Phase 7: Allocation of Feed Space Acres

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Watershed Technical Workgroup

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U.S. Department of the Interior
U.S. Geological Survey

Goal

Inform the workgroup on the feed space acres *allocation* methods update from Phase 6 to Phase 7 for a Watershed Technical **decision via email** by **December 18th**

What does this mean?

Discuss how we plan to downscale county feed space acres to land river segments for modeling in the Chesapeake Assessment Scenario Tool (CAST)

Phase 6 Method Review

- Described in Section 5.7.5 *Maintaining Constant Land-River Segment Size* of the Chesapeake Bay Program Phase 6 Watershed Model Documentation
- Land use class error rates determine how many acres are available to accommodate feed space.
- Acres available = land use error rate * land use acres in a land river segment
- The acres needed for feed space is proportionally subtracted from these acres.

What's Changing?

What is staying the same?

- Methods to calculate county feed space acres
- Feed space land uses in CAST (permitted and non-permitted feed space)
- Handling of reported percentages of animals in and outside of the watershed
- Handling of feed space BMPs

What is changing?

- Spatial allocation of county feed space acres towards rural Land River Segments
- Balancing land use acres by shrinking specific land uses, instead of shrinking all land uses by error rates

Phase 7 Method Proposal

Compute Rural Fraction by Land River Segment (LRSEGs)

Compute a percentage to prioritize rural, agricultural land river segments (LRSEGs) in each county

Adjust Rural Fraction With Reported Data

Adjust the rural percentage to reflect the % of animals in and outside of the watershed as reported by the jurisdictions

Compute County Impervious and Pervious Feed Space Acres

Methods for computing total feed space acres in a county are not changing, but are being separated into impervious and pervious portions

Spatially Allocate Feed Space Acres to LRSEGs

Downscale county feed space acres (impervious and pervious) to the LRSEGs using the adjusted rural fraction

Balance Feed Space Acres with Other Land Uses

Take feed space acres from Impervious Non-Roads, Compacted Pervious and Turf Grass

Phase 7 Method Proposal

Compute Rural Fraction by Land River Segment (LRSEGs)

