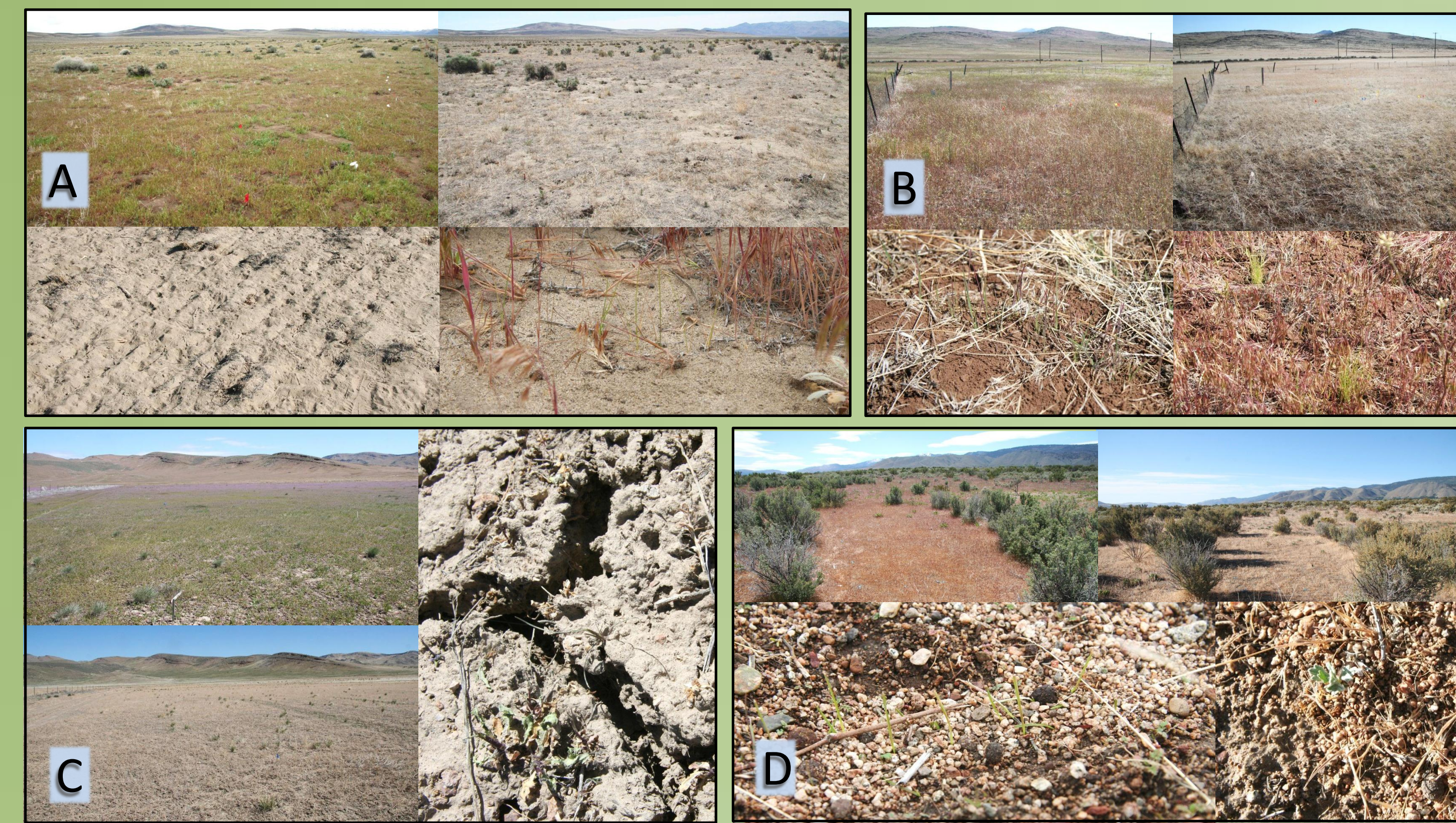


Rehabilitation of Great Basin rangelands is an expensive yet largely unsuccessful process. Establishment predominantly falls below requirements for cheatgrass suppression (~10 perennial grass/m<sup>2</sup>). We hypothesize that April to July die-off is the largest contributor to this failure.

