What Limits Reproduction?

Study System

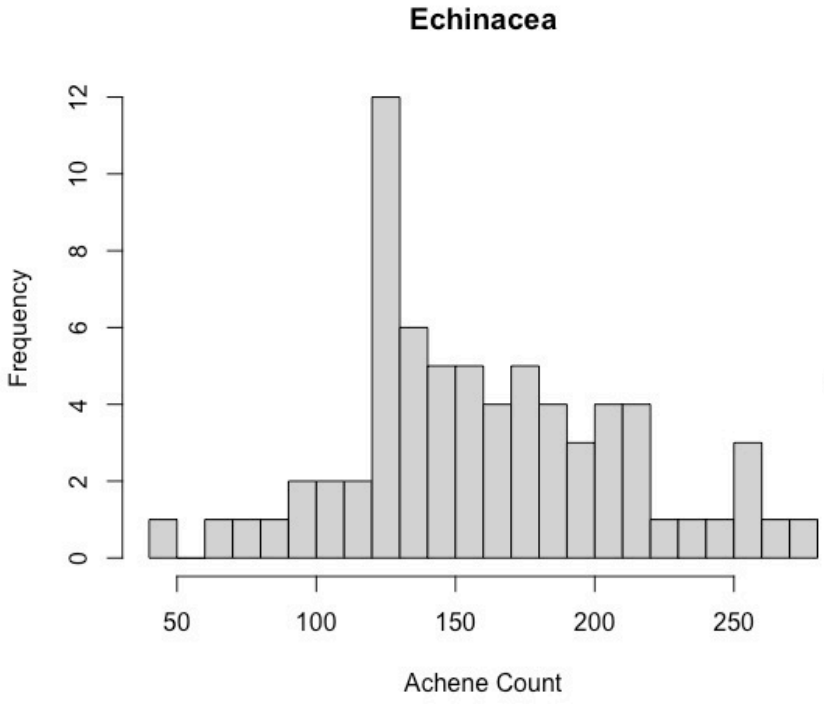
Echinacea angustifolia & *Liatris aspera*

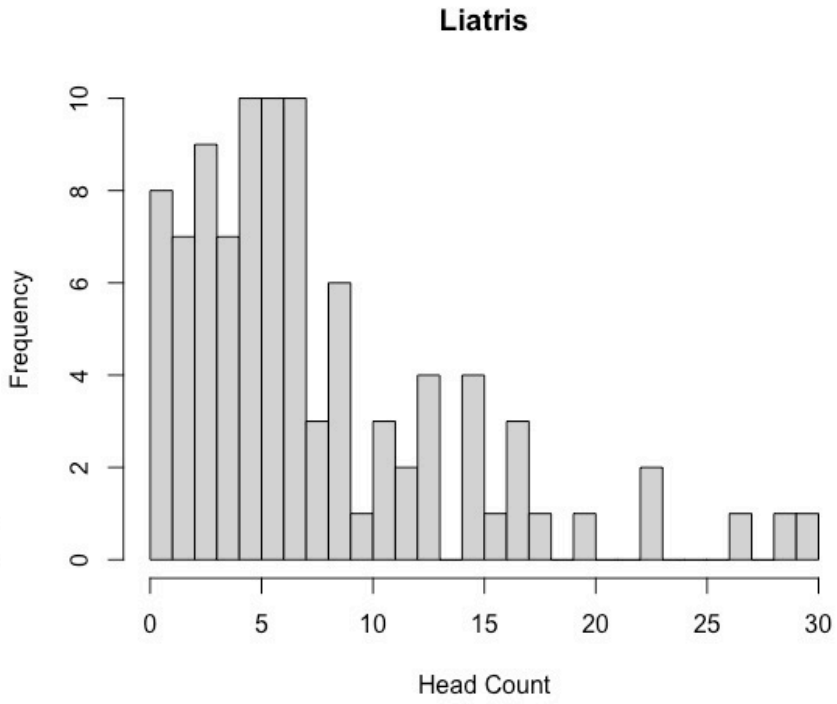
- Both have variation in the number of heads produced
- Composite flower heads
- One fruit per ovule whether pollinated or not

