

Genetic connectedness: it is all about forming strong relationships

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LET'S GR^{OW}

Today's talk

- Connectedness

- What is it?
- Why does it matter?
- How much is needed?

- In practice

- The data
- Their summary
- Their implications

- Summing up



What is connectedness?

- Genetic evaluation is about parsing

$$P = G + E$$



Genotype (EBV)

- WWT: 0.50 kg
- MWWT: 1.15 kg
- NLW: 26.9 %
- NLB: 11.6 %



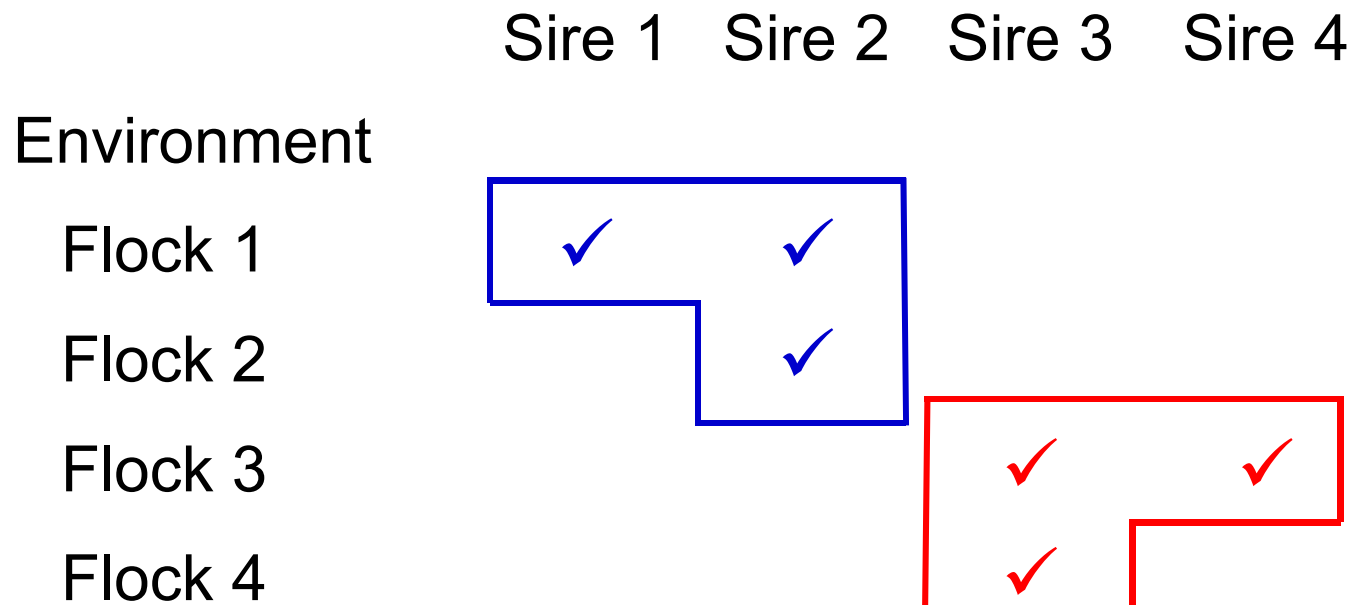
It's all about
forming
relationships

Genetic relationship

	Sire 1	Sire 2
Environment		
Flock 1	✓	✓
Flock 2		✓

Connected

Genetic relationship



Disconnected



Why does it matter?

- Seedstock flocks sizes generally small
 - Few animals to choose among within flock, which slows genetic progress
 - May wish to step outside one's own flock to source new genetics



Why does it matter?

