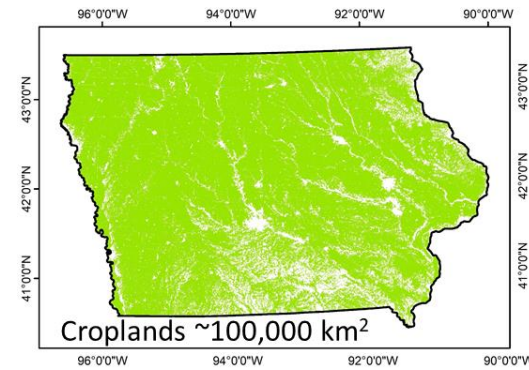
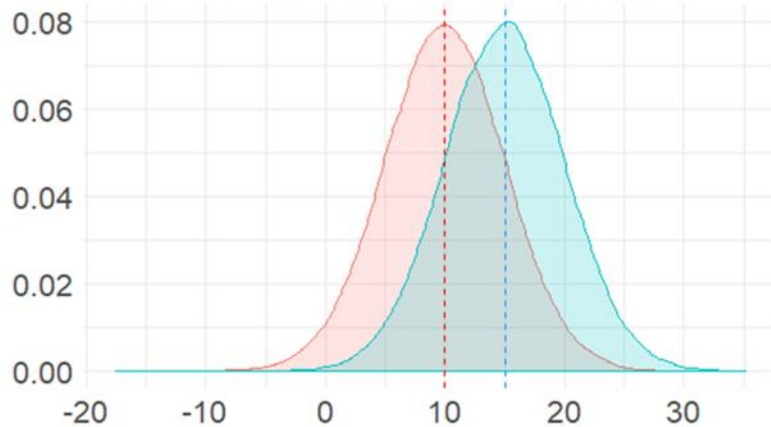


## Challenge description

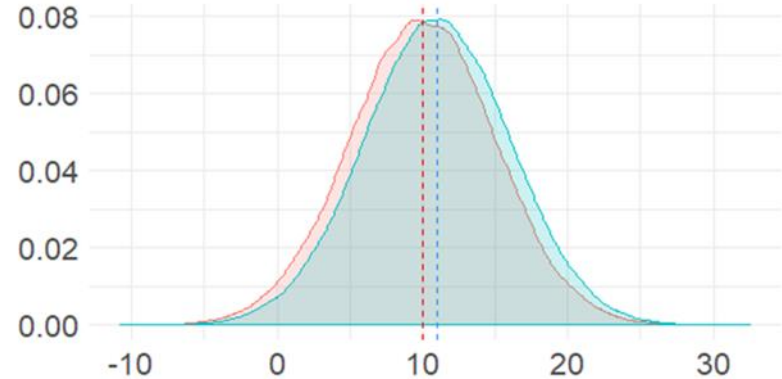
**Challenge:** develop an approach for the design of sampling in Iowa



Different Means, Same Variance



Different Means, Same Variance  
...but smaller effect



## Sample size

- Method of sampling
- Outcome measures
- Standard deviation
- Study power
- Significant level