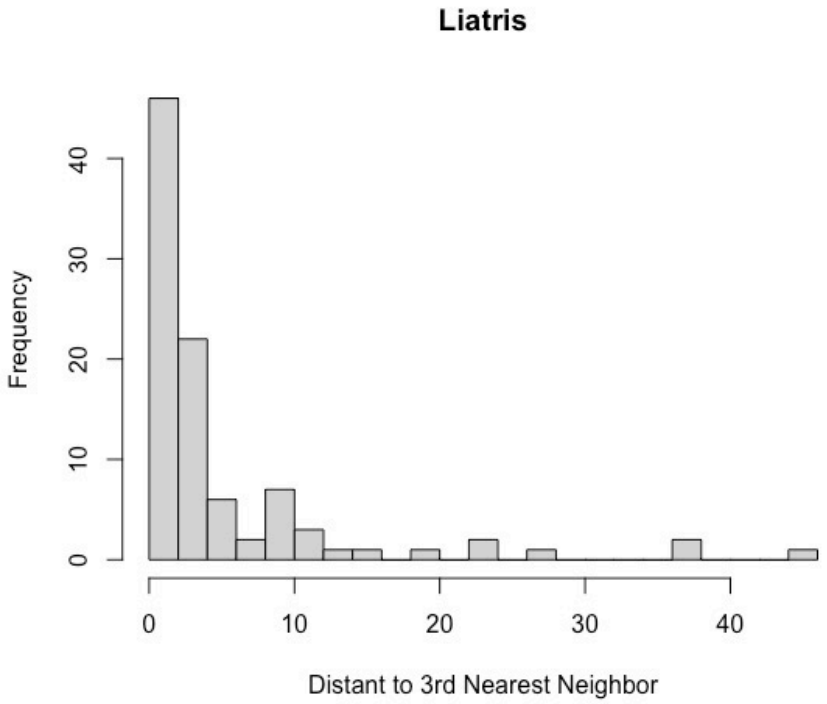
https://swbiodiversity.org/seinet/taxa/index.php?taxon=18155&clid=69

https://www.canr.msu.edu/nativeplants/plant_facts/rough_blazing_star#gallery

Variations


Echinacea
Frequency
0
2
4
6
8
10
12
50
100
150
200
250
Achene Count


Liatris
Frequency
0
2
4
6
8
10
0
5
10
15
20
25
30
Head Count


Liatris
Frequency
0
10
20
30
40
0
10
20
30
40
Distant to 3rd Nearest Neighbor

What I’m interested in:

- Head count
- Achene count

-> reproductive effort

- Distances up to the 10^{th} nearest neighbor

-> level of isolation

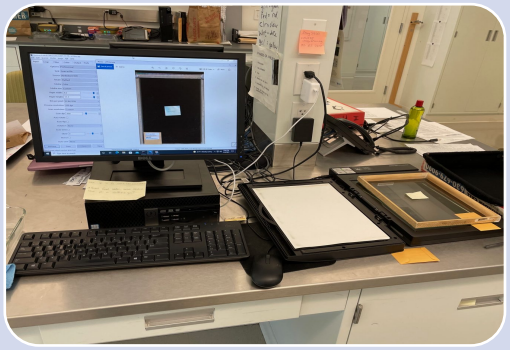
- Seed set

-> reproductive outcome

Method: the ACE workflow

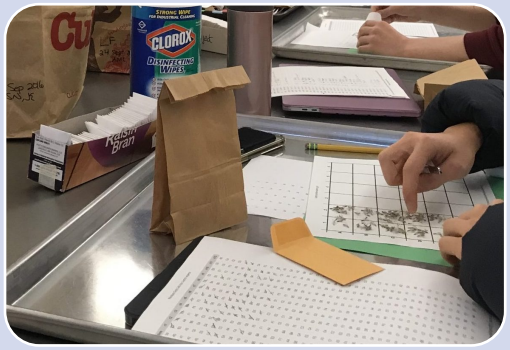
Cleaning & Rechecking

For Liatris, the number of heads and number of achenes in a randomly selected head are recorded



