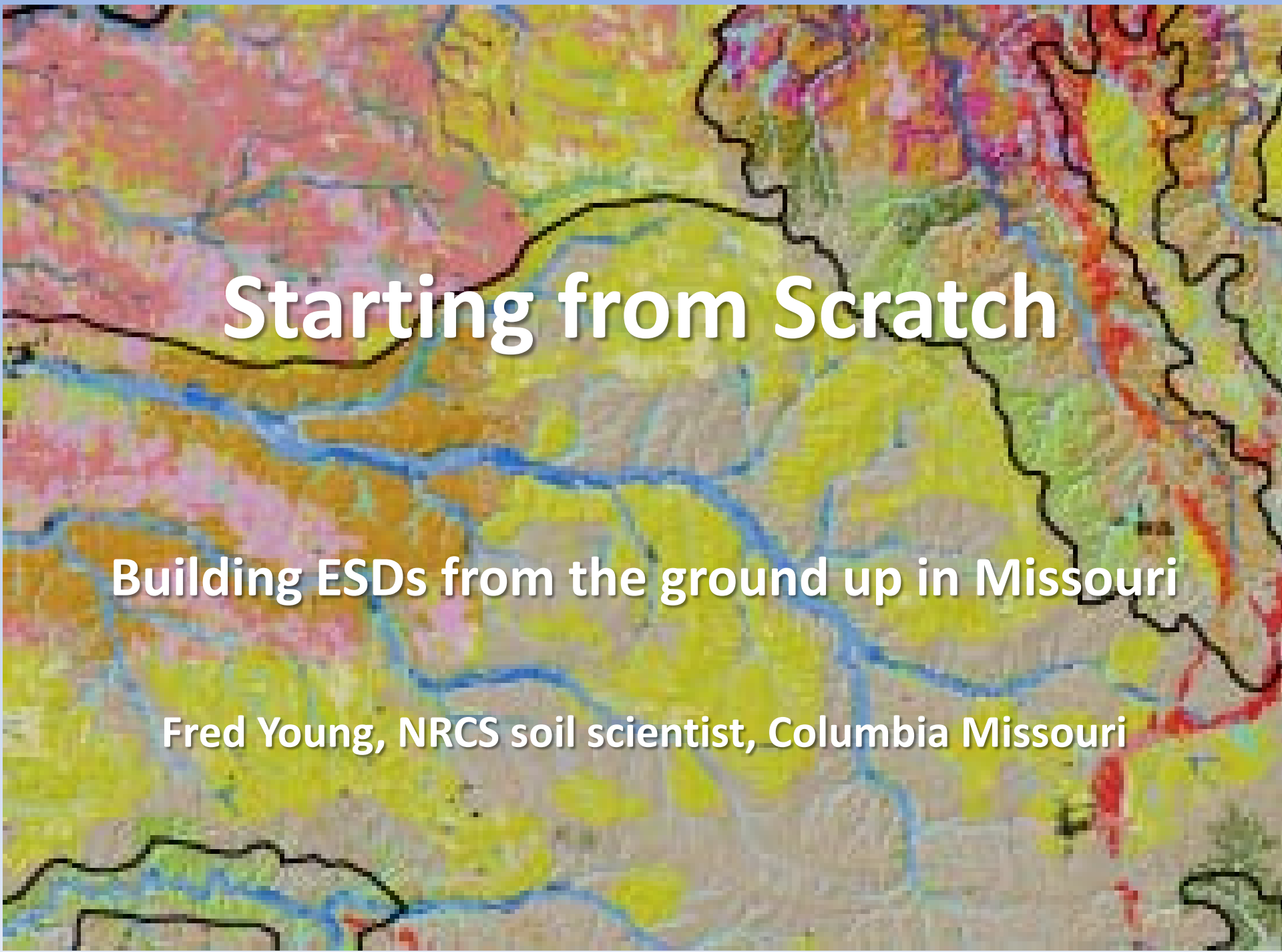


Starting from Scratch

Building ESDs from the ground up in Missouri

Fred Young, NRCS soil scientist, Columbia Missouri

Objectives

- Discuss an approach to building ESDs in a state with no Range Site tradition.
  - “starting from scratch”
  - Applicable to many states in the Udic zone?
- Discuss the “challenges” in the process.
  - What works, and what the barriers are.
  - What kind of problems (and successes) one might encounter in other states.

Background: partner agencies

- Missouri Dept. of Conservation (MDC) has developed the categories of the Ecological Classification System (ECS) for Missouri:
  - Sections, Subsections: MLRA-scale
  - Land Type Associations: STATSGO-scale
  - Ecological Land Types (ELTs): SSURGO-scale
- The ELTs were overwhelming to their small staff.
  - Approached NRCS; use groupings of 1:24K SSURGO map units to create ELTs.
- ELTs = ESDs?
  - As we worked, it became clear that these are, conceptually, the same.
  - Can we make them the same?
    - Easier said than done!
    - We are on track to make this happen.

