Hair Shedding Project Update

NIFA Advisory Board meeting: 7/18/17

Harly Durbin

UNIVERSITY OF MISSOURI Extension

Problem & background

- Tall fescue is the primary forage in large percentage of USA beef cattle country ("fescue belt")
  - Much of this fescue is infected with endophytic fungus, which causes the fescue to be more drought-hardy and pest resistance
  - However: eating endophyte infected "toxic" fescue causes adverse effects in cattle

Losses associated with fescue toxicosis cause over $600 million in losses to beef industry yearly

Problem & background

- Fescue toxicosis affects an animal's ability to adaptively shed hair ("slick off") in early summer
- Adaptive hair shedding is also an effective measure of heat tolerance
- Variants identified in previous research in tropically adapted cattle, but these variants do not segregate in taurine breeds adapted to temperate climates

Problem & background

- Hair shedding is correlated with progeny day 205 weaning weight of progeny (Gray et al., 2011)
  - Effective estimator of heat tolerance, even in absence of genomic data

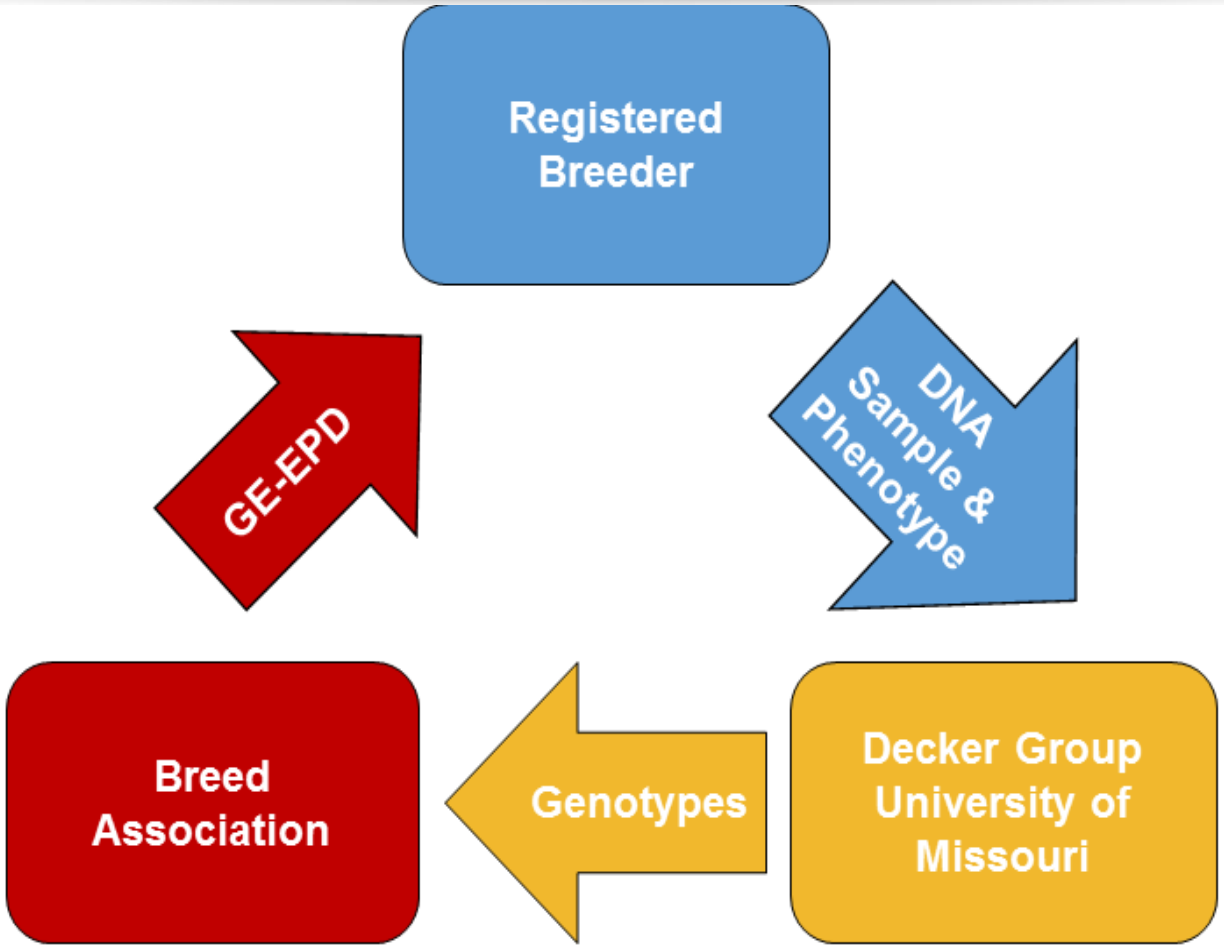
- In preliminary research, females that shed off earliest in summer weaned calves **24 lbs.** heavier than females that shed off latest in the summer