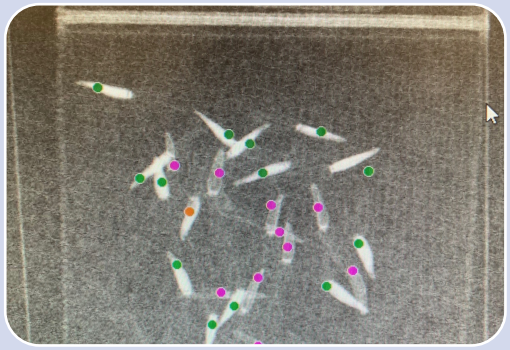
Scanning & Counting

Skipped this step for liatris



Randomizing

30+ liatris achenes and 25+ echinacea achenes randomly selected



X-raying & Categorizing

Full, partial and empty achenes were categorized based on X-ray images

Hypotheses: Resource Limitation

Head count & Achene count

- Resource is limited:

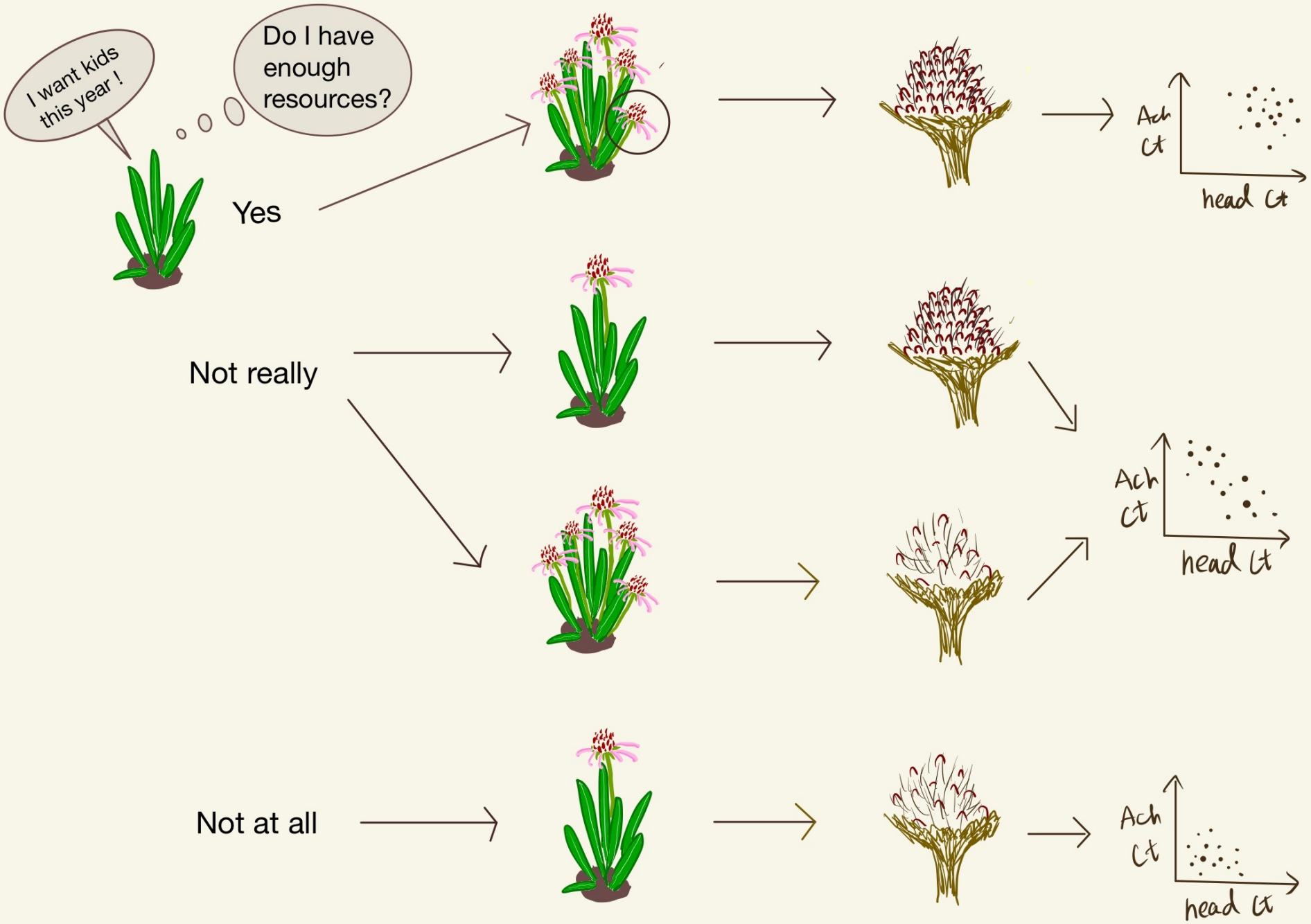
  Higher head count could indicate lower achene count

