Characterization of Turkey Litter Productions

Progress report for the

Agriculture Workgroup (AgWG)

November 21, 2016

Project Team

NAME	ROLE
Jactone A. Ogejo (VT)	Project lead; data processing, analysis, and interpretation; report compilation and writing
Jordan Kristoff (Intern, VT)	Data collection and processing
Austin Shifflett (Intern, VT)	Data collection
Timothy Sexton (VA DCR)	Data QA/QC; supervised interns
Bobby Long (VA DCR)	Historical litter characteristics data; data review and interpretation
Mark Dubin (CBP)	Agriculture Workgroup Coordinator

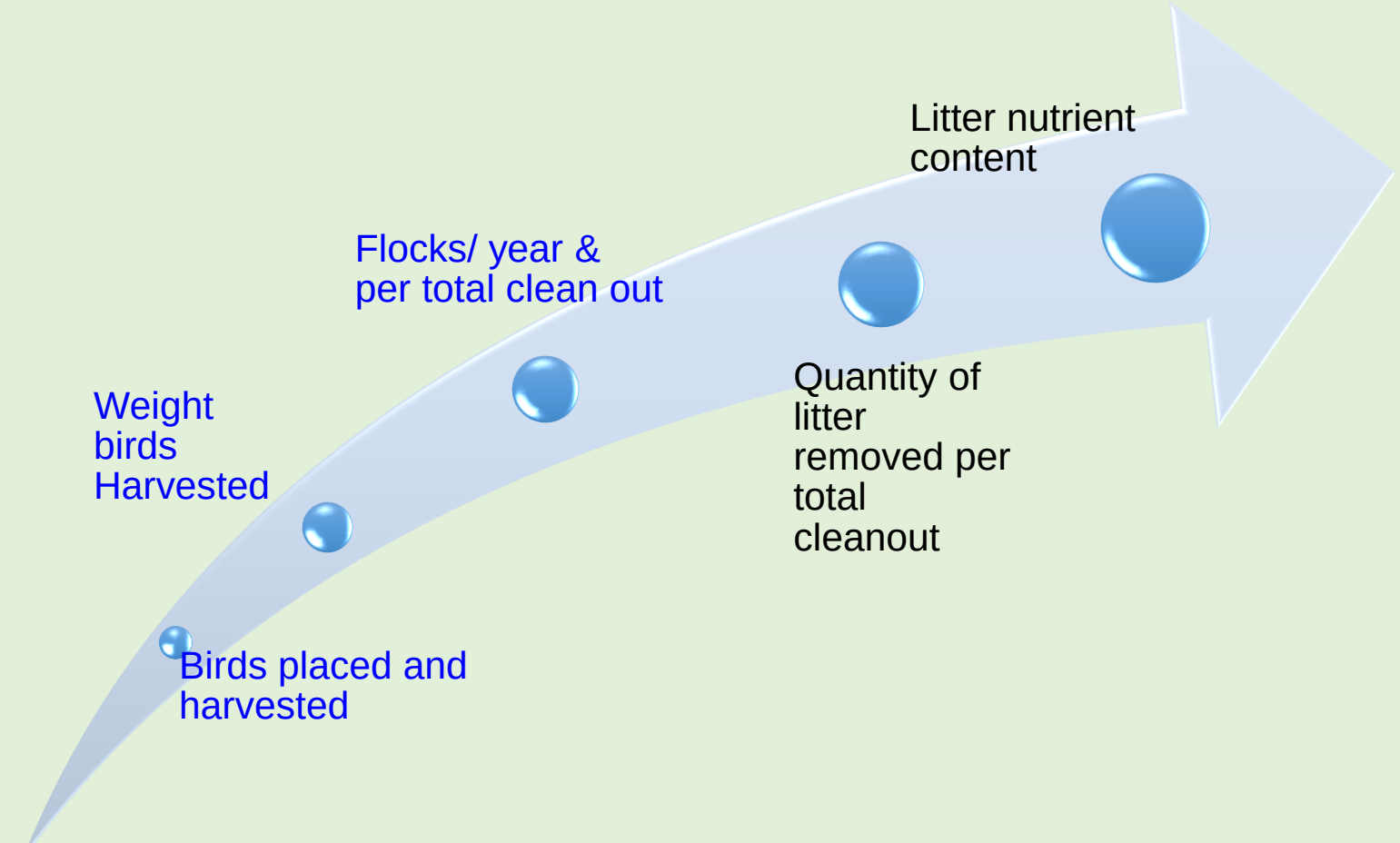
Goals and Objectives

Determine turkey litter generation rates and nutrient content for production systems in Virginia