Working in a partnership: Cooperative Agreement

- Signed w University of Missouri
  - Administratively, this worked, whereas an agreement directly with MDC did not work.
- NRCS provides MDC $50K annually, in a multi-year agreement.
  - Can be renewed easily, every year.
- MDC provides in-kind services
    - Terrestrial ecologist project leader (Tim Nigh)
    - Staff GIS & vegetation specialist
    - Staff soils & vegetation specialist
    - Seasonal field sampling crew
    - 25 ESD write-ups the first year
      - I will do the soils portions!

Partnerships: Pros & Cons

- Pros:
  - SSURGO gets integrated into partner agency land management.
    - SSURGO combines into ESDs, which = ELTs.
    - MDC uses ELTs to manage their many conservation area lands, and to work with private landowners.
    - Dept. of Natural Resources will use ELTs on State Parks.
    - USFS uses the ECS
      - unclear if Mark Twain NF in Missouri will adopt this.
  - Partners can provide considerable ecological expertise.
- Cons:
  - Partner(s) may have different objectives and needs.
  - Partners may find our ESDs difficult to understand; e.g.
    - Multi-component map units; difficult to map one-to-many relationships.
    - State & Transition Models; e.g., may prefer the more deterministic "climax vegetation" model.
  - All the usual problems with multi-partner projects; e.g., scheduling meetings, agency culture, bureaucratic procedures, etc.
  - Takes more staff time (see all of the above).
- Recommendation: the benefits of integrating SSURGO outweigh the hassles of partnership.

Defining ESDs: our basic procedure

- Meeting to determine which soil properties are important to ES distinction, and what the criteria for each soil property are.
  - soil scientists, vegetation specialists (forester, grassland specialist, ecologist).
- Use NASIS queries/reports to assist in the process of grouping soil components into potential ES, for a target MLRA.
- Meet again to evaluate soil groupings, and create draft ES classes for the target MLRA.
  - Create “empty boxes”; the ES category structure for a MLRA.
- Test the ES categories in the field, and with other data (e.g., historic GLO (Government Land Office) survey records).
- Re-evaluate the ES soil criteria; refine and regroup as necessary.
- We think this is entirely consistent with existing guidance:
  - Bestelmeyer et al., 2009 (extremely helpful for our partners!)
  - NRCS guidance sheets.

Soil Properties for ESDs in Missouri MLRAs

- Parent Material
- Landscape Position
- Rooting Restriction
- Soil Order
- Wetness
- Texture
- Ponding

Other MLRAs may have other, or additional, soil property criteria

Example: Parent Material Classes

- Deep Loess (> 100 cm)
- Loess/Till (30 – 100 cm loess)
- Loess/Residuum (30 – 100 cm loess)
- Till (loess < 30 cm)
- Residuum: cherty limestone/dolomite
- Residuum: non-cherty limestone/dolomite
- Residuum: sandstone
- Residuum: shale
- Residuum: volcanic
- Colluvium
- Outwash
- Alluvium: carbonates > 100 cm
- Alluvium: carbonates < 100 cm

No MLRA in Missouri uses all of these classes; e.g. *Residuum: Volcanic* is used only in MLRA 116C (St. Francois Knobs & Basins)

Soil Properties:
some operational details

- Conceptually, our procedure is straightforward and in accordance with NRCS guidance.
  - i.e., this is nothing new.
- Operationally, “the devil is in the details”
  - Different properties are meaningful in different combinations; e.g.
    - Alfisol/Ultisol distinctions are not meaningful for fragipan soils (vegetation is identical).
    - Mollic epipedon (or subgroup) vs ochric epipedon is not meaningful for lithic soils.
    - Loamy vs clayey is not meaningful for the pre-Illinoian-aged Till in Missouri.
  - How clean and consistent are your NASIS data?
    - ESDs prompted a statewide project (5 MLRA offices) to “clean up” our data on geomorphic properties (landscape, landform, 2D, 3D) and parent materials.

Meet to evaluate soil/ESD correlations

- Create a spreadsheet of map unit components and properties with draft ESD assignments.
- Meet with MLRA Project Office staff; go down the list blow-by-blow.
  - May include ArcMap spatial review of map unit location, distribution.
- Typically, many changes as a result:
  - Errors in soil properties (NASIS errors)
  - Refinements of ESD criteria
    - e.g., definition of “claypan” for the Claypan Summit Prairie ESD.
    - Combine some ESDs; split others.
  - Identify “problems” requiring additional work:
    - ESDs requiring more field investigation.
    - Map units that cross ecological boundaries.