$$\text{MDC} = Z_{\alpha} \delta \sqrt{\frac{2}{n}}$$

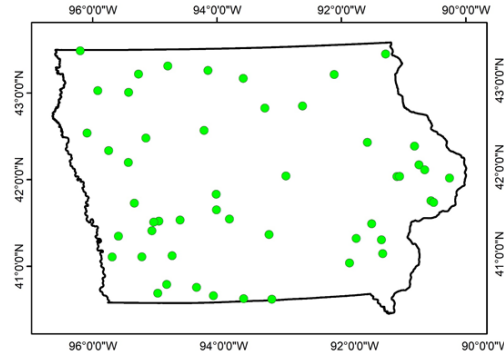
MDC : minimum detectable change

$\delta$  : standard deviation

$Z_{\alpha}$  : 1.96

$n$  : sample size

Carbon change:  
**0.33** Ton C/h



$\delta$  : **17** Ton C/h

1500

Sample Size

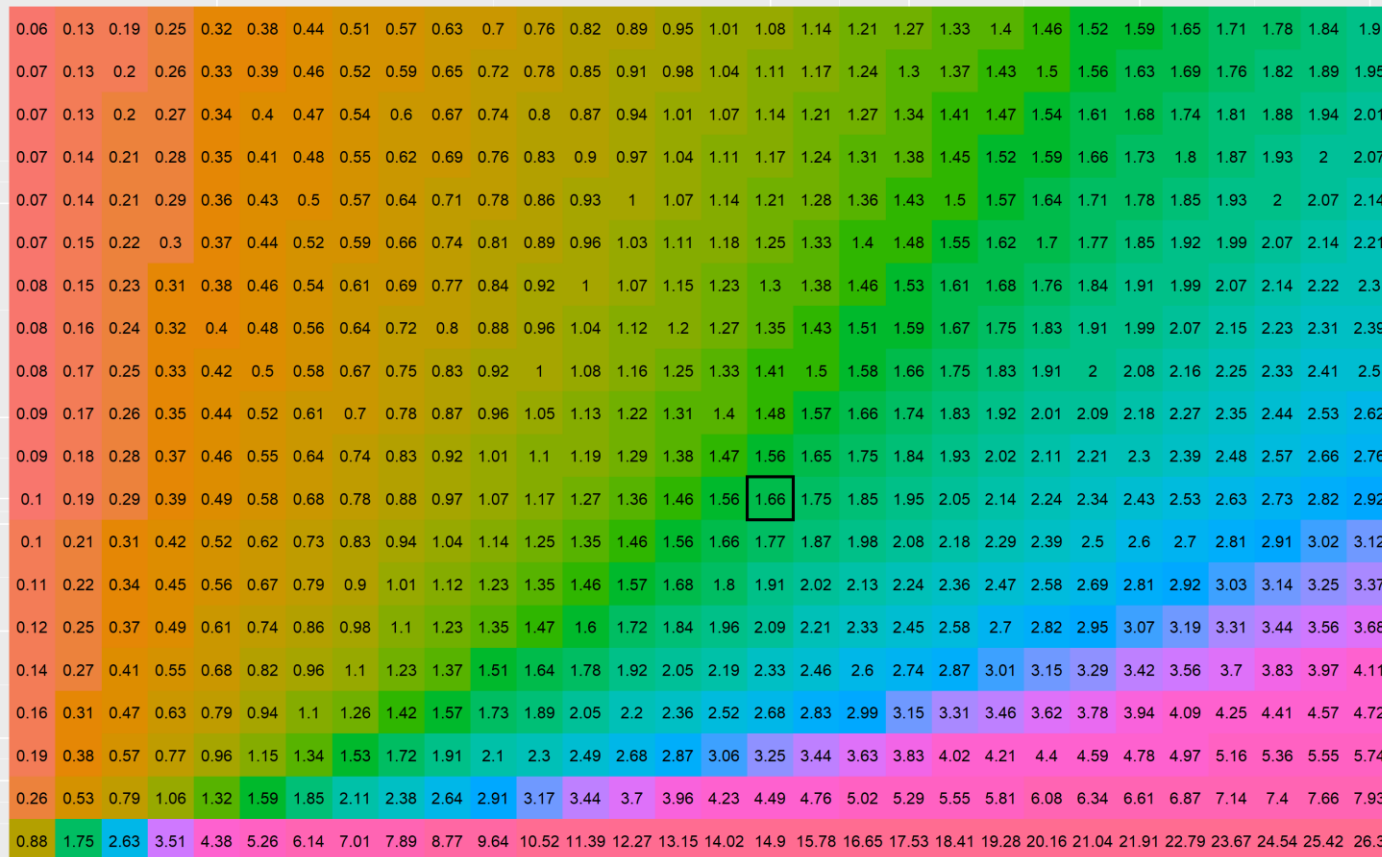
810

750

500

250

150



5

17

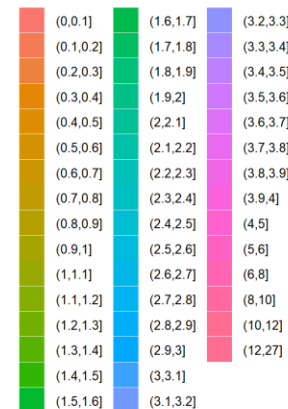
20

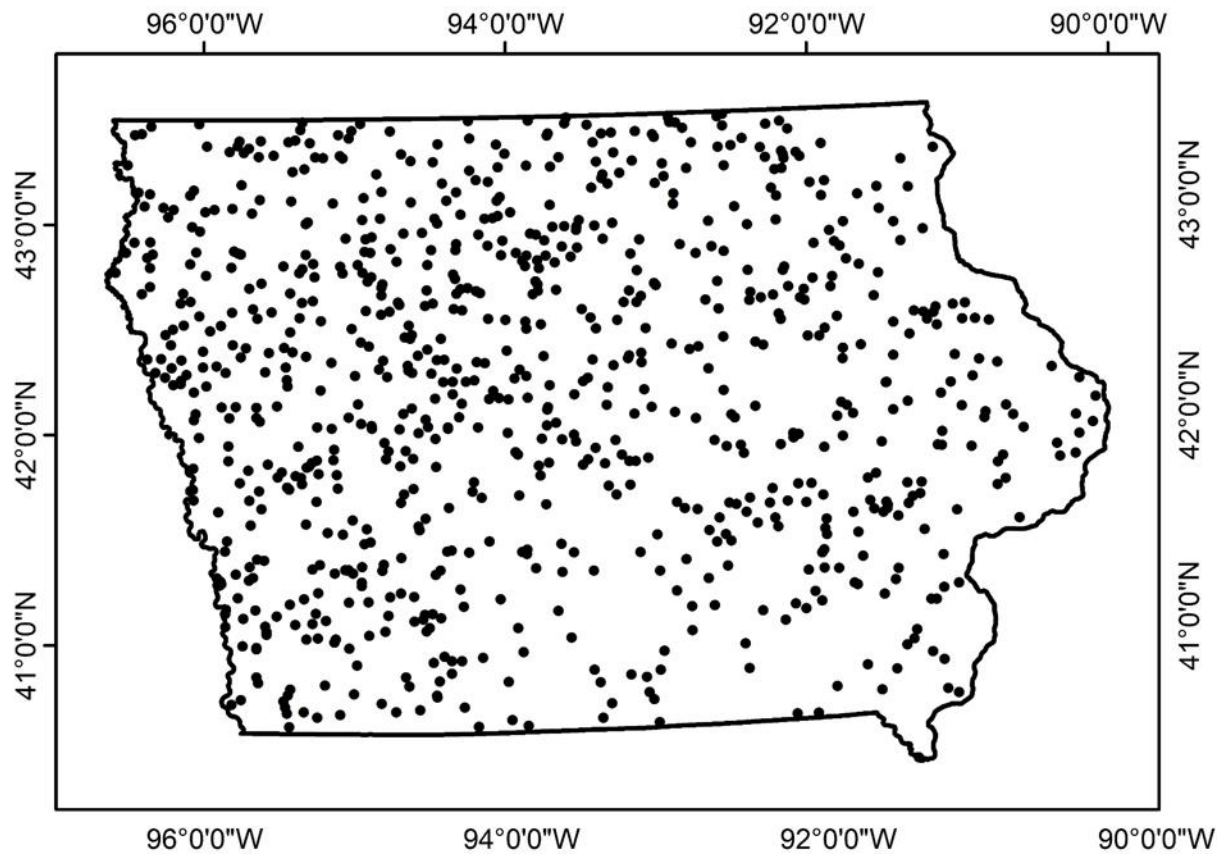