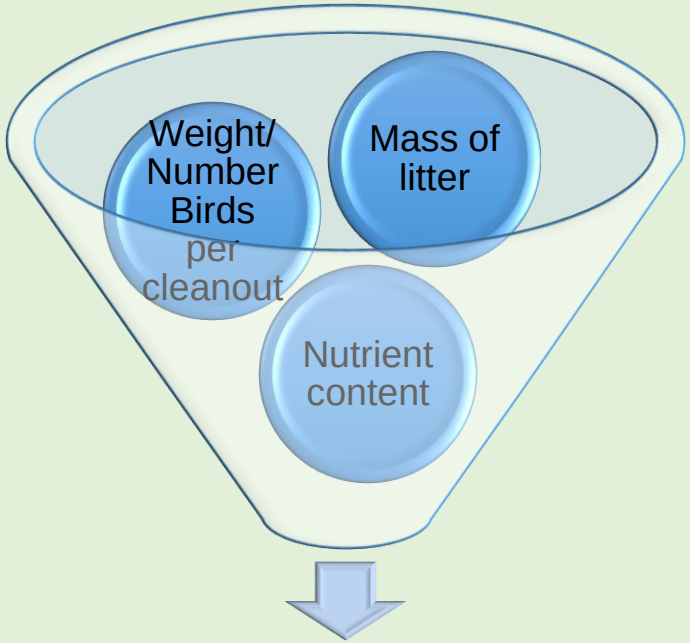
Outcome of work is expected to lead to a better understanding of litter characteristics in the Bay watershed and a better representation of commercial turkey production farms in the Chesapeake Bay Watershed (Bay) Phase 6.0 Modeling Tools

What we did

- Identified production and bird types
- Collected farm level & historical nutrient data
- Processed & analyzed data (statistics)