Create the ESD structure in ESIS:

- Select the ESDs that seem fairly stable, & are unlikely to be abandoned.
- Enter these as “empty boxes” in ESIS.
  - Enter the minimum data necessary to create a draft ESD.
- Next day, these are available in NASIS, in a choice list.
  - Component Ecological Site Table
- Link the appropriate soil components to the draft ESDs.
- Now, you can run several NASIS reports to obtain the soil properties pertinent to the ESD.
- Armed with these reports, you can:
  - Write several sections of the ESDs,
  - Clarify the defining soil properties of each ESD.
- Summary:
  - Build the ESD structure for the target MLRA first (i.e., “empty boxes”).
  - Tie the soils to the structure.
  - Use NASIS reports to prepare the soils information for ESIS.
  - Veg specialists add other material as it is developed (e.g., State & Transition diagrams, community lists & descriptions, etc.).
- I don’t know if anybody else is doing it this way.
  - I can’t guarantee that this method is optimal.

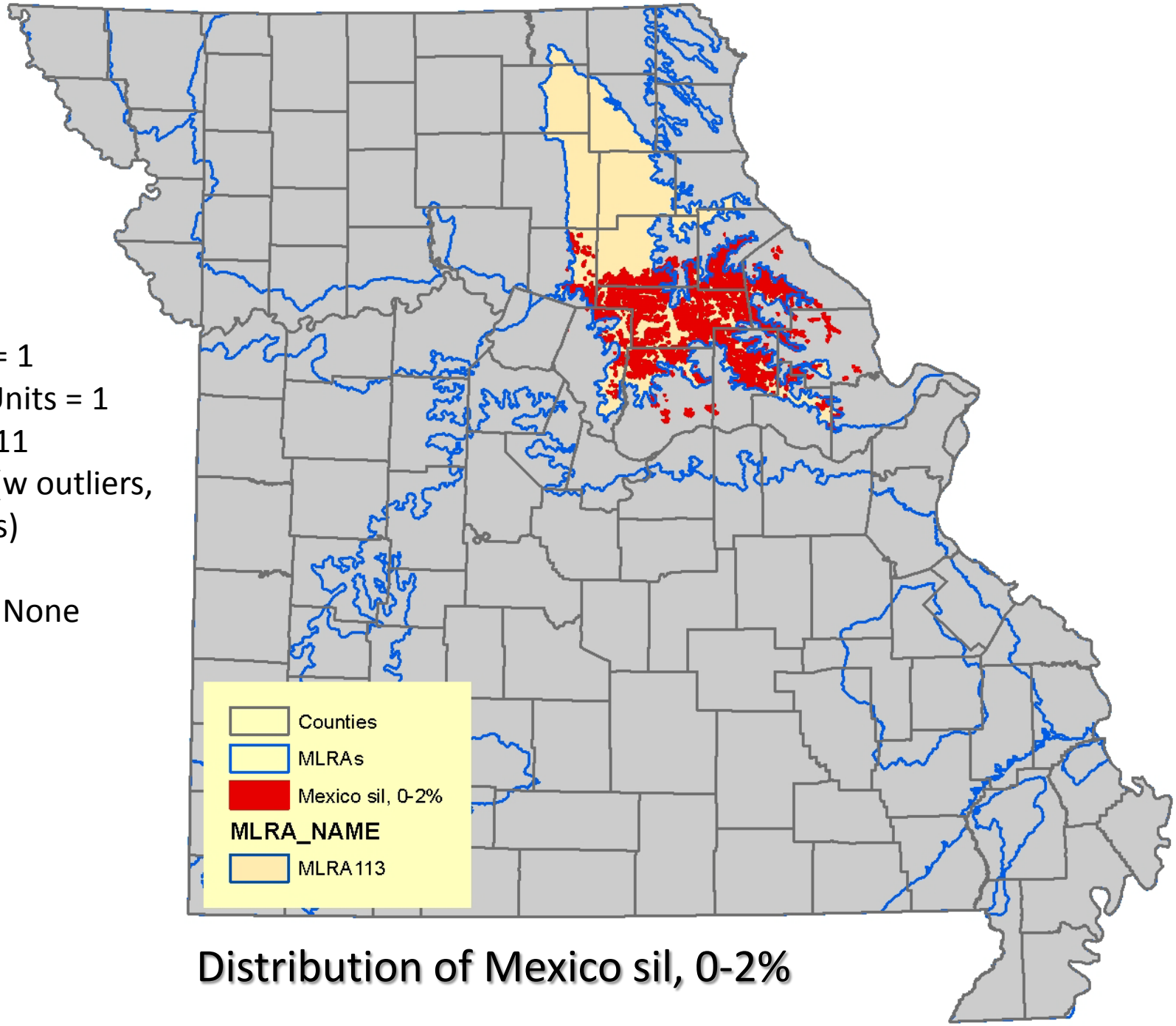
Map units that cross ecological boundaries

