Manure in CAST

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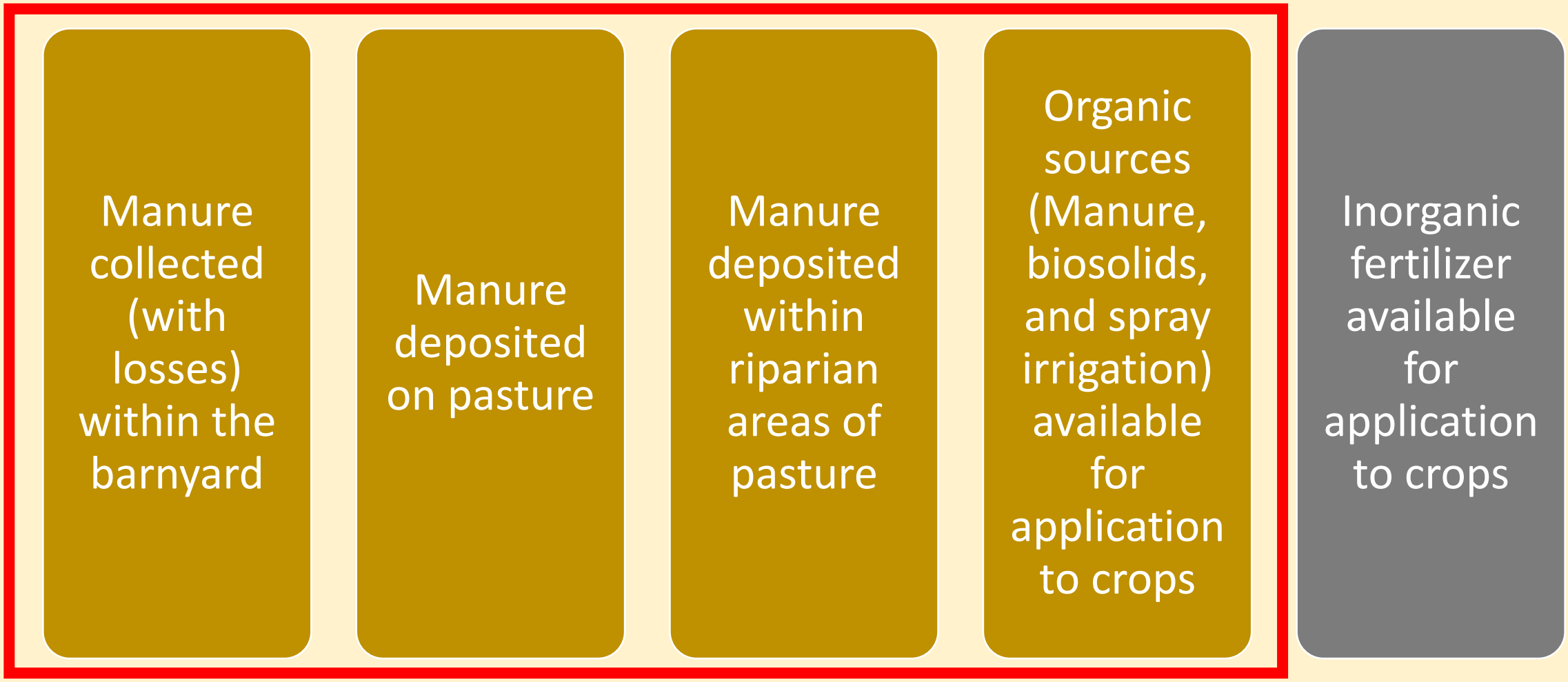
Outline

- Defining Manure
- How Manure is used
- Manure nutrient applications

Agriculture nutrient categories

- Manure collected (with losses) within the barnyard
- Manure deposited on pasture
- Manure deposited within riparian areas of pasture
- Organic sources (Manure, biosolids, and spray irrigation) available for application to crops
- Inorganic fertilizer available for application to crops

Agriculture nutrient categories



How do Ag Nutrients cycle through CAST?

