Appendix B: Technical Requirements for Entering the Animal Mortality BMPs into CAST

**Version: May 1, 2023 DRAFT**

**Background:** In June 2013 the Water Quality Goal Implementation Team (WQGIT) agreed that each BMP expert panel would work with CBPO staff and the Watershed Technical Workgroup (WTWG) to develop a technical appendix for each expert panel report. The purpose of this technical appendix is to describe how the expert panel’s recommendations will be integrated into the modeling tools including NEIEN, CAST and the Watershed Model. This involves how a load source reduction value for animal mortality BMPs can be incorporated as an approved BMP in the next version of CAST after CAST-21. With an expectation of full Expert Panel recommendations being approved in Fall 2023, the practices can be incorporated as planning BMPs in CAST-21. Some aspects of the panel’s recommendations may not be applicable until Phase 7 of the Watershed Model.

**Q1. What practices will be available for planning scenarios in CAST-21 and as approved BMPs in a future CAST update? Are any current planning or approved BMPs affected or superseded by these new practices?**

**A1**. Following adoption of the panel’s recommendations of the following BMPs to be available in CAST, and reportable to NEIEN, but will not be simulated as part of official Progress scenarios until the next version of CAST is released.

The previously existing Mortality Composters BMP will be replaced with the new Animal Mortality Disposal by Composting practice (see below for definition).

The current planning-only BMP for broiler mortality freezers will be eliminated and replaced in favor of the rendering BMP, which includes the use of freezers or refrigeration units to store mortalities prior to transfer to the rendering facility.

**Animal mortality disposal by landfill or rendering** is the handling, storage and disposal of poultry, livestock, or other routine animal mortalities by internment in a landfill or processing at a rendering facility. Report units of animal units or tons of carcasses of dead animal for an annual practice or in units of systems for a structural system.

**Animal mortality disposal by burial** is the handling and disposal of poultry, livestock, or other routine animal mortalities by placing the carcass or carcasses below ground into an excavated pit, hole, or trench, which is then covered or capped.

**Animal mortality disposal by incineration** is the handling, storage and disposal of poultry, livestock or other routine animal mortalities by thermochemical conversion using combustion, gasification, pyrolysis, or some combination of those methods. The methods result in gaseous and solid byproducts. It is expected that most nitrogen is transformed and lost to the atmosphere, while all phosphorus remains available or land application or transport. Report units of animal units or tons of carcasses of dead animal for an annual practice or in units of systems for a structural system.

**Animal mortality disposal by composting** is the handling, storage and disposal of poultry, livestock or other routine animal mortalities by composting including one or more of the following, alone or in combination: static piles and windrows (a.k.a. passive piles), turned windrows, static aerated windrows, a bin system, a tunnel composter, or in-vessel composter such as a rotating drum. Report units of animal units or tons of carcasses of dead animal for an annual practice or in units of systems for a structural system.

**Q2. What are the reductions a jurisdiction can claim for planning purposes under these practices in the Phase 6 Watershed Model?**

**A2**. The panel’s recommended transfer efficiency values had unintended consequences when applied in Phase 6, which does not have a dedicated load source for animal mortalities. To streamline the reporting and simulate the recommended effects for each BMP, an analysis between the panel’s recommended nutrient pathways was performed using burial as a baseline, which yields the relative efficiency values shown in Table B.1 (see Attachment A; Mortality Memo Efficiency Recommendations; Table 1 for more details). These efficiency values are proposed for the animal mortality BMPs for the Phase 6 Watershed Model and can be adapted or replaced if an explicit animal mortality load source is added in the next model version (Phase 7).