Estimate litter generation rate and nutrient content by production and bird type



Annual nutrient loading equation for the Bay model

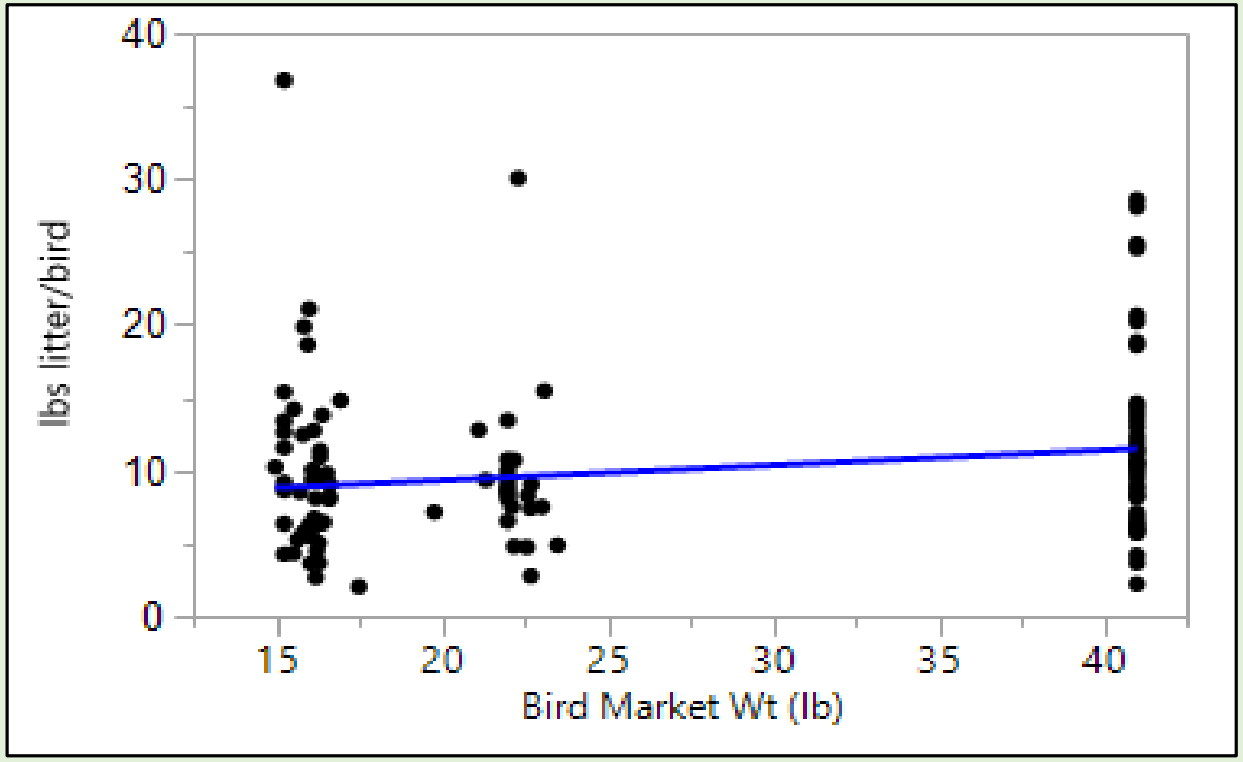
What we found

Production and Bird Types	Litter generated per bird	Litter generated per lb bird
1 Stage Hen	8.45 ± 3.85 A,B	0.52 ± 0.24 A,B
2 Stage Hen	10.99 ± 4.75 A,B	0.68 ± 0.30 A
2 Stage Heavy Hen	7.39 ± 2.45 B	0.35 ± 0.14 B,C