25

30

Standard Deviation (T C/ha)

MDC (T C/ha.y)

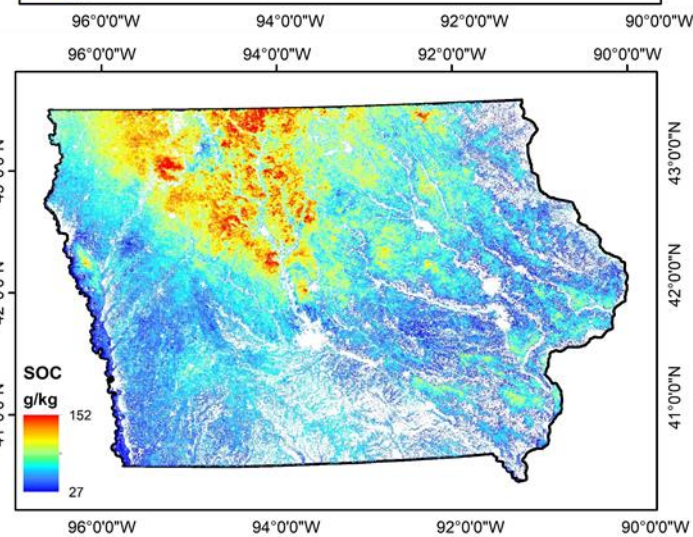
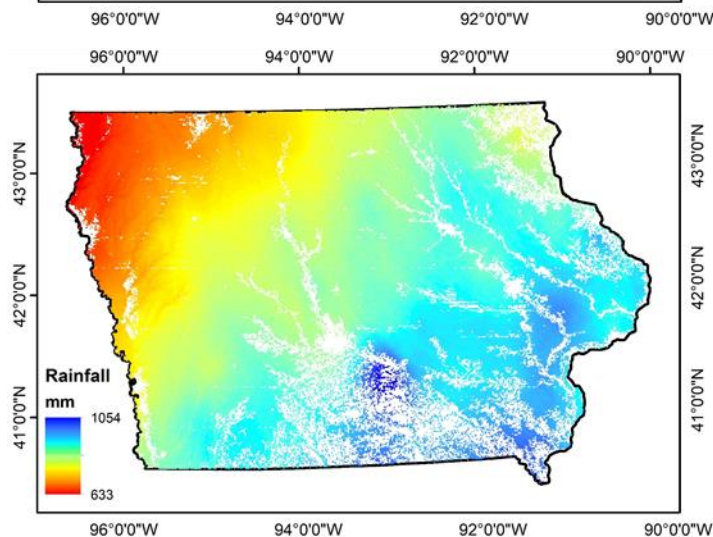
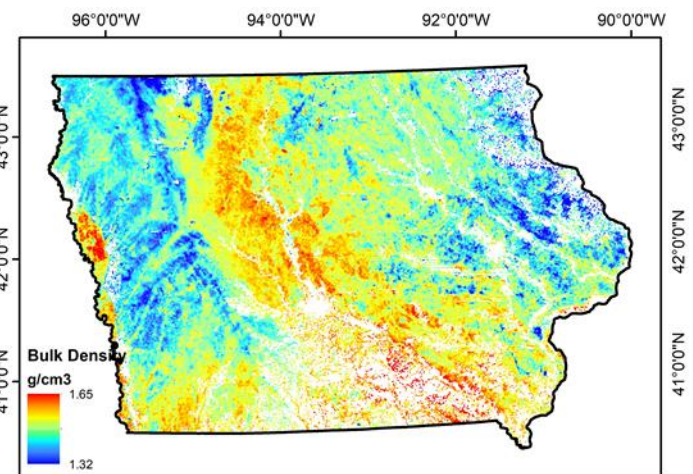
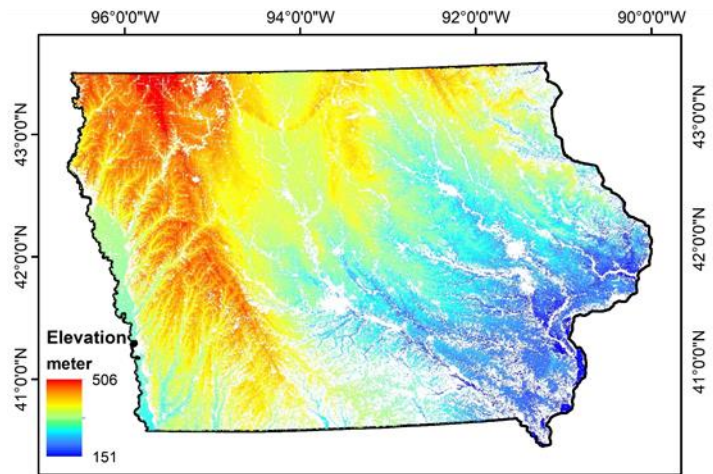