1. Map rural Impervious Non-Roads (INR) and agriculture (AG)

Landscape

Mapped Impervious Footprint

Rural Landscape

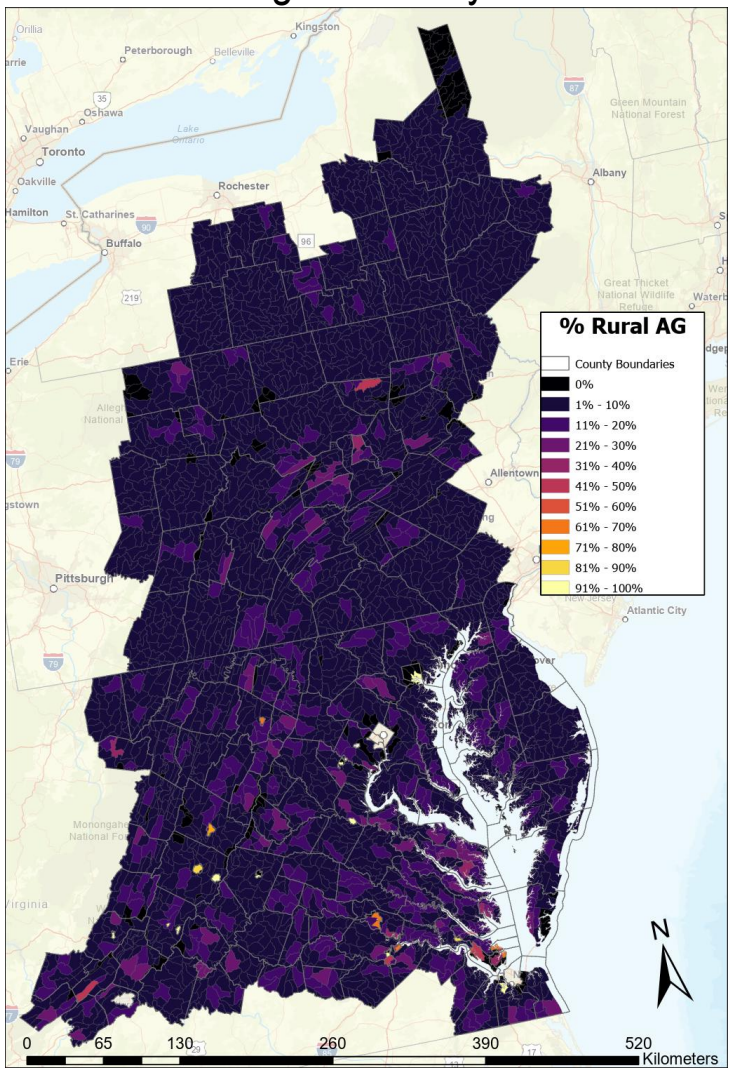
Rural Impervious Footprint

Phase 7 Method Proposal

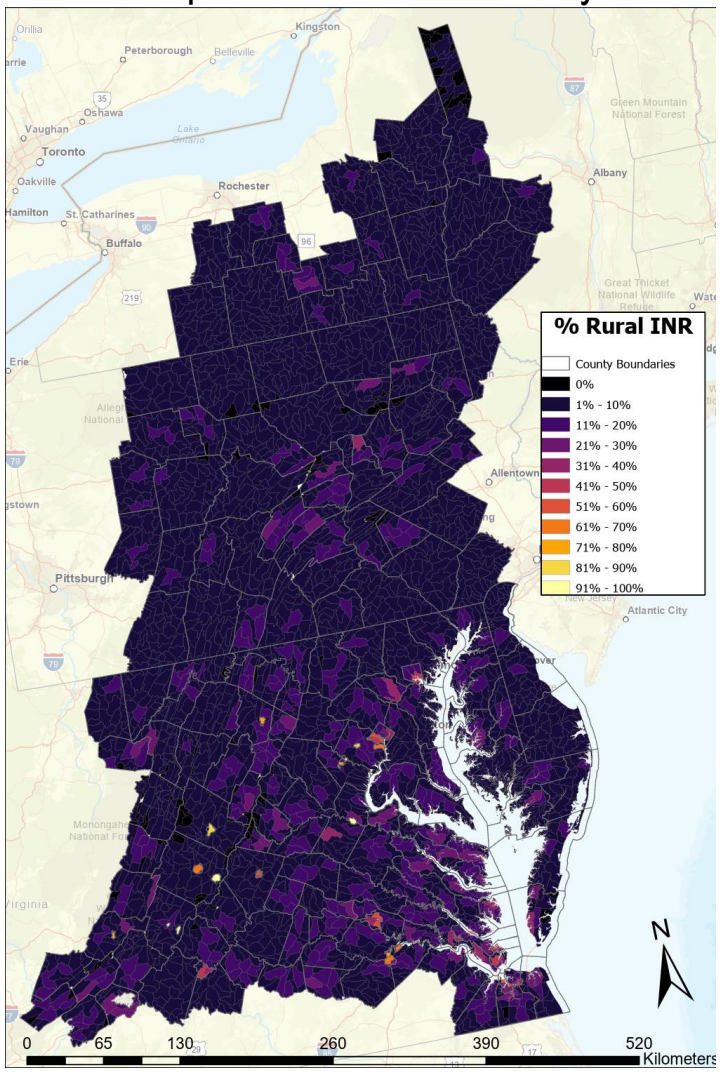
Compute Rural Fraction by Land River Segment (LRSEGs)