- Resource is NOT limited:

  Higher head count could indicate higher achene count

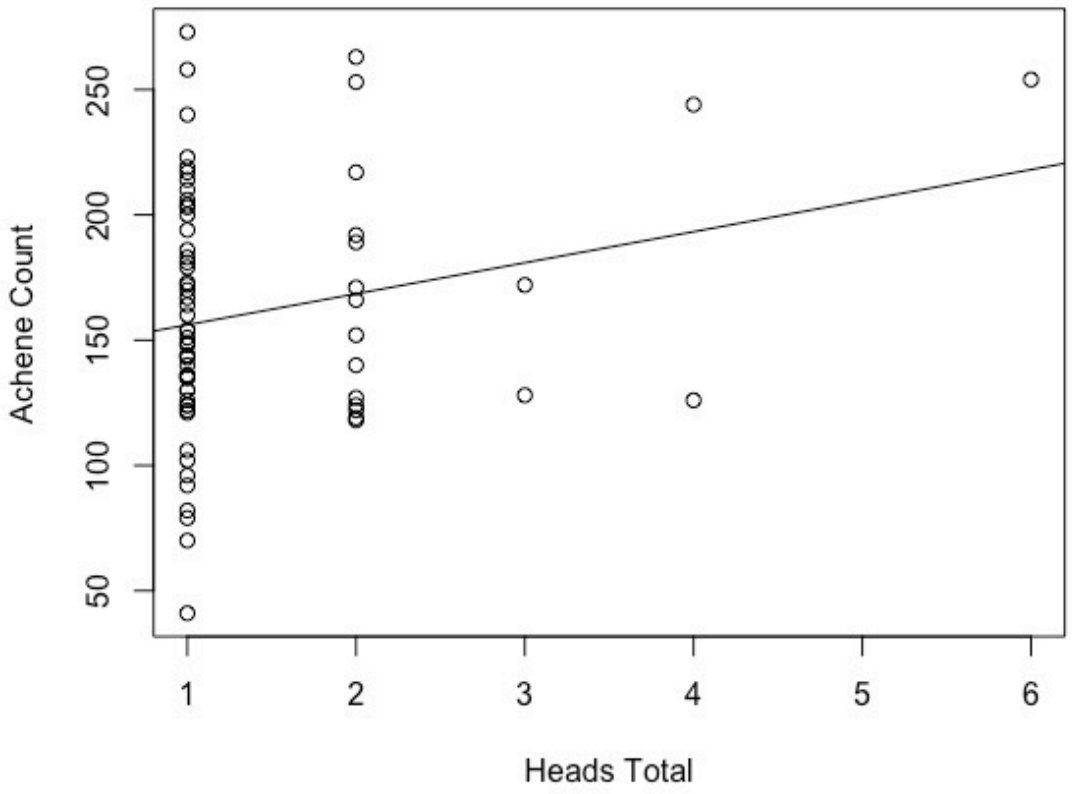
- Null Hypothesis

  There is no relationship between head count and achene count

