

# Brief Overview: Statistical Sub-Sampling per Appendix B, Agriculture BMP Verification Guidance

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# What is the difference between Visual and Non-Visual Assessment BMPs?

- **Visual Assessment BMPs - Single Year**

A practice that can be visually assessed and with a limited physical presence in the landscape over time, i.e., lasting as short as several months to a single growing season.

- **Visual Assessment BMPs - Multi-Year**

A practice that can be visually assessed and has a long-term physical presence on the landscape, i.e., of more than one year when properly maintained and operated.

- **Non-Visual Assessment BMPs**

A practice that cannot typically be visually assessed because it is a type of management system or enhanced approach, rather than a physical BMP. This class of BMPs is more challenging to verify since it does not have a physical presence on the landscape.

Table B-1. Examples of agricultural BMPs by category.

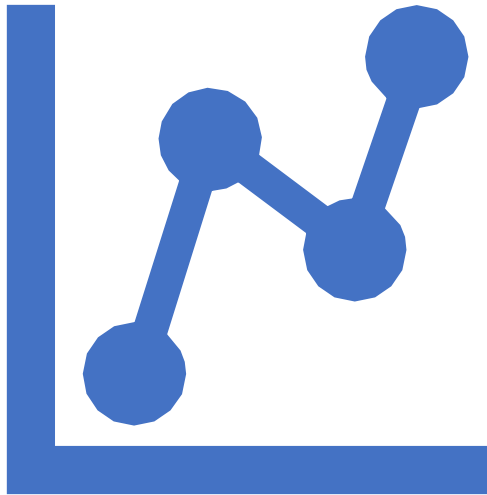
B-1a. Visual Assessment - Single Year	B-1b. Visual Assessment - Multi-Year	B-1c. Non-Visual Assessment
Conservation Tillage	Animal Waste Management Systems	Decision/Precision Agriculture
High-Residue Minimum Disturbance Management	Barnyard Runoff Control	Swine Phytase
Traditional Cover Crops	Stream Side Grass Buffers	Enhanced Nutrient Management Plans
Commodity Cover Crops	Prescribed Grazing	Soil Conservation and Water Quality Plans
	Pasture Alternative Watering Systems	Poultry Litter Transport

Can statistical sub-sampling apply to each of these categories? Yes.

What is the difference between Visual and Non-Visual Assessment BMPs?

# What is statistical sub-sampling?

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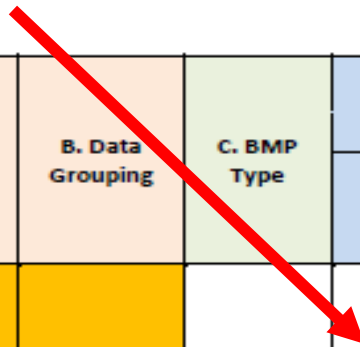
- In Statistics, Subsampling is a method that reduces data size by selecting a subset of the original data.
- Can statistical sub-sampling be applied to initial inspections?
  - **For Visual Assessment BMPs:** ONLY for single-year practices at a limited capacity like tillage practices.
  - **For Non-Visual Assessment BMPs:** No.
  - The Ag Guidance calls for 100% verification of the initial identification of single or multi-year structural BMPs but does allow sub-sampling for single-year BMPs like tillage practices.
  - States may propose subsampling for follow up BMP inspection/verification using the *“Statistical Sampling Approach for Initial and Follow-Up BMP Verification”*
- Statistical sub-sampling is primarily used for **follow up checks/inspections of single and multi-year BMPs.**

# What sub-sample is allowed for each BMP type?

- Table B-3 in Appendix B gives default sub-sample values for visual, single year, visual multi-year and non-visual BMPs.

**Table B-3. Jurisdictional Agriculture Verification Protocol Design Table: Visual Assessment BMPs—Single Year**  
**Chesapeake Bay Program Agriculture Workgroup**

A. BMP Priority	B. Data Grouping	C. BMP Type	D. Initial Inspection <i>(Is the BMP there?)</i>				E. Follow-up Check <i>(Is the BMP still there?)</i>			F. Lifespan/ Sunset <i>(Is the BMP no longer there?)</i>	G. Data QA, Recording & Reporting
			Method	Frequency	Who inspects	Documentation	Follow-up Inspection	Statistical Sub-sample	Response if Problem		
High / Low	Visual Assessment: Single Year	Non-Cost Shared BMPs	On-Site Visual Assessment (Limited Statistical Sampling)	100% of All Tracked & Reported BMPs	Trained and certified technical agency/NGO field staff or engineers	BMPs meet appropriate government and/or CBP practice standards	Single Year	10% <sup>1</sup> / 5% <sup>2</sup> QA of All Tracked & Reported BMPs (within the year)	Bring into compliance within one year or less, or remove from reported BMPs	Single Year	Document inspections/follow-up checks, prevent double counting, and QA reported data
High / Low	Visual Assessment: Single Year	Cost-Shared Programs	On-Site Visual Assessment Only	100% of All Tracked & Reported BMPs	Trained and certified technical agency/NGO field staff or engineers	BMPs meet appropriate government and/or CBP practice standards	Single Year	10% / 5% QA of All Active Contractual BMPs (within the year)	Bring into compliance within one year or less, or remove from reported BMPs	Single Year	Document inspections/follow-up checks, prevent double counting, and QA reported data