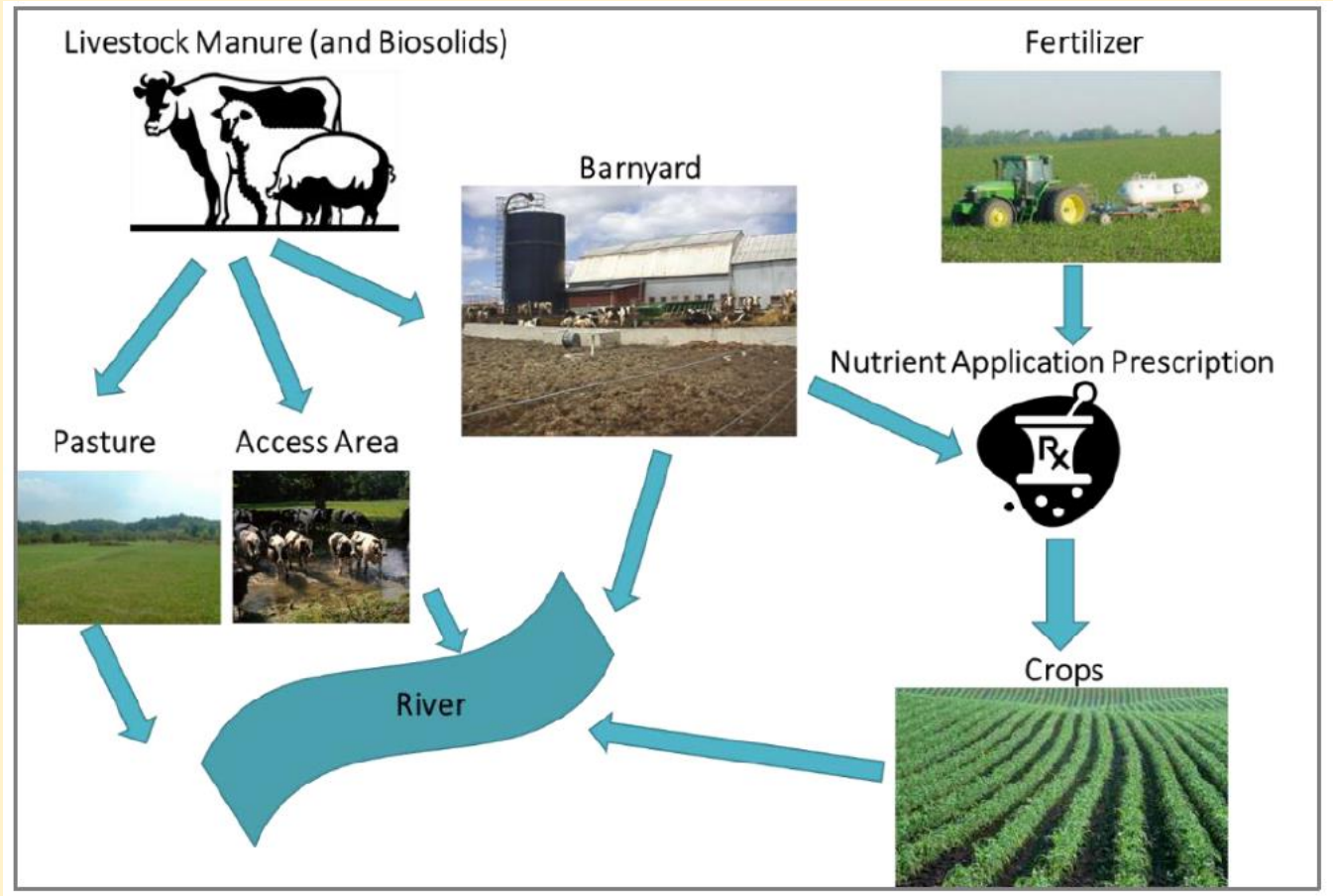
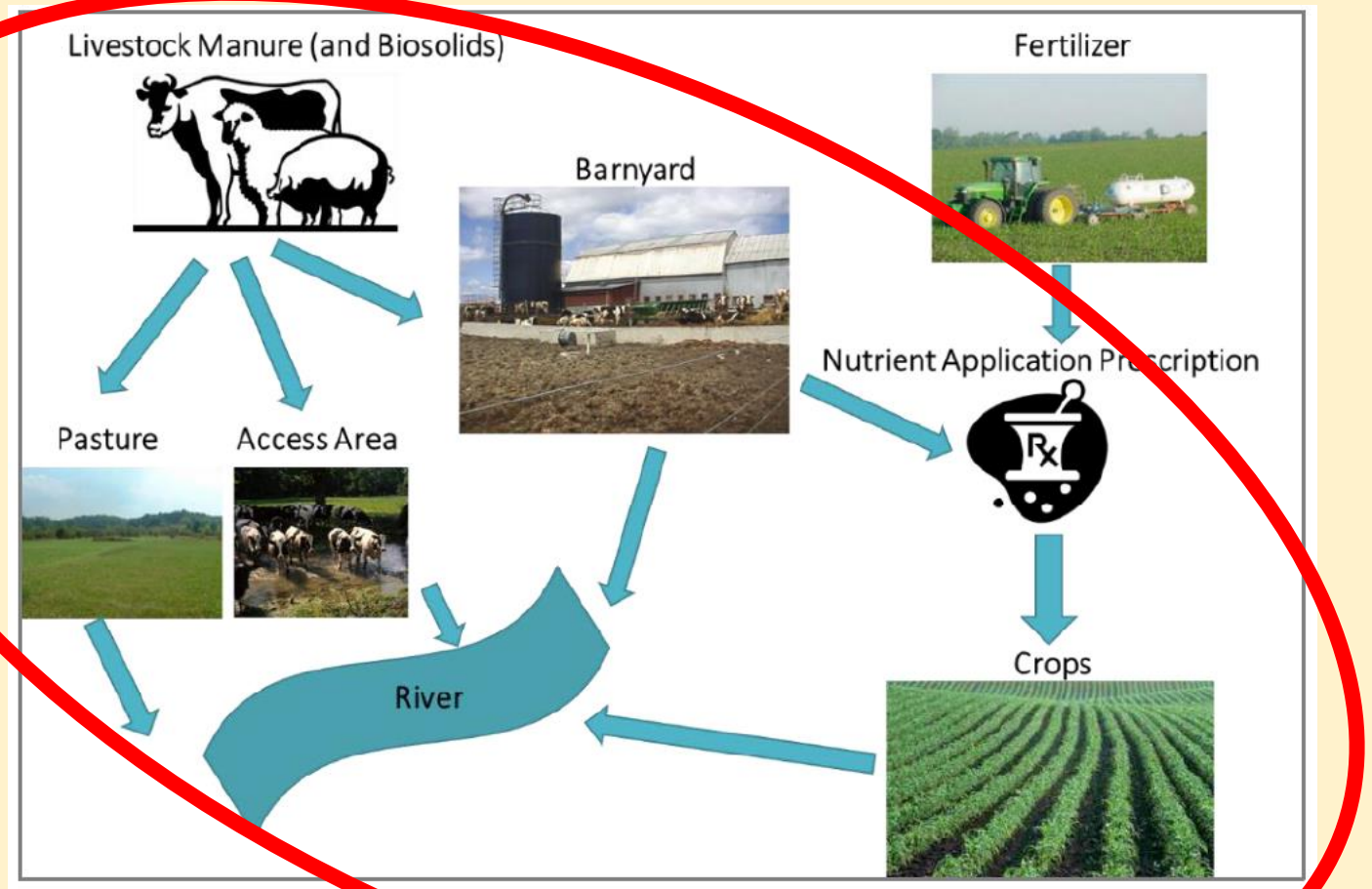


Figure 3-4 Conceptual diagram of nutrient fate through agricultural lands

How do Ag Nutrients cycle through CAST?



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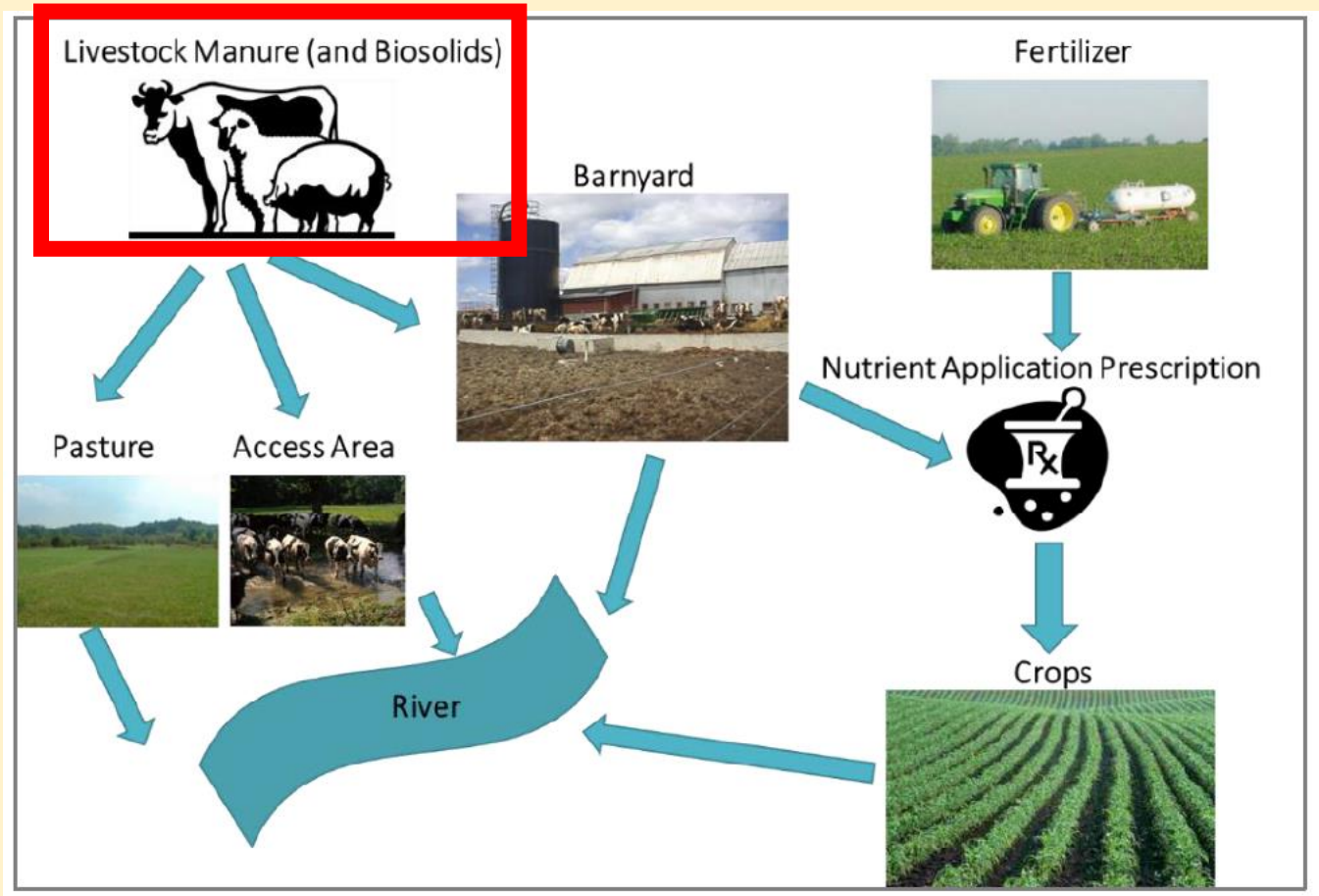