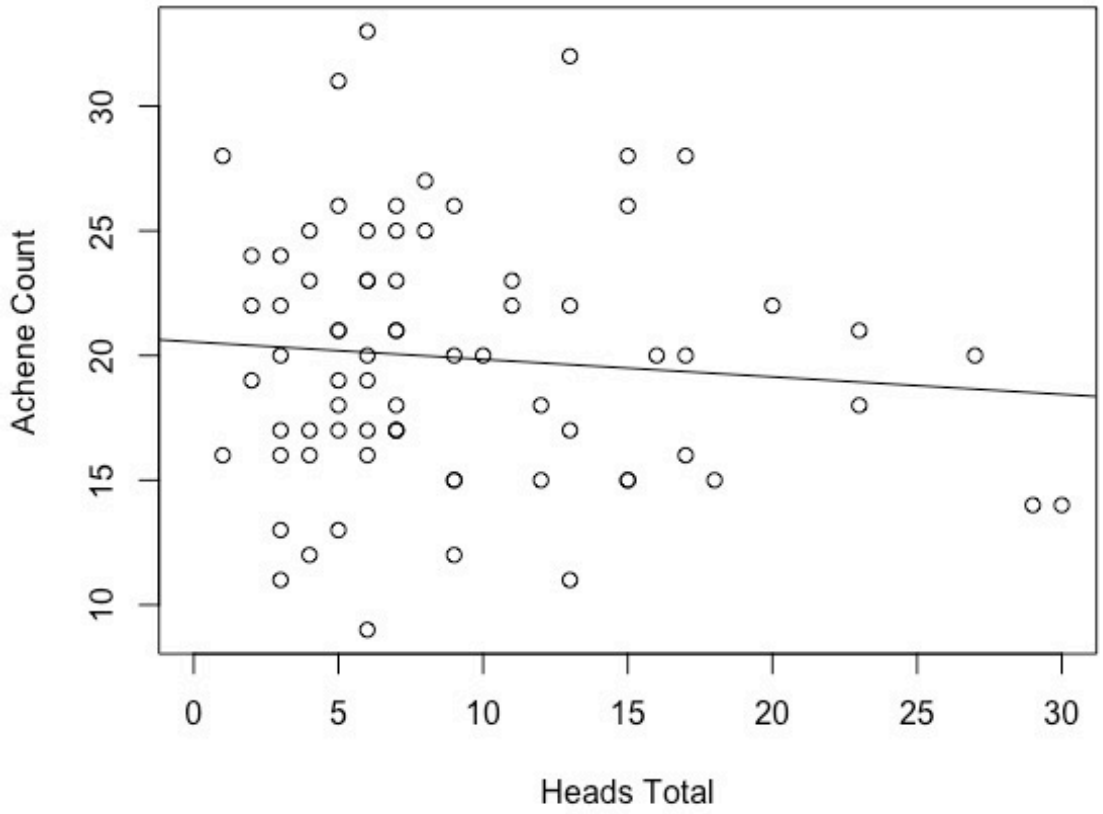

I want kids this year !
Do I have enough resources?
Yes
Not really
Not at all
Ach Ct
head Ct
Ach Ct
head Ct
Ach Ct
head Ct