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High / Low	Visual Assessment: Single Year	Permit-Issuing Programs	On-Site Visual Assessment Only	100% of All Tracked & Reported BMPs	Trained and certified technical agency field staff or engineers	BMPs meet the appropriate government and/or CBP practice standards	Single Year	20% Annually of All Active Permits	Bring into compliance within one year or less, or remove from reported BMPs	Single Year	Document inspections/follow-up checks, prevent double counting, and QA reported data
EXAMPLE BMP	Visual Assessment: Single Year	Cost-Shared Programs: Traditional Cover Crop-Early Drilled Rye	On-Site Visual Assessment: Cover Crop Establishment	100% of All Active Contracts	County Conservation District USDA-NRCS Certified Field Technician	Cost-Share Program BMP Certification Form	On-Site Visual Assessment: Cover Crop Termination	10% QA of All Active Contractual BMPs	Cost-Share Program Contract Compliance Policy	Contract Year	Cost-Share Program Documentation / 10% QAQC Compliance Checks by State Agency / Tracking & Reporting Protocol

# The 10% vs 5% for Follow Up Inspections

## The 10%

- Applies to single or multi-year BMPs that account for >5% of a jurisdiction's agricultural sector nutrient/sediment load reductions as estimated in the most recent progress scenario.
- For these BMPs, as a default, random, follow-up assessments are recommended to be conducted on 10% of these single or multi-year BMPs.
  - **For example**, if CAST estimates that 9% of all the nitrogen reductions from a jurisdiction's agricultural nitrogen load resulted from the collective implementation of animal waste management systems, then the jurisdiction should conduct random, follow-up inspections on 10% of all farms with reported animal waste management systems.

## The 5%

- Applies to single or multi-year BMPs that constitute  $\leq 5\%$  of the jurisdiction's agricultural sector nutrient and/or sediment load reductions as estimated in the most recent progress scenario.
- For these BMPs, 5% statistical sub-sampling of tracked and reported practices is allowable for the non-cost share and regulatory program BMP categories. For cost-shared category BMPs, 5% of the active contracts is permissible, and for permit-issued BMPs, 20% sampling is recommended.



# How are sample sites selected?

Appendix B

Agriculture BMP Verification Guidance

The statistics-based approach for selecting sites to inspect for verification (utilizing the on-site or alternative verification methods outlined within the Ag Guidance) is outlined in the document *“Statistical Sampling Approach for Initial and Follow-Up BMP Verification”*

## Statistical Sampling Approach for Initial and Follow-Up BMP Verification

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### Purpose

This document provides a statistics-based approach for selecting sites to inspect for verification that BMPs are on the ground (or otherwise continue to be implemented) and performing as expected based on engineering specifications or other applicable criteria. Verification on a BMP-by-BMP basis is emphasized here to both simplify the approach and reflect the need for practical methods to address this large undertaking.



# The “Statistical Sampling Approach for Initial and Follow-Up BMP Verification” Describes...

- **Sampling Methods**

- Simple Random Sampling
- Stratified Random Sampling

- **Confidence Intervals**

- **And outlines a simple approach to sampling:**

1. Estimate sample sizes for the priority BMPs,
2. Choose the largest “n” value from the set of priority BMPs,
3. Randomly select the farms to inspect for the priority BMPs,
4. Check records for the non-priority BMPs at the selected farms to determine the respective “n” values for non-priority BMPs,
5. Estimate confidence intervals for the non-priority BMPs based on the “n” values
6. Do either:
  - o Increase random sample size for priority BMPs as needed to reach suitable confidence intervals for the non-priority BMPs and repeat steps 3-5 until a suitable confidence interval is reached for all BMPs of interest, or
  - o Develop a separate sampling approach for non-priority BMPs by carrying out steps 1-3 for the non-priority BMPs. This creates two sampling approaches, but there may be overlap on sites visited.

Example from New York:  
Appendix 1 of New York's Nonpoint Source QAPP: Statistical  
Sampling Approach to Agricultural BMP Verification in New York  
State

# Appendix 1. Statistical Sampling Approach to Agricultural BMP Verification in New York State

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## **Purpose**

This document outlines an adaptive management approach for selecting sites to inspect for verification that agricultural BMPs are on the ground (or otherwise continue to be implemented) and performing as expected based on performance criteria, NRCS standards, engineering specifications or other applicable criteria. Techniques used to inspect BMPs at selected sites and record and track findings are described in *Upper Susquehanna Coalition (USC) Quality Assurance Project Plan for New York Work Plan for the Chesapeake Bay Program (2015)*.

# Discussion

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- For states that have not implemented this approach, would implementing it help overcome previously discussed obstacles to performing verification, like manpower?
- What additional information could be beneficial to your state to develop a sub-sampling process to incorporate into your QAPPs?
- What obstacles are preventing states from using statistical sub-sampling?