Figure 3-4 Conceptual diagram of nutrient fate through agricultural lands

CAST Manure Data

- County scale
- Based on animal populations
  - Ag Census
  - American Society of Agricultural Engineers (ASAE)
  - Poultry Litter Subcommittee (PLS)
  - Swine characterization report
- Lbs. dry excreted

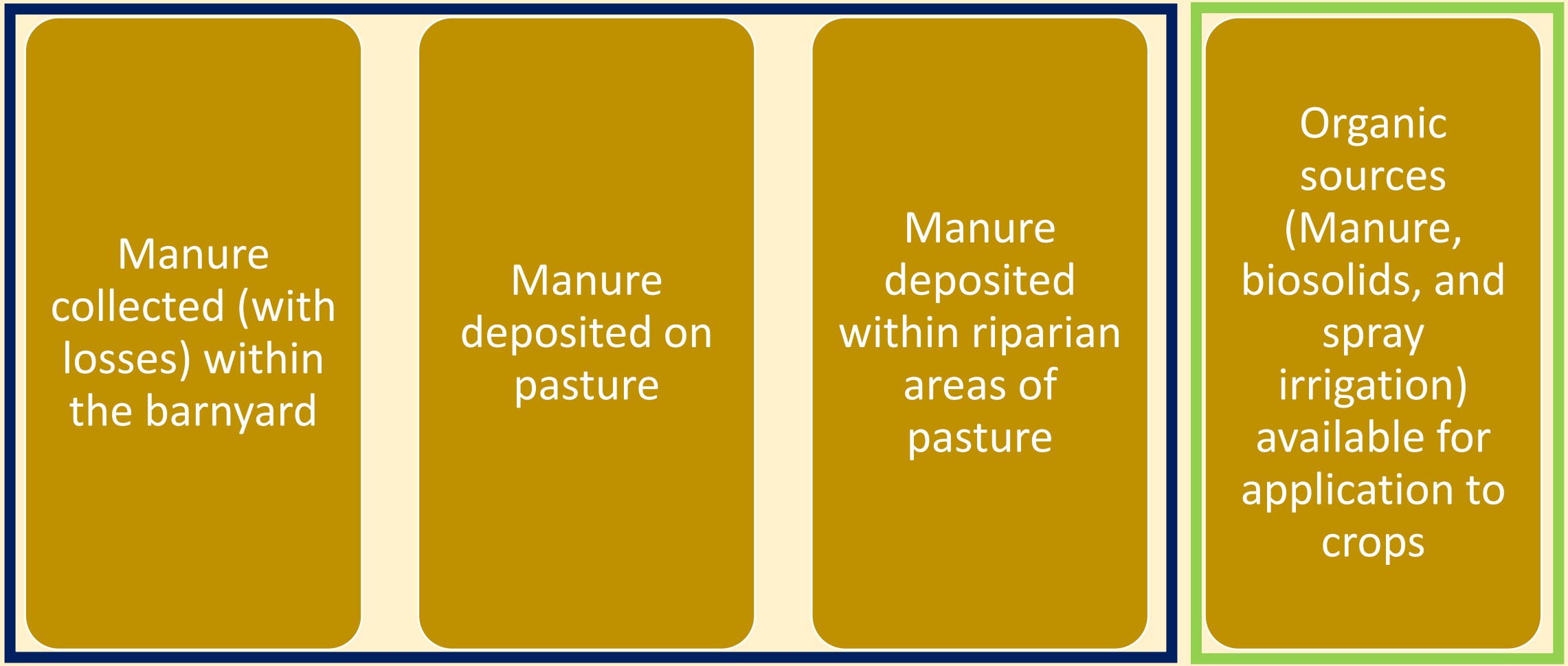
Table 3-4: Total nutrient manure characteristics for livestock

Animal Type	Manure Source
Beef	Beef - Cow (confinement) from ASAE 2005 for manure values
Dairy	Lactating Cow, Dry Cow and Heifer from ASAE 2005 for manure values
Other Cattle	Estimated based upon weighted average combination of Beef and Dairy from Census of Agriculture; See Appendix D
Horses	Average of Horse- Sedentary and Horse - Intense Exercise from ASAE 2005 for manure values
Hogs for Breeding	Swine Characterization Report; See Appendix E
Hogs for Slaughter	Swine Characterization Report; See Appendix E
Sheep and Lambs	ASAE 2003 for manure values
Goats	ASAE 2003 for manure values
Pullets	PLS Report; See Appendix A
Layers	PLS Report; See Appendix A
Broilers	PLS Report; See Appendix A
Turkeys	Turkey Characterization Report; See Appendix F

Agriculture nutrient categories

Manure deposition categories

Crop available nutrients



Manure depositional categories example: Beef

Manure collected (with losses) within the barnyard

Manure deposited on pasture

Manure deposited within riparian areas of pasture

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

How do Ag Nutrients cycle through CAST?