Refresher…

Cattle hair shedding scored in early summer: April 20 – June 30

- **Score 5:** Full winter coat, 0% shed
- **Score 4:** Some shedding around topline, ~25% shed
- **Score 3:** Halfway shed, winter hair remains around flank, legs, and belly
- **Score 2:** Nearly slick, some winter hair remains around flank, legs, and belly
- **Score 1:** Completely slick summer coat

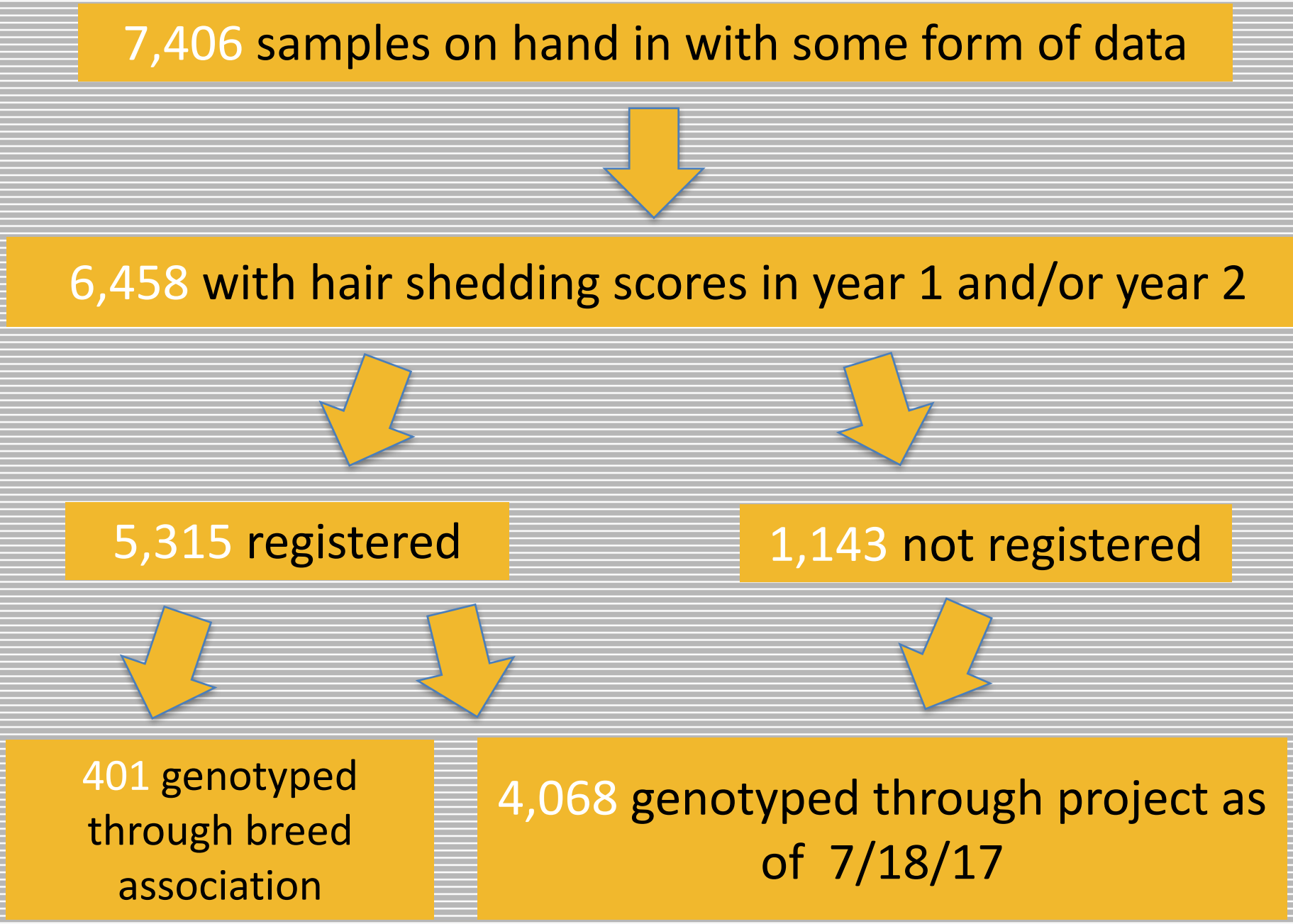
Refresher…

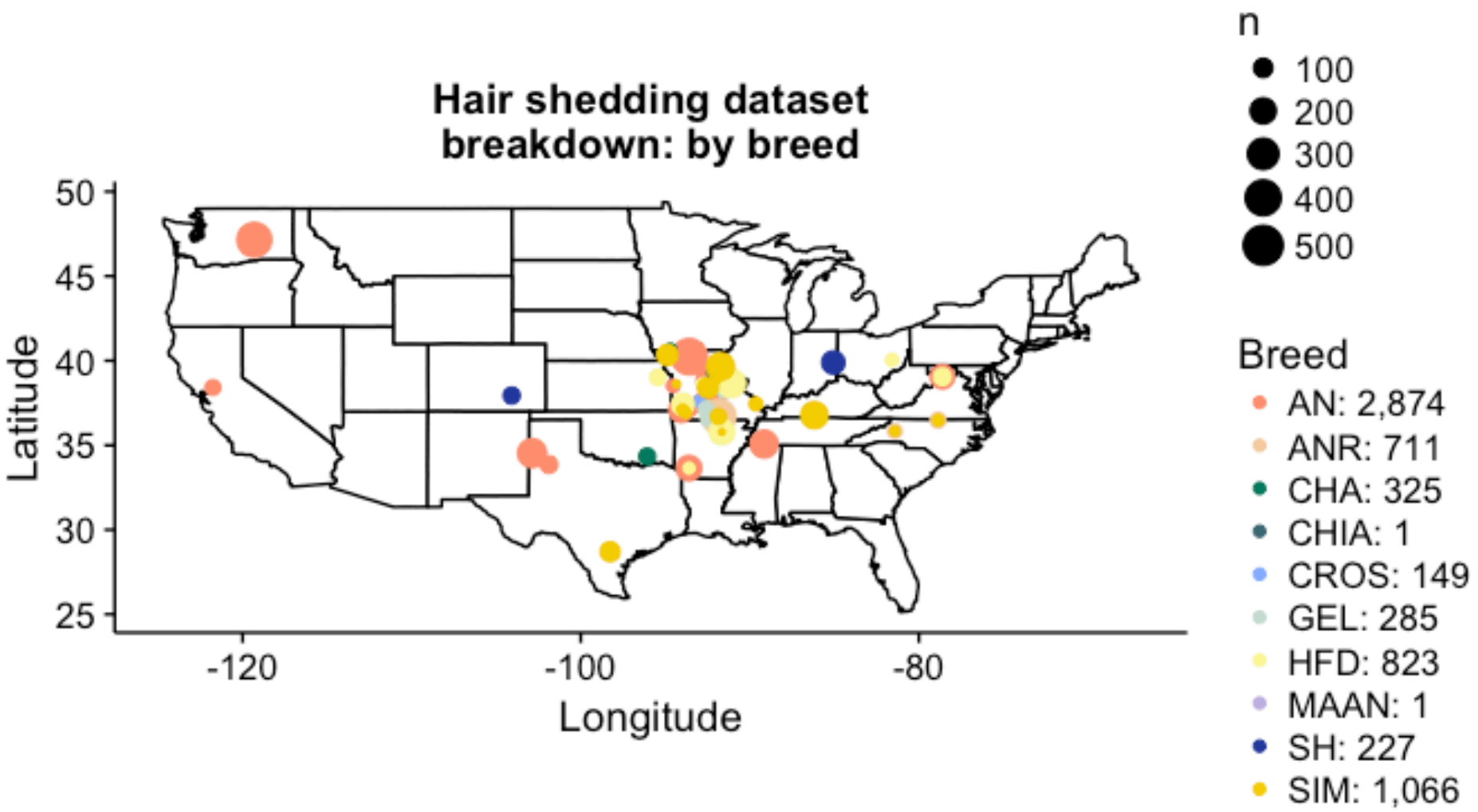

Registered Breeder
DNA Sample & Phenotype
Decker Group University of Missouri
Genotypes
Breed Association
GE-EPD