- Seedstock flocks sizes generally small
- Seek fair comparisons of genetic merit of animals across flocks
 - But flocks spread over a wide geographical region
 - ... and husbandry differences among flocks can mask genetic differences

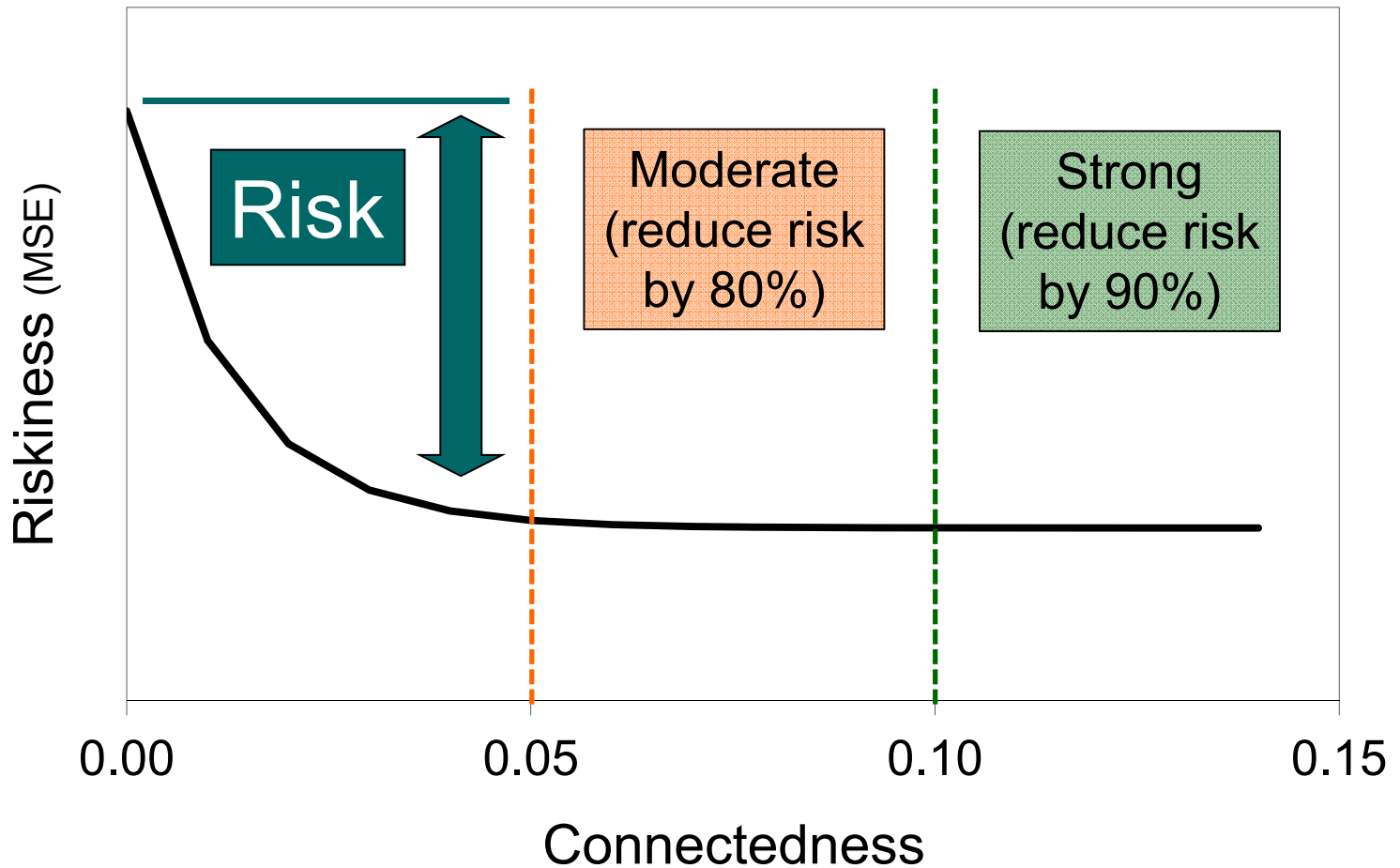


Why does it matter?

- Connectedness describes risk when comparing EBV of animals in different flocks
 - Degree of risk depends on how well flocks are genetically related
- Since such risk is bounded, aim is for sufficient connectedness

Connectedness is different from accuracy

How much is needed?