**Table B.1. Proposed mortality BMP efficiency values for application to feeding space load source in Phase 6 Watershed Model.**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  |  |  |  |  |
| **Pollutant** | **Burial** | **Compost** | **Incineration** | **Rendering** |
| TN | 0 | 0.124% | 0.372% | 0.372% |
| TP | 0 | 0.059% | 0.059% | 0.059% |
| TSS | N/A | N/A | N/A | N/A |

In this case, it is assumed that the system is a mortality composter, and the number of animals is determined with the following conversion (from CAST detailed source data – Animal):

**Table B.2** – CAST conversion rates of animals per system

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| State | Animal Name | Average animal count per system | Animals per Animal Unit (AU) | Acres per animal count |
| All | turkeys | 3,744 | 38.33866 | 0.000023 |
| All | beef | 22 | 1.14 | 0.001890 |
| DC | Broilers | 198,096 | 163.93 | 0.000003 |
| DE | Broilers | 198,096 | 136.9826 | 0.000003 |
| MD | Broilers | 198,096 | 163.93 | 0.000003 |
| NY | Broilers | 198,096 | 178.0822 | 0.000003 |
| PA | Broilers | 198,096 | 178.5749 | 0.000003 |
| VA | Broilers | 198,096 | 175.4352 | 0.000003 |
| WV | Broilers | 198,096 | 256.3884 | 0.000003 |
| All | dairy | 84 | 0.74 | 0.002881 |
| All | Goats | 13 | 15.38 | 0.000344 |
| All | Swine (Hogs and pigs for breeding) | 428 | 2.222222 | 0.000311 |
| All | Swine (hogs for slaughter) | 74 | 3.703704 | 0.000111 |
| All | horses | 7 | 1 | 0.006765 |
| All | layers | 1,720 | 250 | 0.000040 |
| All | other cattle | 43 | 3.34 | 0.002385 |
| All | Pullets | 9,734 | 352.5 | 0.000010 |
| All | Sheep and lambs | 33 | 10 | 0.000574 |

Applying those animal counts and the panel’s recommendations (mortality nutrients per AU) translate to the above estimates, using CAST values.

**Q2. What types of projects are eligible to receive credit in the Phase 6 Watershed Model?**

**A2**. Any mortality management practice or method mentioned that meets the definitions above in Q1/A1 and treats routine animal mortalities from one of the animal groups listed in Table B.2 above. Practices or methods used for catastrophic mortality events are not eligible under this set of practices. Practices or methods that are also used to treat manure should not be reported twice, i.e., they should not be reported as both mortality and manure treatment practices.

**Q3**. **How do the new BMPs relate to existing NEIEN practices and what will jurisdictions need to submit to NEIEN to receive credit for these practices upon approval for progress?**

**A3**. For now, these BMPs are for planning purposes only until the next version of CAST, anticipated in 2024, but they can be reported into NEIEN immediately, though they will not be credited for progress until next progress assessment after the CAST version release.

The jurisdictions will need to report the following into NEIEN:

* BMP Name: 
  + Animal mortality disposal by incineration
  + Animal mortality disposal by burial
  + Animal Mortality Facility (NRCS316), Animal Compost Structure RI, Composter Facilities, Composting Facility, Dead Bird Composting Facility, Animal mortality disposal by composting
  + Animal mortality disposal by rendering or landfill
* Measurement Name: Any one of the following can be used.
  + au , Unit = count
  + beef , Unit = count
  + broilers , Unit = count
  + dairy heifers , Unit = count
  + goats , Unit = count
  + hogs and pigs , Unit = count
  + hogs for slaughter , Unit = count
  + horses , Unit = count
  + layers , Unit = count
  + livestock , Unit = count
  + no , Unit = count
  + no systems , Unit = count
  + no. systems , Unit = count
  + number , Unit = count
  + other cattle , Unit = count
  + poultry , Unit = count
  + pullets , Unit = count
  + sheep and lambs , Unit = count
  + st , Unit = count
  + swine , Unit = count
  + systems , Unit = count
  + turkeys , Unit = count
* NEIEN geographic BMP site location: [Latitude, Longitude; County; County (CBWS Only); Hydrologic Unit Code (HUC12, HUC10, HUC8, HUC6, HUC4); State (CBWS Only)]
* Year the animal disposal practice was implemented.
* *Load source Group*: Permitted feeding operation, non-permitted feeding operation, feeding operation

**Q4. What should a jurisdiction include in CAST in order to receive credit for these practices?**

**A4.** Jurisdictions must include the animal type and either the production/inventory of the operation (AUs) or the weight (tons) of carcasses disposed using the BMP. All systems, tons, animal counts, or AU are converted to acres using the standard conversions, above.

