



BMP Expert Panel for Animal Mortality Management

Friday, August 13, 2021

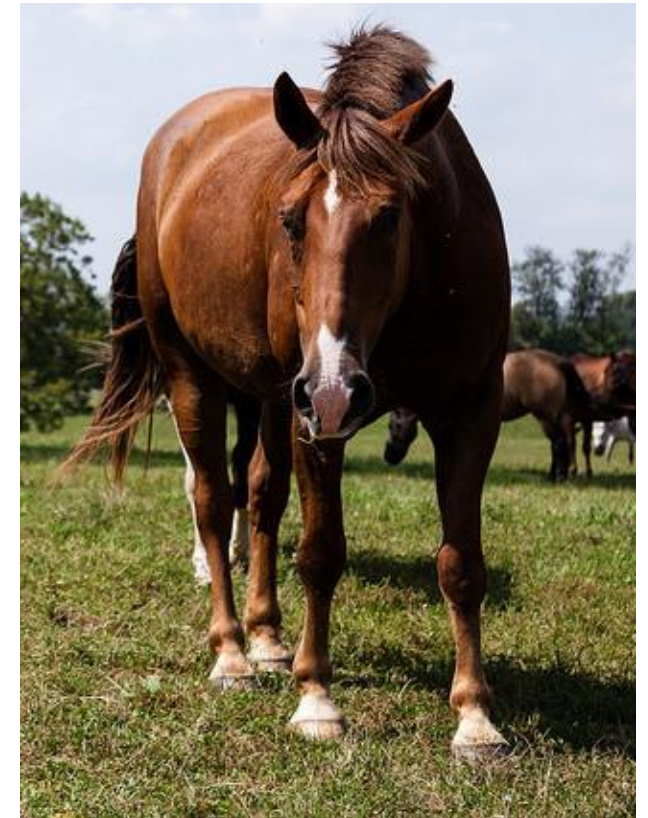
Welcome to the webinar! Everyone is currently muted. We will begin at 11:00am.

Getting started

- **If you can't hear me right now, please double-check your audio!**
- Click the “start audio” button in your Zoom control panel and follow the prompts to connect audio through either your computer or conference line
 - If Zoom control panel is hidden, hover your mouse over the minimized control panel at the bottom or top of your screen; “start audio” is on left-hand side of panel
- Participants are muted automatically to avoid disruptions.



Jeremy Hanson
Virginia Tech, Panel Coordinator

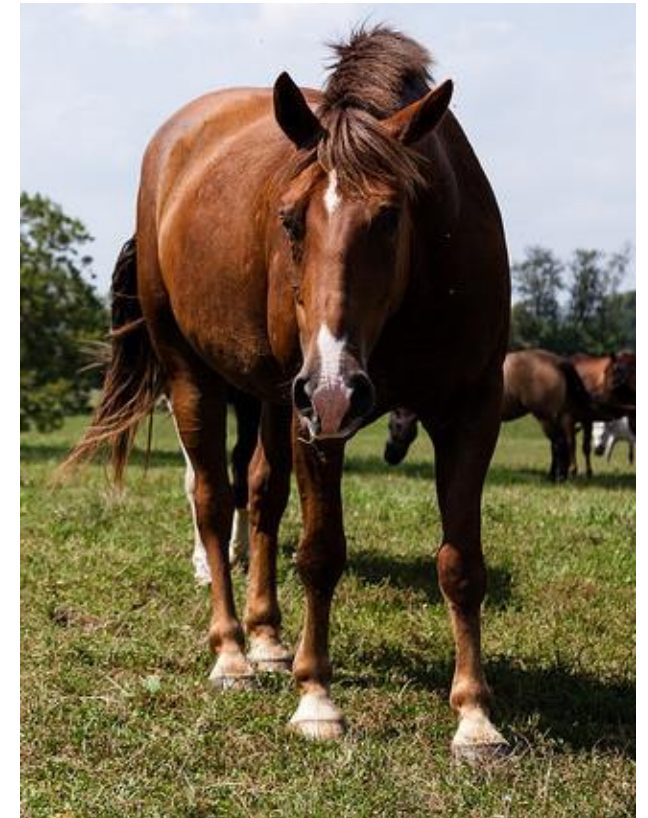


Getting started

- **If you can't hear me right now, please double-check your audio!**
- Please enter your questions for the speakers into the chat box throughout the webinar.
 - We will note your questions and pose them later in the webinar, or at pauses as able.
Therefore, please provide a slide number if your question refers to a specific slide.
- We are recording this session and will post the link to the CBP event calendar entry:
<https://bit.ly/2Wlw6Nr>



Jeremy Hanson
Virginia Tech, Panel Coordinator



Webcast agenda

- Introduction & Background
 - BMP panels & charge for this panel
- **Overview of panel recommendations**
 - **Part I: Routine animal mortality**
 - **Part II: Disposal methods**
- Preview of “technical appendix”
- General Q&A

Sorry for the acronyms, here are some to remember...

CBP = Chesapeake Bay Program

BMP = Best Management Practice

WQGIT = Water Quality Goal Implementation Team

AgWG = Agriculture Workgroup

WTWG = Watershed Technical Workgroup

CAST = Chesapeake Assessment Scenario Tool

...plus various units, such as:

AU(s) = Animal Unit(s)

1 AU is 1,000 lbs live weight



What is a BMP Expert Panel?

Photo: Chesapeake Bay Program

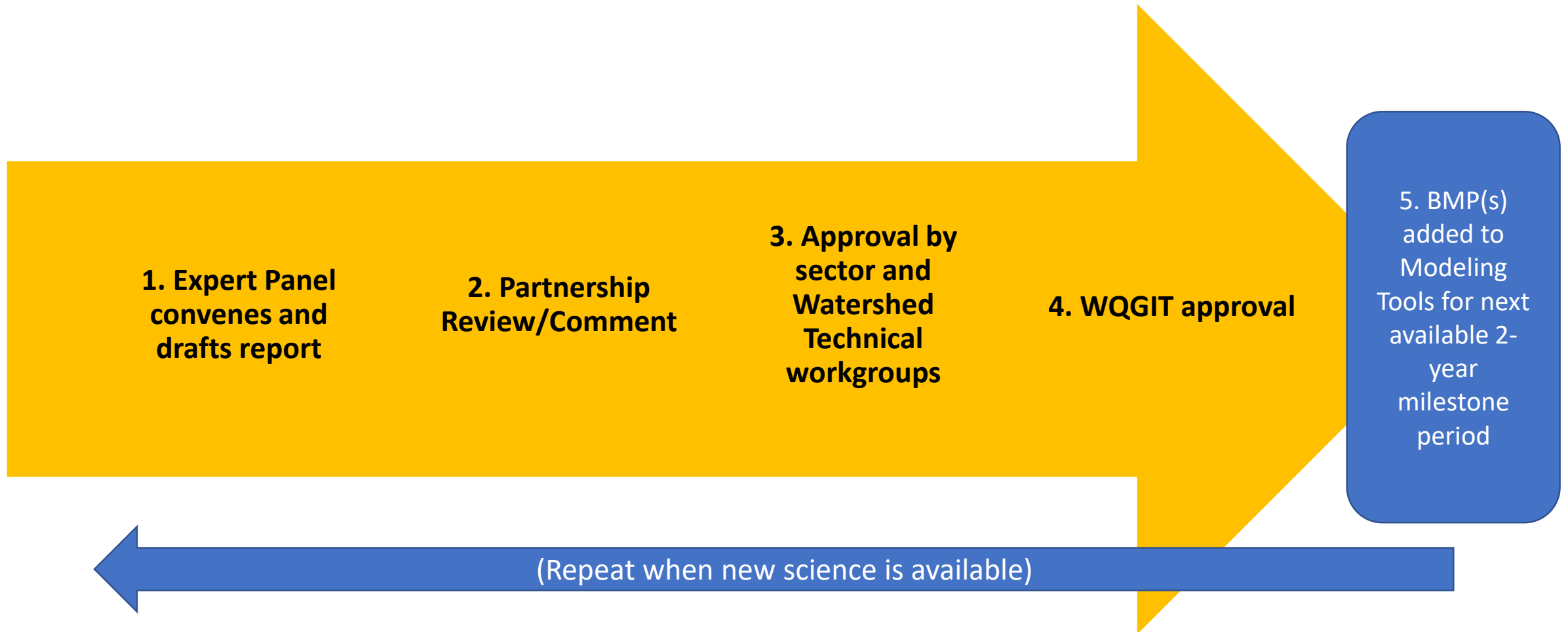
Best Management Practices (BMPs) are practices or technologies that **reduce pollution loads when implemented or installed** (can be structural, non-structural, programmatic)

Expert panels use the best available science and best professional judgment to inform the Chesapeake Bay Program partnership how much a BMP reduces pollution

- The panel writes a report with a lot of information in it
- They follow the BMP Protocol

Expert panels focus on the water quality benefits – specifically, the nitrogen, phosphorus and sediment reductions – associated with BMPs. They consider ancillary effects, too.

The “BMP Protocol” process (simplified)



Panel Charge

Investigate nutrient loads associated with routine animal mortality

Animal groups of interest used in Phase 6 Chesapeake Bay Watershed Model

- Poultry
 - Broilers
 - Layers
 - Turkeys
- Swine
- Dairy
- Beef
- Other cattle
- Equine
- Other (sheep, goats)

Evaluate practices' effect on nitrogen and phosphorus

Practices of interest from the AgWG

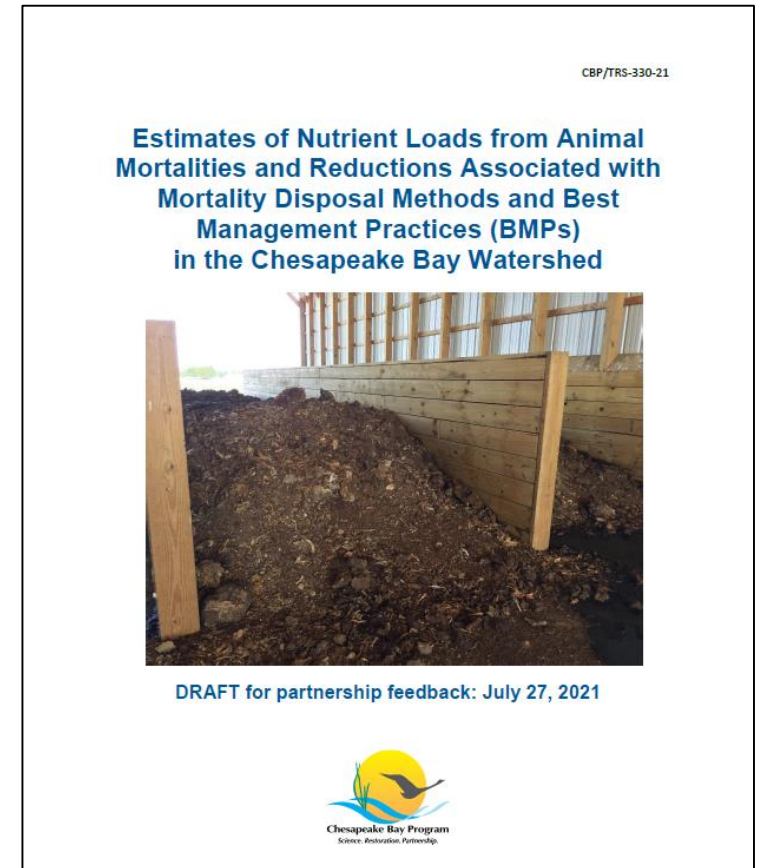
- Burial
- Composting
- Incineration
- Landfill
- Rendering
- Freezers

Altogether this info can then give us estimated load reductions for the BMPs that can be added into the Watershed Model (CAST)

Name	Role	Affiliation
Douglas W. Hamilton, PhD, P.E.	Panel Chair	Oklahoma State University
Thomas M. Bass	Member	Montana State University
Amanda Gumbert, PhD	Member	University of Kentucky
Ernest Hovingh, PhD	Member	Pennsylvania State University
Mark Hutchinson	Member	University of Maine
Teng Teeh Lim, PhD, P.E.	Member	University of Missouri
Sandra Means, P.E.	Member	USDA NRCS, East National Technology Support Center (now retired)
George "Bud" Malone	Member	Malone Poultry Consulting; University of Delaware (retired)
<u>Panel support</u>		
Jeremy Hanson	Panel Coordinator	Virginia Tech, CBPO
Brian Benham, PhD	VT Project Lead	Virginia Tech
Jeff Sweeney	WTWG & CBPO Modeling Team rep	EPA, CBPO
Mark Zolandz	Regulatory contact	EPA Region III
Loretta Collins	AgWG Coordinator	University of Maryland, CBPO
Mark Dubin	Senior Ag Advisor	University of Maryland, CBPO