Results

y=12.40x+143.71
p-value: 0.06771

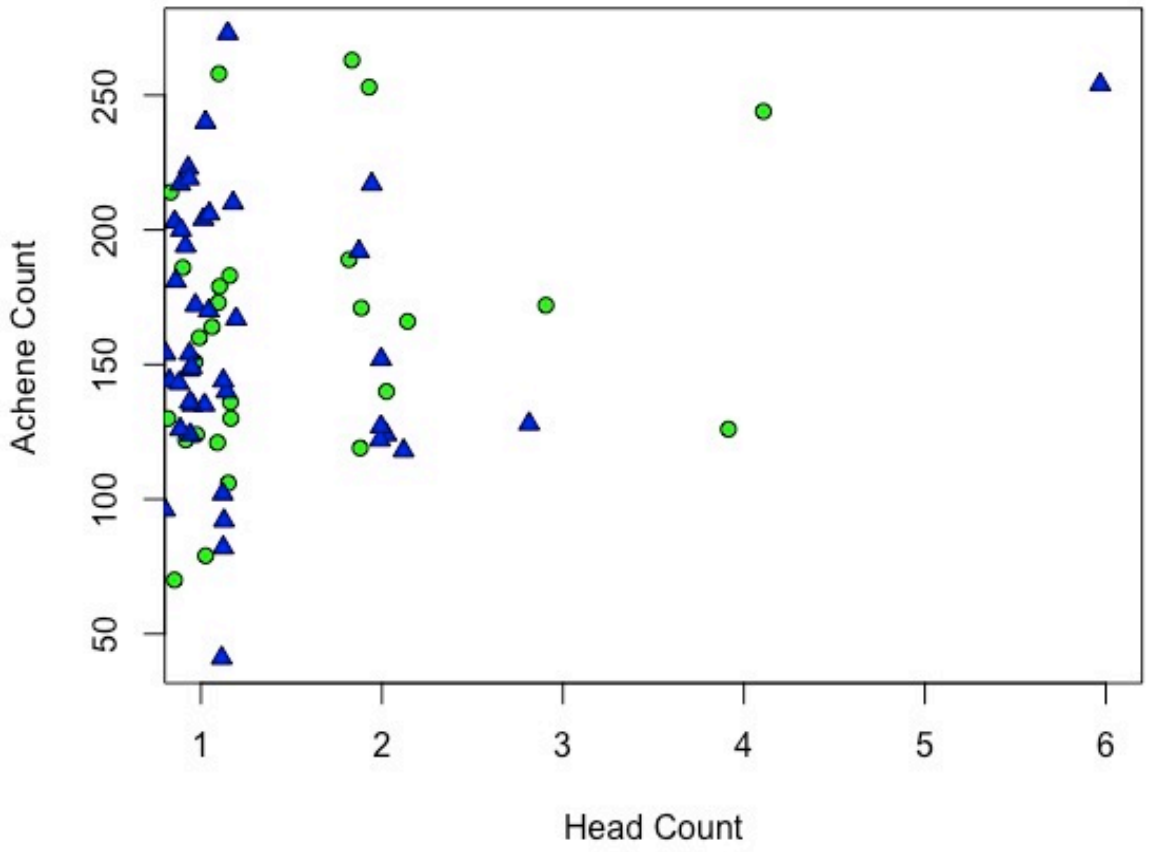


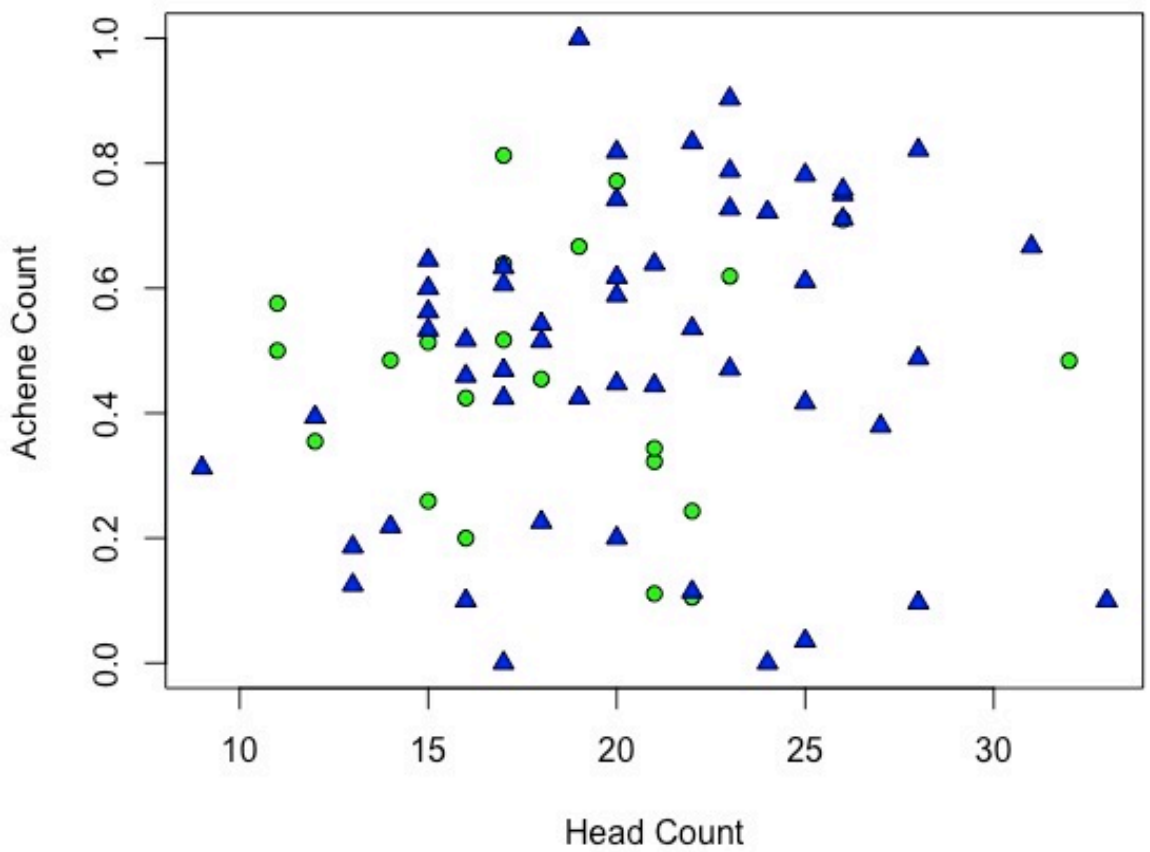
y=-0.07x+20.54
p-value: 0.4467



Results

Burned
Unburned





Hypotheses: Pollination Limitation