Simple random sampling: 810

# Stratification

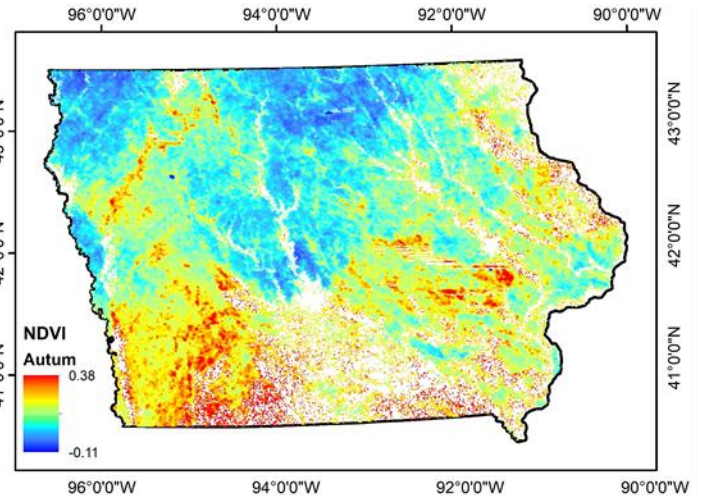
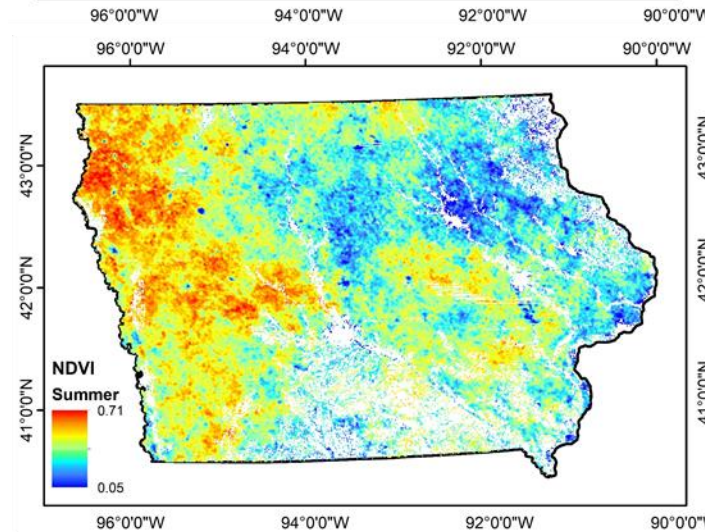
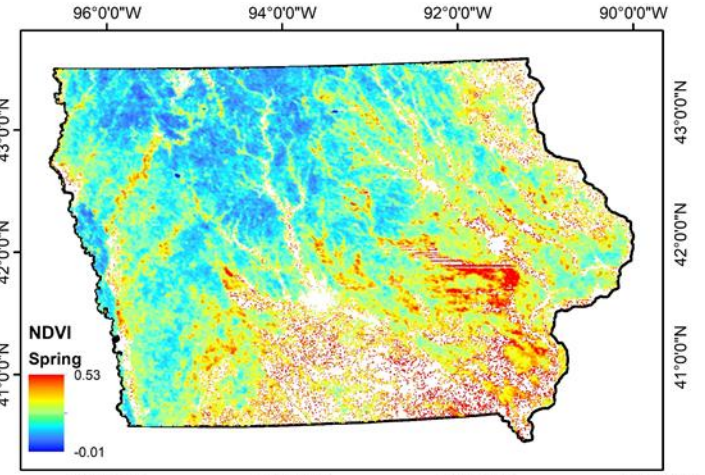
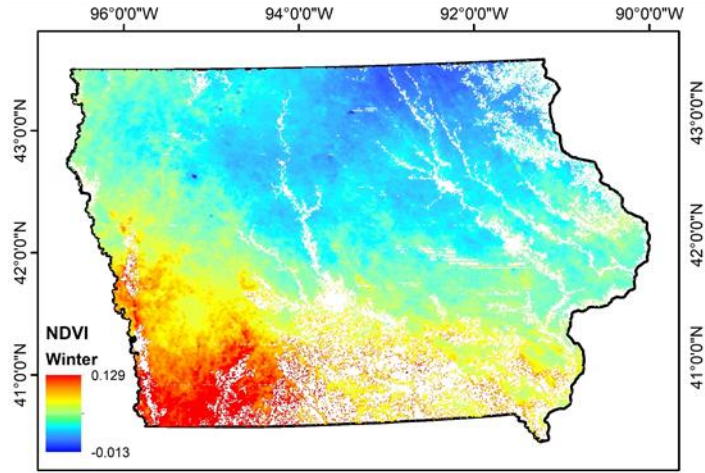
- decrease the SD
- decrease sample size
- clustering
- which data?
- DSM
- NDVI
- number of cluster?