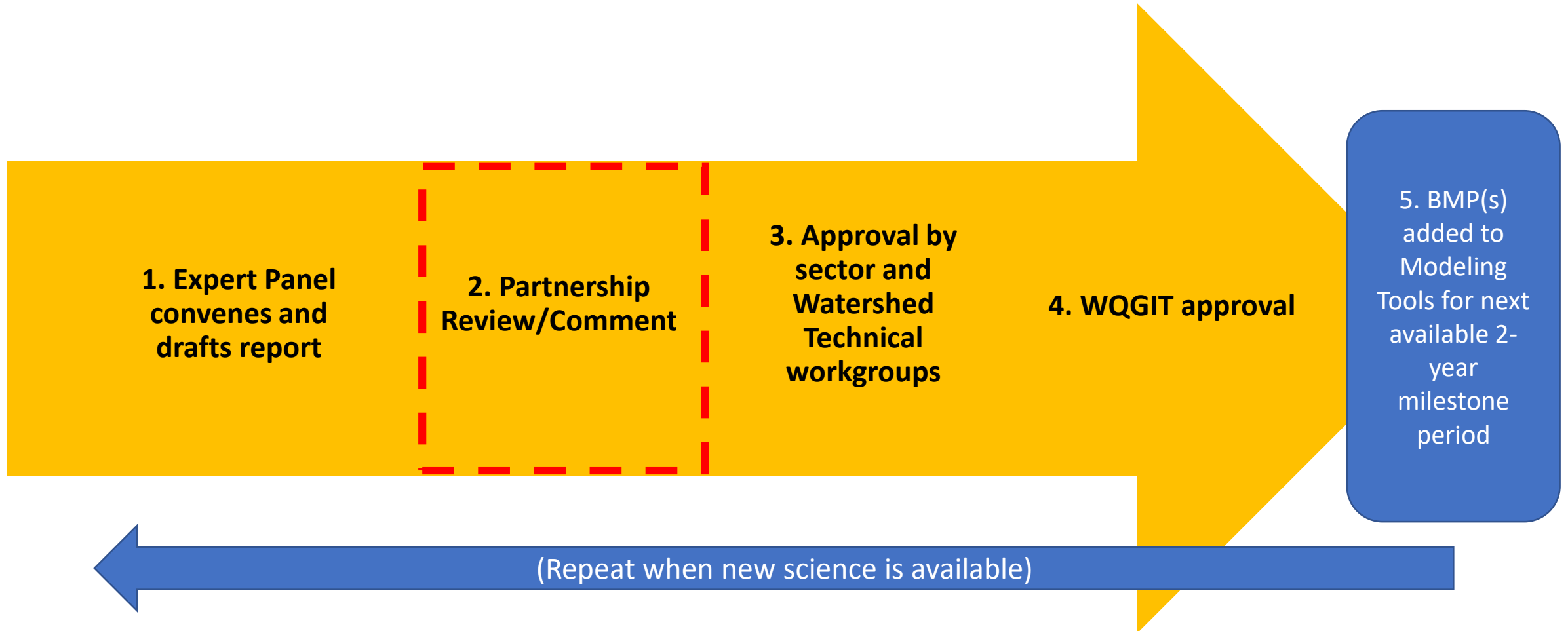
Panel timeline

- AgWG formed exploratory group known as an “EPEG” (Nov 2017 thru Jan 2018); their memo approved Mar 2018
- Panel membership approved by AgWG in Aug 2018
- Panel convened for first call in Nov 2018
 - Public stakeholder session on Nov 25 2018¹
- Panel met 14 times in-person or remotely thru July 2021
- Report released July 27 for CBP feedback
- *Fall 2021: Decisions from AgWG, Watershed Technical Workgroup and Water Quality Goal Implementation Team*



¹ https://www.chesapeakebay.net/what/event/open_stakeholder_session_animal_mortality_management_bmp_expert_panel

The “BMP Protocol” process (simplified)



Today's speakers



Doug Hamilton, PhD, PE
Oklahoma State University
Panel Chair



Mark Hutchinson
University of Maine
Panel member



Tommy Bass, MS
Montana State University
Panel member

Part I: Routine Mortality Production

Part I: Routine Mortality Production

“Traditional” Method

Capacity X Annual Death Rate X 70th Percentile Body Weight

Part I: Routine Mortality Production

Method used by this Panel

Capacity X

Production-Based Death Rate X

Body Weight at Death =

Mortalities per Production Period

Part I: Routine Mortality Production

Method used by this Panel

Capacity X

Production-Based Death Rate X

Body Weight at Death =

Mortalities per Production Period

Normalized and Annualized based on Production

Type of Farm	Characteristic Animal(s)	Weight of Mortality Nutrients Produced per Farm (lbs AU ⁻¹ year ⁻¹)	
		TN	TP
Poultry			
Broiler	6 lb. Market Birds	1.8	0.25
Layer	Laying Hens	2.2	0.40
Tom Turkey	48 lb. Market Toms	2.5	0.33
Hen Turkey	25 lb. Market Hens	2.5	0.32
Swine	270 lb. Market Hog	1.5	0.34
Cattle			
Cow-Calf Herd	Mother Cow	0.65	0.19
Cattle Feedlot	Heifer and Steer Capacity	0.47	0.14
Dairy	Mature Cows (Milking and Dry)	1.9	0.57
Equidae	1,150 lb. Horse	0.34	0.12

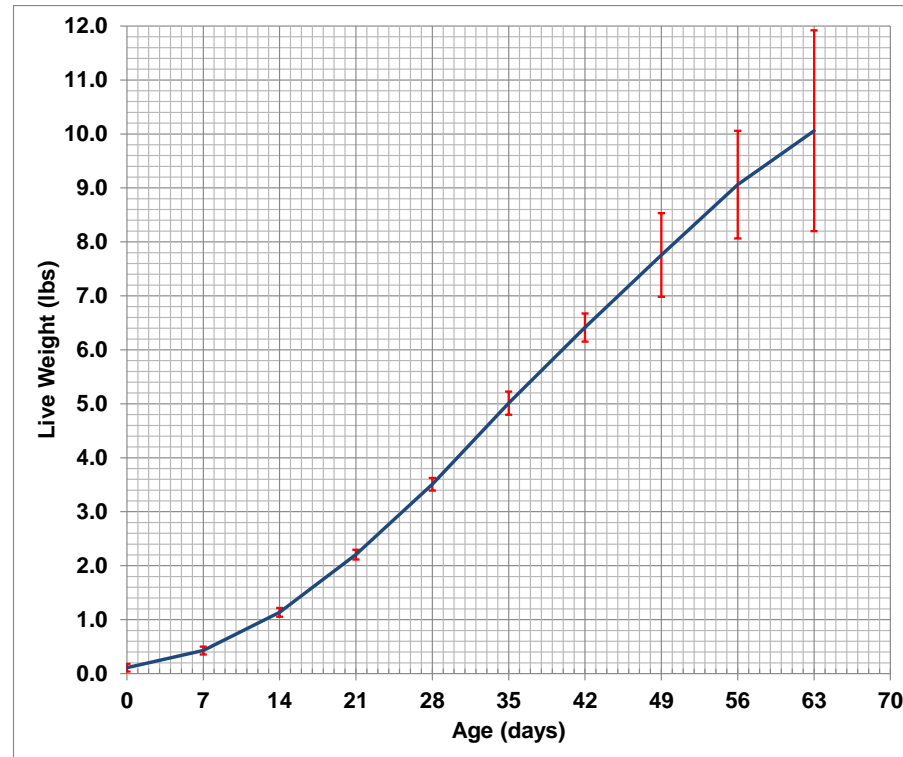
Broilers



Poultryventilation.com

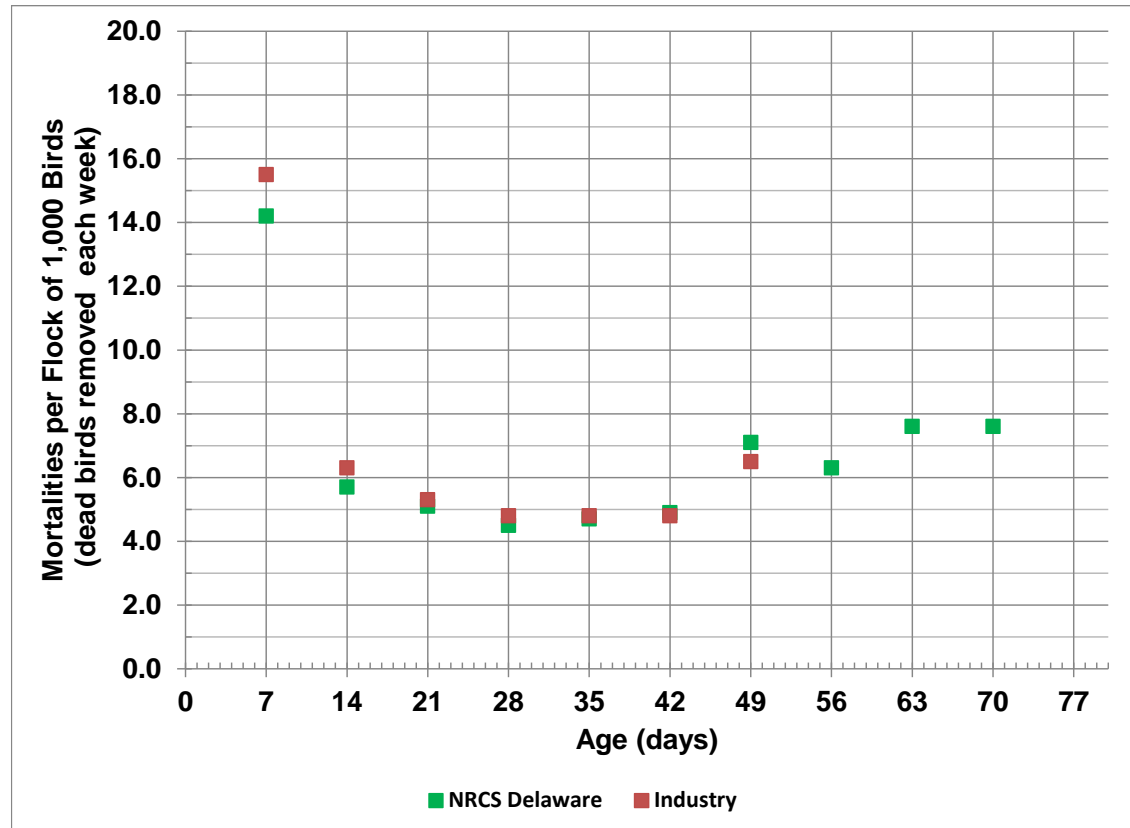
Broiler Growth Curve

Error bars indicate 95% confidence interval



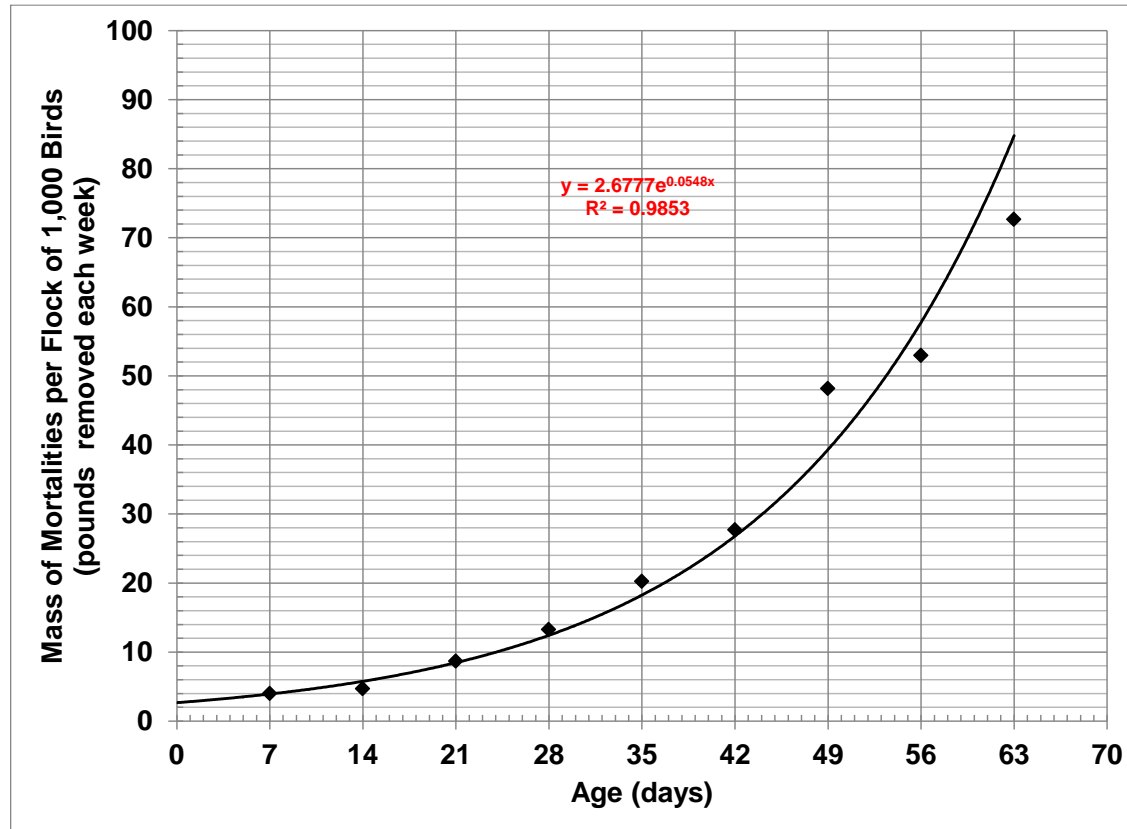
Cobb-Vantress, 2018
Aviagen, 2019
Caldas et al., 2019