1. Map rural Impervious Non-Roads (INR) and agriculture (AG)
2. Calculate % county rural INR and rural AG in each LRSEG

% Rural Agriculture by LRSEG



% Rural Impervious Non-Roads by LRSEG

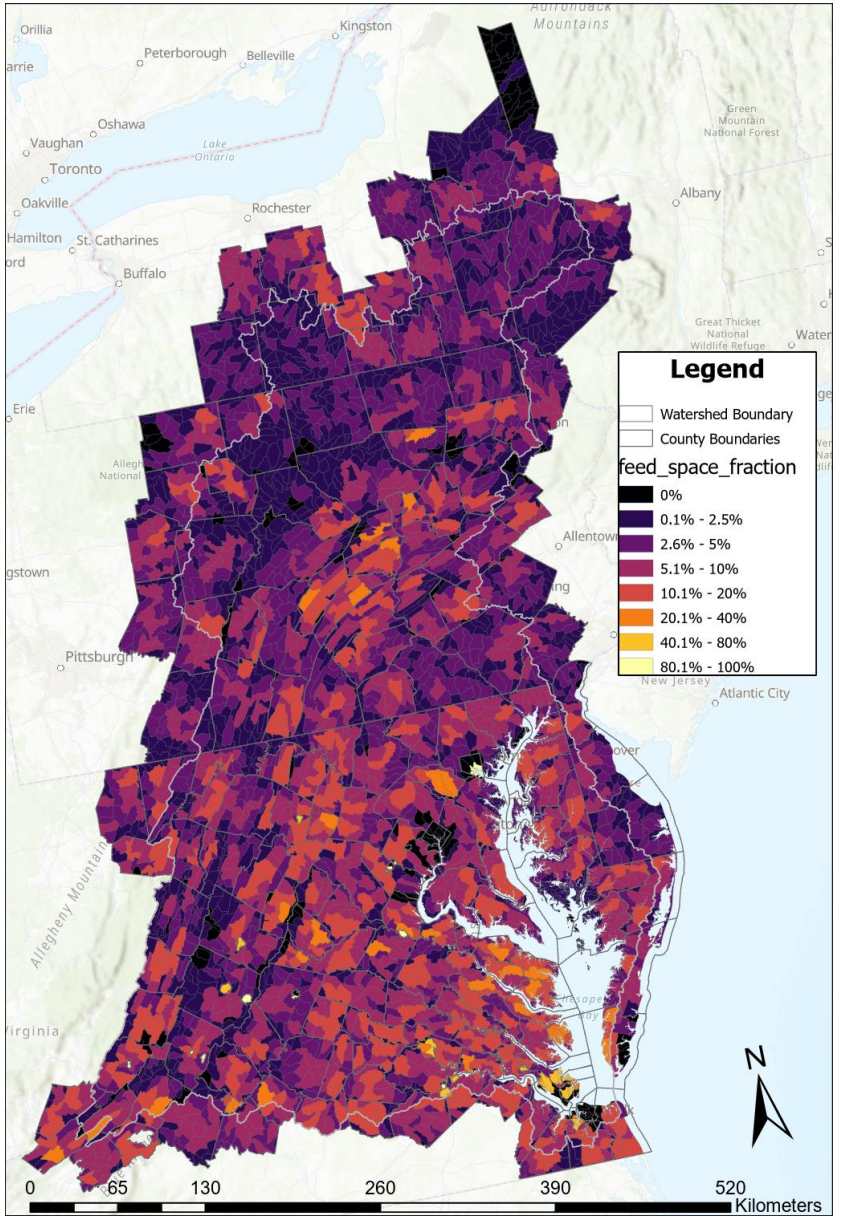


Phase 7 Method Proposal

Compute Rural Fraction by Land River Segment (LRSEGs)

1. Map rural Impervious Non-Roads (INR) and agriculture (AG)
2. Calculate % county rural INR and rural AG in each LRSEG
3. Average the percentages to create rural fraction