- Provides many “opportunities for improvement” to Missouri SSURGO data.
- ESDs are MLRA-centric; an ESD “belongs” to a MLRA.
  - Many map units in Missouri cross MLRA boundaries… and not just a little bit.
  - Many map unit distributions are currently being evaluated, in relation to MLRAs.
    - 1) most are completely within a MLRA (no problem!)
    - 2) some have delineations along borders (no problem!)
    - 3) some have nearby outliers (no problem, in my opinion)
    - 4) some range far across 2 or more MLRAs (these are problematic)
- Even within MLRAs, there are problems; e.g.,
  - Upland Drainageways vs Valley Floodplains
    - Discussion to follow.

DMUs, County Lines, and ESDs

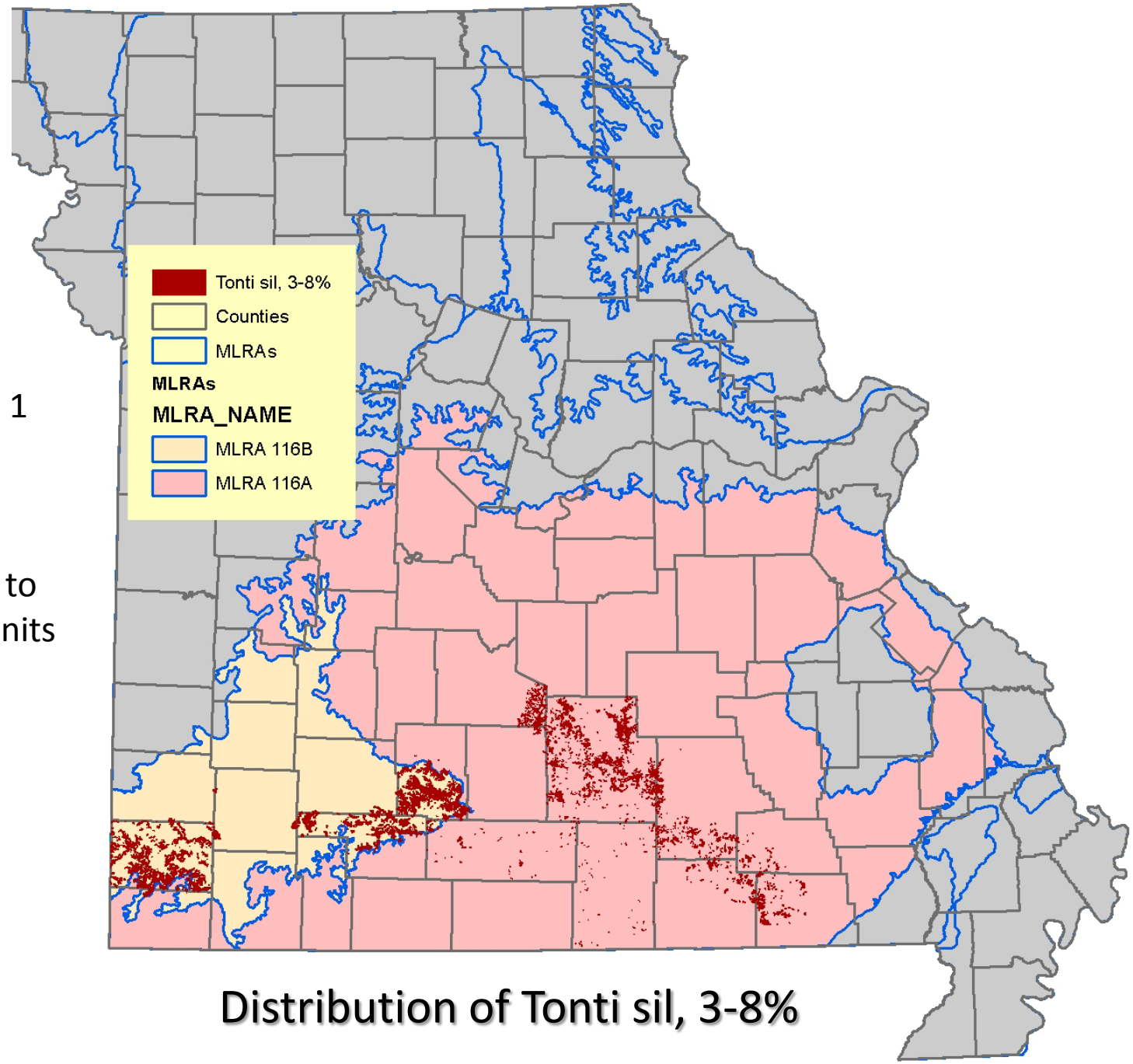
- Missouri decided, at the end of the once-over surveys, to remove county lines from the survey.
  - e.g., *Mexico sil, 0-2% slopes*, has a single musym, a single data map unit, and occurs in 11 counties.
  - Data are consistent across counties.
- We continue to advocate this approach.
- However, the ESD Project shows us that, in retrospect, we went too far.
  - Some map units now extend beyond MLRA / ecological boundaries.