Broiler Death Pattern

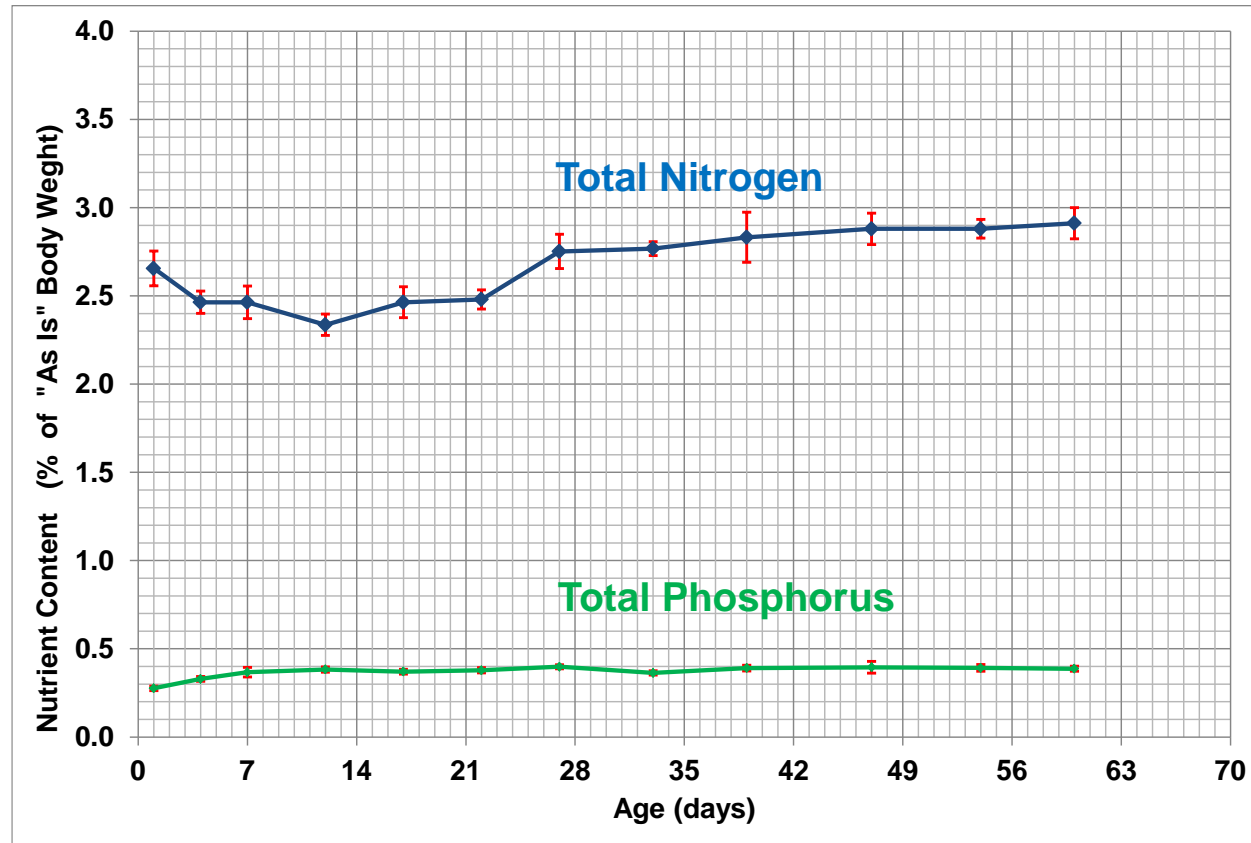


G.W. Malone, 2018

Collected each week from a flock of 1,000 broilers

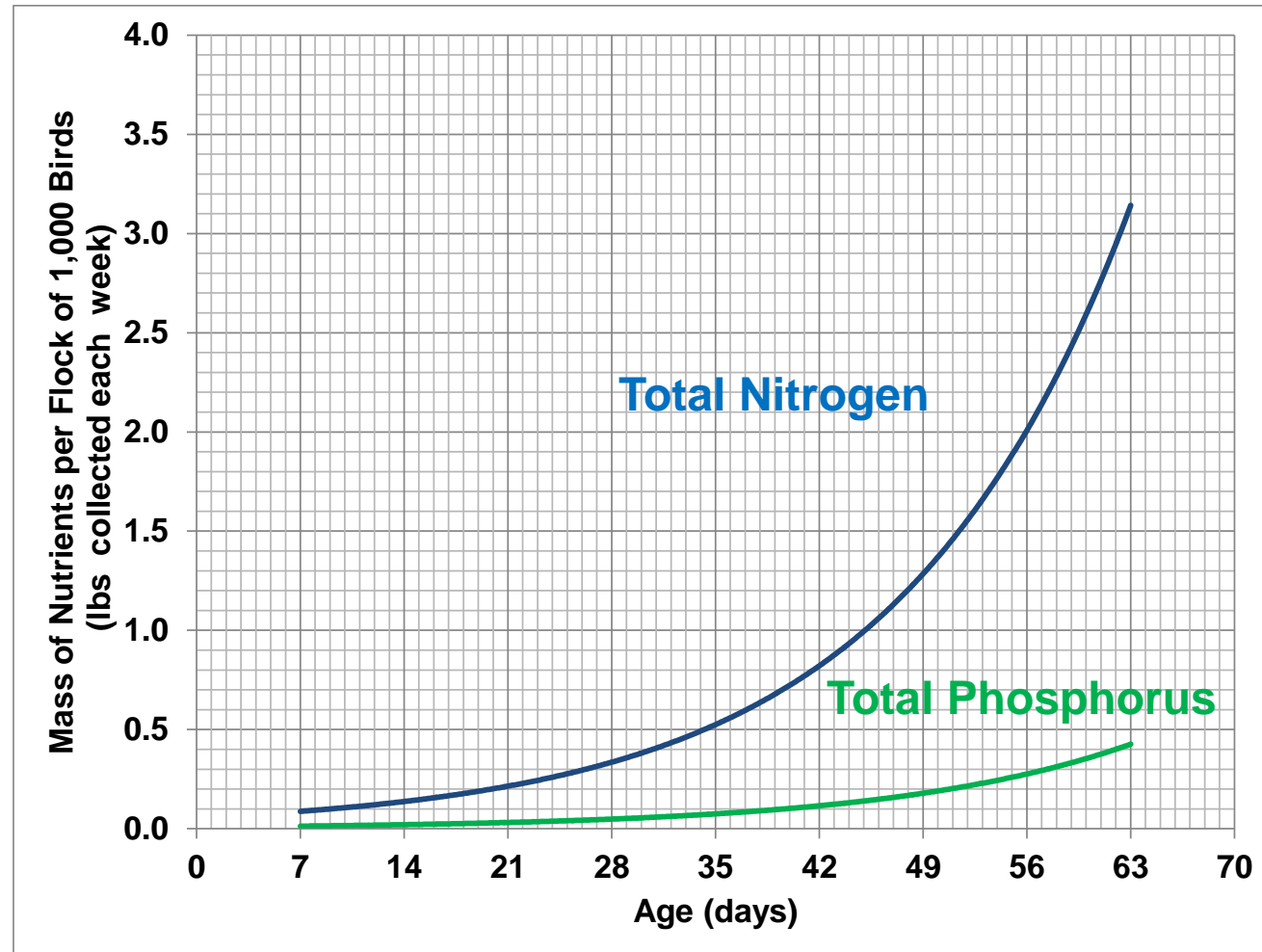


Broiler Carcass Composition

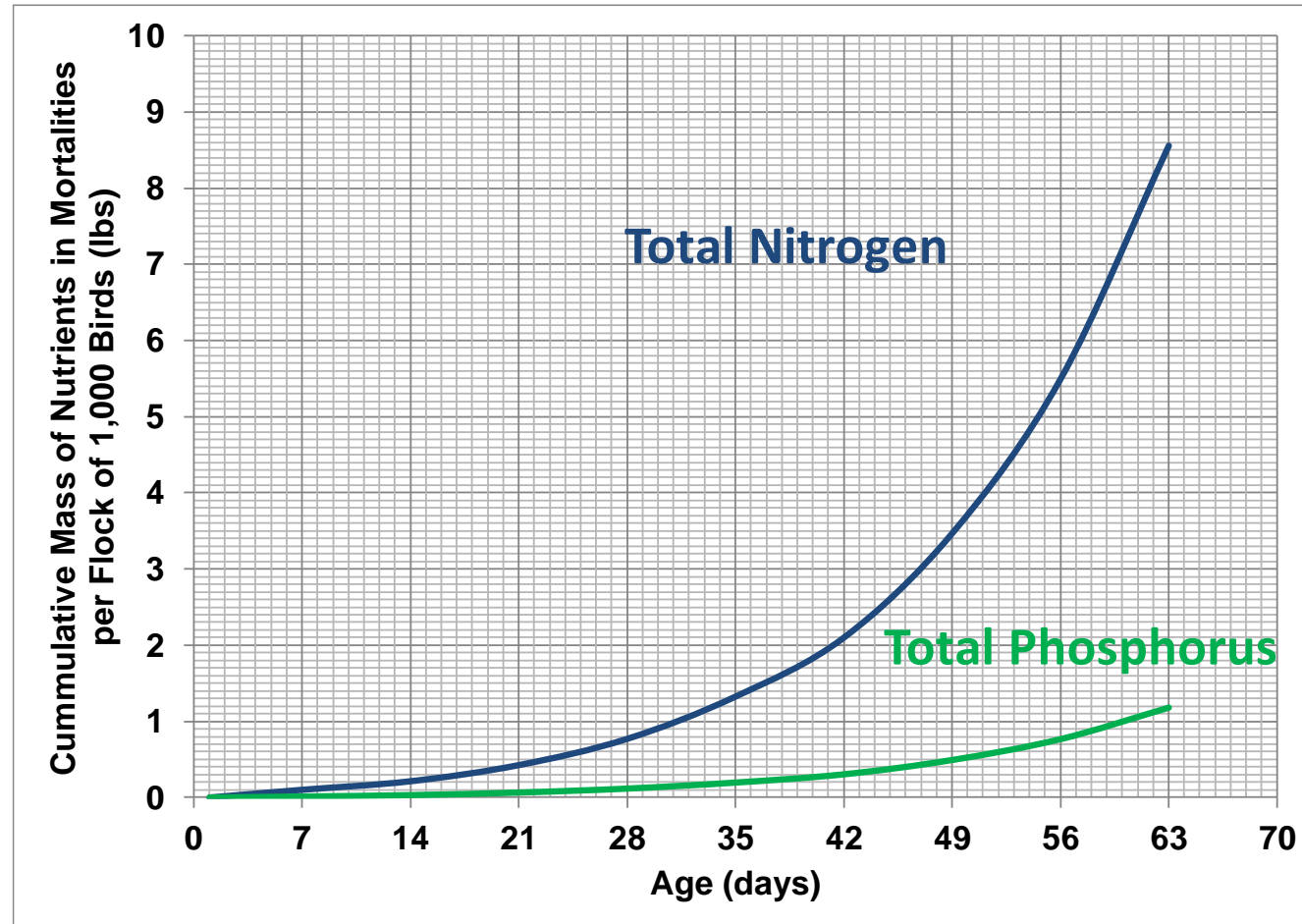


Caldas et al., 2019

Mortality Nutrients Collected Each Week from a Flock of 1,000 broilers



Cumulative Mortality Nutrients Collected from a Flock of 1,000 Broilers



Annual Weight of Mortalities and Nutrients Collected per 1,000 Bird-Space

		Per 1,000 Birds (lbs. year ⁻¹)		
Market Weight (lb)	Flocks per year	Mortalities	Total N	Total P
4	7.3	270	7.3	1.1
6	6.1	430	11	1.5
8	5.2	700	20	2.9

Comparison of this Method to 70% Percentile–Average Death Rate Method*

Broilers

	Mass of Mortalities and Nutrients Collected (lbs.)		
	Mortalities	Total N	Total P
Based on Method of Hamilton et al. (2021)	51	1.3	0.20
Based on Method of Felton et al. (2009)	175	5.1	0.80