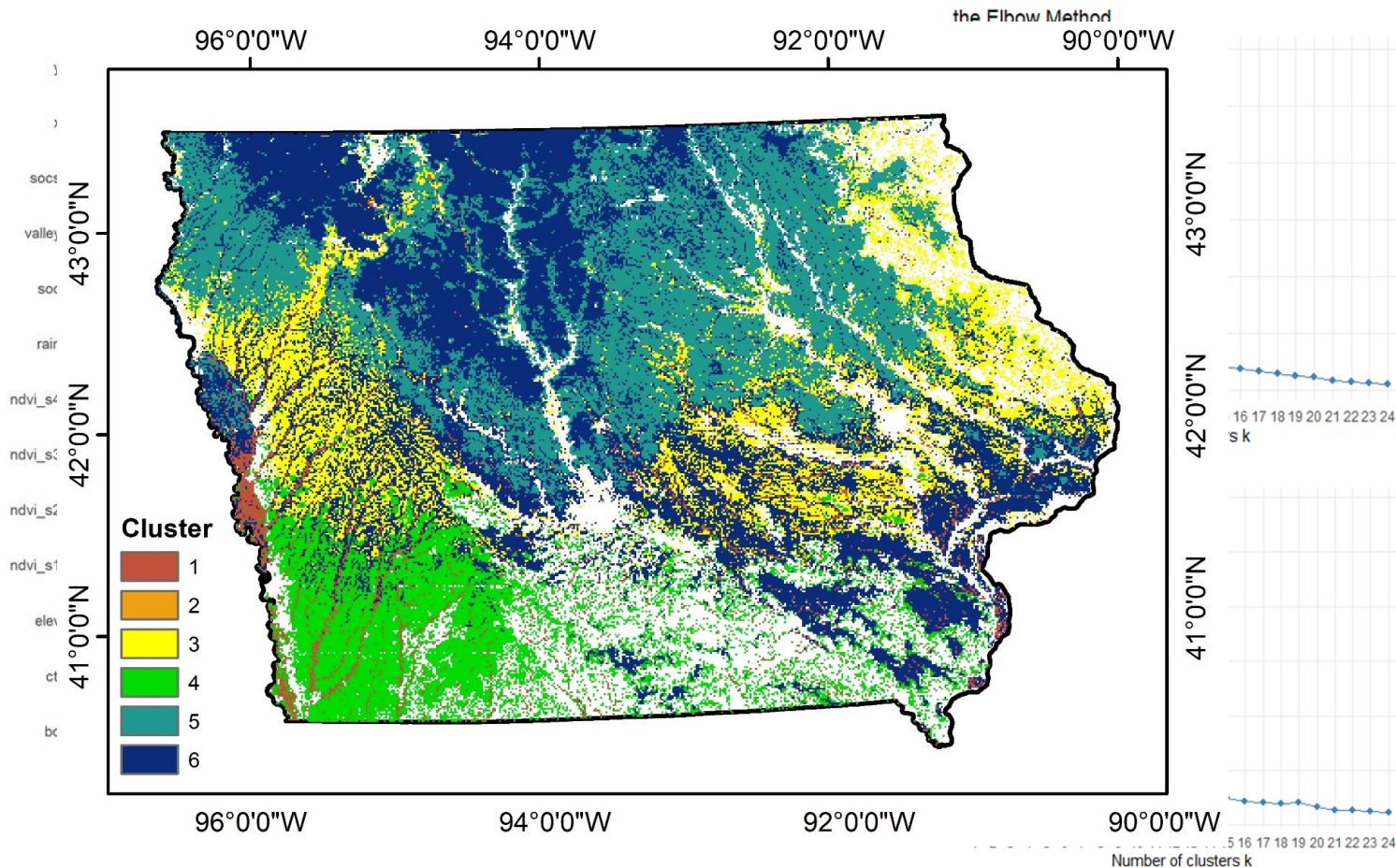
# Stratification

- decrease the SD
- decrease sample size
- clustering
- which data?
- DSM
- NDVI
- number of cluster?



# Stratification

- decrease the SD
- decrease sample size
- clustering
- which data?
- DSM
- NDVI
- number of cluster?



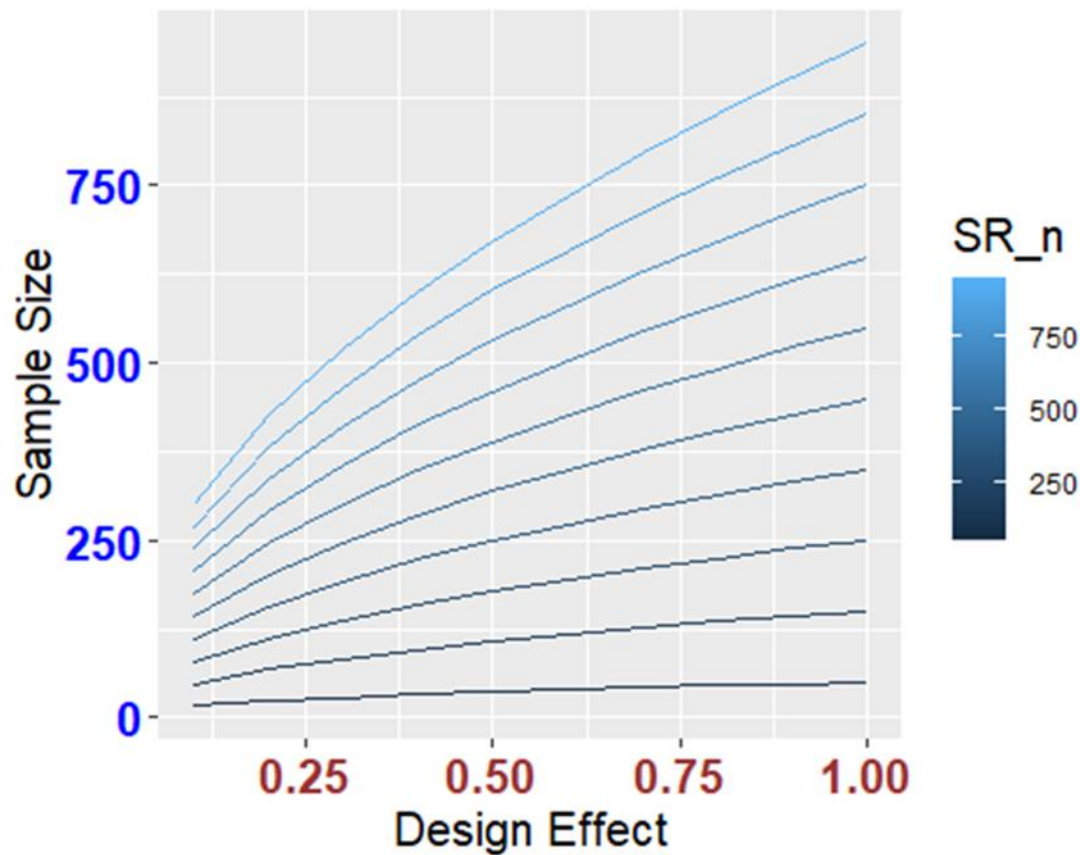
$$n(p, \hat{z}) = \sqrt{de(p, \hat{z})} n(\text{SI}, \pi)$$