Map Units = 1
Data Map Units = 1
Counties = 11
MLRAs = 1 (w outliers, edge effects)
ESDs = 1
Problems = None



Distribution of Mexico sil, 0-2%

Map Units = 1
Data Map Units = 1
Counties = 15
MLRAs = 2
ESDs = 2
Problems = Need to split into 2 map units

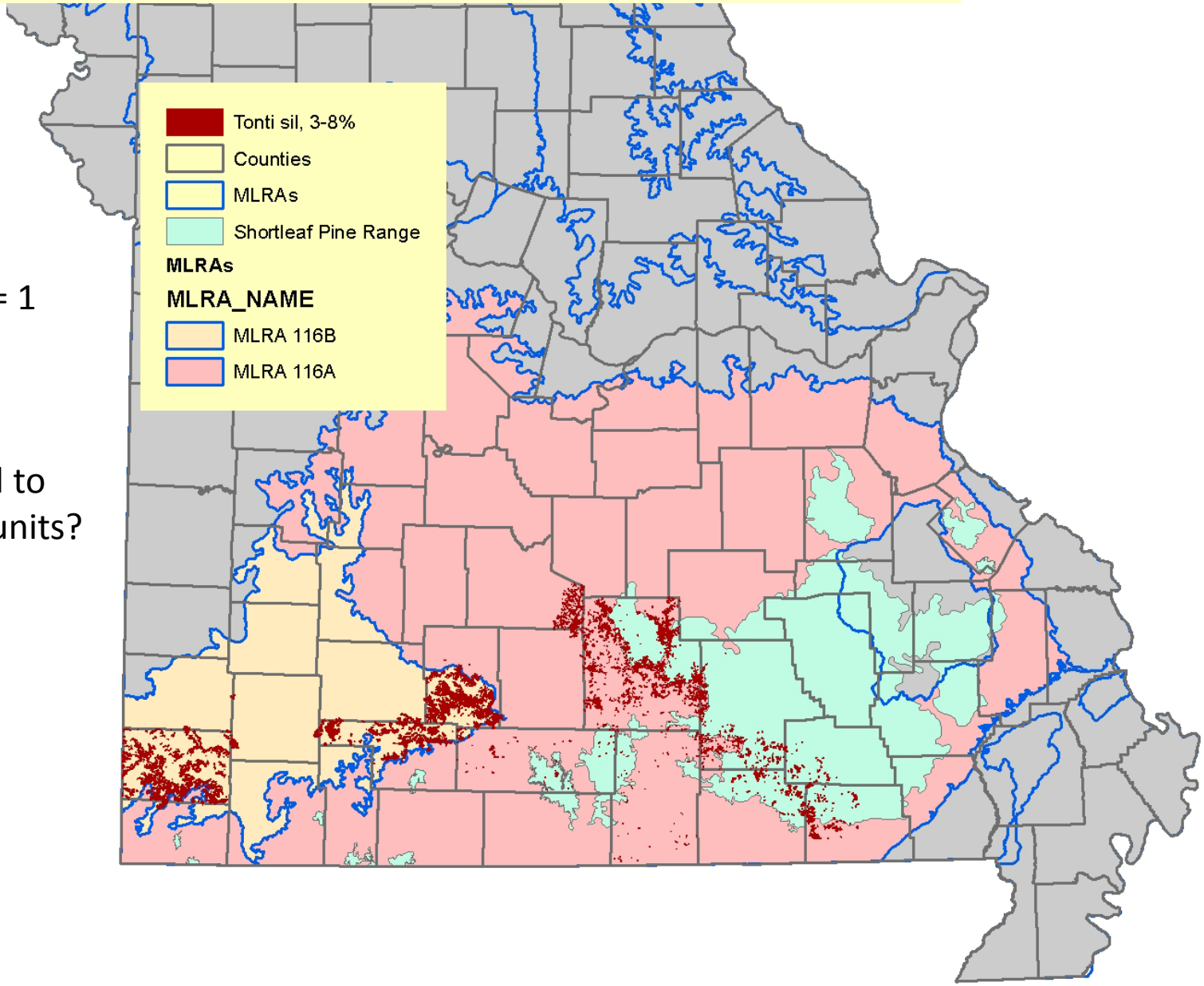


Distribution of Tonti sil, 3-8%

Historic Shortleaf Pine Range in Missouri

ecologically significant, geographically distinct (climate, geology)

Map Units = 1
Data Map Units = 1
Counties = 15
MLRAs = 2
ESDs = 3
Problems = Need to split into 3 map units?