* Five Pound Market Weight Birds

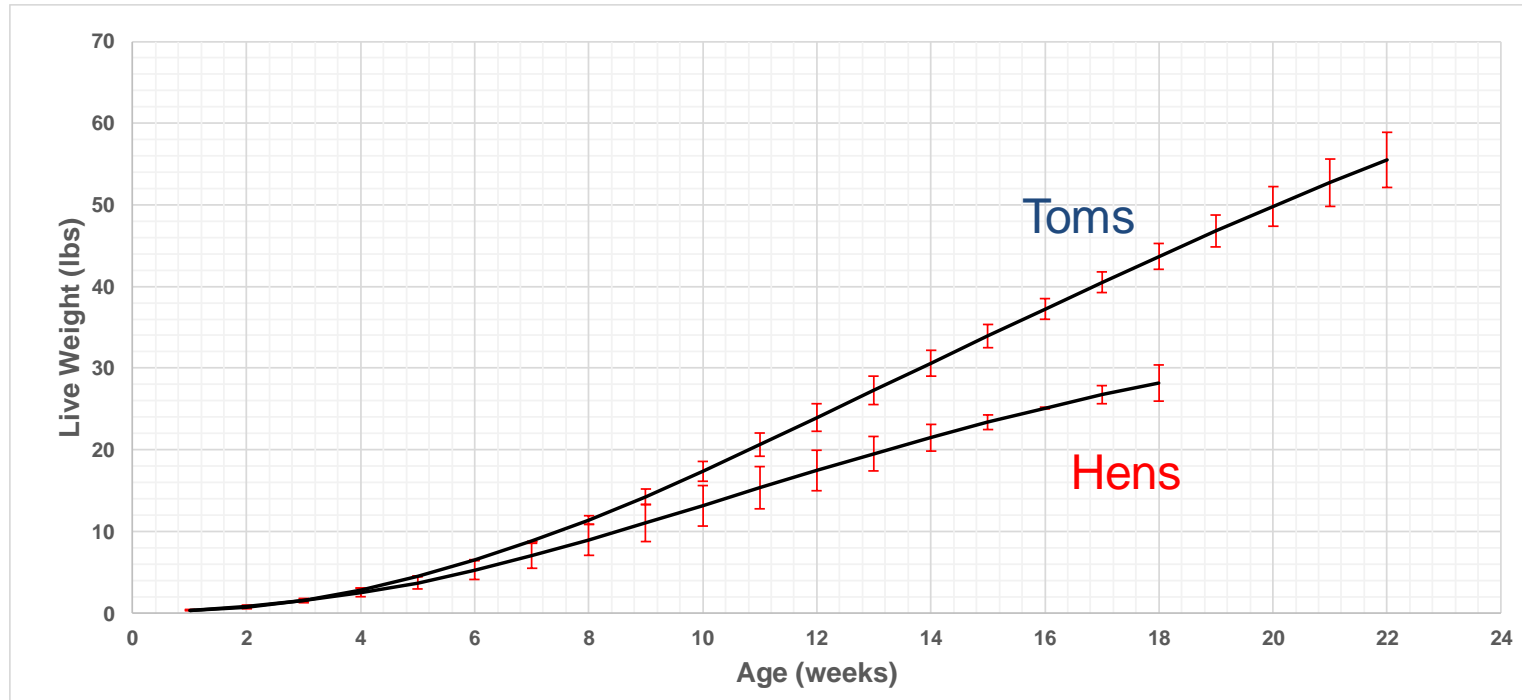
Turkeys



Deposit Photos

Turkey Growth Curve

Error bars indicate 95% confidence interval



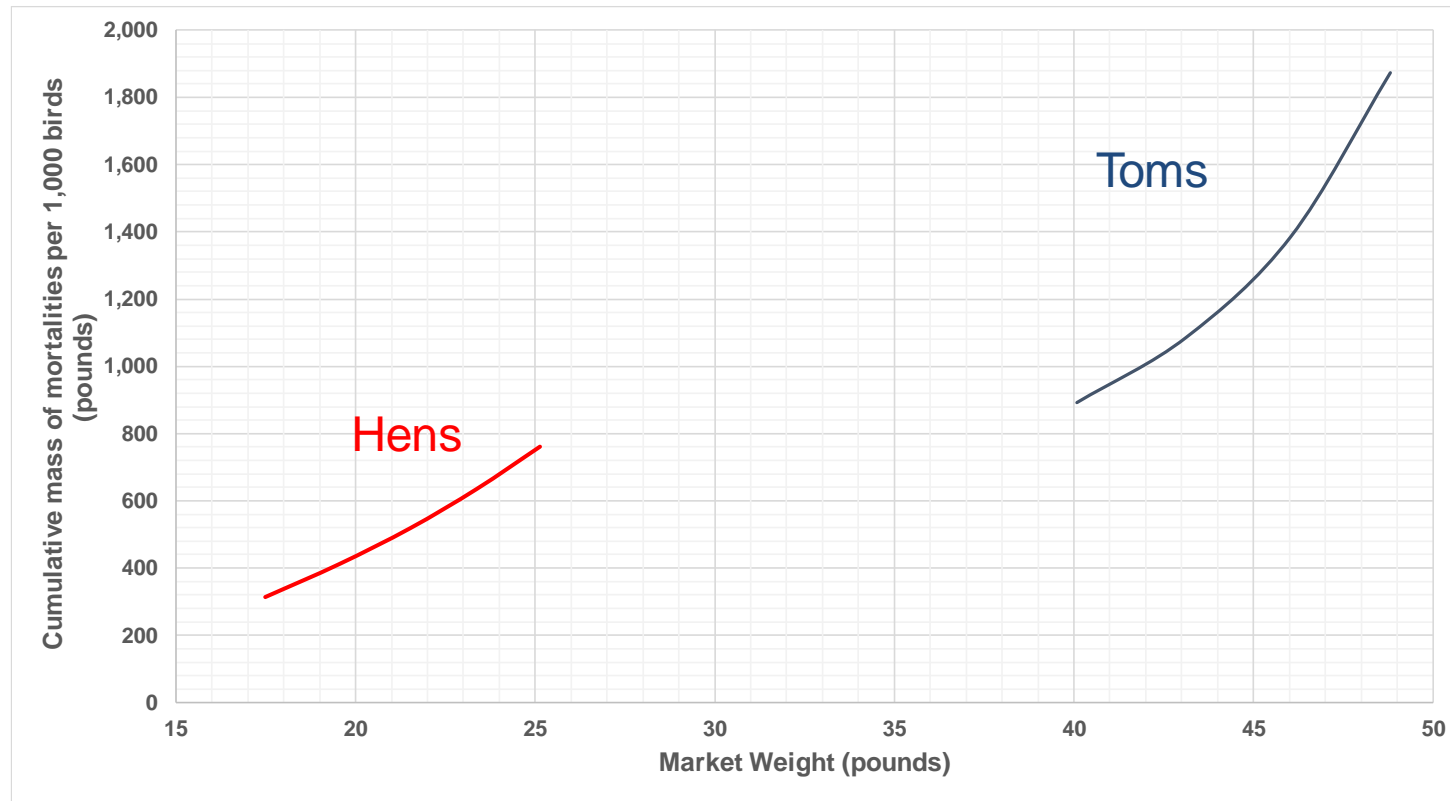
Aviagen Turkeys, 2019
Hybrid Turkeys, 2019

Mortality Rates for Turkeys

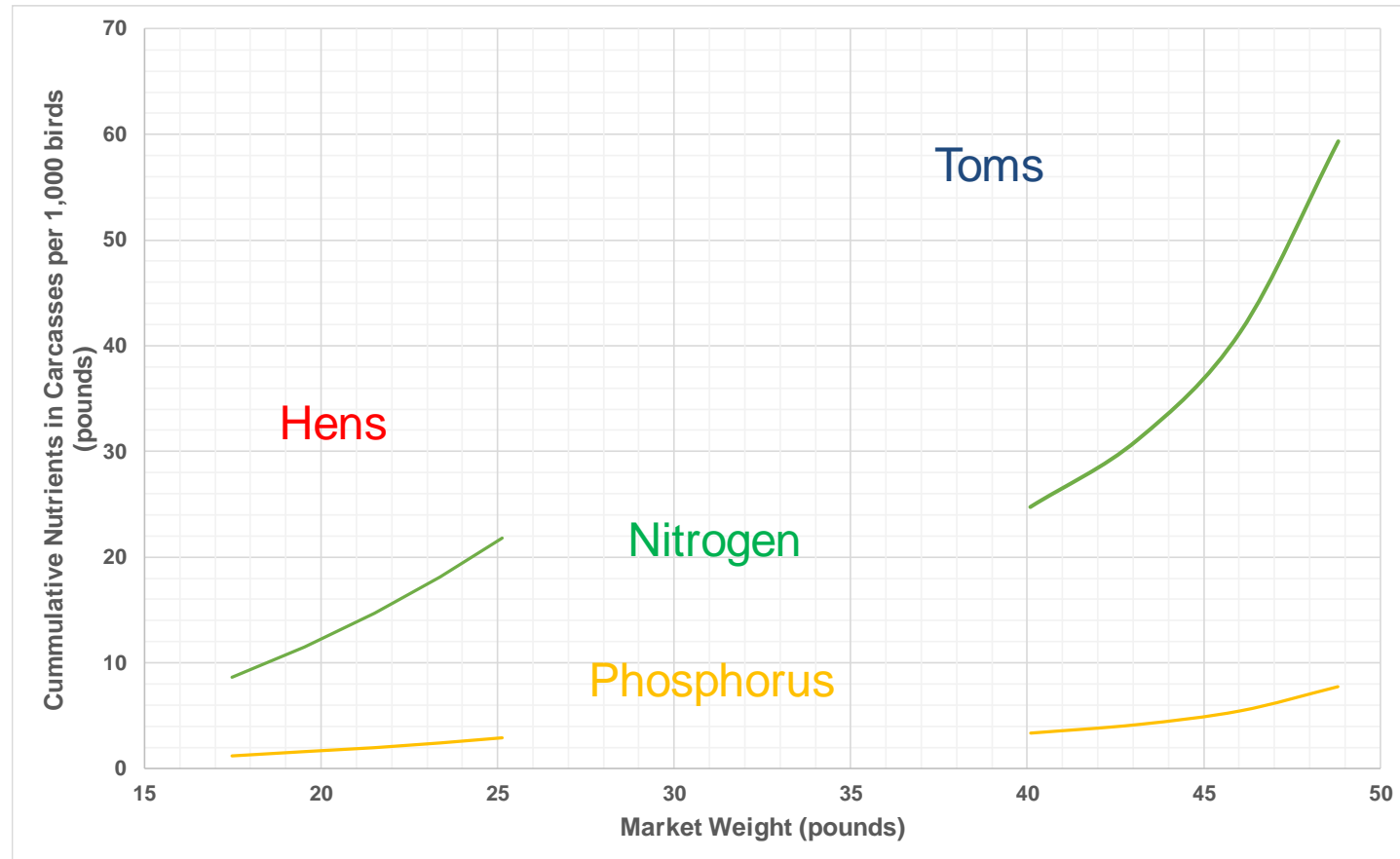
	Males (Toms)	Females (Hens)	
Market Weight (lbs)	42 - 48	18	25
Time to Reach Market Weight (weeks)	20 - 22	12	16
Mortality in First 7 to 10 Days (%)	2 - 3	1	1
Mortality in Last 2 to 3 Weeks (%)	1 - 2	0.5	0.5
Overall Mortality (%)	15	5	7

G.W. Malone, 2018

Cumulative Weight of Mortalities Collected during grow-out for Common Market Weights of Turkeys



Cumulative Weight of Mortality Nutrients Collected during grow-out for Common Market Weights of Turkeys



Annual Weight of Turkey Mortalities and Nutrients Collected per 1,000 Bird-Space

			Per 1,000 bird Flock (lbs year ⁻¹)		
Sex	Market Weight (lbs.)	Flocks per year	Mortalities	TN	TP
Toms	42	2.7	2,700	78	11
	44	2.6	3,100	88	11.5
	46	2.5	3,500	100	13.5
	48	2.4	4,100	120	16
Hens	19	3.3	1,250	36	4.6
	21	3.1	1,500	43	5.6
	23	3.0	1,800	54	6.9
	25	2.8	2,100	62	8.1