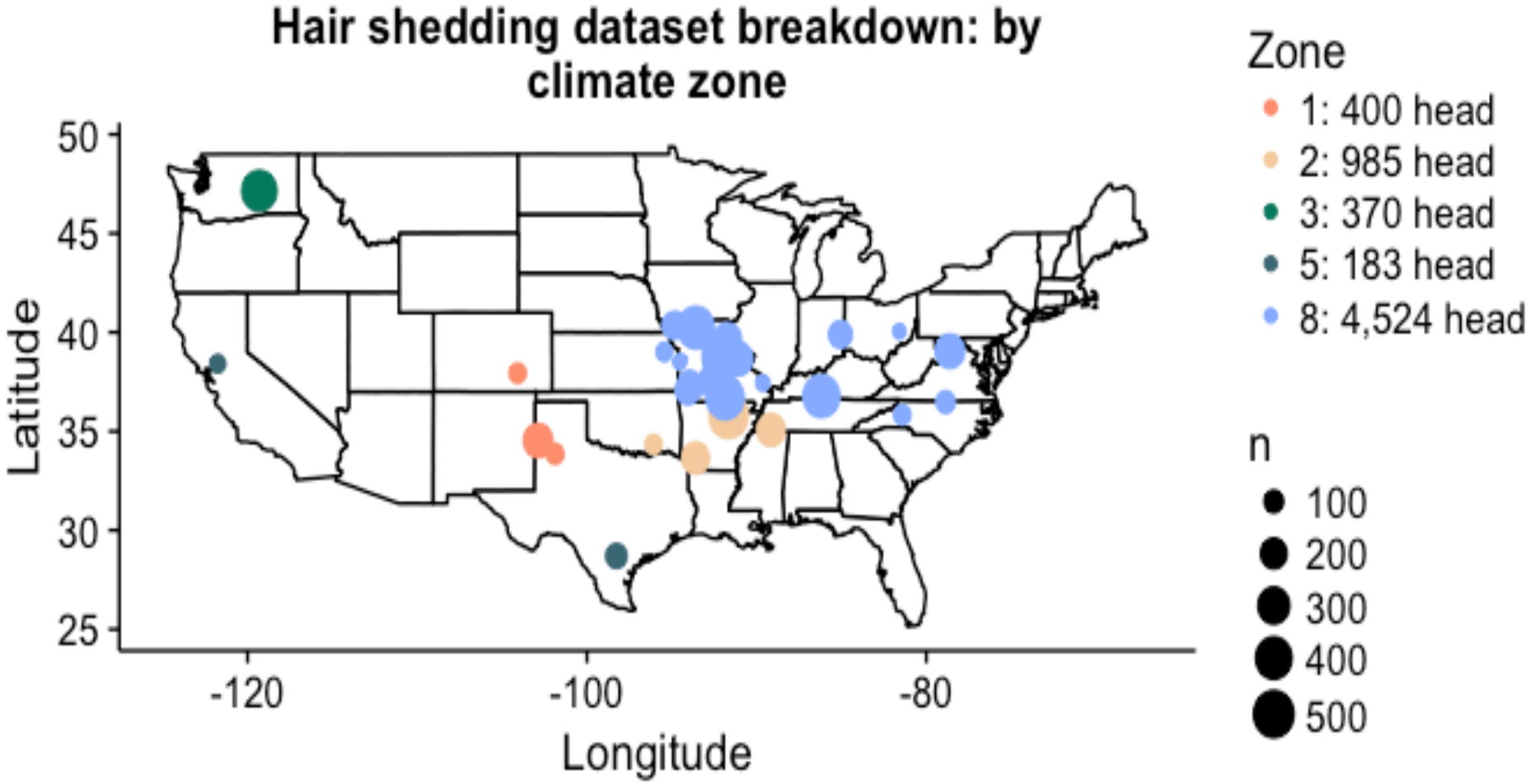
Participants

- 2016 data on hand from **45** herds
  - **6 ,512** animals total
- **7** new herds enrolled in 2017
  - Awaiting data from **4** of these herds
  - Estimated **~2,000** additional animals