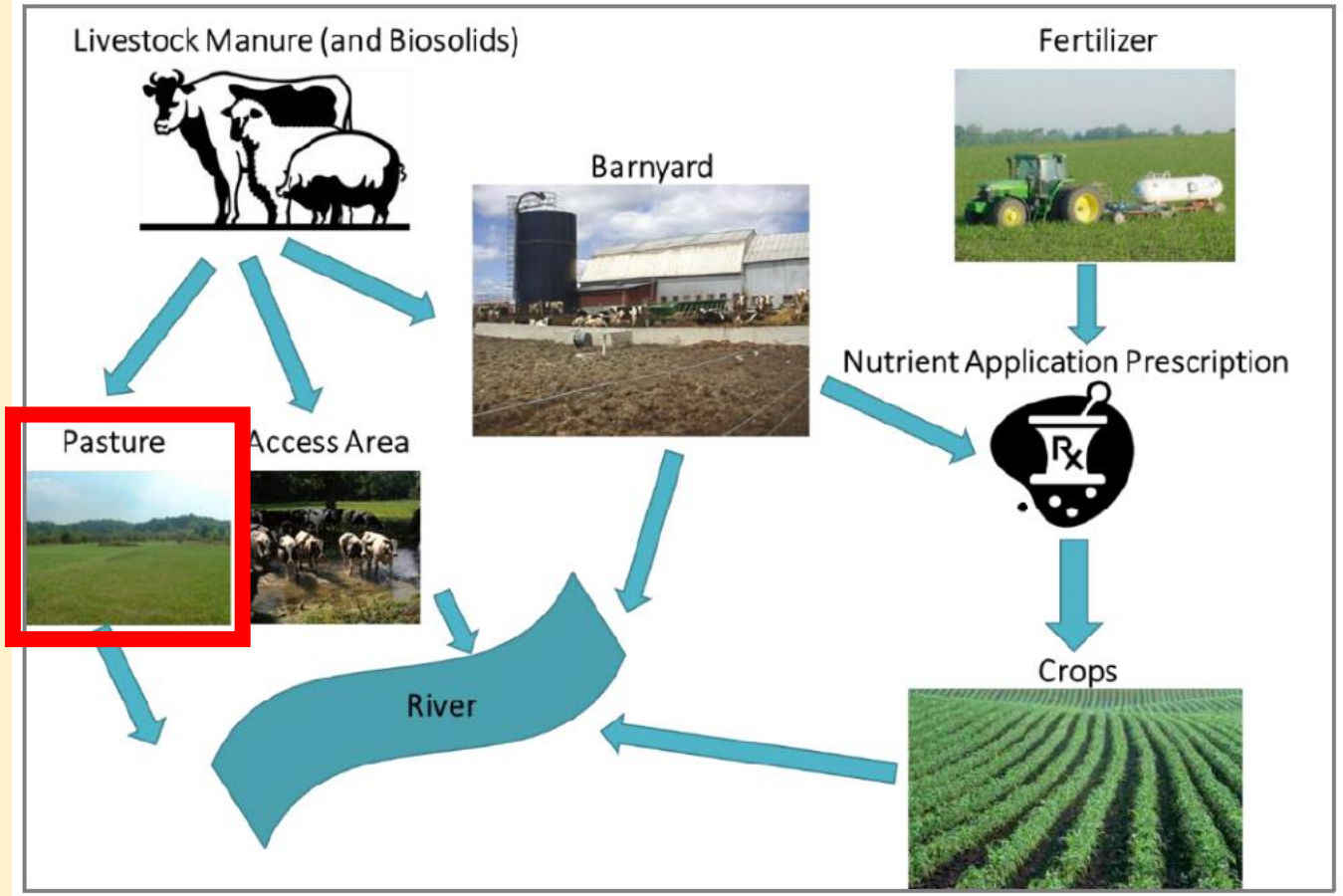


Figure 3-4 Conceptual diagram of nutrient fate through agricultural lands

Manure Direct Deposition to Pasture

- Does NOT count towards pasture crop application goal
  - Can always receive supplemental fertilizer later

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

How do Ag Nutrients cycle through CAST?

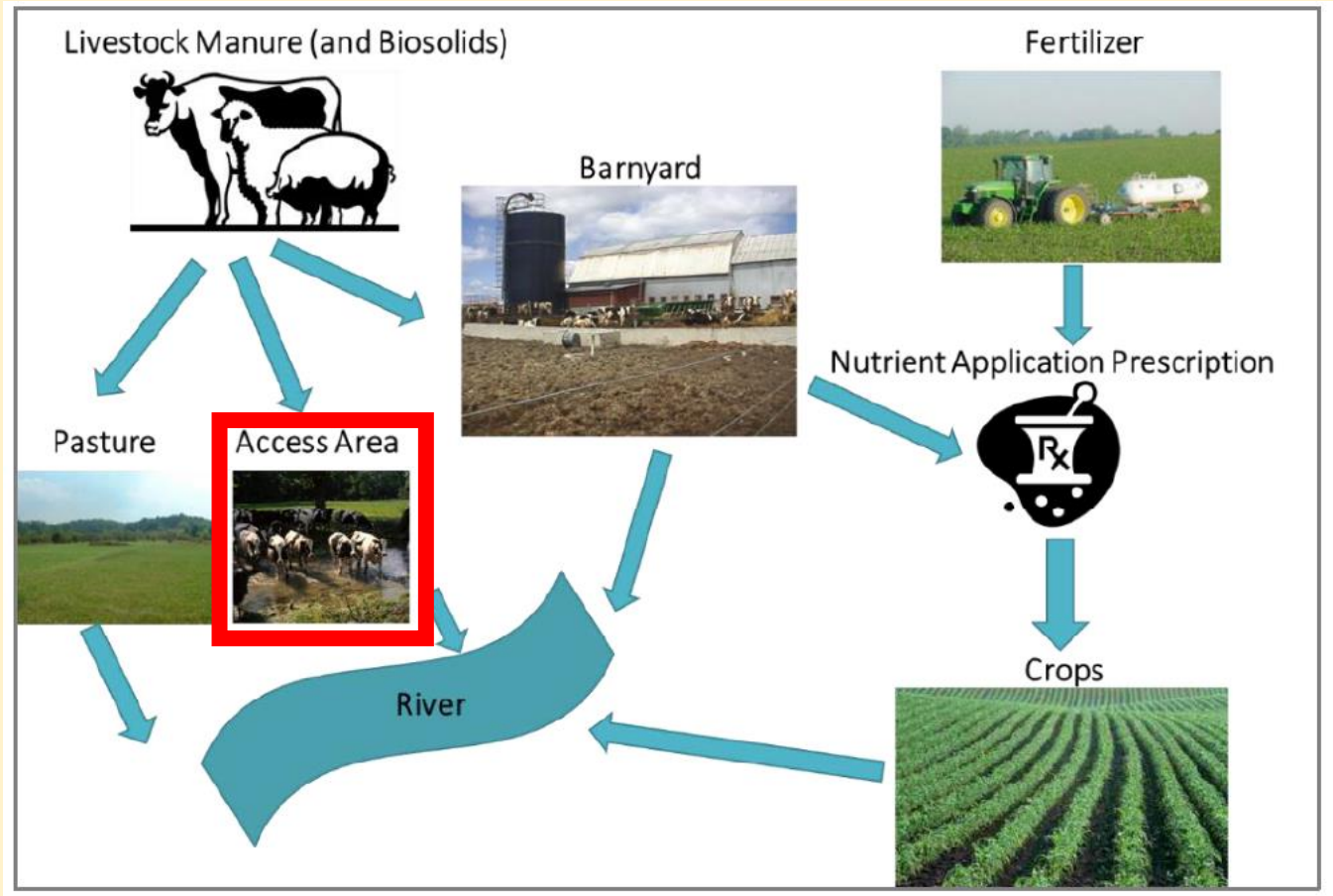
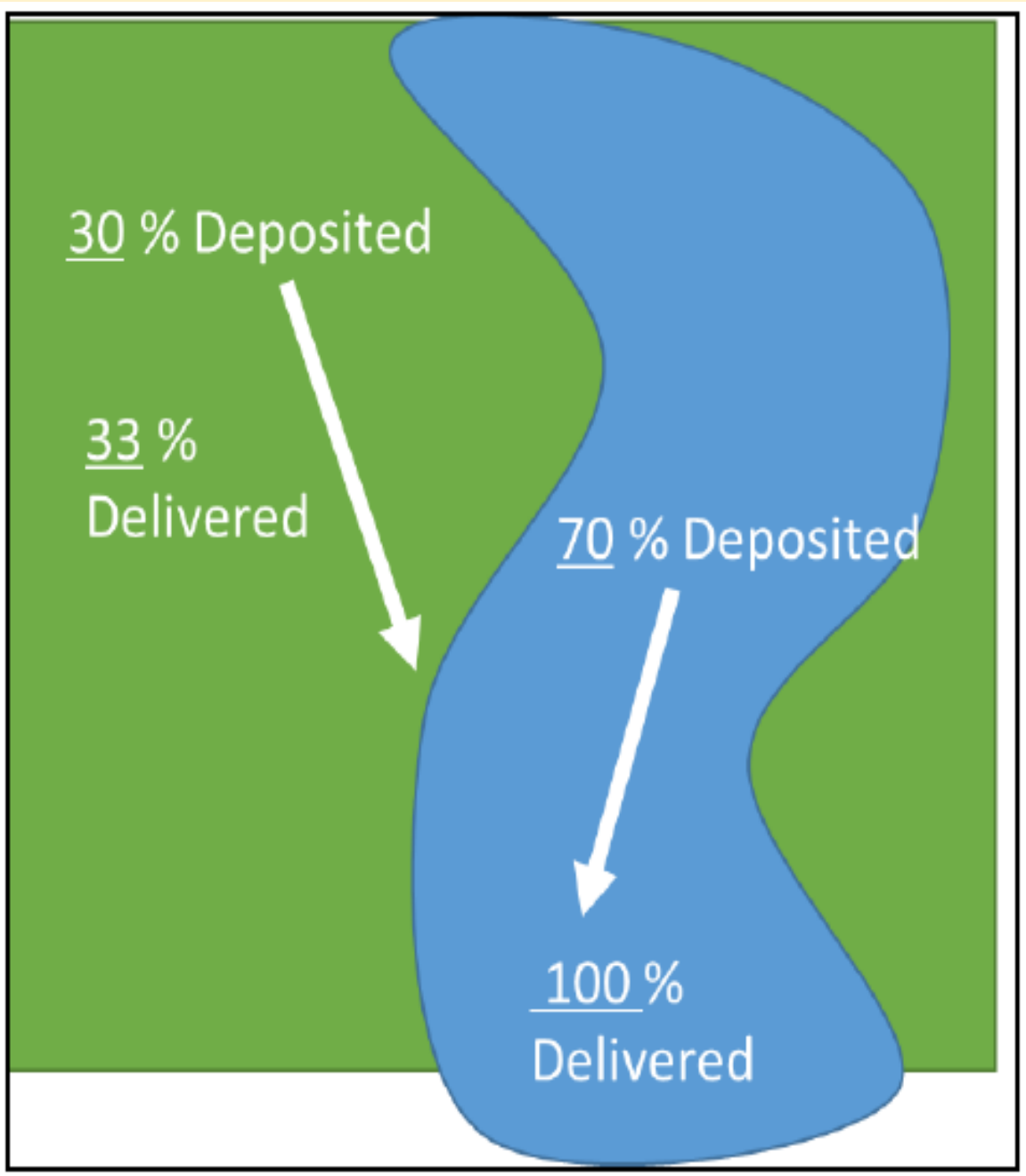


