



Data and Methodology for the North Carolina Animal Feeding Operation Maps

Data on the maps represent estimates of locations and populations in an attempt to accurately document animal feeding operations and their proximity to residential parcels. EWG assumes no responsibility for location accuracy, errors or omissions represented on the maps.

Parcel Boundary Proximity Analysis

Parcel boundaries for all 100 North Carolina counties were taken from [NC ONE MAP – GeoSpatial Portal](#) and represent property delineations from 2014 to 2017. To establish a “residential parcel” the parcels were filtered to extract only parcels with a structure onsite, a residential type (i.e. ‘%residential%’, ‘%SINGLE FAMILY%’, or ‘%Mobile Home%’) parcel use description, or a land use code associated with a residence (i.e., “100”). Those parcels were further subset to keep only properties less than or equal to 10 acres, in order to filter out larger parcels which would reduce accuracy within a half mile radius). The parcel’s center point was used to determine if it was within a half mile of the approximate location of a concentrated animal feeding operation. If more than one facility was associated with an operation, the point was typically in the center of all the operations. Location data for swine operations, lagoon locations and poultry barns were taken from North Carolina Department of Environmental Quality or Waterkeeper Alliance datasets.

Concentrated Animal Feeding Operation Map Attributes

- **Location:** North Carolina county in which animal feeding operation exists.
- **Animal Type:** Animal operation category (i.e., Swine - Poultry) taken from “REGULATED ACTIVITY” of the [N.C. Department of Environmental Quality List of Permitted Animal Facilities](#) (January 2015), or most common poultry type (broiler, layer, pullet, turkey) appearing at the county level of the [Poultry - Inventory and Sales USDA AG Census 2007 and 2012](#).
- **Operation Status:** Operational status taken from [N.C. Department of Environmental Quality List of Permitted Animal Facilities](#) (January 2015), all poultry operations documented as “Unknown.”
- **Waste Lagoons:** “NUMBER OF LAGOONS” taken from [N.C. Department of Environmental Quality List of Permitted Animal Facilities](#) (January 2015), a count of waste holding pools for an individual operation.
- **Barns:** Number of poultry barns visible at the location taken from [Waterkeeper Alliance](#), contracted by Justin S. Quinlivan.
- **Animal Estimate:** Animal count taken from “ALLOWABLE COUNT” of the [N.C. Department of Environmental Quality List of Permitted Animal Facilities](#) (January 2015), or aggregated count

of highest amount of poultry types (broiler, layer, pullet, turkey) between 2007 and 2012 taken from [Poultry - Inventory and Sales USDA AG Census 2007 and 2012](#).

- **Estimated Animal Waste:** Annual estimated waste output calculated using the [2016 North Carolina Agricultural Chemicals Manual](#), specifically, [Chapter IV-Fertilizer Use, on page 62](#), “Livestock & Poultry Manure Production Rates and Nutrient Content.” See WASTE ESTIMATE METHODOLOGY below for more information.

Concentrated Animal Feeding Operation County Map Attributes

- **Location:** North Carolina county in which animal feeding operations exist.
- **Concentrated Animal Feeding Operations:** Count of animal feeding operations within the county boundary.
- **Residential Parcels Detected Within Half Mile of CAFO:** Count of residential parcels detected within a half mile for all CAFOs in the county.
- **Estimated Residents within Half Mile of CAFO:** County data taken from [U.S. Census – Quick Facts](#) for population and household using the American Community Survey.
- **Dry Waste Output:** Aggregate of estimated dry waste within county calculated using the [2016 North Carolina Agricultural Chemicals Manual](#), specifically the [Chapter IV-Fertilizer Use, on page 62](#), “Livestock & Poultry Manure Production Rates and Nutrient Content.” See **Waste Estimate Methodology** below for more information.
- **Wet Waste Output:** Aggregate of estimated wet waste within county calculated using the [2016 North Carolina Agricultural Chemicals Manual](#), specifically the [Chapter IV-Fertilizer Use, on page 62](#) “Livestock & Poultry Manure Production Rates and Nutrient Content.” See **Waste Estimate Methodology** below for more information.
- **Animals Within County:** Aggregated animal count taken from “ALLOWABLE COUNT” of the [N.C. Department of Environmental Quality List of Permitted Animal Facilities](#) (January 2015), or county level poultry type (broiler, layer, pullet, turkey) taken from [Poultry - Inventory and Sales USDA AG Census 2007 and 2012](#) within the county boundary.
- **Hogs and Pigs:** Aggregated animal count taken from “ALLOWABLE COUNT” of the [N.C. Department of Environmental Quality List of Permitted Animal Facilities](#) (January 2015) within the county boundary.
- **Waste Lagoons:** Aggregate count of waste lagoons operations within the county boundary.
- **Poultry:** Aggregated animal count taken from [Poultry - Inventory and Sales USDA AG Census 2007 and 2012](#) within the county boundary.
- **Poultry Barns:** Aggregate count of poultry barns visible at the location taken from [Waterkeeper Alliance](#) within the county boundary.