Finisher Heavy Hen	8.95 ± 3.32 A,B	0.38 ± 0.14 B,C
1 Stage Heavy Tom	9.65 ± 2.16 A,B	0.24± 0.05 C
2 Stage Heavy Tom	11.73 ± 7.45 A,B	0.29 ± 0.18 C
Finisher Heavy Tom	12.82 ± 5.80 A	0.31 ± 0.14 C
Brooder/Poult	-	-
Breeder	-	-

Litter generation rates per bird are about 48 to 77 % less than ASABE 2005 tabulated values

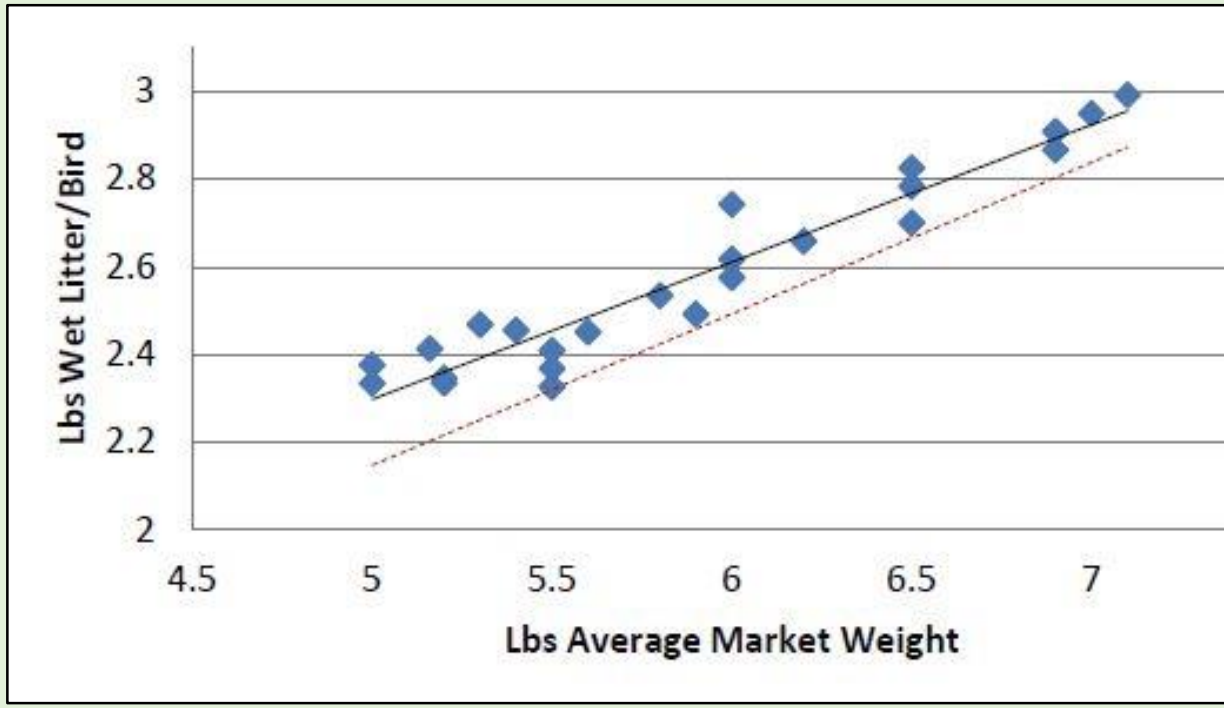
We found a weak linear fit between litter generated per bird and bird market weight