Stratified random sampling

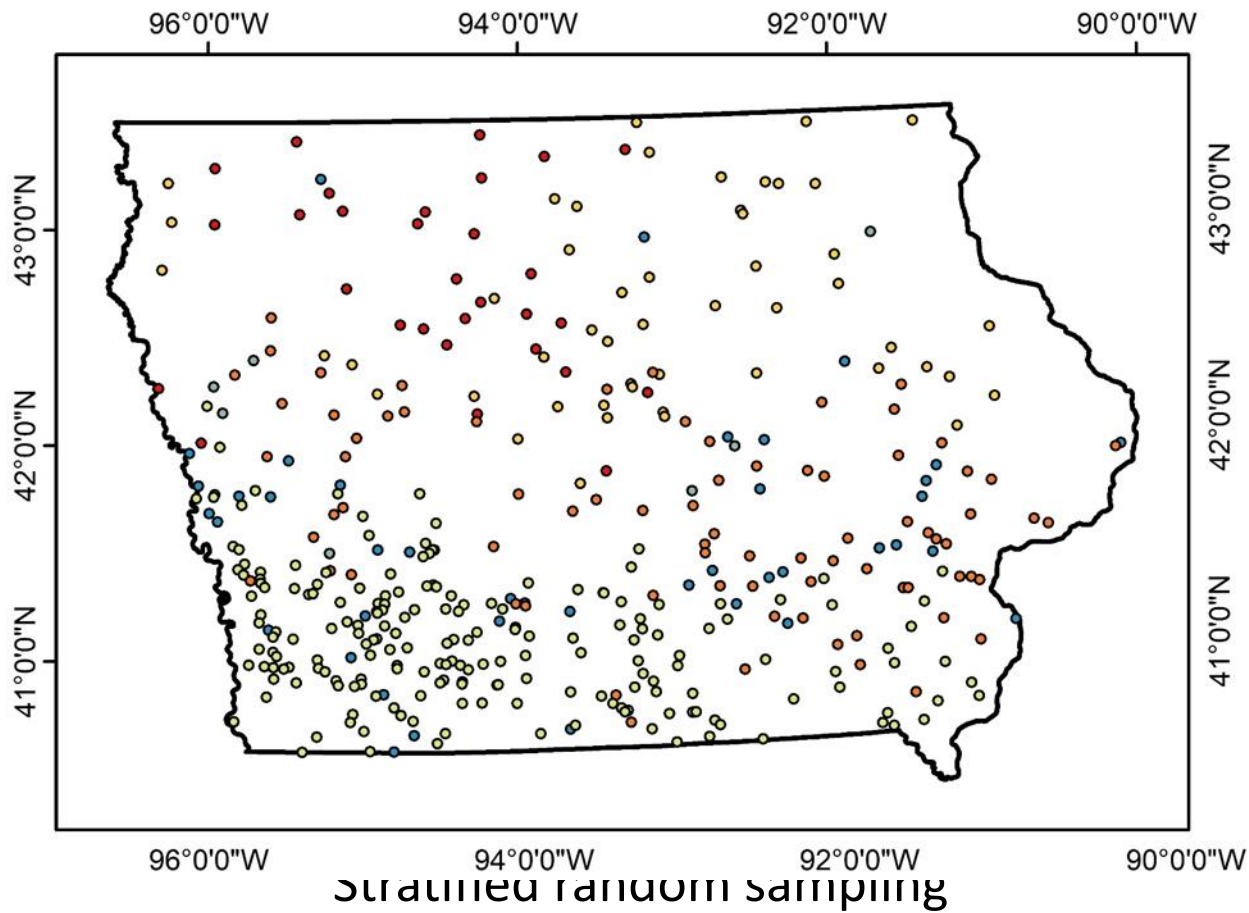
**0.70 :400**

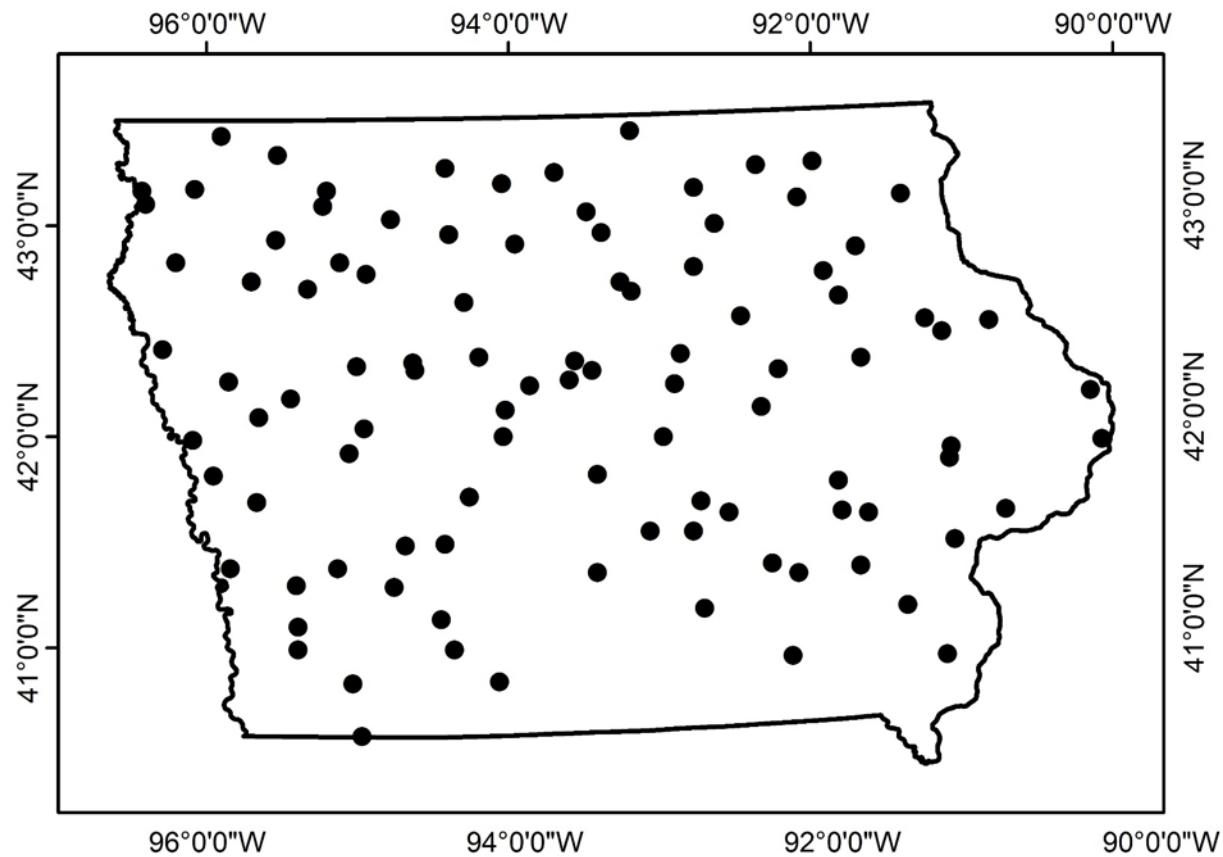