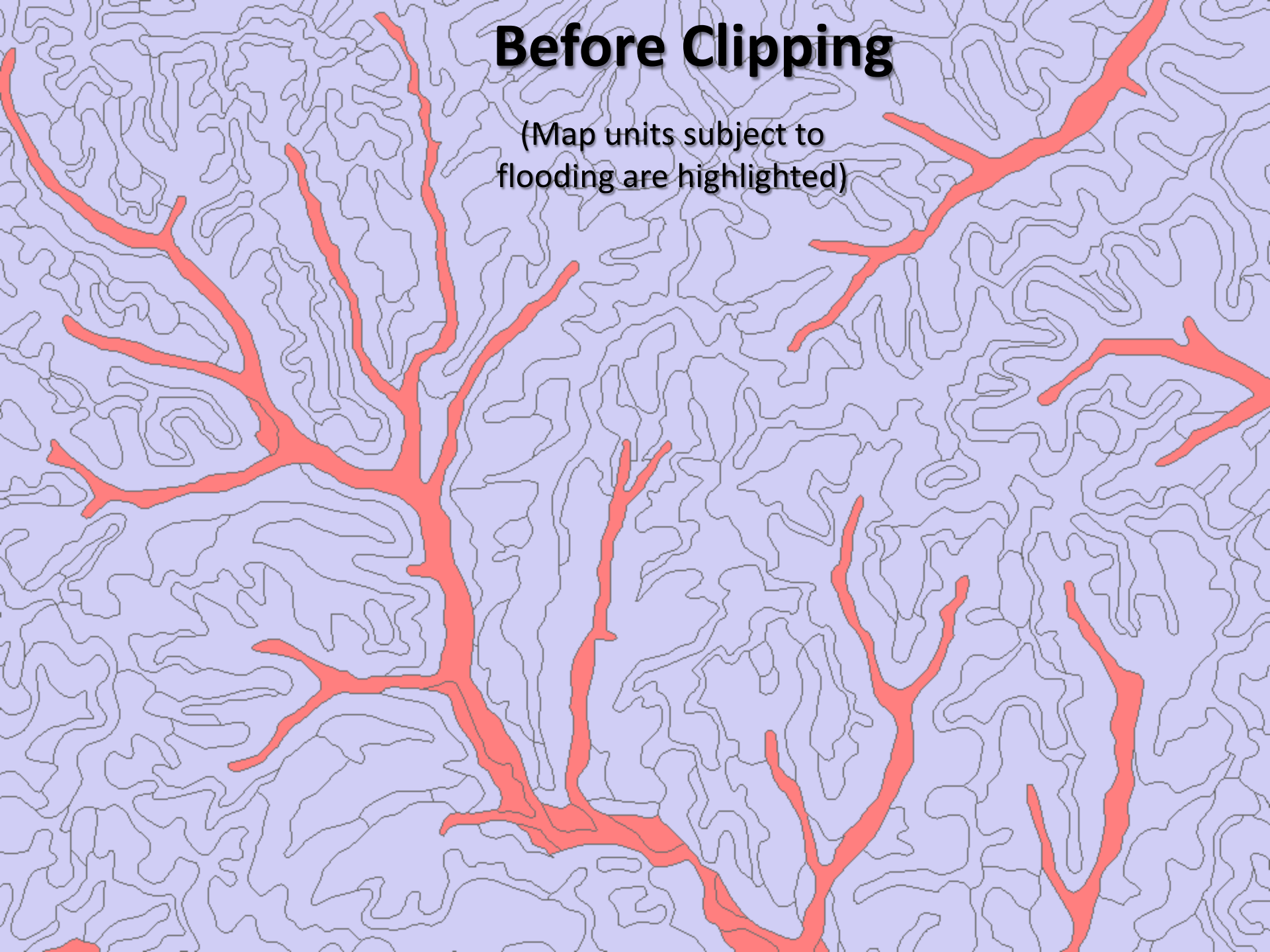


The Upland Drainageways Project

- Upland drainageways are ecologically distinctive:
  - Mixture of upland & floodplain species.
  - Ecologists really want an ESD for these.
- Floodplain map units:
  - Most are entirely within River Valley landscapes.
    - No problem!
  - Some are entirely within Drainageways.
    - No problem!
  - Many are partially within River Valleys, and partially within Upland Drainageways.
    - Problem! Cannot assign two ESDs to the same map unit component.
  - In the county-based soil surveys, there was no known reason to separate the Upland Drainageways from the River Valley Floodplains.
    - Now, there *is* a reason.
- Statewide project to delineate the Upland Drainageways.
  - “snippin’ tails”.
  - 7 MLRA Project Offices involved.