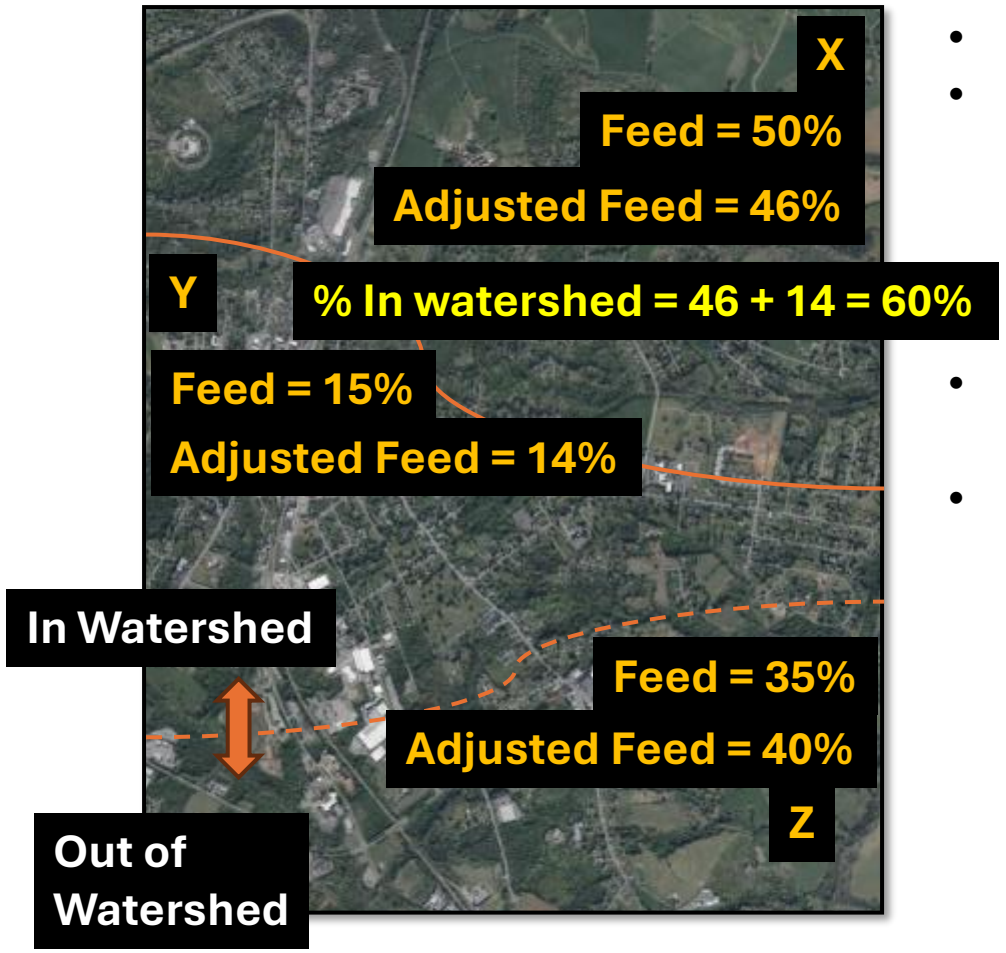
$$Feed\ Space\ Fraction = \frac{\%\ \text{Rural Impervious Non-Roads} + \%\ \text{Rural Agriculture}}{2}$$



Phase 7 Method Proposal

Adjust Rural Fraction With Reported Data

1. Adjust the rural (or feed) fraction to account, per animal type, for reported % of animals in watershed data



- This is **County A**
- **County A** has 3 Land River Segments:
  - X, feed fraction = 50%
  - Y, feed fraction = 15%
  - Z, feed fraction = 35%
- X and Y are in the watershed and Z is outside of the watershed
- If goats are reported as 60% inside the watershed portion of County A, the adjusted fractions to apply to goats are:
  - X = 50% feed fraction * (60% goats in the watershed / 65% feed fraction in the watershed) = 46%
  - Y = 15% * (60% / 65%) = 14%
  - Z = 35% * (40% / 35%) = 40%

$$Feed\ Space\ Fraction_{\ Watershed\ Adjustment} = Feed\ Space\ Fraction * \frac{\%\ Animal\ Type\ in\ Watershed}{\sum Feed\ Space\ Fraction\ in\ Watershed}$$

$$Feed\ Space\ Fraction_{\ Outside\ Watershed\ Adjustment} = Feed\ Space\ Fraction * \frac{1 - \%\ Animal\ in\ Watershed}{\sum Feed\ Space\ Fraction\ Outside\ Watershed}$$

Phase 7 Method Proposal

Compute County Impervious and Pervious Feed Space Acres

1. Calculate the portion of feed space that is impervious (roofed structures) and pervious (barnyards) for each animal type

$$\%\ \text{Impervious Feed Space} = \frac{Roofed\ Structures}{Open\ Air\ Barnyard\ + Roofed\ Structures}$$

2. Compute county feed space acres (no change from Phase 6 methods)
3. Separate county feed space acres into impervious and pervious acres per animal type

$$\text{Impervious feed space acres} = \%\ impervious\ feed\ space\ * feed\ space\ acres$$

Source Name	Open-Air Barnyard (sq feet) MED	Roofed Structures (sq feet) MED	% Impervious Feed Space
Beef (Beef Heifers)	55.4	26.9	33%
Broilers	0	0.85	100%
Dairy (Dairy Heifers)	96.8	28.6	23%
Goats	0	15	100%
Hogs and Pigs for Breeding	0	13.6	100%
Hogs for Slaughter	0	9.7	100%
Horses	147.4	147.4	50%
Layers	0	1.7	100%
Other Cattle	45.2	18.3	29%
Pullets	0	1	100%
Sheep and Lambs	0	25	100%
Turkeys	0	2	100%

