs within a 14km x 9km test area in Osceola, Iowa.



## Legend



## Methodology

**1. SURGO Hydrologic Soil Group:** Soil Survey Spatial data was obtained from the USDA Geospatial Gateway and joined with a hydrologic soil factor table, Muagatt, to create a hydrologic soil group based on water infiltration rates. The groups are classified into A, A/D, B, B/D, C, C/D, and D (A is the quickest rate of infiltration and D is the slowest rate of infiltration). The dual hydrologic groups (A/D, B/D, or C/D) first letter is for drained areas and the second is for undrained.

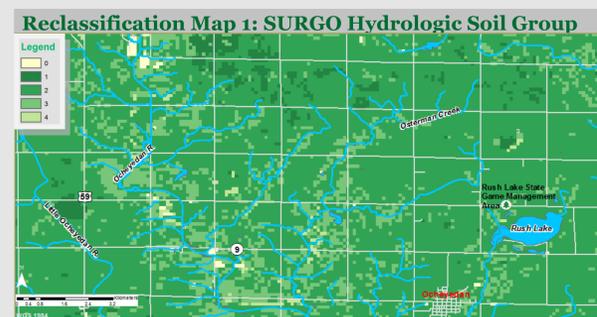
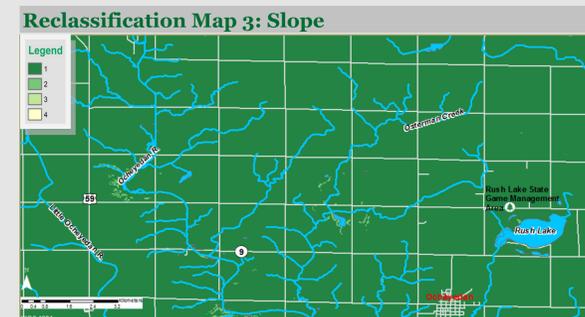
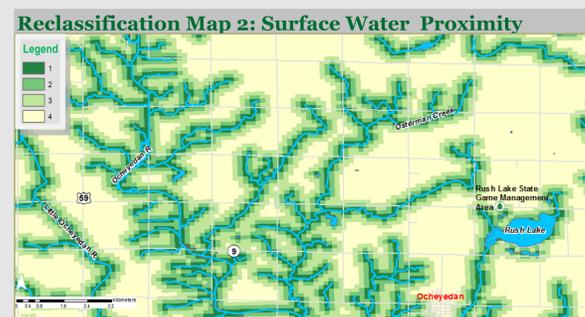
**2. Surface water proximity:** The National Hydrology dataset was reclassified into euclidean distances of 60.96 m, 152.4 m, 304.8 m, 457.2m, which were estimated based on NRCS guidelines for CAFOs near waterbodies.

**3. Slope:** The National Elevation dataset 10m was reclassified, after a transformation into a slope raster,

into four categories including 10.17°, 5°, 1°, and 0° based on a study of slope and runoff potential.

Each variable was reclassified 1-4, with 1 being the highest priority; 2, moderate priority; 3, low priority; and 4, no priority, (except the hydrologic soil group, which had a 0 classification because of soil with non-hydrologic characteristics).

After reclassification of each variable, a suitability map of a CAFO locations' runoff potential was calculated by combining the variable scores in each location. Locations with high runoff potential were classified in the suitability analysis as a 1 and moderate runoff potential was classified as 2. Finally, the CAFO datalayer was used as



## Limitations

Several analysis limitations were related to the data. Firstly, the proximity of the hydrology dataset to the established CAFO locations was inexact. The distance estimations were based on meters from the parameter of the property. However, the CAFO point is situated on the physical confinement infrastructure. Thus, the distances selected for classification were overestimated. Secondly, the hydrologic soil data was created at an intended visual scale of 1:24,000, which constrained the map area of study. Additionally, the additional classification of 0, not a hydrologic soil, for the hydrologic soil group data may have produced slightly inaccurate suitability map classifications. Finally, ideally the analysis would have included a more comprehensive set of factors to determine runoff potential. However, based on limitations of data availability and precision only three variables were incorporated into the geoprocessing model.

## Results

The results of the analysis are depicted in the site suitability for a CNMP map. In the map the 2 CAFO sites, ranked as high priority for a CNMP, are coded with a red CAFO symbol, while the remaining 22 sites, ranked as moderate priority, are coded with pink CAFO symbols. The three suitability variables (reclassified) are displayed as maps 1-3. The two sites classified as high priority are Van Gelder Pork Site 2 (FID number of 172) and Voss Steve (FID number of 4547) (Table 1).

Table 1. Confined Animal Feeding Operation Data

FID	Value	Operation
172	1	Van Gelder Pork Site 2
306	2	Brockhus Dairy
646	2	West Timbers Inc
826	2	Schmidt Doug & John
1560	2	Schmidt Doug & John
2148	2	Hp Pork
2694	2	Pedley Holsteins
2865	2	Jmd Pork
3959	2	Dykstra Gilbert
4547	1	Voss Steve
4637	2	Van Gelder Pork Site 1
6028	2	Frick Farms Ltd #2
6738	2	Kohn Jeff
7753	2	Cea
7757	2	Mj's Concrete
7810	2	Bosma Noah
7908	2	Loerts Brian
8039	2	Jb Farms Feedlot
3288	2	Bob Nasers- Home Place
3317	2	Nnik Pork
1188	2	Wolfswinkel Kevin
6210	2	Farm 180-Tomas
1663	2	Farm 179- T&K
1861	2	Bremer Mark

## Sources

**Primary Sources:**  
 Confined Animal Feeding Operations: Iowa Department of Natural Resources, 2005  
 National Hydrology Dataset: U.S. Geological Survey, 1999  
 National Elevation Dataset 30 meter: U.S. Geological Survey, 1998  
 Street MapUSA, Esri, 2005

**Other Sources:**  
 Iowa Department of Natural Resources. "AFO Sitting Atlas." AFO Sitting. Iowa Department of Natural Resources, 2005. Web. 29 Apr. 2015

Fundamentals of GIS Final Project  
 Cartographer: Tegan Gregory  
 Date: April, 2015  
 Projected Coordinate System: WGS 1984