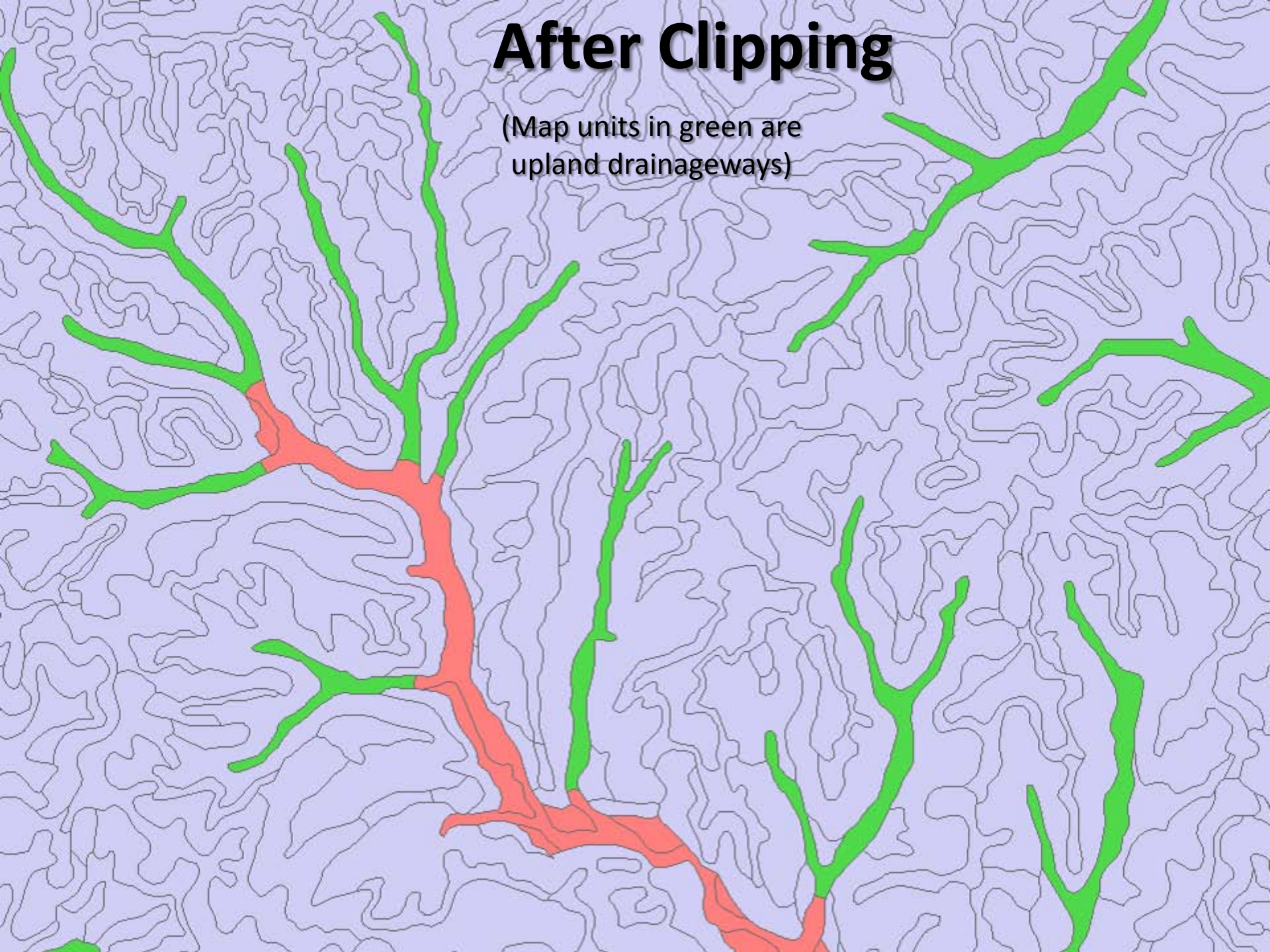
Before Clipping

(Map units subject to flooding are highlighted)