Balanced sampling with spreading

**0.35 :100**

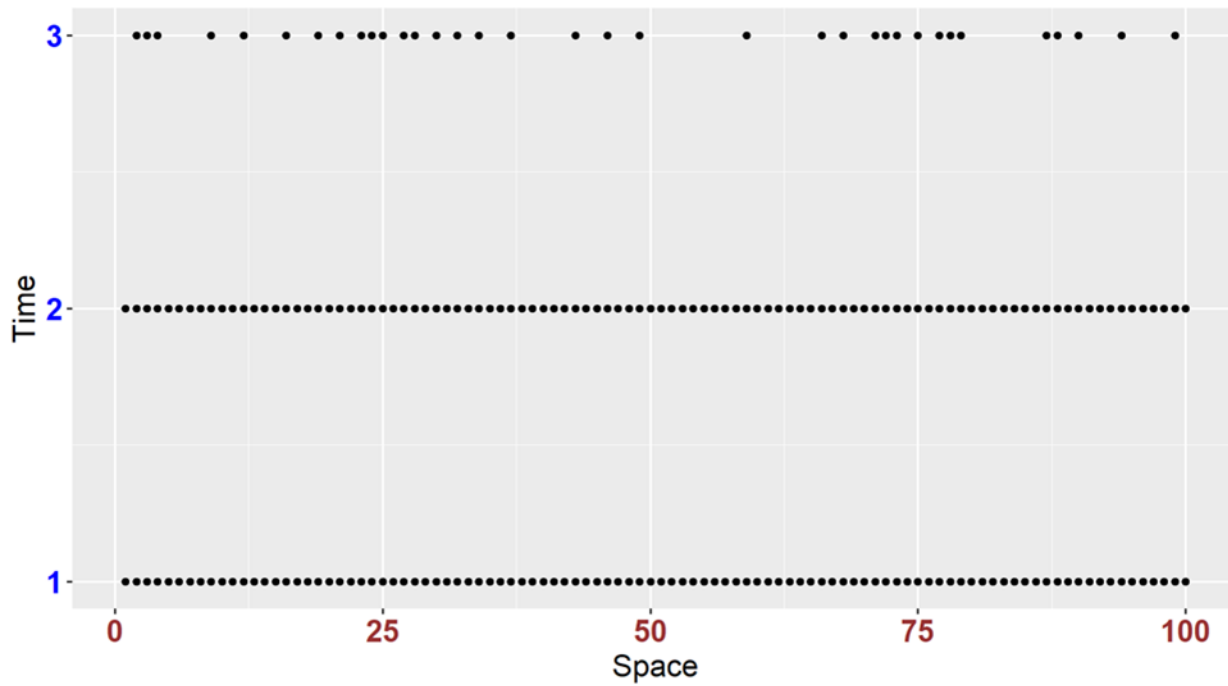








Balanced sampling with spreading



the space-time design