Section 5.4.3 of the Chesapeake Bay Program Phase 6 Watershed Model Documentation

Phase 7 Method Proposal

Spatially Allocate Feed Space Acres to LRSEGs

1. Allocate county impervious feed space acres to LRSEGs using the adjusted feed (rural) fraction for each unique animal type

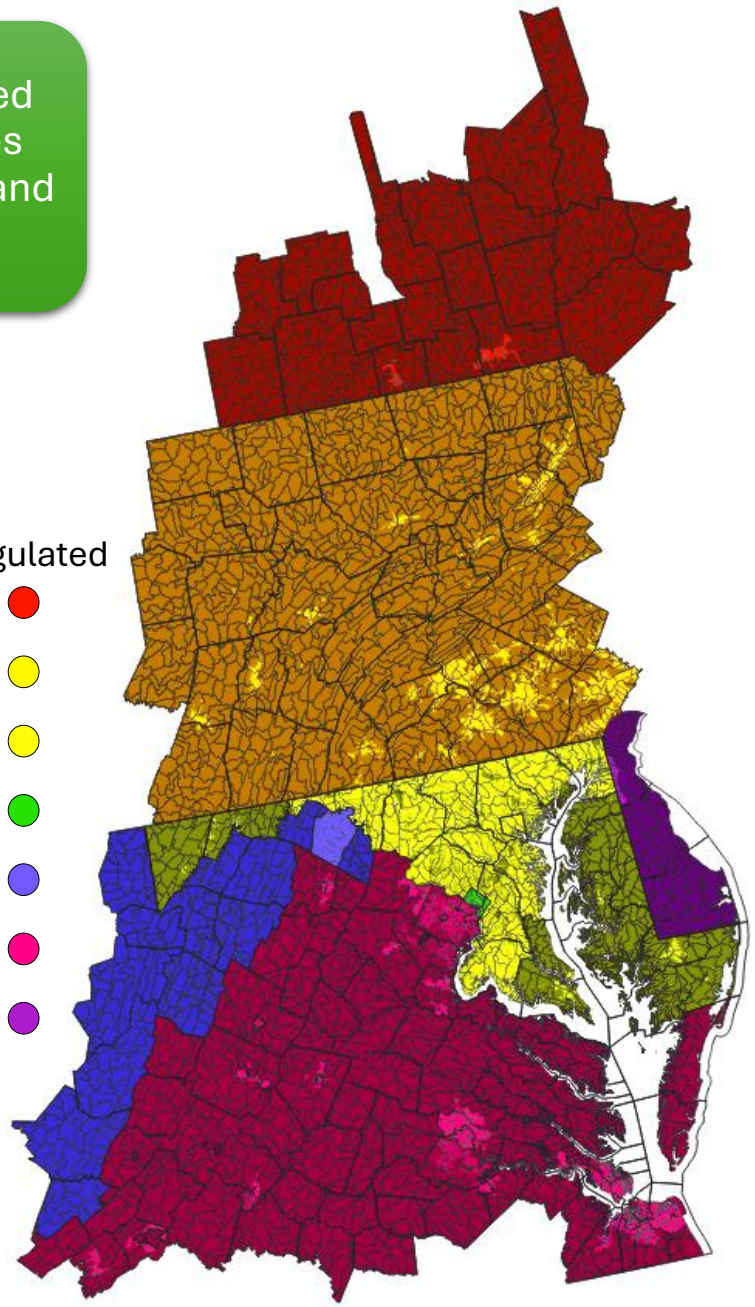
$$Impervious\ Feed\ AcresLRSEG = Impervious\ Feed\ Acres_{County} * Adjusted\ Feed\ Fraction_{LRSEG}$$

2. Allocate county pervious feed space acres to LRSEGs using the adjusted feed (rural) fraction for each unique animal type

$$Pervious\ Feed\ AcresLRSEG = Pervious\ Feed\ Acres_{County} * Adjusted\ Feed\ Fraction_{LRSEG}$$

Phase 7 Method Proposal

Balance Feed Space Acres with Other Land Uses



1. Take Impervious feed space acres from unregulated Impervious, Non-Roads (INR) land use *
    1. There are places where this isn't feasible due to MS4 coverage, in these cases, some land will come from MS4 INR

1. Take Pervious feed space acres from unregulated Compacted Pervious (COMP) and Turf proportionally
    1. There are places where this may not be feasible due to MS4 coverage, in these cases, some land will come from MS4 COMP and TURF

* Taking feed space from INR was presented to the WQGIT in September

What's Changing?

