AMT September Office Hours

9/12/2025

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Todays agenda:

- Land Use Loading Rate Ratios
- Exclusion fencing

Land Use Loading Rate Ratios

A quick refresh of how CAST works:

CAST Structure

Illustrative example

Average Load

+

ΔInputs * Sensitivity

*

BMPs

*

Acres

*

Land to Water

*

River Delivery

Average nitrogen load to stream for double cropped ag land watershed wide is 40 pounds per acre

Load by land-river segment and land use

CAST Structure

Average Load

+

ΔInputs * Sensitivity

*

BMPs

*

Acres

*

Land to Water

*

River Delivery

Load by land-river segment and land use

Illustrative example

FERTILIZER

Your area applies 115 pounds of fertilizer while the watershed-wide average is 140.

Each additional pound of fertilizer results in 0.2 lbs of runoff

(115-140) * 0.2 = -5 lbs/acre

CAST Structure

Average Load

+

ΔInputs * Sensitivity

*

BMPs

*

Acres

*

Land to Water

*

River Delivery

Load by land-river segment and land use

UPTAKE

Illustrative example

Your area uptakes 110 pounds of fertilizer while the watershed-wide average is 120.

Each additional pound of uptake results in -0.17 lbs of runoff

(110-120) *- 0.17 = 1.7 lbs/acre

CAST Structure

Illustrative example

Average Load

+

ΔInputs * Sensitivity

*

BMPs

*

Acres

*

Land to Water

*

River Delivery

SUM each of the inputs* sensitivities for each input category (e.g. fertilizer, uptake, etc.) with the watershed average load

(-5)+(1.7)+(40) =36.7 lbs

Fertilizer

Uptake

Average Load

Load by land-river segment and land use

CAST Structure

Illustrative example

Average Load

+

ΔInputs * Sensitivity

*****

BMPs

*****

Acres

*****

Land to Water

*****

River Delivery

BMPs are applied which give, in aggregate, a 20% reduction

36.7 * (1-.20) = 29.36 lbs/acre

Load by land-river segment and land use

CAST Structure

Illustrative example

Average Load

+

ΔInputs * Sensitivity

*****

BMPs

*****

Acres

*****

Land to Water

*****

River Delivery

There are 100 acres of double cropped land in this segment

29.36 lbs/acre * 100 acres = 2936 lbs

Load by land-river segment and land use

CAST Structure

Illustrative example

Average Load

+

ΔInputs * Sensitivity

*****

BMPs

*****

Acres

*****

Land to Water

*****

River Delivery

The land here is 50% leaker than average due to high groundwater recharge in the piedmont carbonate

The river system reduces loads by 30%

2936 lbs * 1.5 * (1-.30) = 3082.8 lbs Delivered to the Bay from this land use and segment