Figure 3-4 Conceptual diagram of nutrient fate through agricultural lands

Direct Deposition to Riparian

- Unavailable for application or transport
- 80% deposited reaches streams

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



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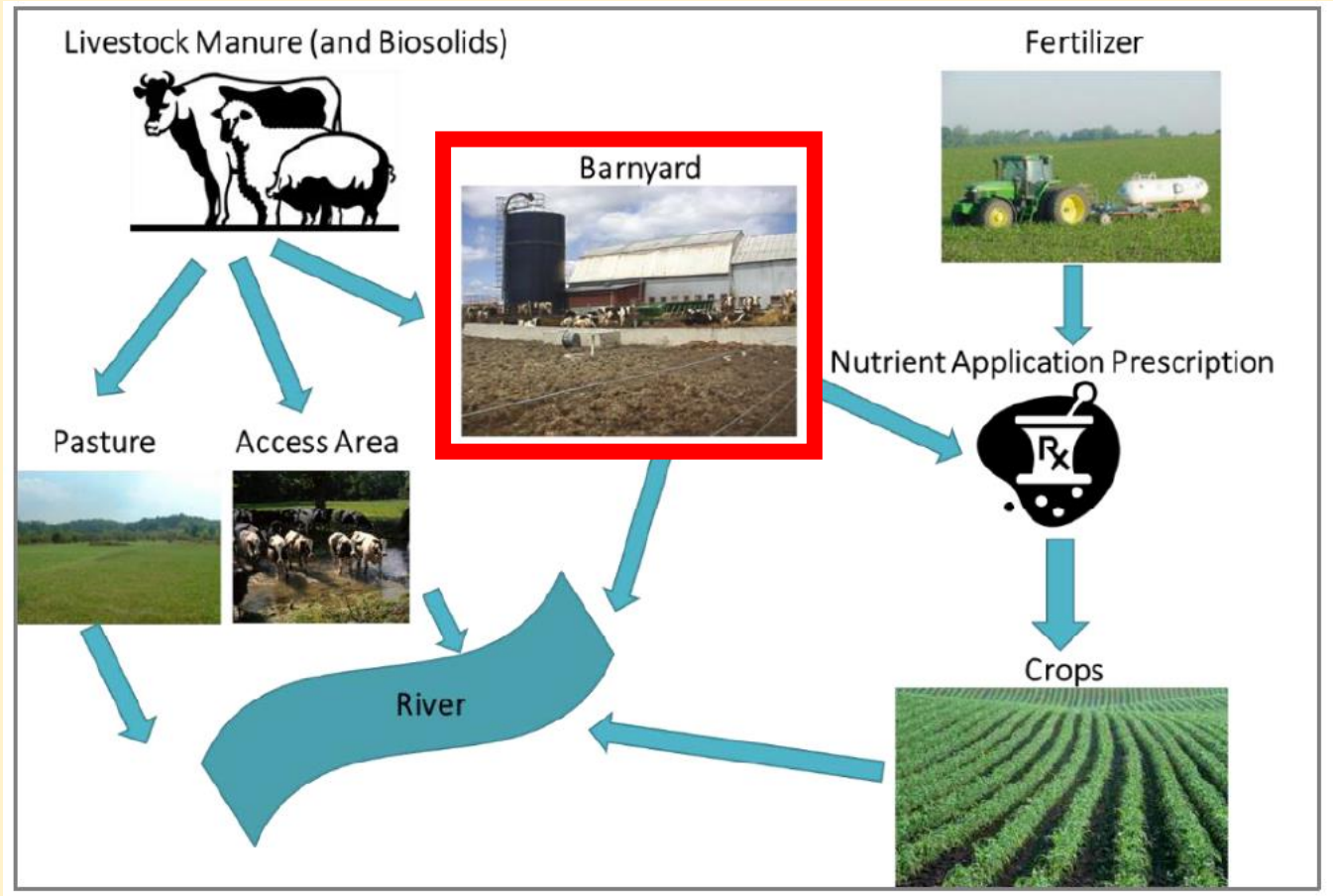


Figure 3-4 Conceptual diagram of nutrient fate through agricultural lands

Confined Deposition (Barnyard)

- Lost to the environment
- Collect and transport to another area
- Storage
- Remainder is applied to crops in the county