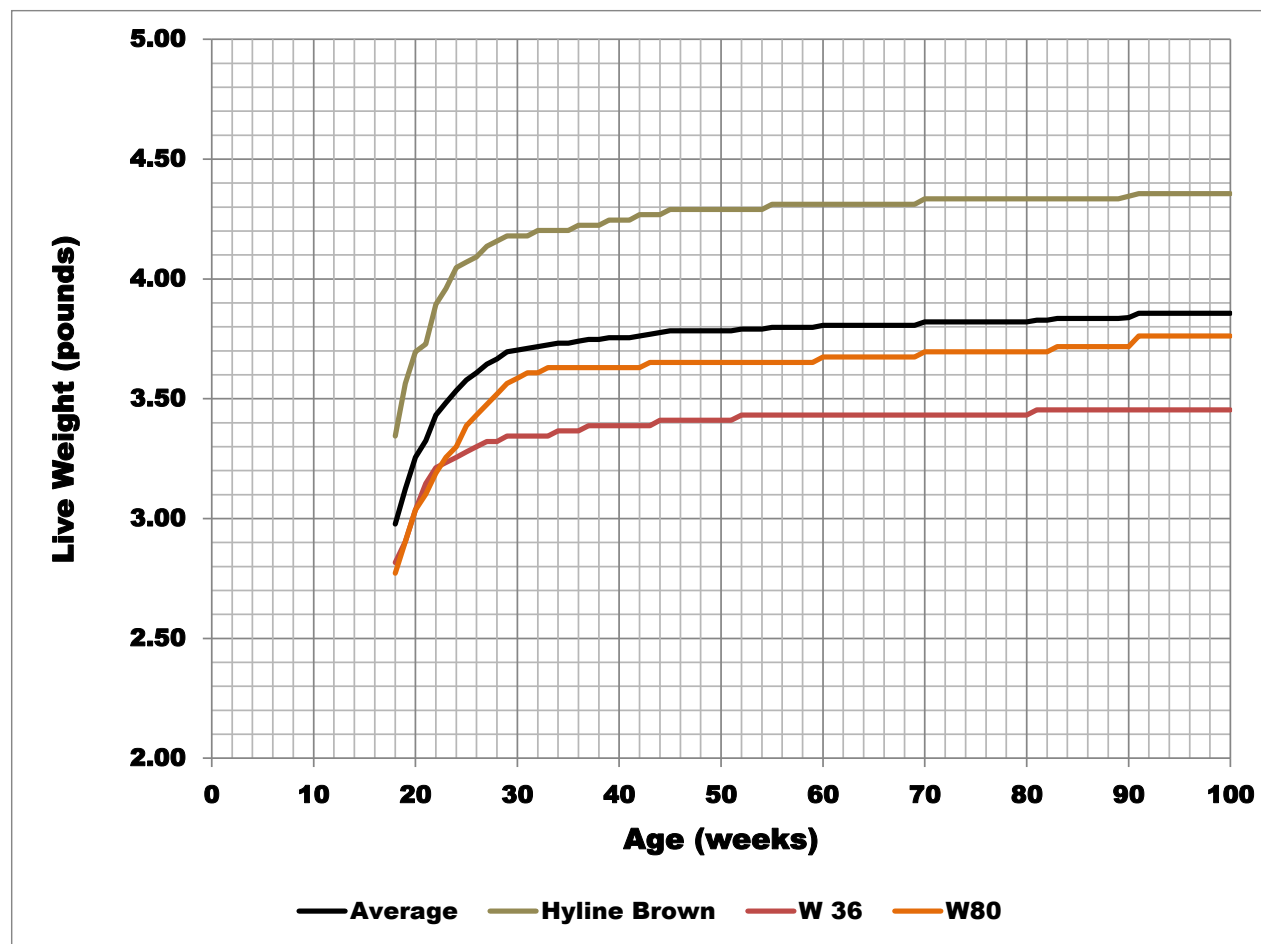
Annual Weight of Mortalities and Nutrients Collected per AU

			Per Animal Unit (lbs year ⁻¹)		
Sex	Market Weight (lbs.)	Flocks per year	Mortalities	TN	TP
Toms	42	2.7	64	1.9	0.26
	44	2.6	70	2.0	0.26
	46	2.5	76	2.2	0.29
	48	2.4	85	2.5	0.33
Hens	19	3.3	65	1.9	0.24
	21	3.1	71	2.0	0.27
	23	3.0	78	2.3	0.30
	25	2.8	84	2.5	0.32

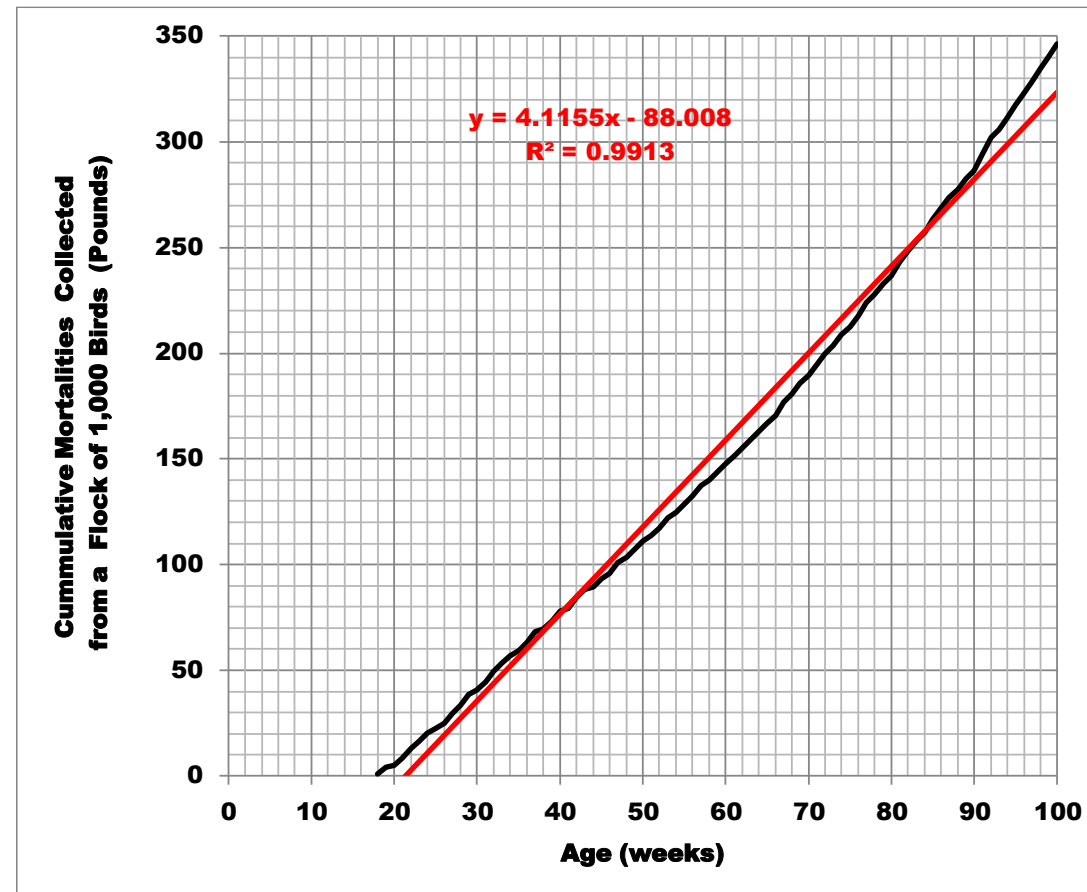
Layers



Layer Growth Curve(s)



Cumulative Weight of Mortalities Collected during the Placement of 1,000 Laying Hens



Annual Weight of Layer Mortalities and Nutrients Collected per 1,000 Bird-Space

Per 1,000 Bird Flock (lbs year ⁻¹)		
Mortalities	Total N	Total P
210	8.3	1.5

Comparison of this Method to 70% Percentile–Average Death Rate Method **Layers**

	Mass of Carcasses and Nutrients collected (lbs. per 1000 birds per year)		
	Mortalities	Total N	Total P
Based on Method of Hamilton et al. (2021)	210	8.3	1.5
Based on Method of Felton et al. (2009)	250	6.9	1.2

Cattle: Cow-Calf



USDA-NRCS Virginia

Assumed Weights for Beef Cattle

Life Stage	Weight (lbs)
Calf at Birth	80.4
Calf at Weaning	458
Heifer	840
Finished Steer	1,100
Mature Mother Cow	1,400

Death Rates Cow-Calf

	Annual Mortality (%)
Born Dead	3.03
Died before Weaning	3.83
Died after Weaning	1.73
Mother Cows	0.00

Annual Mortalities for a 50-Cow Cow-Calf Herd

	Head dying	Average Life Stage Weight (lbs.)	Weight of Mortalities (lbs. yr ⁻¹)
Born Dead	1.52	80.4	122
Died Before Weaning	1.92	269	516
Died After Weaning	0.865	1,130 ¹	977
TOTAL ANNUAL MORTALITY WEIGHT			1,615
TOTAL ANNUAL MORTALITY WEIGHT per MATURE COW			32.3

Mortality Nutrients Cow-Calf Herds

Per Mother Cow (lbs. per year)			Per AU (lbs. per year)		
Mortalities	Total N	Total P	Mortalities	Total N	Total P
32.3	0.905	0.265	23.1	0.646	0.189

Cattle: Cattle on Feed



USDA-NRCS Maryland

Annual Mortality Rates for Cattle on Feed

	Annual Mortality (%)
First 30 days	0.67
Mid-Feeding	1.59
60 to 31 Days Pre-Harvest	0.19
Final 30 days	0.23

Vogel et al., 2015

Annual Mortalities for a Feedlot with 100-Head Capacity

	Head dying	Average Live Weight (lbs.)	Weight of Mortalities (lbs. yr ⁻¹)
First 30 days	0.67	500	335
Mid-feeding	1.58	690	1,090
60-31 days pre-harvest	0.18	875	160
Final 30 days	0.22	1,100	240
TOTAL ANNUAL MORTALITY WEIGHT			1,825
TOTAL ANNUAL MORTALITY WEIGHT per Head in Confinement			18.25

Mortality Nutrients Cattle on Feed

Per Head (lbs. per year)			Per AU (lbs. per year)		
Mortalities	Total N	Total P	Mortalities	Total N	Total P
18.25	0.52	0.15	16.5	0.47	0.14

Cattle: Dairy



USDA-NRCS Virginia



USDA-NRCS Maryland

Assumed Weights for Dairy Cattle

Life Stage	Average Weight (lbs.)
Pre-Weaned Calf	122.5
Weaned Heifers	555
Mature Cow	1,300

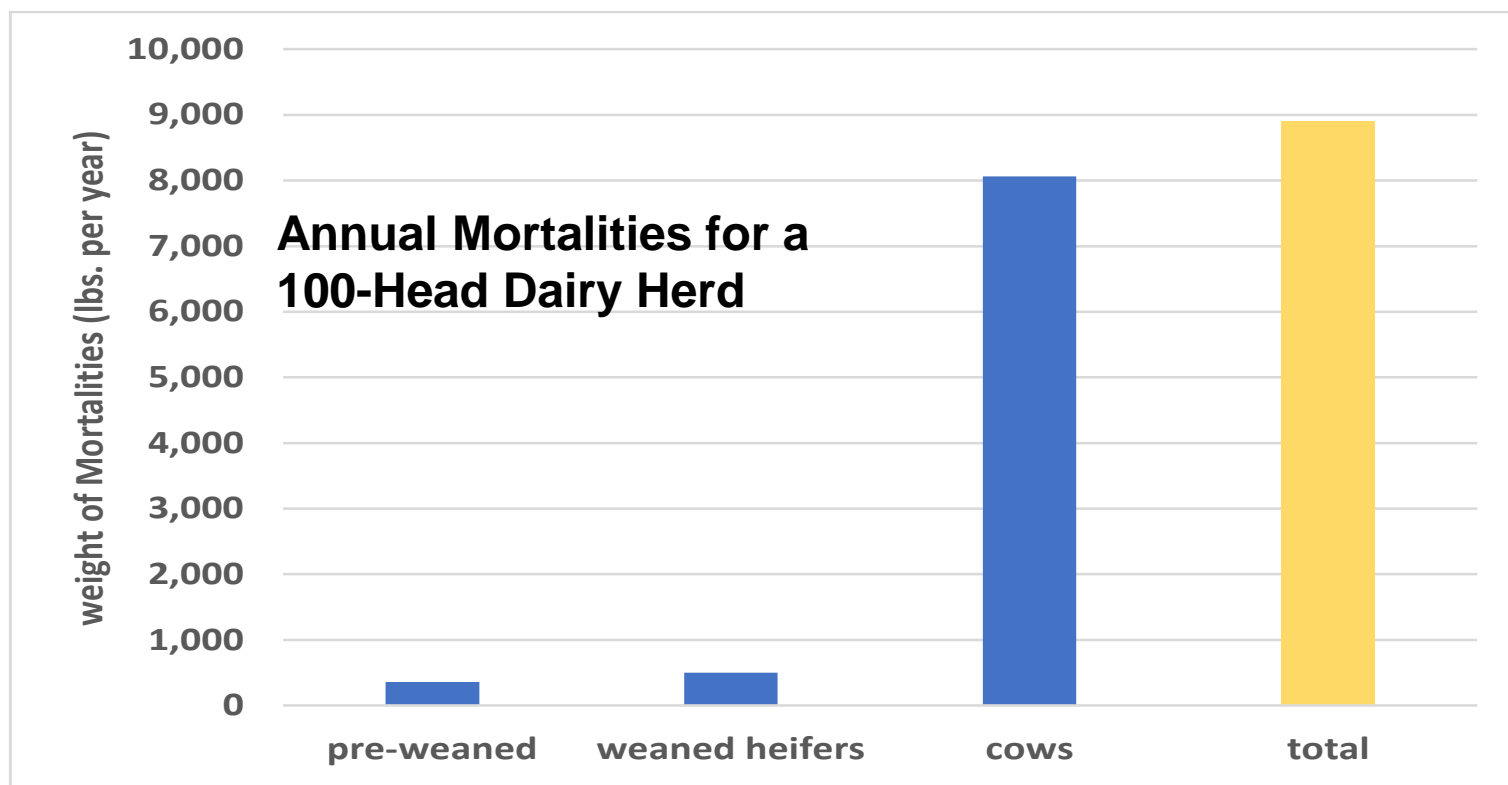
Annual Mortality Rates for Dairy Cattle

Life Stage	Annual Mortality (%)
Pre-Weaned Heifers	5.8
Weaned Heifers	1.8
Mature Cow	6.2

Annual Mortalities for a 100-Head Dairy Herd

	Head Dying	Life Stage Weight (lbs.)	Weight of Mortalities (lbs. yr ⁻¹)
Pre-Weaned Heifers	2.9	122.5	355
Weaned Heifers	0.90	555	500
Cows	6.2	1,300	8,100
TOTAL ANNUAL MORTALITY WEIGHT			8,955
TOTAL ANNUAL MORTALITY WEIGHT per MATURE COW			90