Load by land-river segment and land use

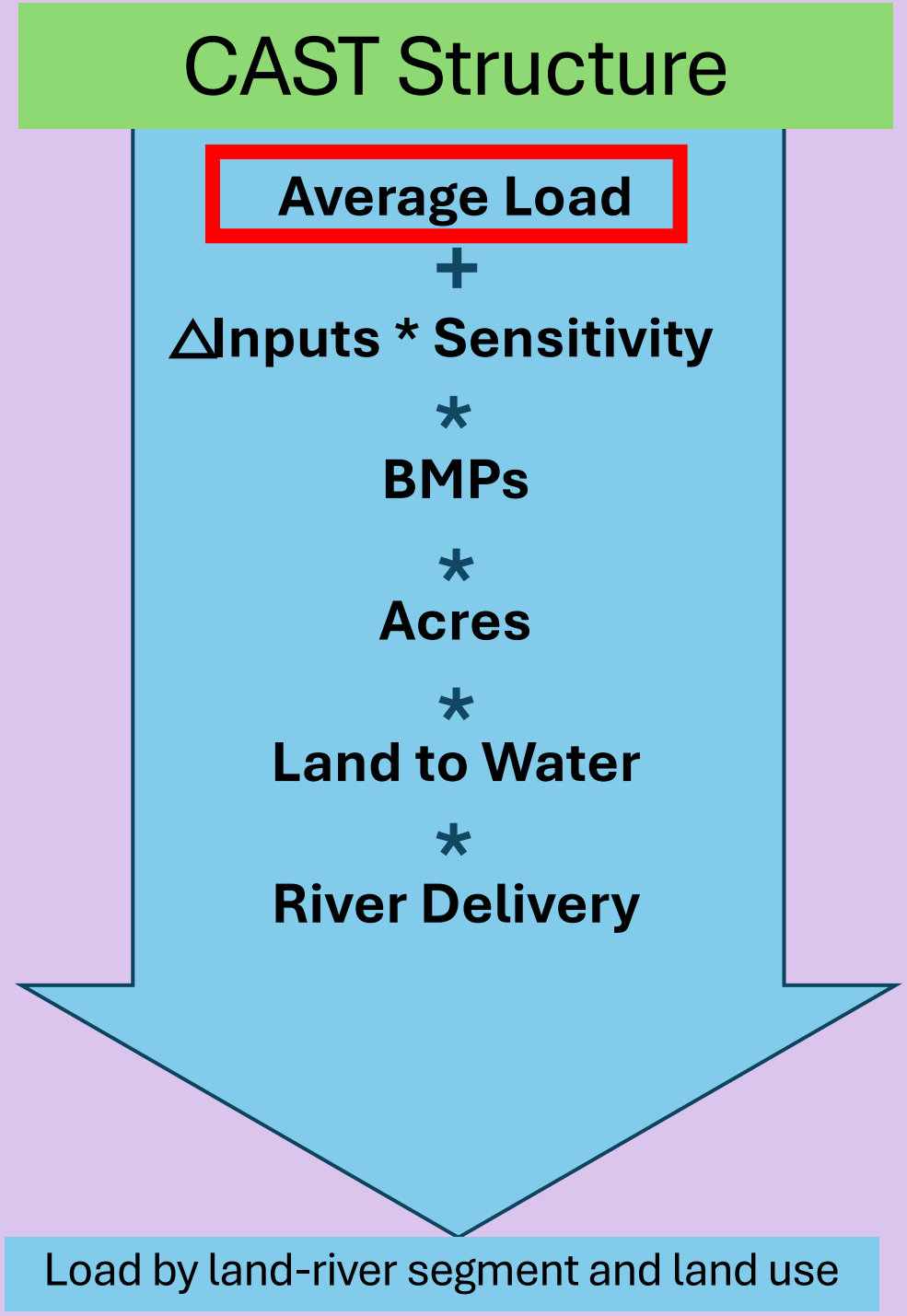
Loading Rate Ratio (LRR)

- Relates the estimated amount of nitrogen, phosphorus, or sediment exported from a land use to a “reference land use”

Chesapeake Bay Average	
Land class	Land Use
Pasture	Ag Open Space
	Legume Hay
	Other Hay
	Managed Hay*
	Pasture: **Reference Land Use**
	Managed Pasture *

Why does this matter for ratios?

- Average Load
  - Chesapeake Bay watershed scale
  - Independent of:
    - location
    - local application rates
    - physical characteristics
  - Utilizes Loading Rate Ratios
- CAST Scenarios
  - All use average load value