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

Manure nutrient losses

Volatilization

- Confined
- Pasture
- Riparian

Storage and Handling

- Confined

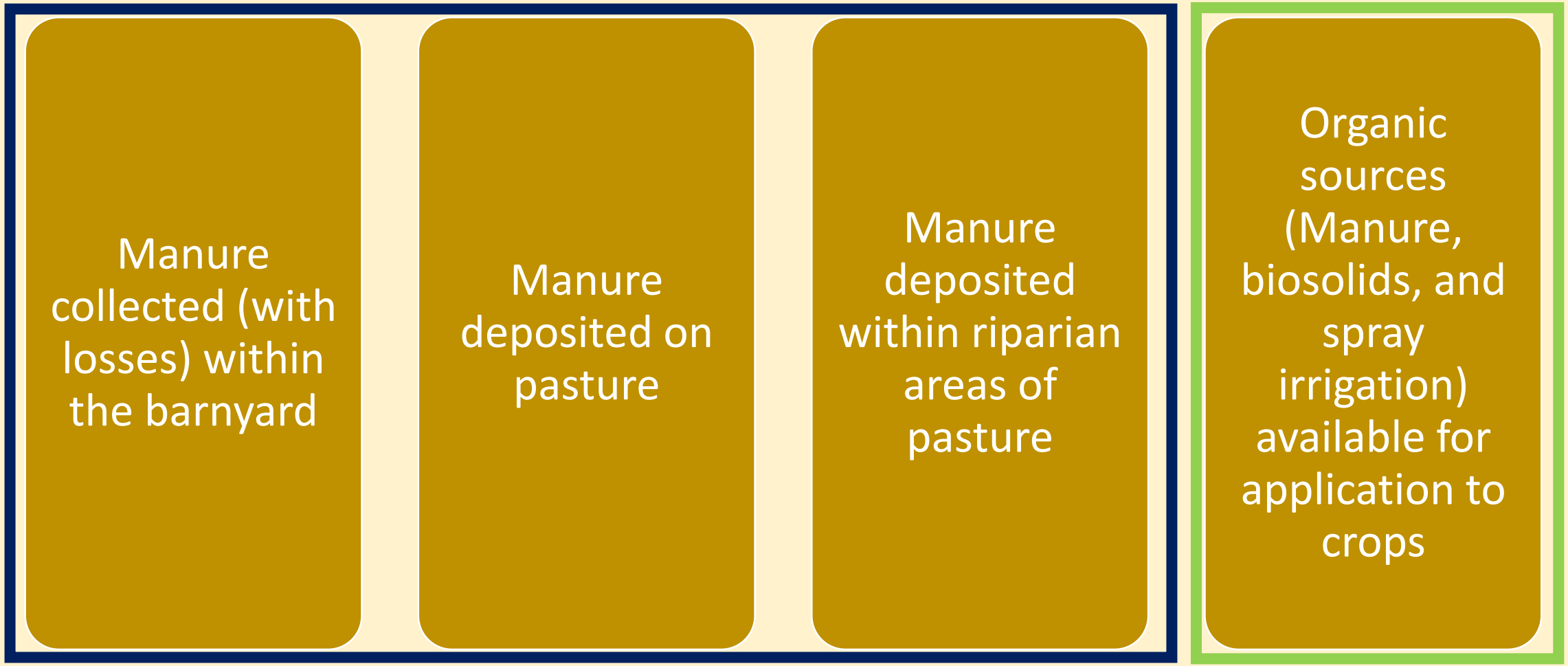
Transport

- Confined
- Moved across county lines
  - Estimate the percent moisture to calculate the nutrients transported
  - States have also reported as a dry weight

Agriculture nutrient categories

Manure deposition categories

Crop available nutrients



Not all nutrients will be plant available

Volatilization	Happens in the field after application
Mineralization	If its not mineralized it is removed
	Organic Nitrogen mineralization fraction
	Phosphate and mineralized phosphorus concentration

There are also human biosolids

Jurisdictionally provided
Lbs. of nutrients from wastewater treatment plants
Applied prior to Manure applications

How do Ag Nutrients cycle through CAST?

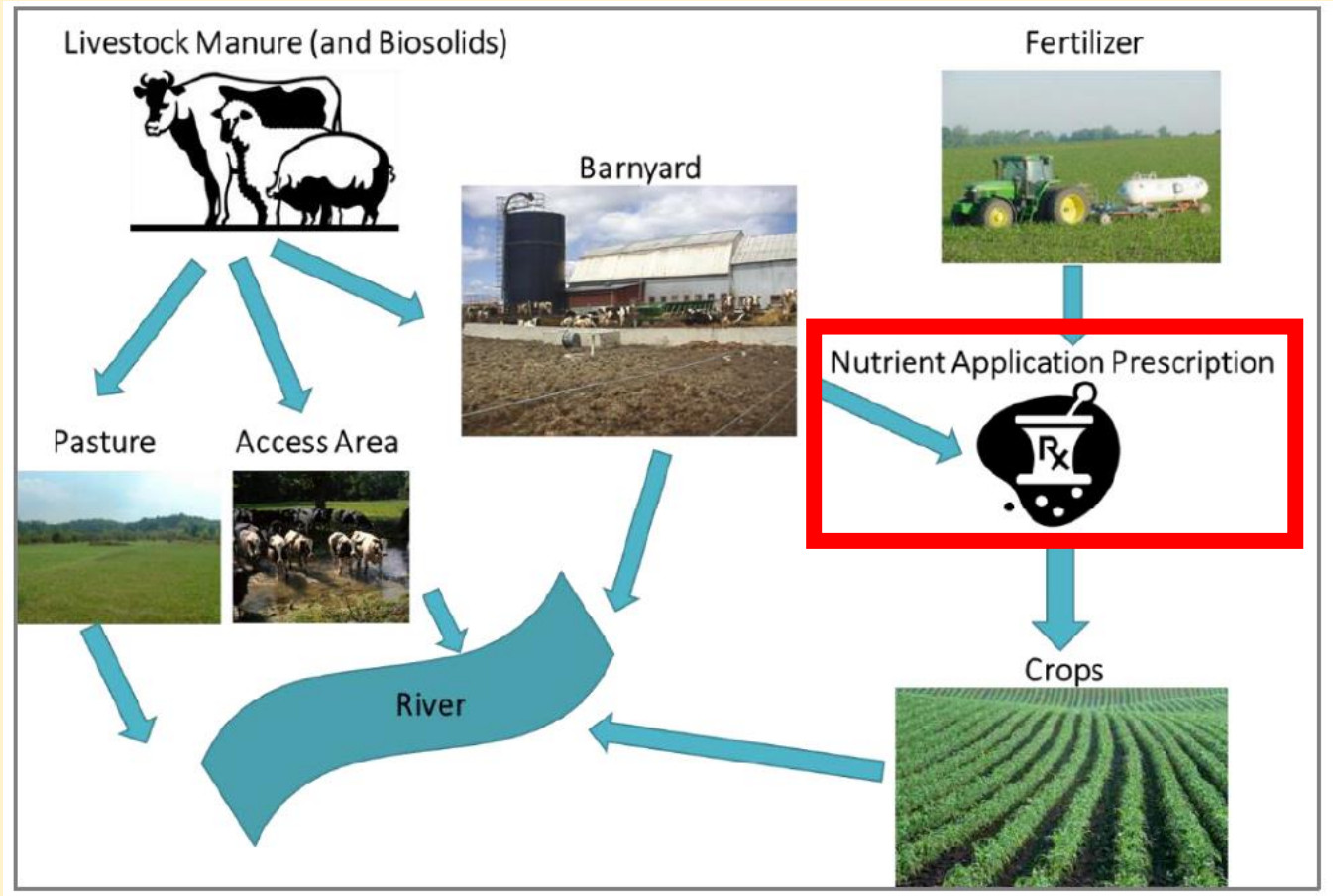


Figure 3-4 Conceptual diagram of nutrient fate through agricultural lands

Organic Nutrient Application

Biosolids (septage and spray irrigation) then Manure applied

- Applied to meet crop application yield goals
- Adjusted based off nutrient management plans
- Prioritized applications
- N:P = 3:1 application

Nutrient Management

Table 3-13: Non-nutrient management application goal multipliers

Land Use	Non-Nutrient Management Nitrogen Multiplier	Non-Nutrient Management P Multiplier
Full Season Soybeans	1.2	1.5
Grain w/ Manure	1.3	3
Grain w/o Manure	1.2	1.5
Legume Hay	1.2	1
Silage w/ Manure	1.4	3
Silage w/o Manure	1.2	1.5
Small Grains and Grains	1.2	1.5
Small Grains and Soybeans	1.2	1.5
Specialty Crop High	1.3	2
Specialty Crop Low	1.2	2
Other Agronomic Crops	1.1	1.5
Other Hay	1	1
Pasture	1	1

How do Ag Nutrients cycle through CAST?