Turkey



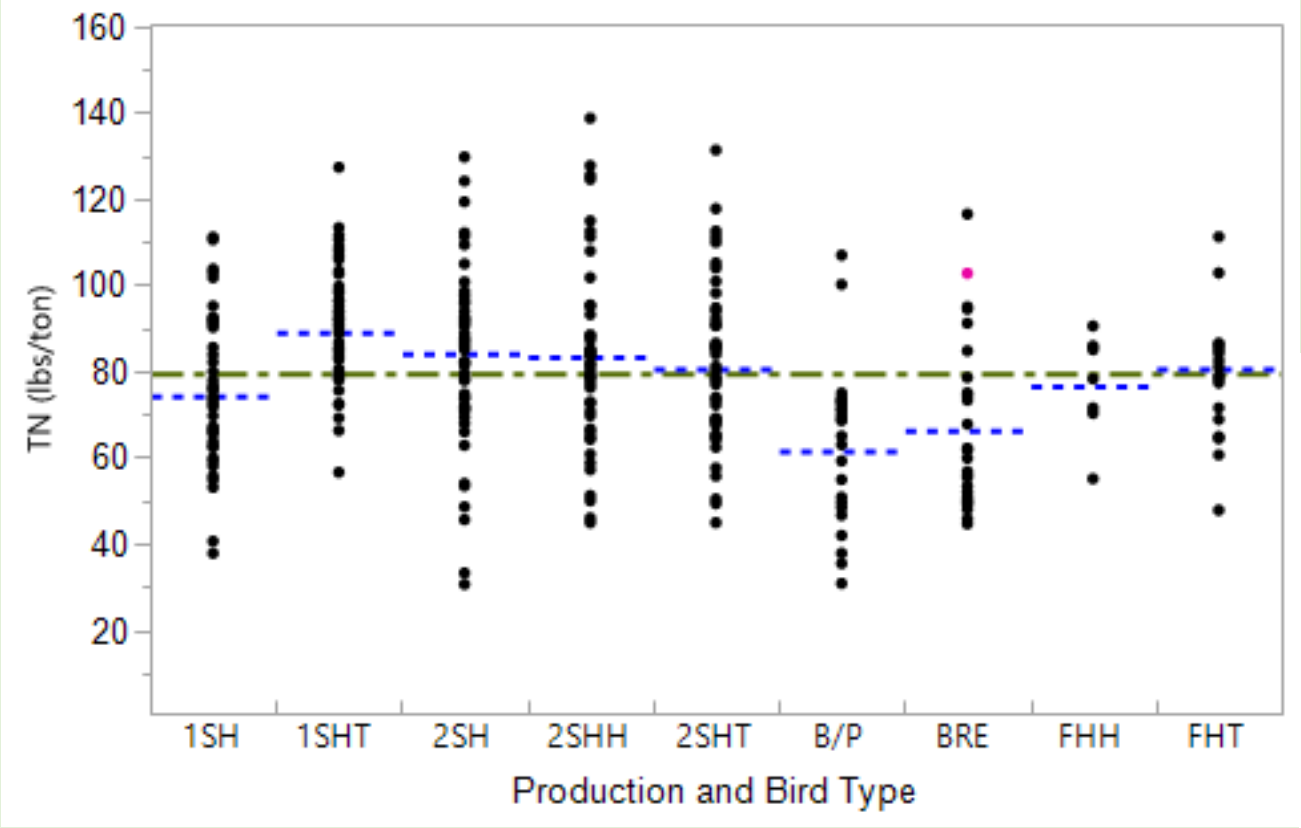
y = 0.1036x + 7.270; R^2=0.0542

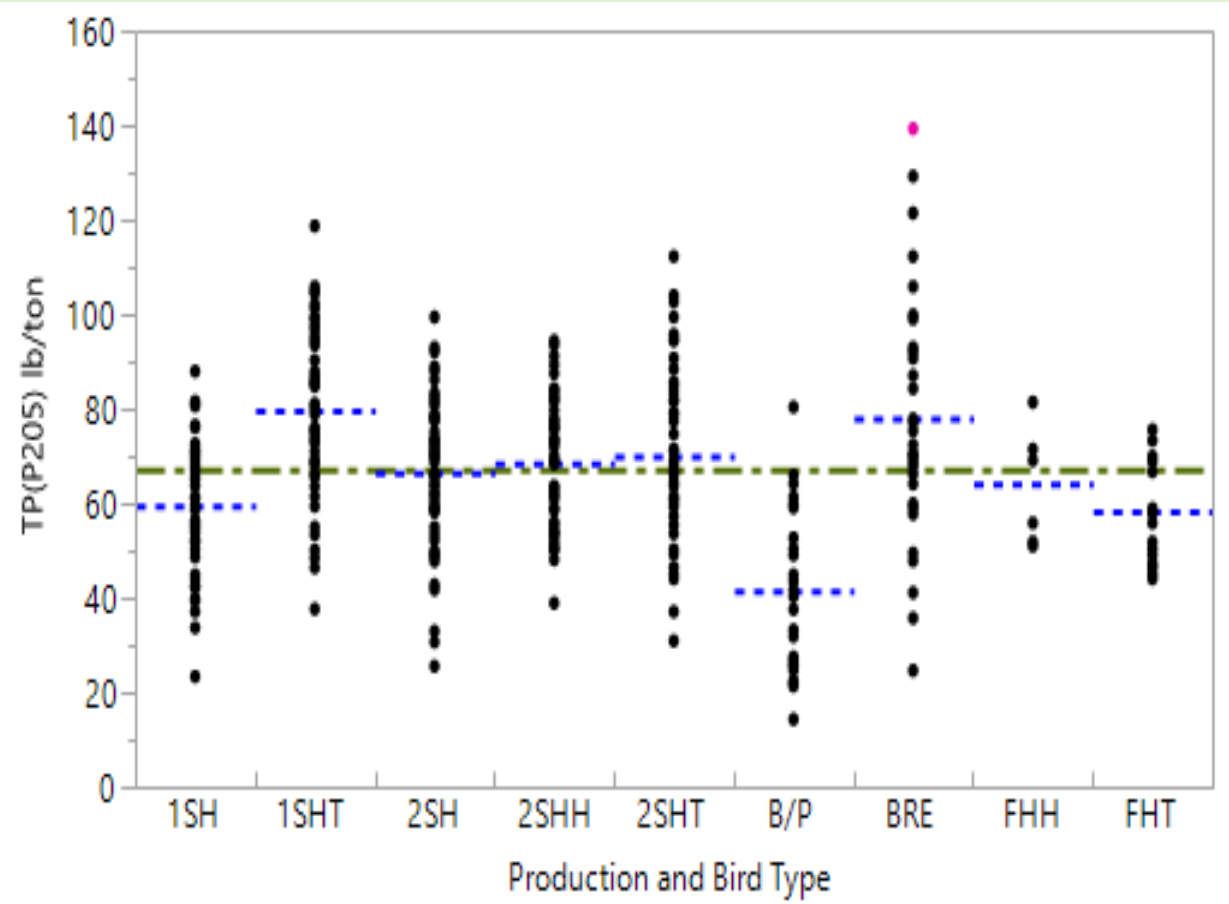
Broilers



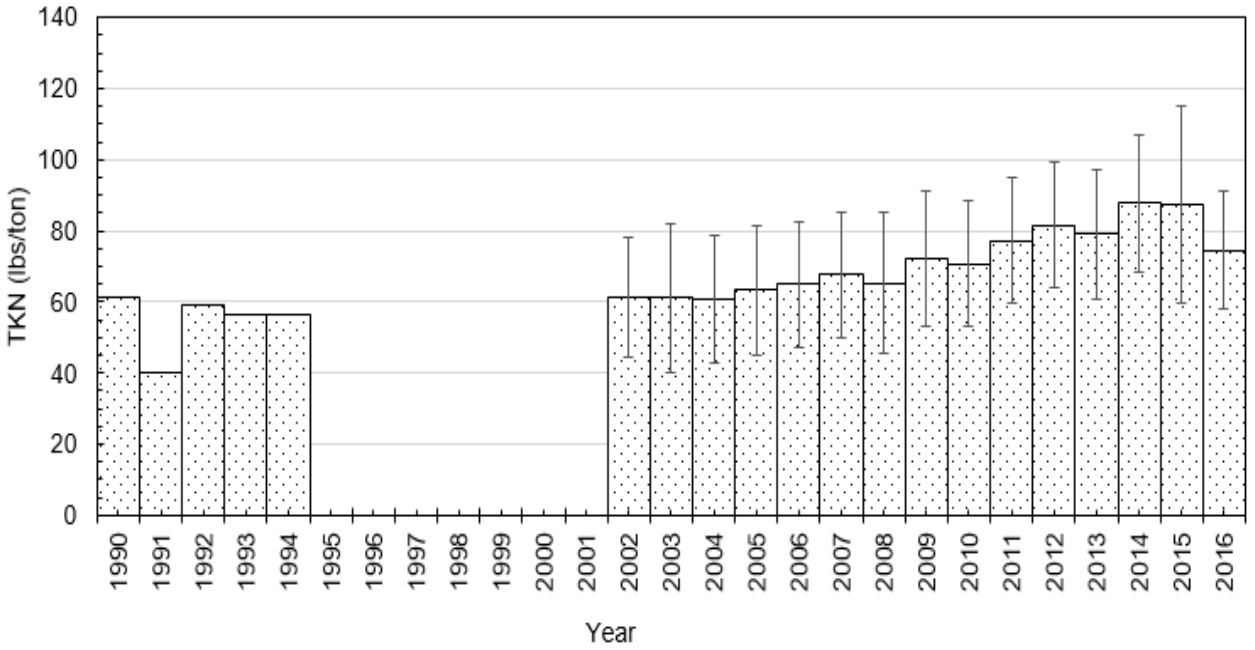
y = 0.3130x + 0.7327; R^2=0.9225

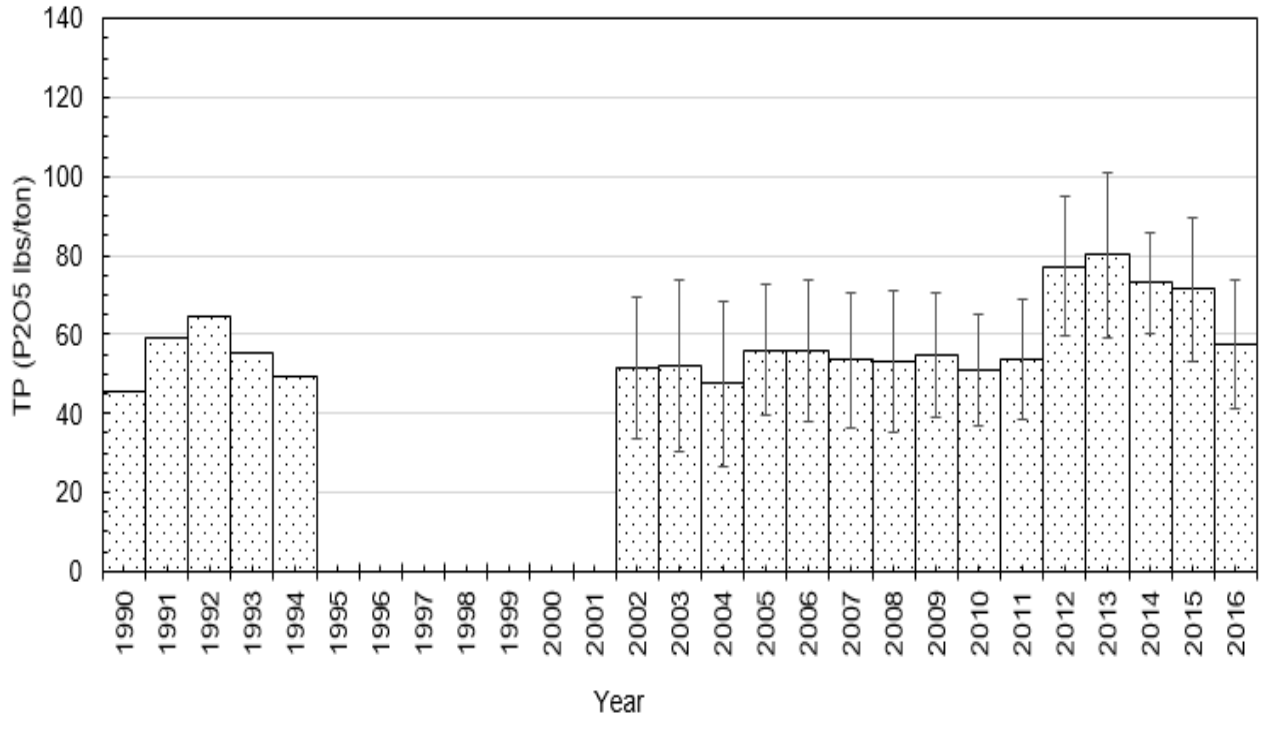
Litter nutrient concentrations





Total nitrogen and phosphorus concentrations in litter 1990 to 2016





Nutrient loading calculation

Because of weak linear fit between litter generated per bird and bird market weight we recommend the following equations

Nitrogen

$$Annual\ N\ load\ (\mathrm{lbs}) = \mathrm{LGB}\left(\frac{\mathrm{lbs}}{\mathrm{bird}}\right) \times \mathrm{TN}\ \left(\frac{\mathrm{lbs}}{\mathrm{ton}}\right) \times \left(\frac{1\ \mathrm{ton}}{2000\mathrm{lbs}}\right) \times \frac{\mathrm{Y\ Birds}}{\mathrm{year}}$$

Phosphorus

$$Annual\ P\ load\ (\mathrm{lbs}) = \mathrm{LGB}\left(\frac{\mathrm{lbs}}{\mathrm{bird}}\right) \times \mathrm{TP}\ \left(\frac{\mathrm{lbs}}{\mathrm{ton}}\right) \times \left(\frac{1\ \mathrm{ton}}{2000\mathrm{lbs}}\right) \times \frac{\mathrm{Y\ Birds}}{\mathrm{year}}$$

Litter generation and TN and TP concentrations for calculating annual nutrient loading

Production and Bird Type	LGB (lbs/bird)	TN (lbs/ton)	TP (lbs/ton)
1SH	9.05	74.64	59.19
2SH	9.05	82.57	66.29
2SHH	9.05	82.57	69.36
FHH	9.05	74.64	66.29
1SHT	11.67	89.09	79.26
2SHT	11.67	82.57	69.36
FHT	11.67	82.57	59.19
BRE	tbd	63.91	79.26
B/P	tbd	63.91	41.62

Data gaps and needs

- Expand data collection to include other states in the Bay to make results more robust.
- Identify and verify all production systems – need data for brooders/poults and breeders.
- Farm level data: number of birds harvested, litter removed at clean out, flocks per clean out, weights of birds harvested needed.
- Establish an ongoing system to receive and analyze data. Should build on what has been started with this study.