Things to note

The Loading Rate is a factor of additional model processes

- Will change with Phase 7 calibration

Ag sector loads will not change with new Loading Rate Ratios

- Distribution will be altered between ag lands

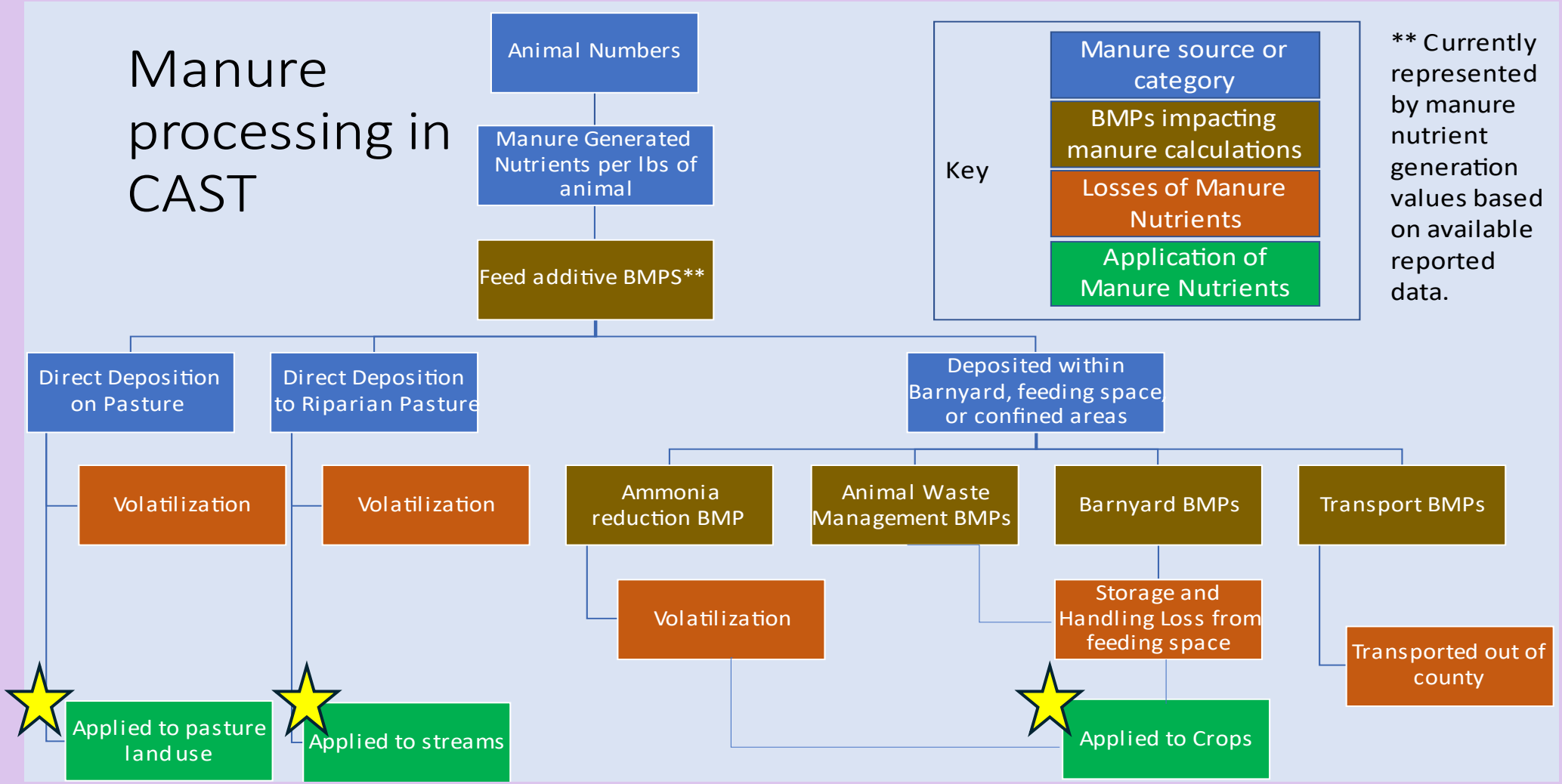
Questions?

Exclusion fencing

Keep animals from accessing streams

Change where manure nutrients are deposited

Exclusion fencing



What is impacted by exclusion fencing?

- In the real-world pastures have different properties
  - Some DO have streams in/touching them
  - Some DON'T have streams
- In the CAST world is not that specific regarding pasture
- If the population has access to a stream, then all the animals have access

Table 3-5: Beef percent manure deposited by area in West Virginia growth region 1

Growth Region	Animal Type	Month	Barnyard Percent	Pasture Percent	Access Area Percent
WV_1	beef	1	6	91	3
WV_1	beef	2	6	91	3
WV_1	beef	3	0	96	4
WV_1	beef	4	0	94	6
WV_1	beef	5	0	94	6
WV_1	beef	6	0	90	10
WV_1	beef	7	0	90	10
WV_1	beef	8	0	90	10
WV_1	beef	9	0	94	6
WV_1	beef	10	0	96	4
WV_1	beef	11	0	96	4
WV_1	beef	12	6	91	3

What pieces to this practice are relevant?

Conversion

- Currently 1000 linear feet reported excludes 17.6 Animal Units (applied across the watershed)

Current width

- 10ft wide for narrow buffers
- 35ft wide for regular or full buffers

Conversion:

Virginia specific study led to a conversion factor for linear feet to Animal Units (AU).

- Accounted for Animal Units being in upland pasture
  - Pasture acres that have no stream (Not the same as pasture with a stream that is fenced out)

CAST AUs and Pasture acres are a possible comparison point

- Does not separate out upland pasture and animals
- Can show general stocking density of AU per area of buffer eligible pasture

Width

- RECOMMENDATION ONLY
- State reported values may differ from current default values
- Want to see if there is additional information on how these data may be updated.

Questions?

Thank you for attending office hours!

We will begin our main meeting at 09:00.