~8,512 animals enrolled

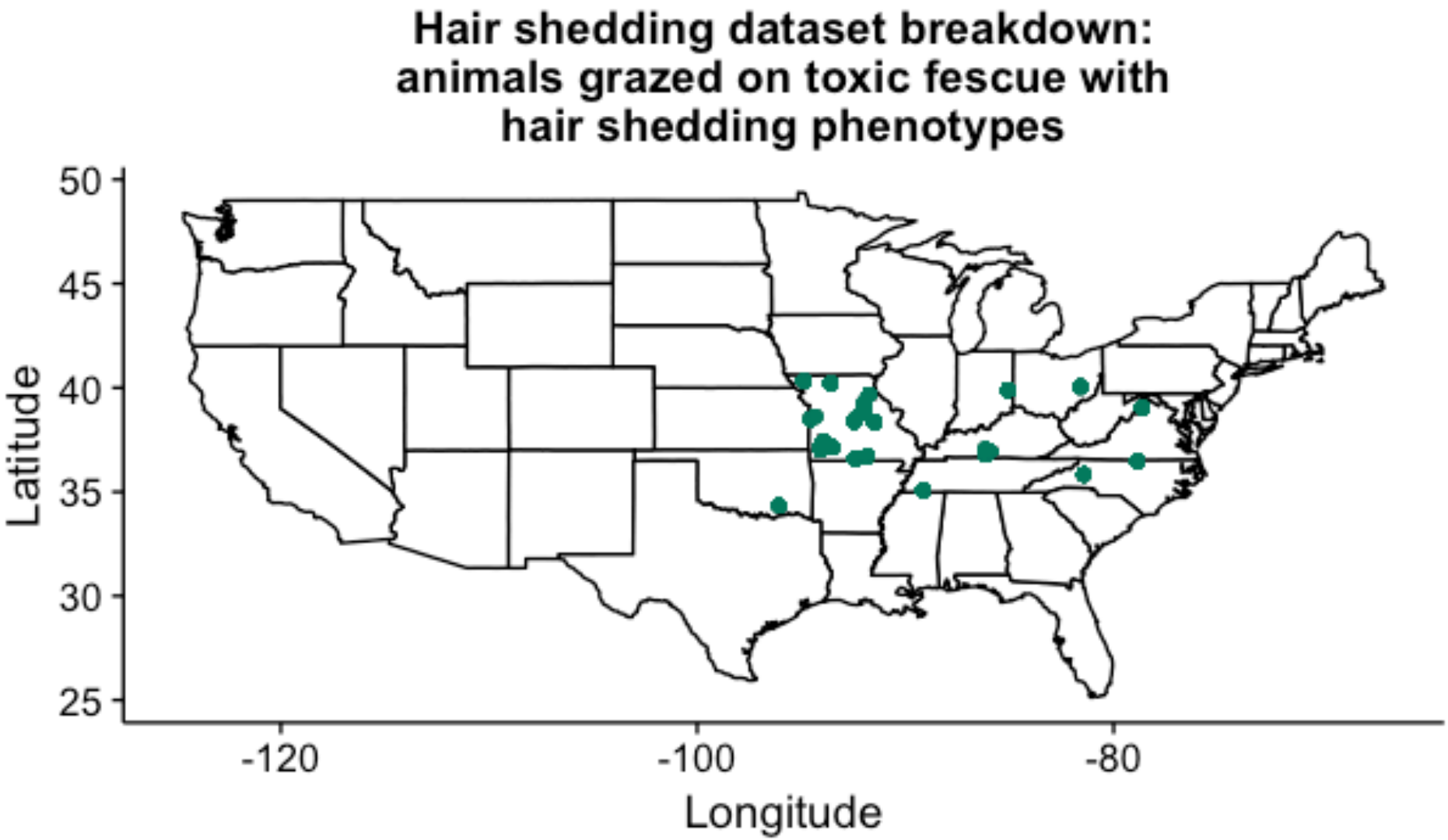

7,406 samples on hand in with some form of data
6,458 with hair shedding scores in year 1 and/or year 2
5,315 registered
1,143 not registered
401 genotyped through breed association
4,068 genotyped through project as of 7/18/17


Hair shedding dataset
breakdown: by breed
Latitude
50
45
40
35
30
25
-120
-100
-80
Longitude
n
100
200
300
400
500
Breed
AN: 2,874
ANR: 711
CHA: 325
CHIA: 1
CROS: 149
GEL: 285
HFD: 823
MAAN: 1
SH: 227
SIM: 1,066


Hair shedding dataset breakdown: by climate zone
Latitude
50
45
40
35
30
25
-120
-100
-80
Longitude
Zone
1: 400 head
2: 985 head
3: 370 head
5: 183 head
8: 4,524 head
n
100
200
300
400
500

Future directions

- **Genome wide association analysis**
  - Correlate genotypic and phenotypic data
    - Hair shedding score
    - Production measures reported to breed associations
  - Identify genetic variants associated with adaptive hair shedding and resistance to fescue toxicosis


Hair shedding dataset breakdown:
animals grazed on toxic fescue with
hair shedding phenotypes
50
45
40
35
30
25
Latitude
-120
-100
-80
Longitude

3,763 TOTAL

Future directions

- **Fescue toxicosis and heat tolerance specific breed EPDs**

USDA SARE graduate grant proposal: *"Impact of early summer hair shedding on prediction of susceptibility to fescue toxicosis and heat stress in taurine cattle"*

- Expansion of hair shedding scoring educational and extension work
- Integration of hair shedding scoring into Missouri's value-added marketing program, Show-Me-Select
- Development of online resource
  - Data management tool for producers
  - Further data collection for research

Approval decision expected early August 2017

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Questions?