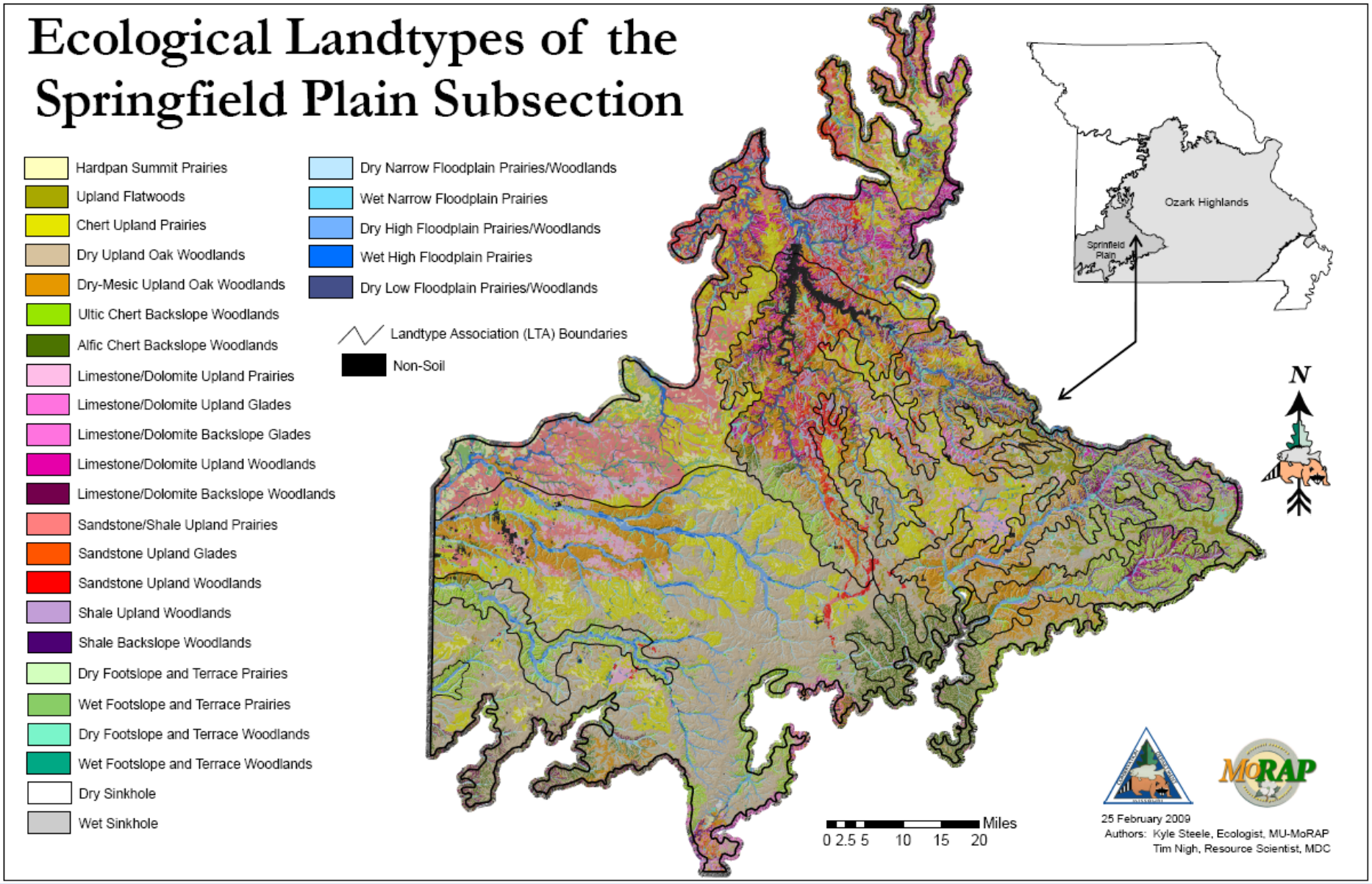


After Clipping

(Map units in green are upland drainageways)



Summary

- ESDs are good for the soil survey program in Missouri!
  - Expanding our user group.
  - Incorporating SSURGO directly into partner agency land management policies.
  - Helping us find weaknesses (including inconsistencies and errors) in our data.
- Direct collaboration with partner agencies provides the best chance for wide ESD use.
  - Count on lots more time, though.
- Starting ESDs from scratch for one or multiple MLRAs is opening a can of worms.
  - This has resulted directly in several multi-MLRA-office projects, some active & ongoing into FY 2011.
- We recommend multi-county data map units.
  - However, consider ESDs if/when you dissolve the county lines.
- We are creating the ESD structure for an entire MLRA first, then filling in the details.
  - This contrasts with a one-at-a-time approach.

First Draft… questions & comments?