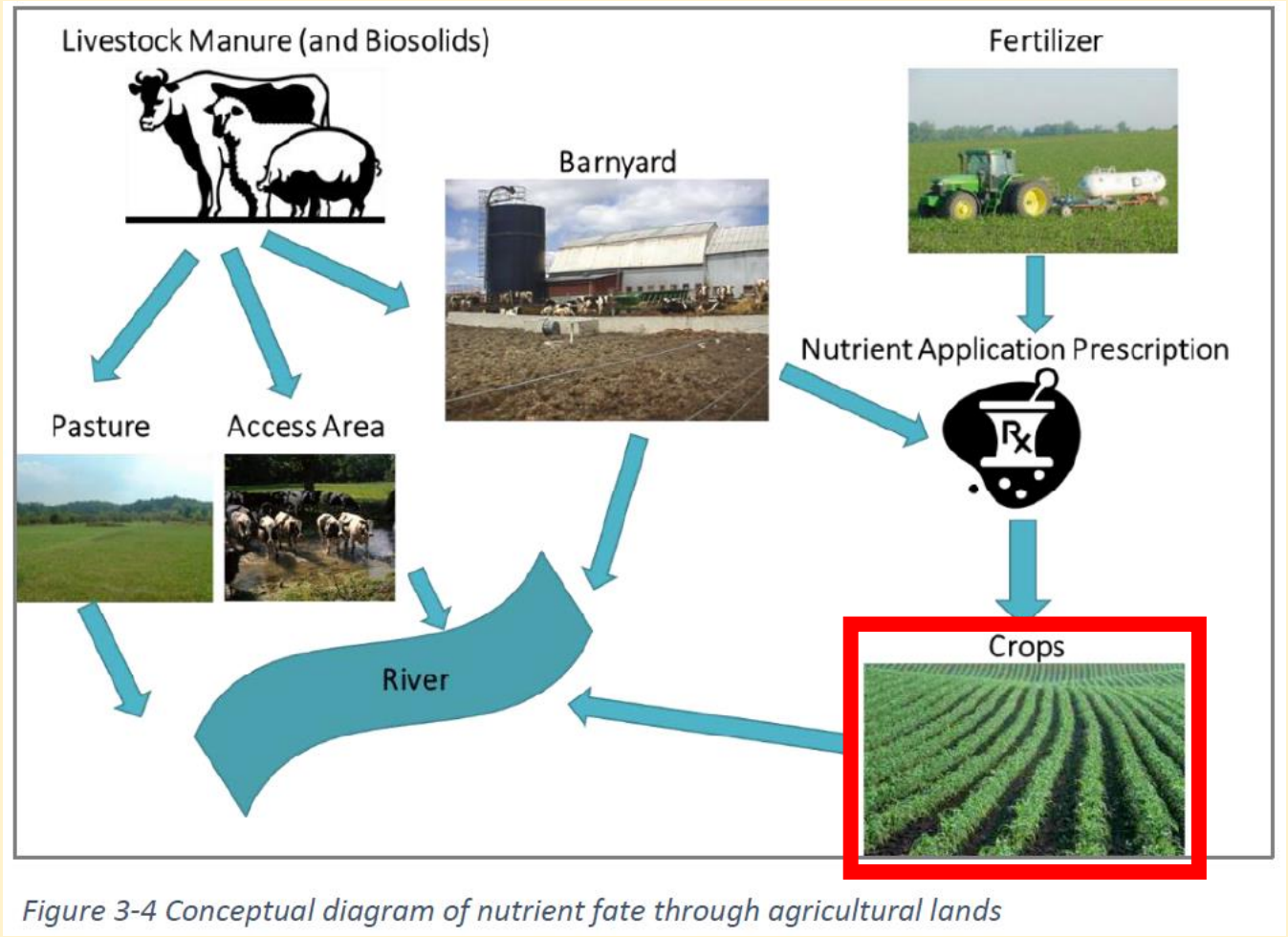


Figure 3-4 Conceptual diagram of nutrient fate through agricultural lands

Crops

- States provided data for growing regions
  - Applications are by county
  - States provide growing regions with multiple counties
  - Causes spatial yield variations

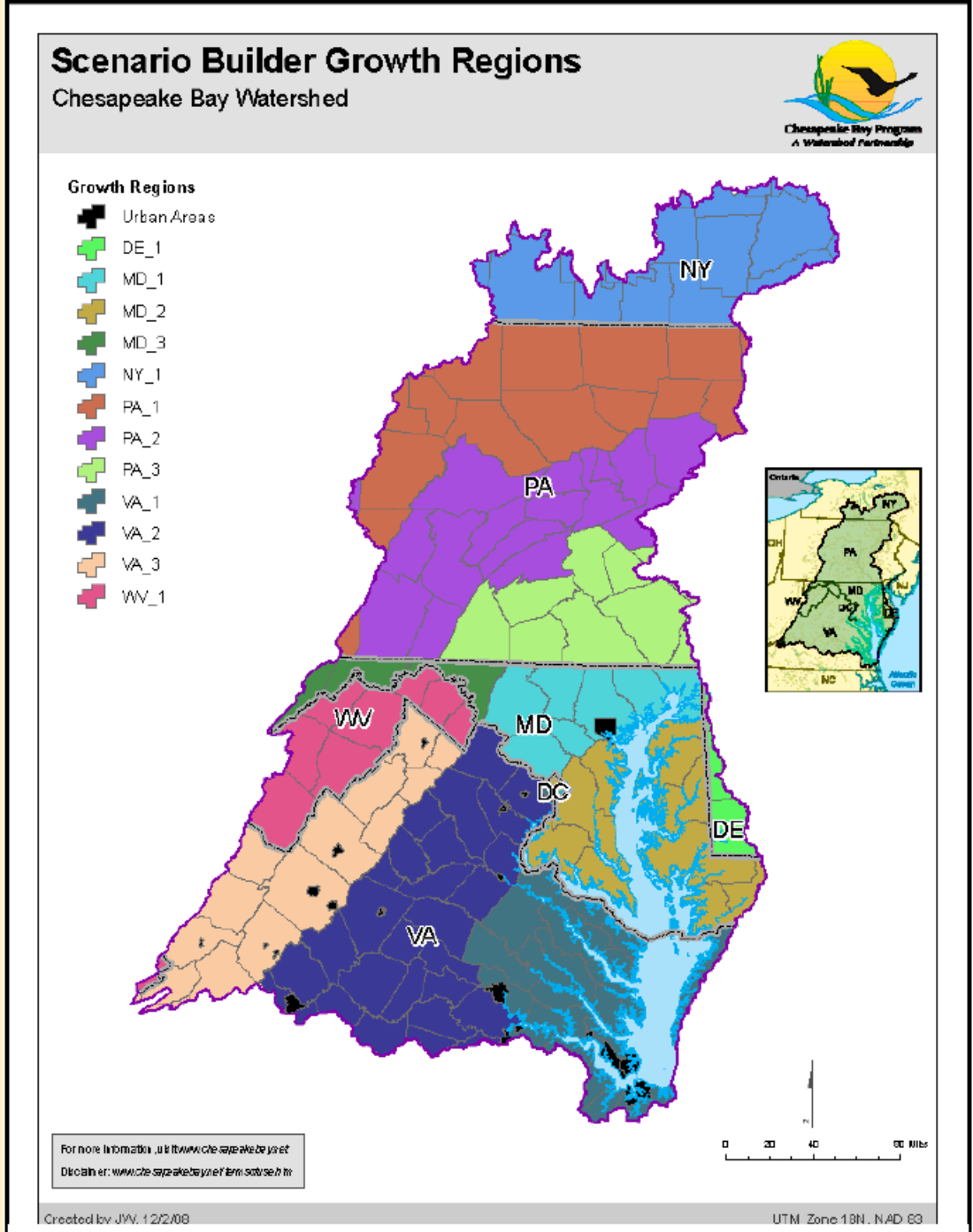


Figure 3-5 Phase 6 growth regions

Leguminous Nitrogen Fixation

- Legumes will pull N from the atmosphere when soils have low available N.
- Phase 6 Model uses an agreed upon equation for estimating N uptake.
  - 77% fixed if no additional N is added