What is staying the same?

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- Handling of feed space BMPs

What is changing?

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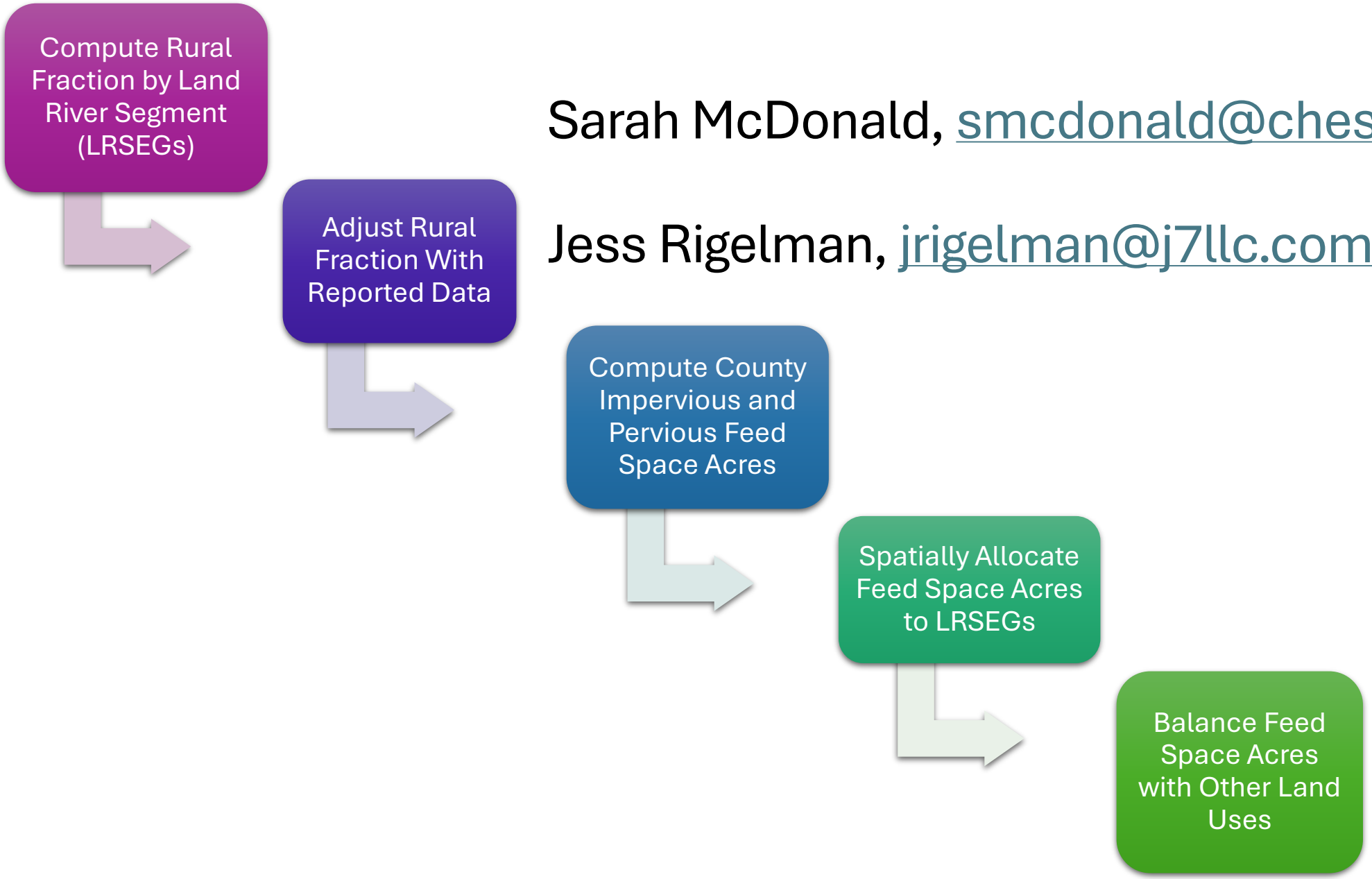
Need More Details or Clarification?



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