Waste Estimate Methodology

Poultry Waste Estimates

To calculate poultry waste, EWG took the highest county level estimates found in the USDA Agricultural Census between 2007 and 2012 for “Pullet,” “Turkey,” “Layer” and “Broiler.” Those county level numbers were then evenly distributed by the number of poultry barns associated within an individual operation, within the county for each poultry category, as documented by Waterkeeper Alliance. Manure

outputs were calculated using the specific poultry type and count from the [2016 North Carolina Agricultural Chemicals Manual](#) specifically the [Chapter IV-Fertilizer Use, on page 62](#): “Livestock & Poultry Manure Production Rates and Nutrient Content.” (See figure 1 below.)

Animal Production System	NCDA&CS Waste Code	Accumulated Manure
		tons/1,000 bird capacity/year
Poultry Litter - Broilers	HLB	7.2
Poultry Litter – Broiler Pullets	HBP	7.2
Poultry Litter – Layers	HLL	24
Poultry Litter - Turkeys	HLT	25

Figure 1. Manure Volume and Weights in Typical North Carolina Animal Production Systems

Swine Waste Estimates

To calculate swine waste, EWG used the permit data from the North Carolina Department of Environmental Quality to determine animal type and animal count. Manure outputs were calculated using the specific type and count from the [2016 North Carolina Agricultural Chemicals Manual](#), specifically the [Chapter IV-Fertilizer Use, on page 62](#): “Livestock & Poultry Manure Production Rates and Nutrient Content.” For animal types that did not appear on the 2016 North Carolina Agricultural Chemicals Manual, EWG used a manure metrics for similar animal types. This was done for Swine - Boar/Stud, Swine – Gilts and Swine – Other. (See figure 2 below).

Animal Production System	NCDA&CS Waste Code	Accumulated Manure
		gallons/animal/year
Swine - Boar/Stud	ALS	3,861
Swine - Farrow to Feeder	ALS	3,861
Swine - Farrow to Finish	ALS	10,478
Swine - Feeder to Finish	ALS	927
Swine - Gilts	ALS	3,861
Swine - Other	ALS	3,861
Swine - Wean to Feeder	ALS	191
Swine - Wean to Finish	ALS	776
Swine - Farrow to Wean	ALF	3,203

Figure 2. Manure Volume and Weights in Typical North Carolina Animal Production Systems

Cattle Waste Estimates

To calculate cattle waste, EWG used the permit data from the North Carolina Department of Environmental Quality to determine animal type and animal count. Manure outputs were calculated using the specific type and count from the [2016 North Carolina Agricultural Chemicals Manual](#), specifically the [Chapter IV-Fertilizer Use, on page 62](#) : “Livestock & Poultry Manure Production Rates and Nutrient Content.” For animal types that did not appear on the 2016 North Carolina Agricultural Chemicals Manual, EWG used a manure metrics for similar animal type. This was done for Cattle - Dry Cow. (See figure 3 below).

Animal Production System	NCDA&CS Waste Code	Accumulated Manure
		tons/animal/year
Cattle - Beef Brood Cow	SSB	3
Cattle - Beef Feeder	SSB	2.2
Cattle - Beef Stocker Calf	SSB	1.5
		gallons/animal/year
Cattle - Dairy Calf	LSD	1,876
Cattle - Dairy Heifer	LSD	5,535
Cattle - Dry Cow	LSD	7,749
Cattle - Milk Cow	LSD	7,749

Figure 3. Manure Volume and Weights in Typical North Carolina Animal Production Systems