Isolation & Seed set

- Pollination is limited:

  Being farther away from neighbors could result in lower seed set

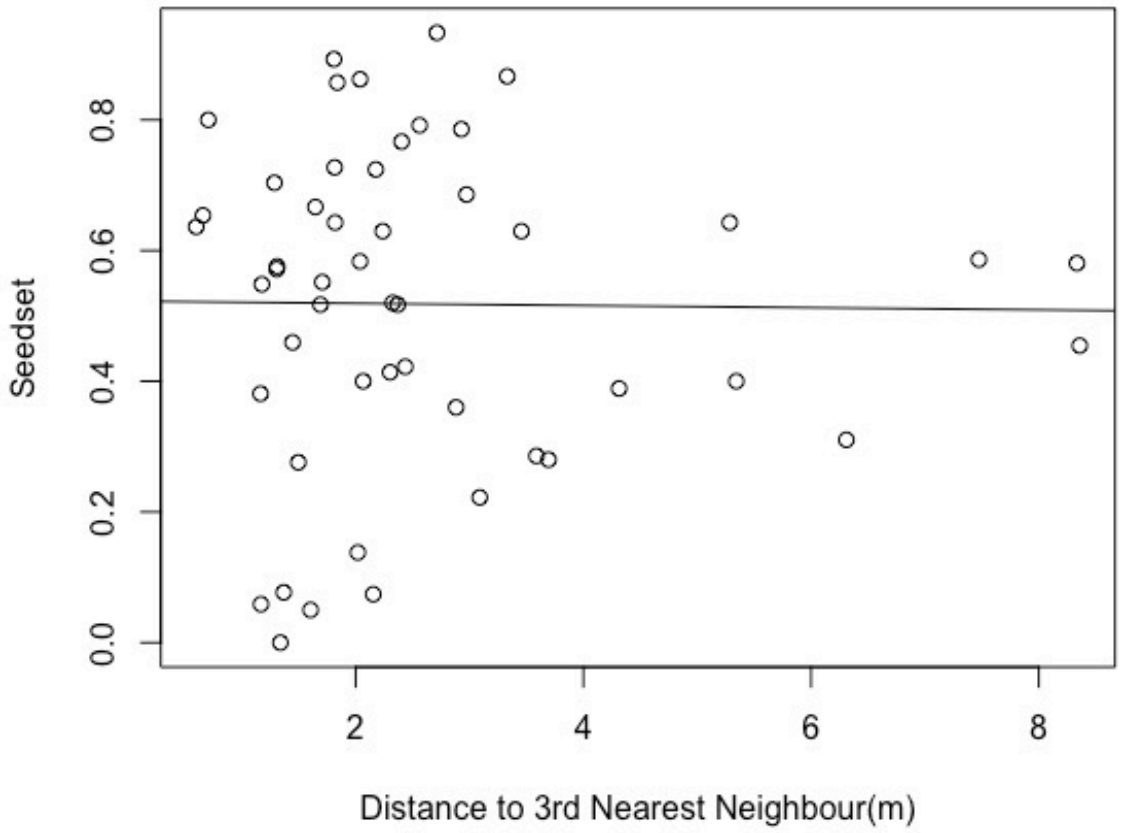
- Pollination is NOT limited (null hypothesis) :