Annual Mortalities for a 100-Head Dairy Herd



Mortality Nutrients Dairy Cattle

Per Head (lbs. per year)			Per AU (lbs. per year)		
Mortalities	Total N	Total P	Mortalities	Total N	Total P
90	2.5	0.74	69	1.9	0.57

Swine

Hogs and Pigs for Breeding (Sows)



Thepigsite.com Global Ag Media

Hogs for Slaughter (Market Hogs)



National Hog Farmer

Phases of Market Hog Growth

Farrowing

Weaning

Nursery (15 to 55 Pounds)

Growing (55 to 120 Pounds)

Finishing (120 to 250-280 Pounds)

Phases of Swine Production

Breeding and Gestation

Farrowing

Weaning

Nursery (15 to 55 Pounds)

Growing (55 to 120 Pounds)

Finishing (120 to 250-280 Pounds)

Instantaneous Inventory for “Production Flow” of 25,000 Market Hogs per Year

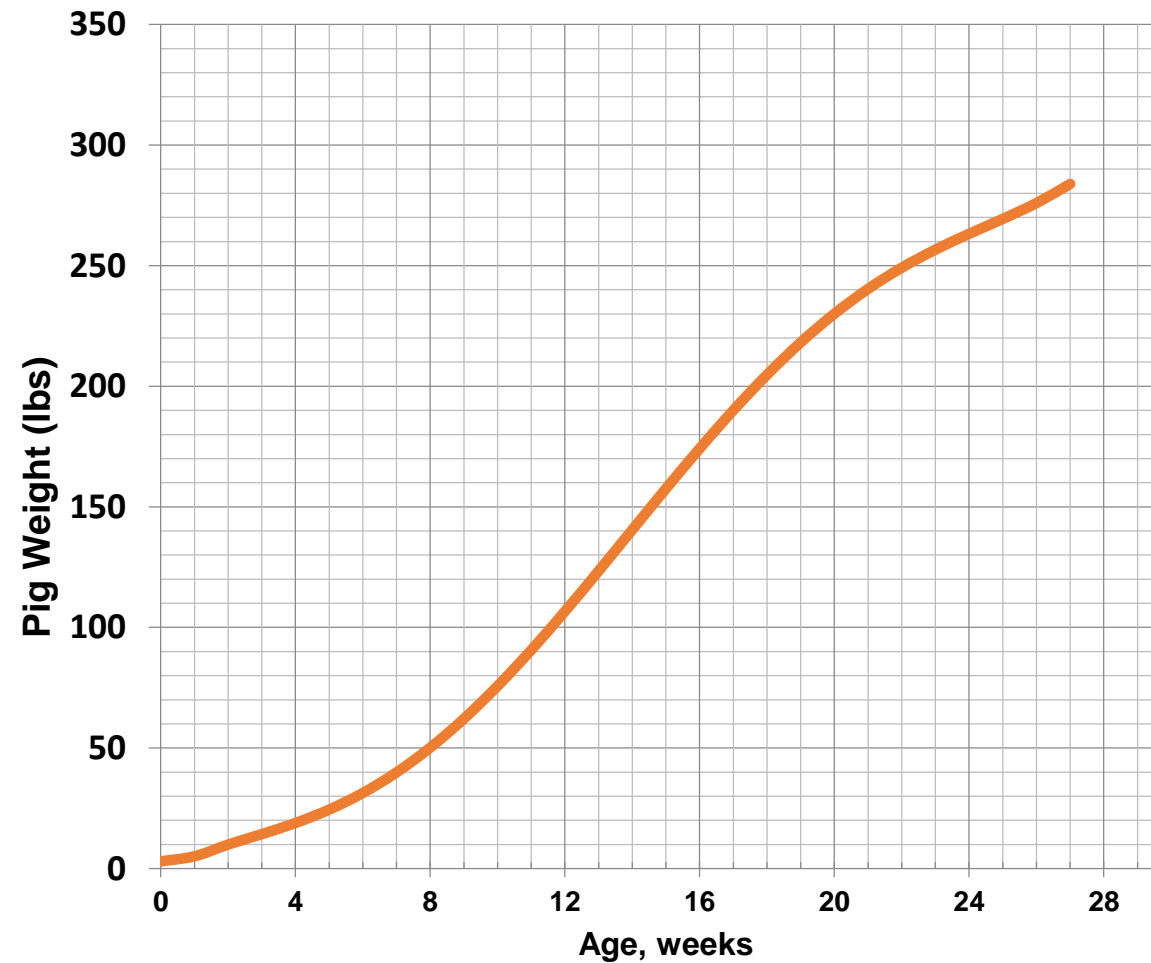
	Number Housed	Liveweight (AUs)
Gestating Sows	990	446
Boars	12	8.4
Gilts	115	34.5
Sows with Litters	160	72
Piglets in Litters	2,000	15
Nursery Pigs	3,900	130
Finisher Pigs and Hogs	9,700	1,100
Total	16,877	1,805.9

Swine Birth and Mortality Statistics 2011-2017

Litters per Sow per Year	2.35
Piglets per Litter	13.5
Piglets Born Alive (Number per Litter)	12.35
Piglets Weaned (Number per Litter)	10.1
Pre-weaning Mortality (Per Placement %)	17.6
Nursery Mortality (Per Placement %)	4.615
Grow-Finisher Mortality (Per Placement %)	5.32
Sows – Gilts – Boars Mortality (Annual %)	7.8

USDA-APHIS, 2012
Pork Checkoff, 2018
Pork Checkoff, 2019

Modeled Growth of Pigs



Cumulative Weight of Mortalities Collected for 1,000 Pig Placements

	Mortality Mass Collected Over Entire Growth Phase (lbs. per 1,000 pigs)	Mortality Mass Collected Over Entire Growth Phase (lbs. per pig)
Piglets Born Dead	317	0.317
Pre-Wean	911	0.911
Nursery	2,340	2.34
Finisher	9,880	9.88

Mortality Nutrients Produced for an Inventory for “Production Flow” of 25,000 Market Hogs per Year

	Inventory	Animals Dying (Head yr ⁻¹)	Mortality Mass (lbs. yr ⁻¹)	Mass of TN (lbs. yr ⁻¹)	Mass of TP (lbs. yr ⁻¹)
Sows	1,150	90	40,000	1,025	227
Gilts	115	19	2,700	68	15
Boars	12	1	700	16	4
Pigs Born Dead	0	3,200	9,450	240	53
Weaned Pigs	2,000	9,500	30,000	770	170
Feeder Pigs	3,900	1,500	64,000	1,600	362
Finishers	9,700	1,400	260,000	6,600	1,500
Total	16,877		406,900	10,340	2,292

Annual Weight of Mortalities and Nutrients for Entire Population (Farrow to Finish Farm)

	Per Animal Basis			Per Weight Basis		
	lbs. head ⁻¹ year ⁻¹			lbs. AU ⁻¹ year ⁻¹		
	Mortalities	TN	TP	Mortalities	TN	TP
Hogs and Pigs for Breeding (Sows)	350	9.0	2.0	790	20	4.4
Hogs for Slaughter (Market Hogs)	16	0.42	0.092	61	1.5	0.34

Equidae



Nutrients Contained in a Population of 100 Horses with a Mature Weight of 1,000 pounds

Age	Number Dying in Each Group per Year (head yr ⁻¹)	Weight of Animal (lbs.)	Weight of Mortalities in Each Group (lbs. yr ⁻¹)	Weight Fraction of Nutrients (lb. nutrient per lb. carcass)		Nutrients contained in mortalities (lbs. yr ⁻¹)	
				TN	TP	TN	TP
0 to 1 month	0.039	300	11.8	0.032	0.0110	0.38	0.13
1 to 4 months	0.049	350	17.2	0.032	0.0110	0.55	0.19
4 to 5 months	0.016	370	6.0	0.032	0.0110	0.19	0.066
5 to 6 months	0.016	426	6.9	0.032	0.0110	0.22	0.076
6 to 8 months	0.008	495	4.2	0.032	0.0109	0.13	0.045
8 months to year	0.017	596	10.0	0.032	0.0106	0.32	0.11
1 year to 18 months	0.014	711	9.8	0.032	0.0101	0.31	0.099
18 months to 2 years	0.014	807	11.1	0.032	0.0089	0.35	0.099
2 to 4 years	0.028	908	25.0	0.032	0.0086	0.80	0.215
4 to 5 years	0.028	1,000	27.5	0.032	0.0080	0.88	0.22
5 to 20 years	0.525	1,000	524.8	0.032	0.0080	16.79	4.20
20 to 29 years	0.307	1,000	306.9	0.032	0.0080	9.82	2.455
30 and older	0.047	1,000	46.5	0.032	0.0800	1.49	3.72
Totals for the Entire Herd			1,007.5			32.24	11.62
			10.1	Weight per Head (lbs. yr ⁻¹)		0.32	0.12
			10.7	Weight per Herd Weight (lbs. AU ⁻¹ yr ⁻¹)		0.34	0.12

Herd Mortalities based on Mature Weight of Equid Breed

Breed	Breed Type	Mature Weight (lbs)	Weight of Mortalities per Head (lbs yr ⁻¹)	Weight of Nutrient per Head (lbs. yr ⁻¹)	
				TN	TP
Belgian	Draft	1,899	19.2	0.61	0.22
Hanoverian	Warm blood	1,276	12.9	0.41	0.15
Thoroughbred	Race	1,276	12.9	0.41	0.15
Standardbred	Race	1,100	11.1	0.35	0.13
Quarter Horse	Light	1,221	12.3	0.39	0.14
Arabian	Light	1,001	10.1	0.32	0.12
Morgan	Light	999	10.1	0.32	0.12
Pony	Pony	429	4.3	0.14	0.050
Miniature	Donkey	275	2.8	0.089	0.032
Standard	Donkey	500	5.0	0.16	0.058
Mammoth	Donkey	950	9.6	0.31	0.11
Average of All Equids		983	9.9	0.32	0.11
Average of Horses		1,150	11.6	0.37	0.13

Fallback values assuming a herd of average sized (1,150 pound) horses

Annual Production per Head (pounds year ⁻¹)			Annual Production per AU (pounds year ⁻¹)		
Mortalities	TN	TP	Mortalities	TN	TP
11.6	0.37	0.13	10.7	0.34	0.12

Comparison of Mortality Nutrients to Manure Nutrients

	Inventory	Annual Production	Nutrients Excreted per Animal ¹		Annual Nutrient Excretion (lbs. yr ⁻¹)	
	Head	Head yr ⁻¹	TN	TP	TN	TP
Gestating Sows	990	-	0.071 lbs. hd ⁻¹ d ⁻¹	0.020 lbs. hd ⁻¹ d ⁻¹	26,000	7,200
Lactating Sows with Litters	150	-	0.190 lbs. hd ⁻¹ d ⁻¹	0.055 lbs. hd ⁻¹ d ⁻¹	11,000	3,200
Boars	12	-	0.061 lbs. hd ⁻¹ d ⁻¹	0.021 lbs. hd ⁻¹ d ⁻¹	267	92
Replacement Gilts	115	520	10 lbs. hd ⁻¹	1.7 lbs. hd ⁻¹	5,200	880
Nursery Pigs	3,900	26,000	0.91 lbs. hd ⁻¹	0.15 lbs. hd ⁻¹	24,000	3,900
Finisher Hogs	9,700	25,000	10 lbs. hd ⁻¹	1.7 lbs. hd ⁻¹	250,000	42,500
Total Manure Nutrients (lbs. yr ⁻¹)					316,467	57,772
² Total Mortality Nutrients (lbs. yr ⁻¹)					10,340	2,292
Total Nutrients (lbs. yr ⁻¹)					326,807	60,064
Portion of Total Nutrients from Mortalities					3.2 %	3.8 %

¹USDA-NRCS (2008)

Comparison of Mortality Nutrients to Manure Nutrients

Type of Farm	Percentage of Farm Nutrients (Manure and Mortalities) Originating with Mortalities	
	TN	TP
Poultry		
Broiler	1.3 - 2.4	0.65 – 1.2
Layer	0.70	0.40
Turkey	4.0	2.0
Swine	3.2	3.8
Cattle		
Cow-Calf Herd	0.45	0.58
Cattle Feedlot	0.26 – 0.32	0.45 – 0.75
Dairy	0.55 – 0.65	0.93 – 1.2
Equidae	0.30 - 0.52	0.51 – 1.5

Future Research Needs

- **Whole-Animal Nutrient Composition**
- **Death Rates**
- **On-Farm Mortality Mass and Volume**