**Q5. Which land use categories are eligible to receive nutrient reduction credit from mortality BMPs in the Phase 6 Watershed Model?**

**A5.** In the Phase 6 Watershed Model, nutrient reductions from mortality BMPs can be applied to permitted feed operations or non-permitted feed operations. If neither land use is provided in NEIEN, the credit will be applied to the default category, “feed operations”, and the reduction is distributed proportionally between permitted and non-permitted feed operation land uses.

**Q6. Are these BMPs annual or cumulative practices?**

**A6.** These practices are cumulative with a credit duration of 5 years.

**Q7. How does this relate to the previous planning BMP for “Broiler Mortality Freezers”?**

**A7.** In 2019, the Agricultural Workgroup established a planning BMP for “broiler mortality freezers” that used values from Felton et al (2009) – part of the Simpson and (Weammert) Lane (2009) report – to estimate a manure transport credit of 29 lbs N and 4.9 lbs P per ton of dead broiler carcass transported out of the county or watershed. The proposed new BMP for “mortality disposal – landfill or rendering” encompasses the same practice, but as part of the larger “rendering” practice that will be available as an approved BMP with the next release of CAST.

**Q8. Is this practice mutually exclusive with other practices?**

**A8.** Each mortality BMP is mutually exclusive from one another, but these mortality practices are not mutually exclusive with other practices applied to the feeding space load source. In other words, a maximum of one type of mortality BMP can be applied for a given set of animals, but other non-mortality BMPs can also be applied (e.g., barnyard runoff control or loafing lot management).

Checks are in place to ensure that the sum of all four mortality BMPs does not exceed the domain of dead animals. The maximum number of animals that these BMPs, as a group, can be applied is the number of animal units times the mortality fraction, since the mortality BMPs are mutually exclusive with each other.

**Q9. Are reported mortality BMPs assumed to have an Animal Waste Storage Facility on the property?**

**A9.** No. The Animal Waste Storage BMPs must be reported separately in order to receive simulated reductions for those practices.

**Q10. How do mortality BMPs relate to other barnyard practices in the Phase 6 Model, such as Animal Waste Management Systems, Barnyard Runoff Controls and Loafing Lot Management?**

**A10.** These practices should be tracked and reported separately. It is likely that many facilities with a mortality storage or disposal systems will also have a combination of other barnyard practices employed on-site to control runoff from feeding and loafing lot areas. States may report multiple barnyard practices and mortality practices for the same site if applicable.

**Q11: How does the existing “Mortality Fraction” in CAST relate to the panel recommendations?**

A11: The mortality fraction in CAST determines the maximum portion of dead animals eligible for mortality practices. It is a single value for each animal type (seen below in Table B-4).

Table B-4. Current CAST mortality fraction and proposed new mortality fraction, based on the Expert Panel’s mortality estimates.

|  |  |  |
| --- | --- | --- |
| **Animal Name** | **Mortality Fraction** | **Proposed mortality fraction** |
| turkeys | 0.07 | 0.15 |
| pullets | 0.10 | 0.08 (using layers as proxy) |
| dairy | 0.06 | 0.10 |
| goats | 0.06 | 0.03 (using other cattle as proxy) |
| broilers | 0.05 | 0.05 |
| beef | 0.06 | 0.09 |
| hogs for slaughter | 0.06 | 0.05 |
| layers | 0.10 | 0.08 |
| hogs and pigs for breeding | 0.06 | 0.08 |
| horses | 0.06 | 0.01 |
| other cattle | 0.06 | 0.03 |
| sheep and lambs | 0.06 | 0.03 (using other cattle as proxy) |

The proposed change to the mortality fraction will be incorporated in the next version of CAST.

In Phase 6, the mortality fraction acts as an upper limit for the amount of nutrients from the feed space load source and can be removed through the mortality disposal BMPs described in this appendix.