(Lewis et al, 1999, 2005; Kuehn et al., 2008, 2009)

In practice

- Connectedness evaluation of Katahdin flocks enrolled in NSIP



Data

- Pedigree

- Since 1983

- Weaning weight

- since 1996

“Active” flocks: weights recorded in 2014 &/or 2015



Pedigree

Variable	Katahdin
No. animals	49,478
No. sires	1,339
No. dams	9,839
No. flocks	100
<i>Sire family size</i>	
Average	34.5
Largest	541



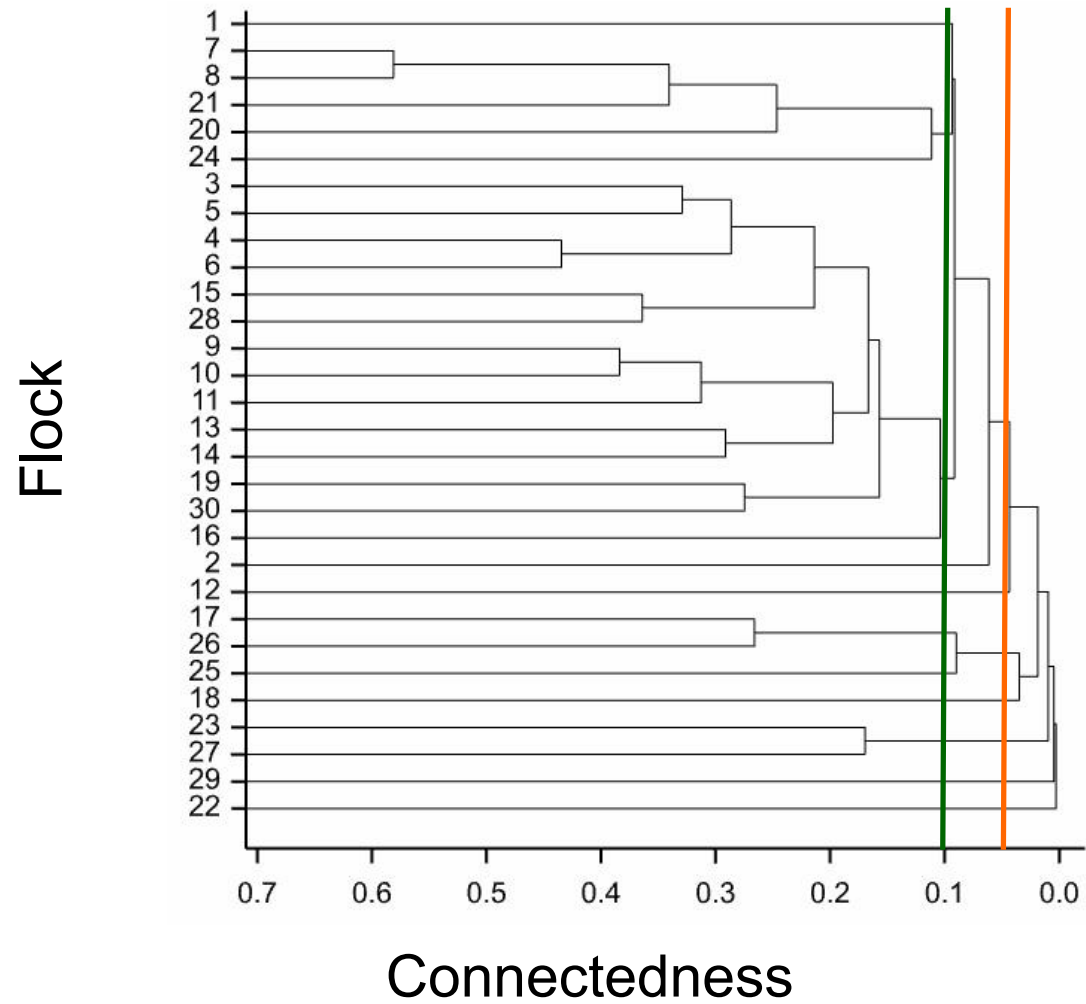
Weaning weight

Variable	Katahdin [†]
No. lambs	36,340
<i>No. flocks</i>	
Total	95
Active	38
<i>Average</i>	
Age (day)	65.9
Weight (lb)	45.2