Part II Disposal Methods

Part II Disposal Methods

Burial

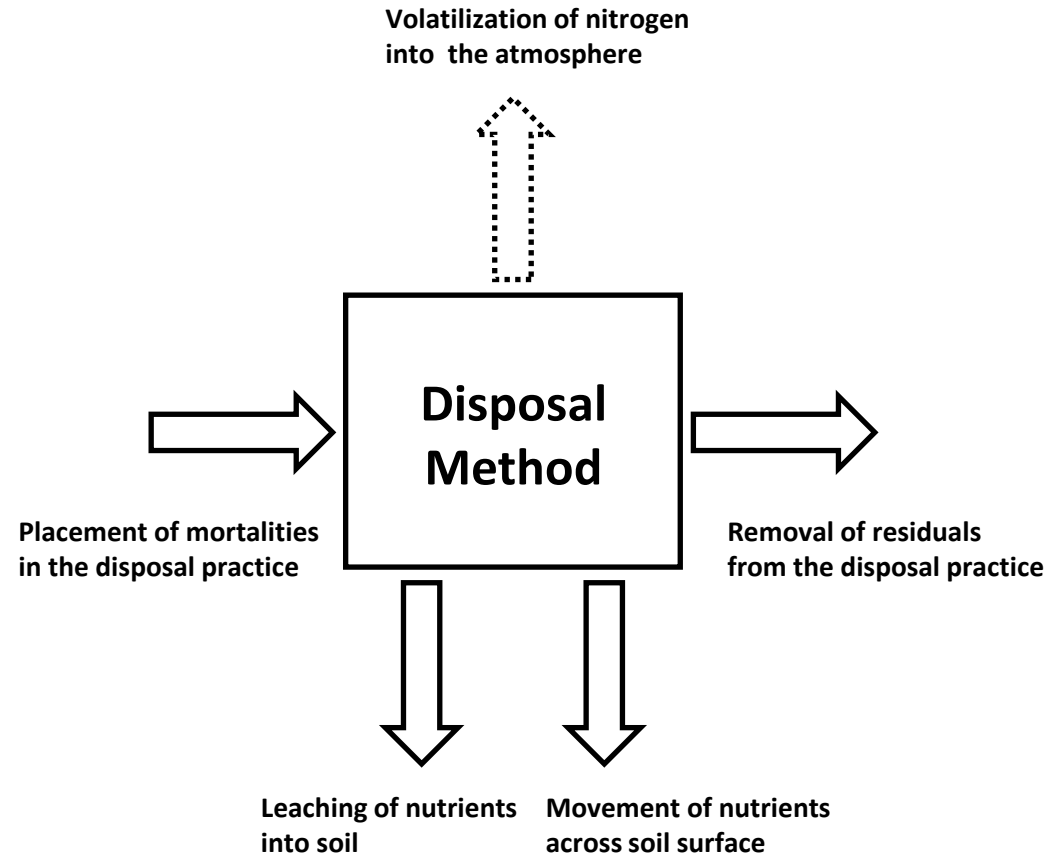
Composting

Incineration

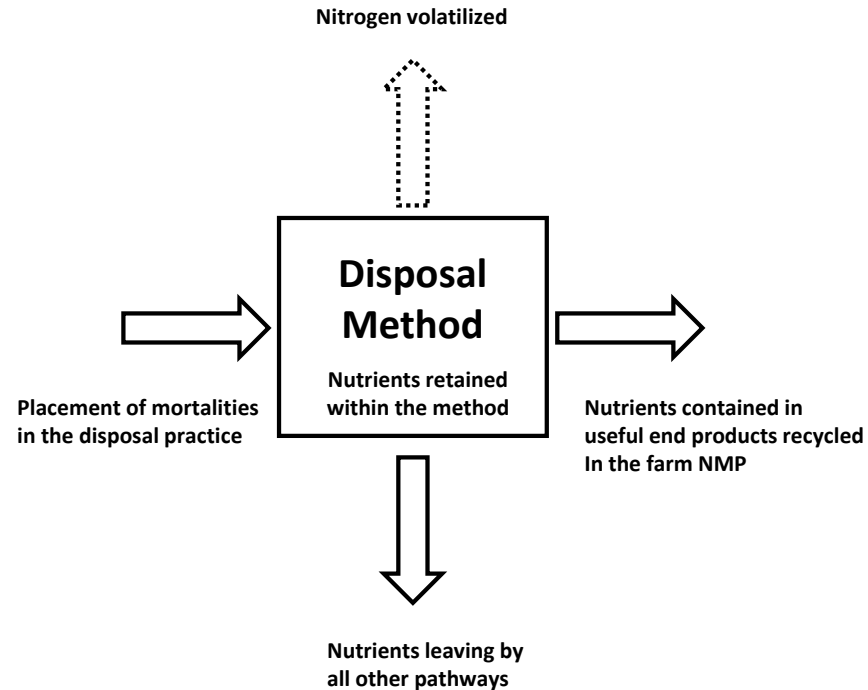
Landfilling

Rendering

Transfer of Nutrients by Disposal Methods



Transfer of Nutrients by Disposal Methods



$$\text{Mass Transfer Efficiency} = \frac{(\text{Mass of Nutrients Indicated by Arrow Leaving the Method})}{(\text{Mass of Nutrients Entering the Method})}$$

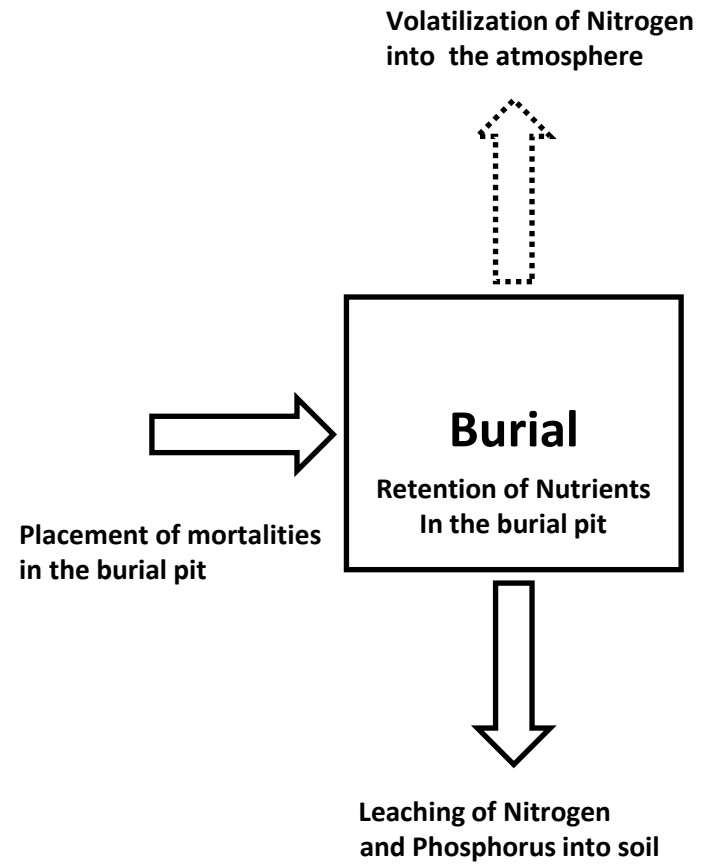
Transfer of Nutrients by Disposal Methods

Disposal Method	Mass Percentage of Carcass Nutrients Exiting the Method (%)				
	Nutrients recycled with end products in the farm nutrient management plan		Nutrients emitted to the atmosphere	Nutrients leaving the method by all other pathways	
	TN	TP	TN	TN	TP
Burial	0	0	0	15	5
Composting	80	100	10	10	0
Incineration	25	100	75	0	0
Landfilling	0	0	0	0	0
Rendering	0	0	0	0	0

Burial

- **Excavate a hole or pit above ground water, deep enough to place animal and cover with a minimum of 2 feet of cap material.**
- **If desired, a layer of dry carbon material such as sawdust can be added to the bottom of the pit to retain leachate.**
- **Consolidate or pack the excavated material over the animal and mound the cap to shed runoff around the burial site and reduce infiltration Cap material should have lower permeability to protect the burial from infiltration of rainfall.**

Burial



Fallback Nutrient Transfers with Burial

	TN	TP
Mortality nutrients recycled with end products in the farm nutrient management plan (% of nutrients entering)	0	0
Mortality nutrients emitted to the atmosphere (% of nutrients entering)	0	0
Mortality nutrients leaving the method by all other pathways (% of nutrients entering)	15	5

Composting

Composting



Static Pile
Mark Hutchinson



Turned Pile
Mark Hutchinson



Negatively Aerated Static Pile
Washington State University

Composting



“Three Bin” Composter
Langston University



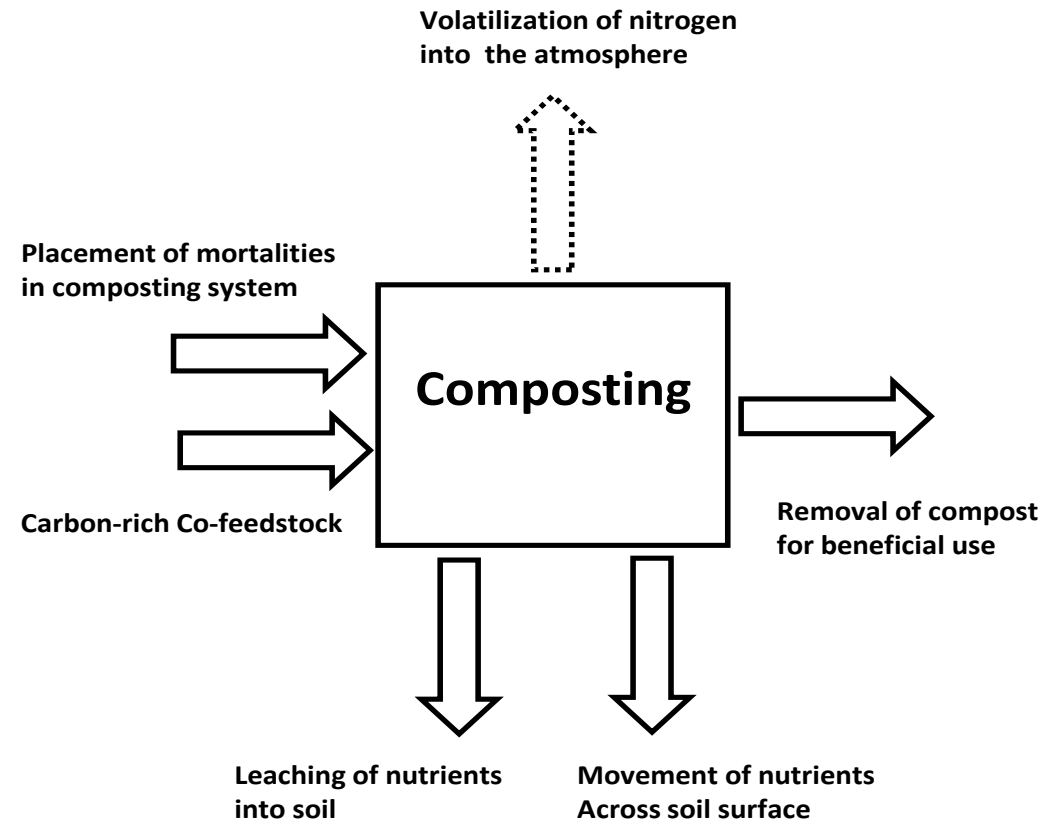
Tunnel Composter
Amanda Gumbert

Composting



Ecodrum™ Rotating Bin In-Vessel Composter
Washington State University

Composting



Composting

	TN	TP
Mortality nutrients recycled with end products in the farm nutrient management plan (% of nutrients entering)	80	100
Mortality nutrients emitted to the atmosphere (% of nutrients entering)	10	0
Mortality nutrients leaving the method by all other pathways (% of nutrients entering)	10	0