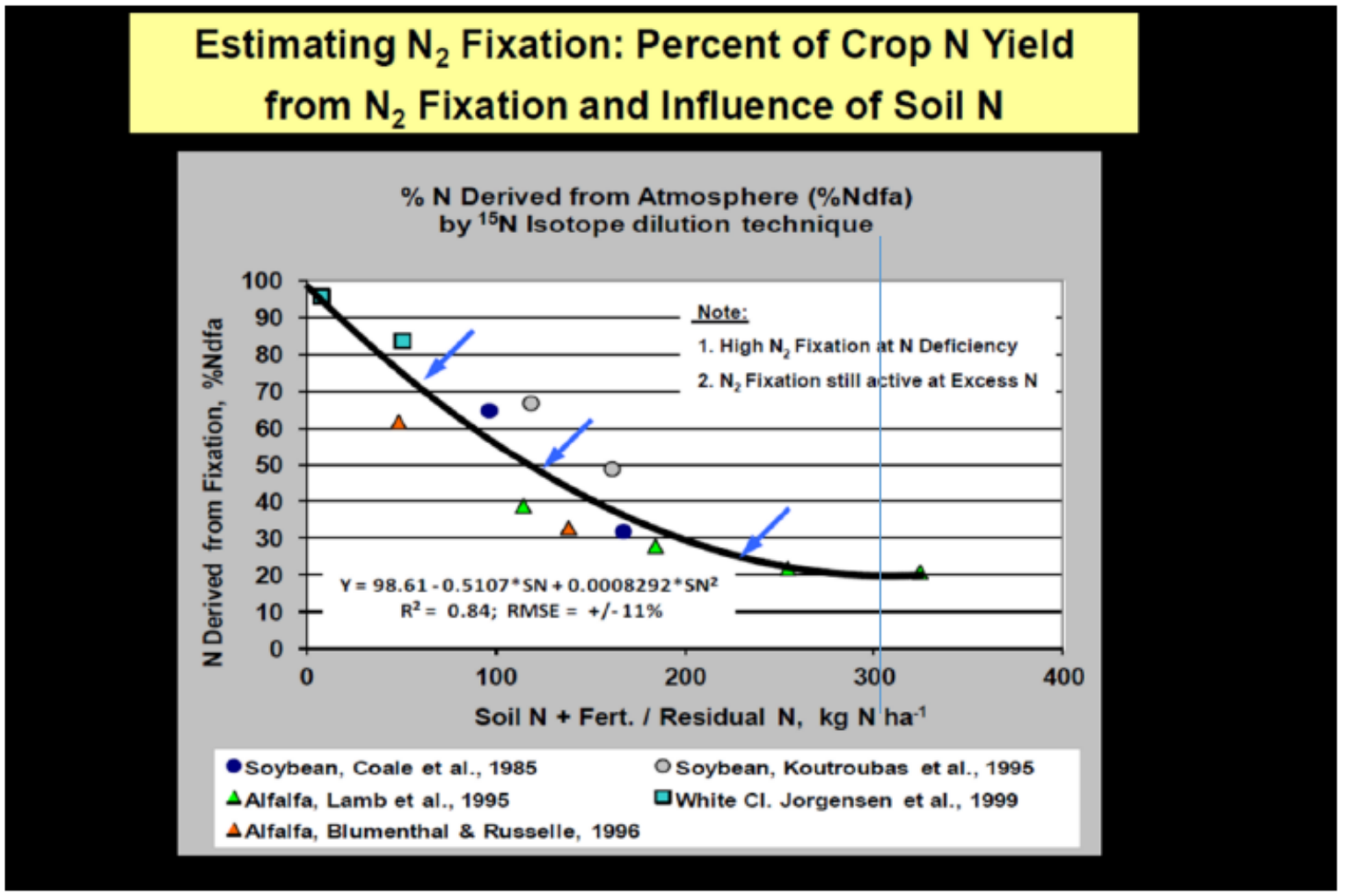


Figure 3-15: Nitrogen fixation as a percent of crop yield

Applications

Different rates for each crop type

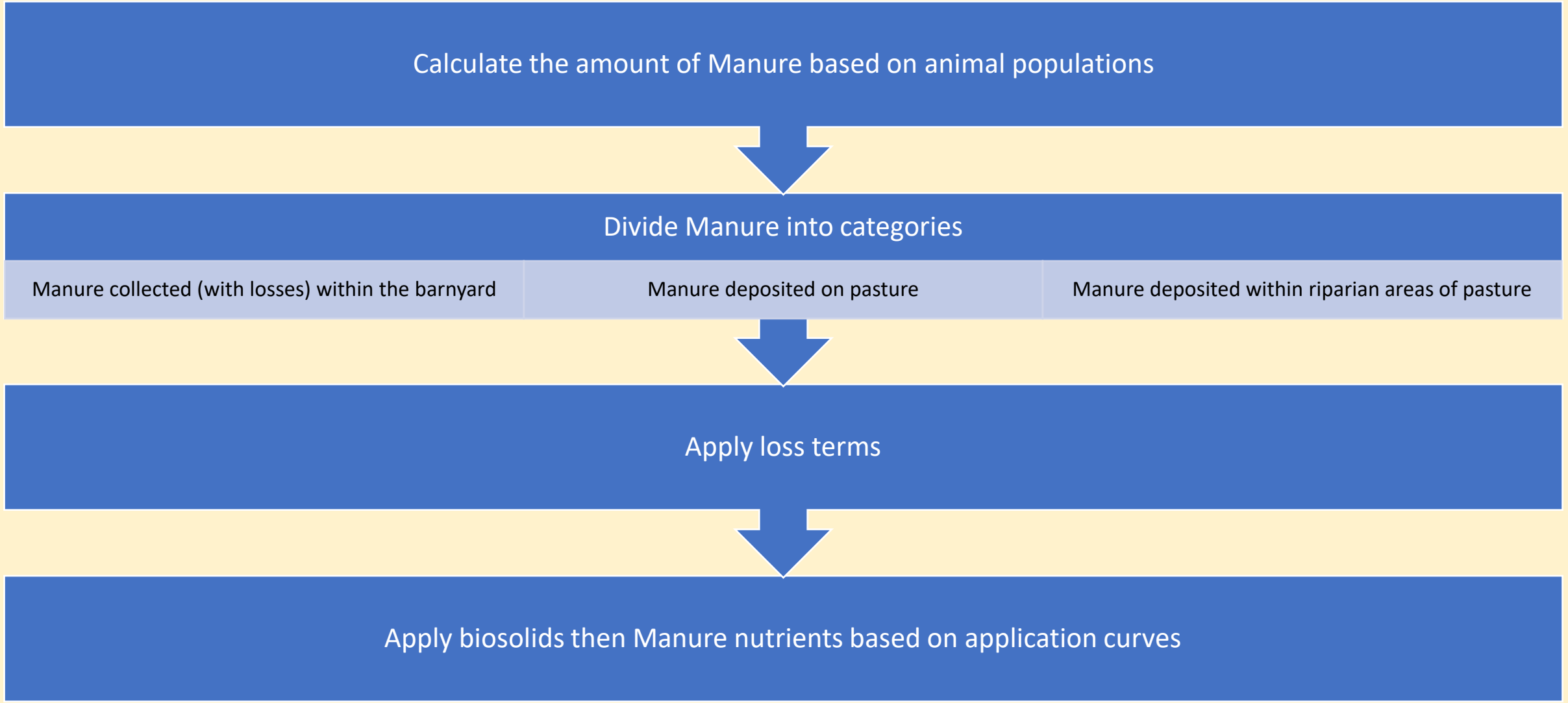
Biosolids

- Large Grains/Specialty
- Pasture/Hay
- Small Grains
- Soybeans

Manure (prioritized applications)

- Specialty crops
- Non-legume hay/pasture
- Legumes

Summary: Manure Nutrient Applications in CAST



Questions?