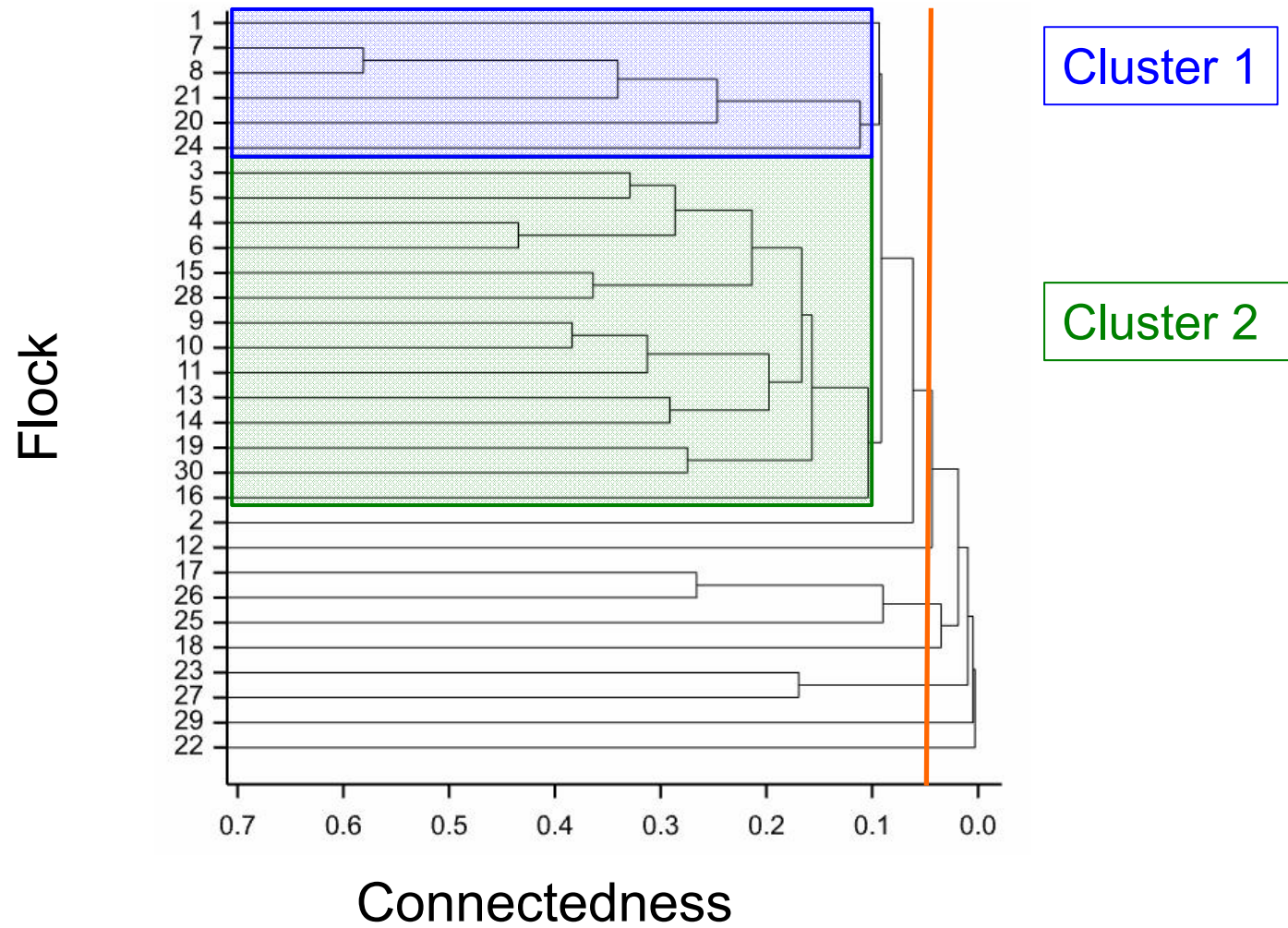
[†] Heritability of 0.12



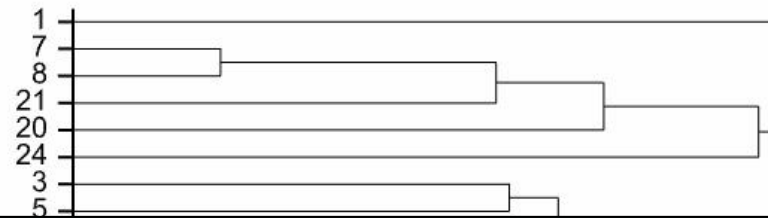
Active flocks



Active flocks

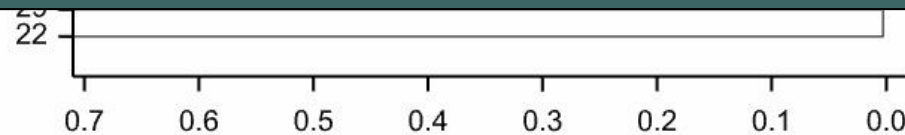


Active flocks



Implications:

- Two main clusters soundly inter-connected
- Connectedness strengthened since 2014
- With rapid growth in membership, strategic sharing of rams will continue to be beneficial



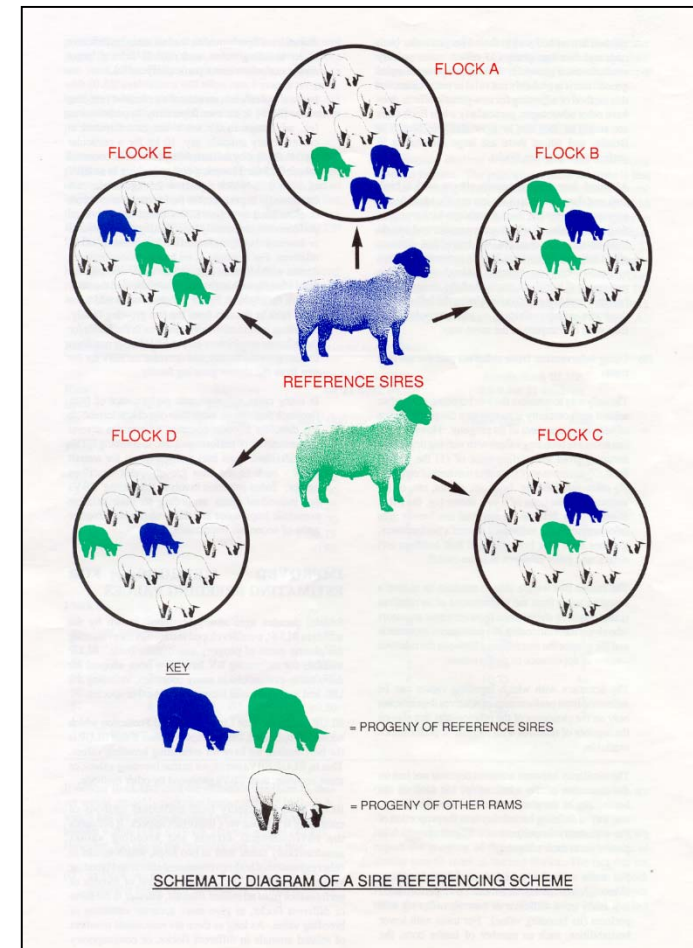
Connectedness

Strategy

- 2 or 3 rams
- Mated to, in total, 20 to 30 ewes



(Lewis and Simm, 2000)





Summing up

- Connectedness matters in across-flock genetic evaluations
 - Flocks often differ genetically and environmentally (e.g., husbandry)
 - If connectedness among flocks is insufficient, comparisons of EBV across flocks become risky



Summing up

- Connectedness can be used to define the dynamics of a breeding program
 - Delineate differences among breeding objectives
 - May be useful for identifying flocks and individuals useful for strategic genotyping

Summing up

- Connectedness is determined for an individual trait
 - Often a weight trait (e.g., weaning; post-weaning)
- If recording norms for alternative traits differ, connectedness levels may also differ
 - e.g., time required for expression of litter size





Summing up

- Increasing connectedness in its own right is not a goal
 - If sufficient, producers have flexibility to focus on other priorities in their breeding programs
- However, if connectedness is tenuous, it is worth implementing strategies to improve genetic relationships
 - Source rams from well-connected flocks with a long history in NSIP

Thanks for listening

- I appreciate the support from ASI and the Let's Grow committee, and from NSIP



Questions?