Incineration



R & K Incinerators

Incineration

Combustion

1,500 to 3,000°F

Excess Oxygen

Gasification

1,400 to 2,700°F

Oxygen Starved

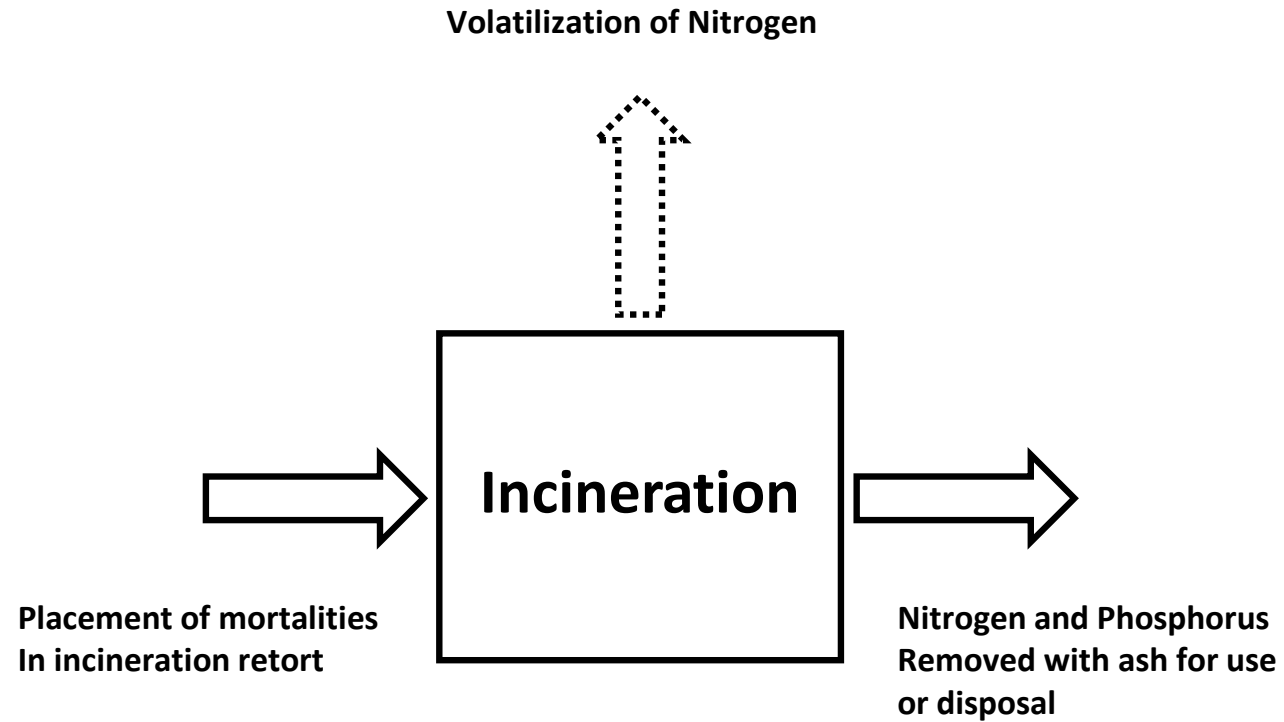
Pyrolysis

575 to 1,475°F

No Oxygen



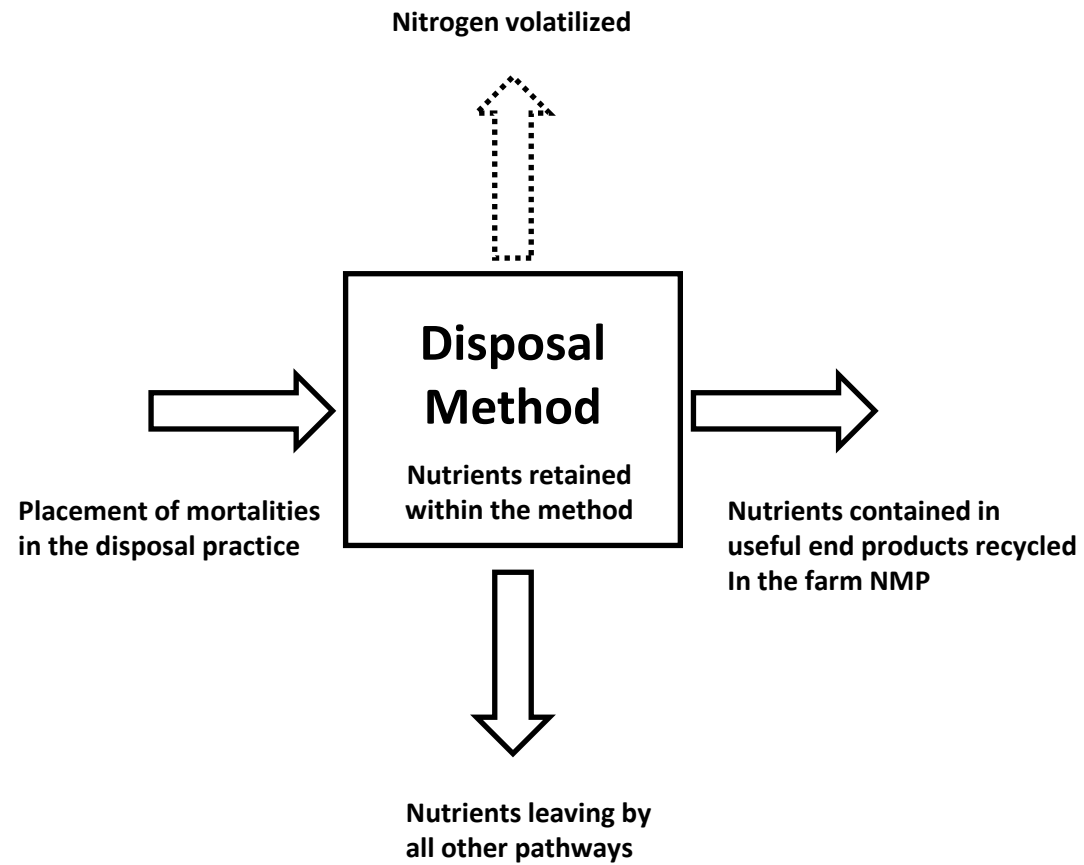
Incineration



Incineration

	TN	TP
Mortality nutrients recycled with end products in the farm nutrient management plan (% of nutrients entering)	25	100
Mortality nutrients emitted to the atmosphere (% of nutrients entering)	75	0
Mortality nutrients leaving the method by all other pathways (% of nutrients entering)	0	0

Rendering and Landfilling



Rendering and Landfilling

	TN	TP
Mortality nutrients recycled with end products in the farm nutrient management plan (% of nutrients entering)	0	0
Mortality nutrients emitted to the atmosphere (% of nutrients entering)	0	0
Mortality nutrients leaving the method by all other pathways (% of nutrients entering)	0	0

Nutrients removed from the Agricultural System

The “technical appendix”

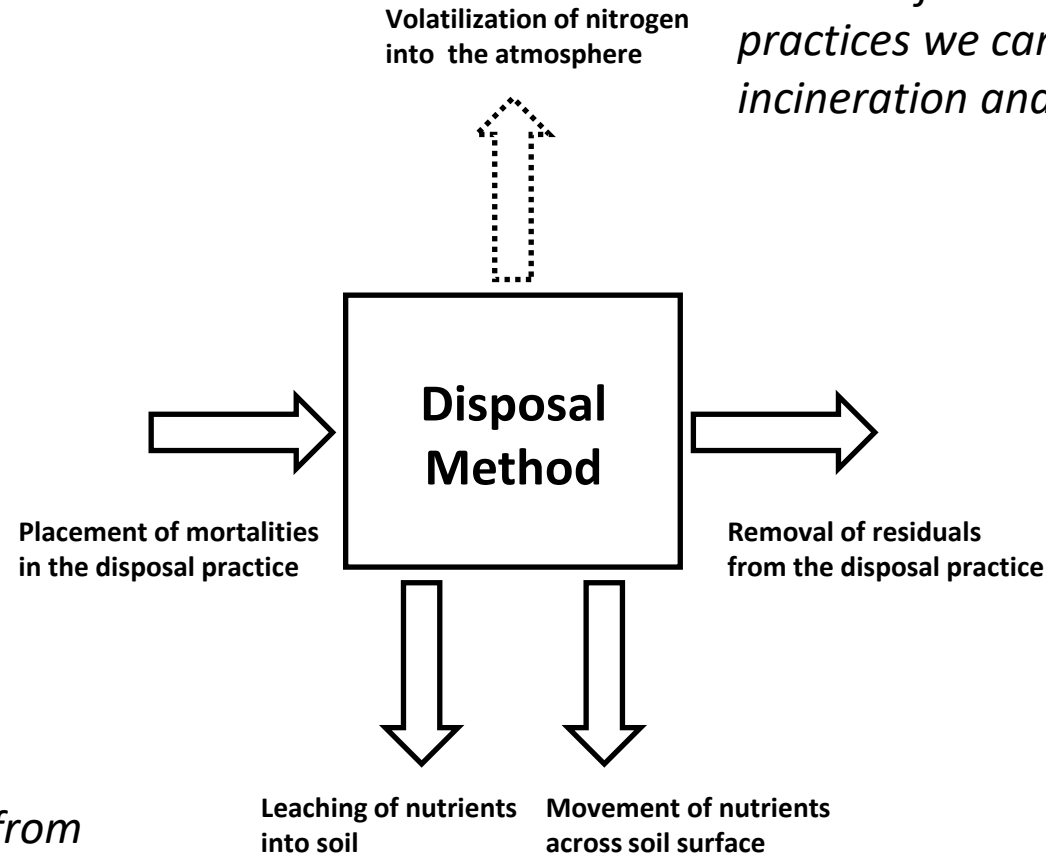
Applying the panel’s recommendations in the model (CAST) and BMP tracking/reporting apparatus (NEIEN)

Preview of “technical appendix”

- Technical appendix still being drafted (sorry), but will be posted to the calendar page as soon as it is ready
 - We can notify interested parties when available (e.g., WTWG, AgWG)
- Summary of plans:
 - Similar to the Manure Treatment Technologies panel, these practices first alter the nutrient “bucket” and then have associated “transport” or land application
 - Transport can simulate a number of possible cases, e.g., removal to a landfill or rendering facility, sale of finished byproducts, etc.
 - Panel gave us all the info we need to simulate the BMPs based on one or both reporting methods:
 - Weight of mortalities treated (and transported)
 - Production/scope of operation (AUs)

Translating the panel's thought process into the model...

N lost to atmosphere is "removed" though reactive forms can deposit back into the watershed; Modelers set methods for similar MTT practices we can apply for incineration and composting



Remaining N and P is left in form that is either "transported" or left on farm and assumed to be land applied

Some losses of N or P (from burial or composting) may be added back to barnyard load

Example using AUs, broilers and layers...*

Type of Farm	Characteristic Animal(s)	Weight of Mortality Nutrients Produced per Farm (Lbs. AU ⁻¹ year ⁻¹)	
		TN	TP
Poultry			
Broiler	6 lb. Market Birds	1.8	0.25
Layer	Laying Hens	2.2	0.40

	Burial						Composting						Incineration						Rendering or Landfill					
	Amount left for transport or application		Amount removed		Amount lost from barnyard		Amount left for transport or application		Amount removed		Amount lost from barnyard		Amount left for transport or application		Amount removed		Amount lost from barnyard		Amount left for transport or application		Amount removed		Amount lost from barnyard	
	TN	TP	TN	TP	TN	TP	TN	TP	TN	TP	TN	TP	TN	TP	TN	TP	TN	TP	TN	TP	TN	TP	TN	TP
Broiler	0	0	1.53	0.24	0.27	0.01	1.44	0.25	0.18	0	0.18	0	0.45	0.25	1.35	0	0	0	0	0	1.80	0.25	0	0
Layer	0	0	1.87	0.38	0.33	0.02	1.76	0.40	0.22	0	0.22	0	0.55	0.40	1.65	0	0	0	0	0	2.20	0.40	0	0

*subject to change, especially based on AgWG and WTWG feedback

Preview of “technical appendix”

- Four BMPs to be added with approval of panel recommendations
 - **Animal mortality disposal - Burial**
 - **Animal mortality disposal - Composting**
 - **Animal mortality disposal - Incineration**
 - **Animal mortality disposal - Rendering or Landfill**
- Animal type will need to be known; the BMPs will apply to specific animal types
 - Broilers
 - Layers
 - Turkeys
 - Swine
 - Dairy
 - Beef
 - Other cattle
 - Equine

Preview of “technical appendix”

Panel/report terms	Proposed NEIEN BMP name*	Relevant NRCS practices*	Other common names or related practices*
Burial	Animal mortality disposal - Burial		
Composting	Animal mortality disposal - Composting	NRCS CP 316 – animal mortality facility** NRCS CP 317 – composting facility**	
Incineration, gasification, pyrolysis	Animal mortality disposal - Incineration	NRCS CP 316 – animal mortality facility** NRCS CP 735 – waste gasification facility**	
Rendering, landfill	Animal mortality disposal - Rendering or Landfill		Freezers (esp. for rendering broilers)

***subject to change, especially based on AgWG and WTWG feedback**

** these NRCS practices can apply to manure treatment; jurisdictions will need to avoid double-counting
NRCS CP 368 (Emergency Animal Mortality Management) does not apply to the panel’s scope of routine mortality management

Next steps

- Reminder: the full report and other related materials are available on the CBP calendar page for this August 13 webinar:
 - https://www.chesapeakebay.net/what/event/animal_mortality_management_bmp_expert_panel_recommendations_roll_out_webin
- Feedback requested by Close of Business (COB) September 3
 - Send written feedback about the report to Jeremy Hanson, Panel Coordinator (jchanson@vt.edu)
 - Email Jeremy with questions or requests (e.g., if more time is desired to provide comments)
 - We can more effectively respond to and resolve concerns/requests the sooner they are raised. Please don't hesitate to reach out before the deadline.

Q&A

Please enter your questions in the chat box.

If you are familiar with Zoom and wish to ask your question verbally, please use the “raise hand” feature and wait to be called on. Un-mute and ask your question when prompted and re-mute when done speaking.

Next steps

- Reminder: the full report and other related materials are available on the CBP calendar page for this August 13 webinar:
 - https://www.chesapeakebay.net/what/event/animal_mortality_management_bmp_expert_panel_recommendations_roll_out_webin
- Feedback requested by Close of Business (COB) September 3
 - Send written feedback about the report to Jeremy Hanson, Panel Coordinator (jchanson@vt.edu)
 - Email Jeremy with questions or requests (e.g., if more time is desired to provide comments)
 - We can more effectively respond to and resolve concerns/requests the sooner they are raised. Please don't hesitate to reach out before the deadline.

THANK YOU

Once again, THANK YOU to all our panelists and others who supported or engaged with the panel. Science is a group effort!

AND

Thank you to everyone who joined us for the live webinar or viewed this recording online. We greatly appreciate your prospective feedback on the report and/or your interest and curiosity in the panel's recommendations.