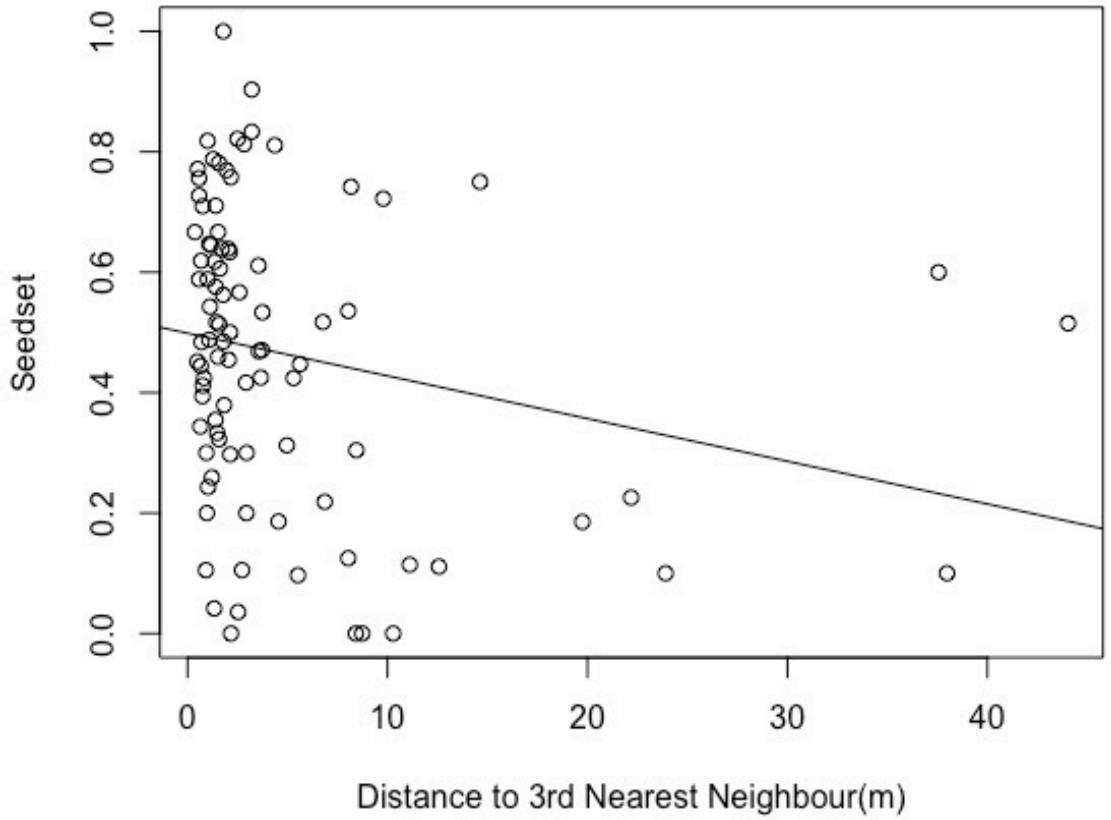
  Being farther away from neighbors does not result in lower seed set

Results

y=-0.002x+0.523
p-value: 0.93

y=-0.007x+0.498
p-value: 0.02914





Discussion

- Interaction between different factors

- Limitations:
  - Head count, achene count and seed set could be related to age / size of plant
  - Reproductive strategy of plants could vary from year to year
  - Other factors that could affect reproductive effort and outcome such as fire and location were not well controlled

Acknowledgements