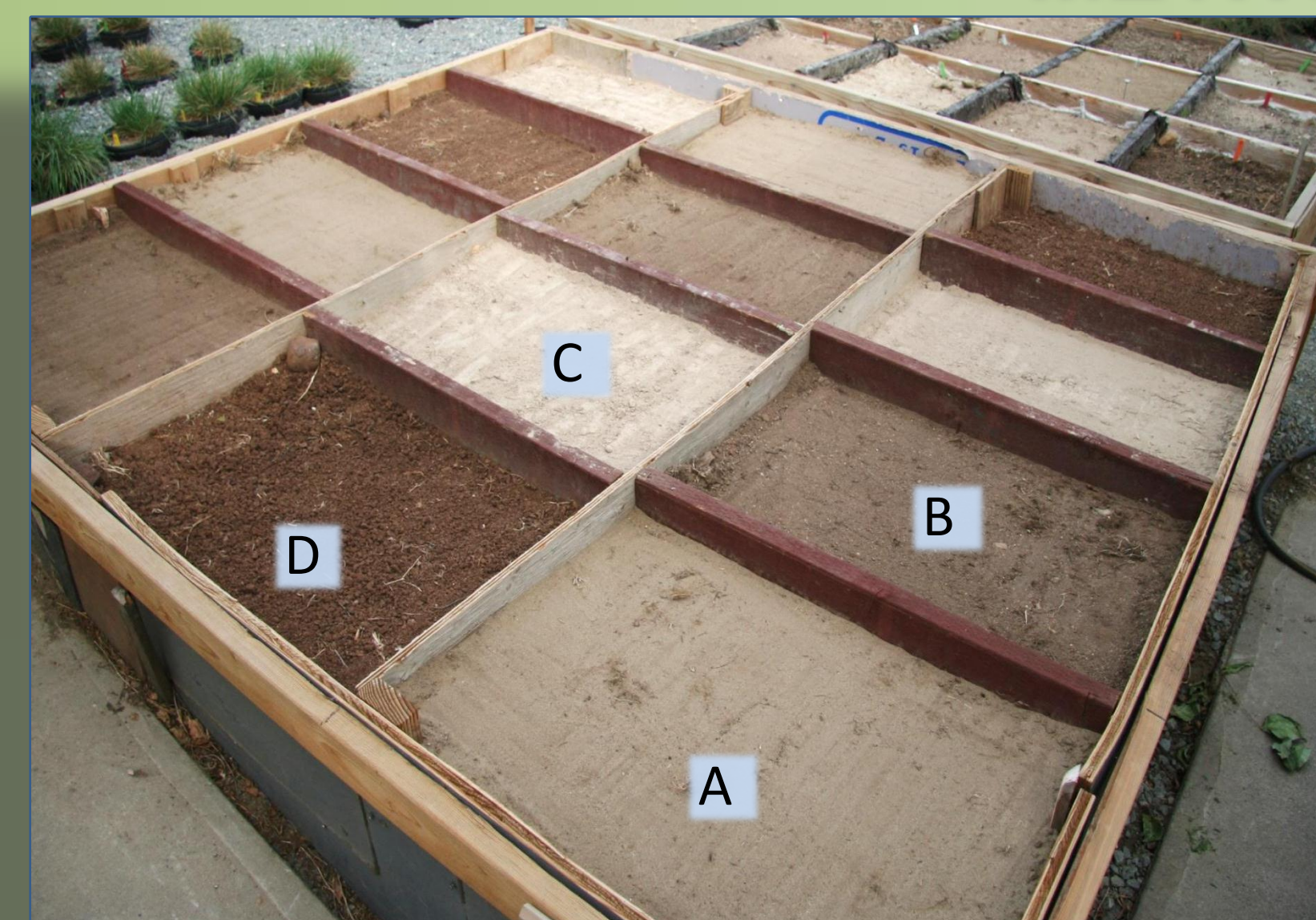
Soil collection sites



Four long term cheatgrass invaded ARS research areas  
Perennial grass establishment has been predominantly unsuccessful at these sites.  
Soil types differ between sites and likely contribute to failure.

**A) Flanigan:** deep sand/salt desert **B) Noble:** expanding lattice clay/Wyoming sagebrush **C) Antelope Valley:** fine silt/salt desert **D) Doyle:** coarse granitic/upland brush \*see appendix for further site descriptions

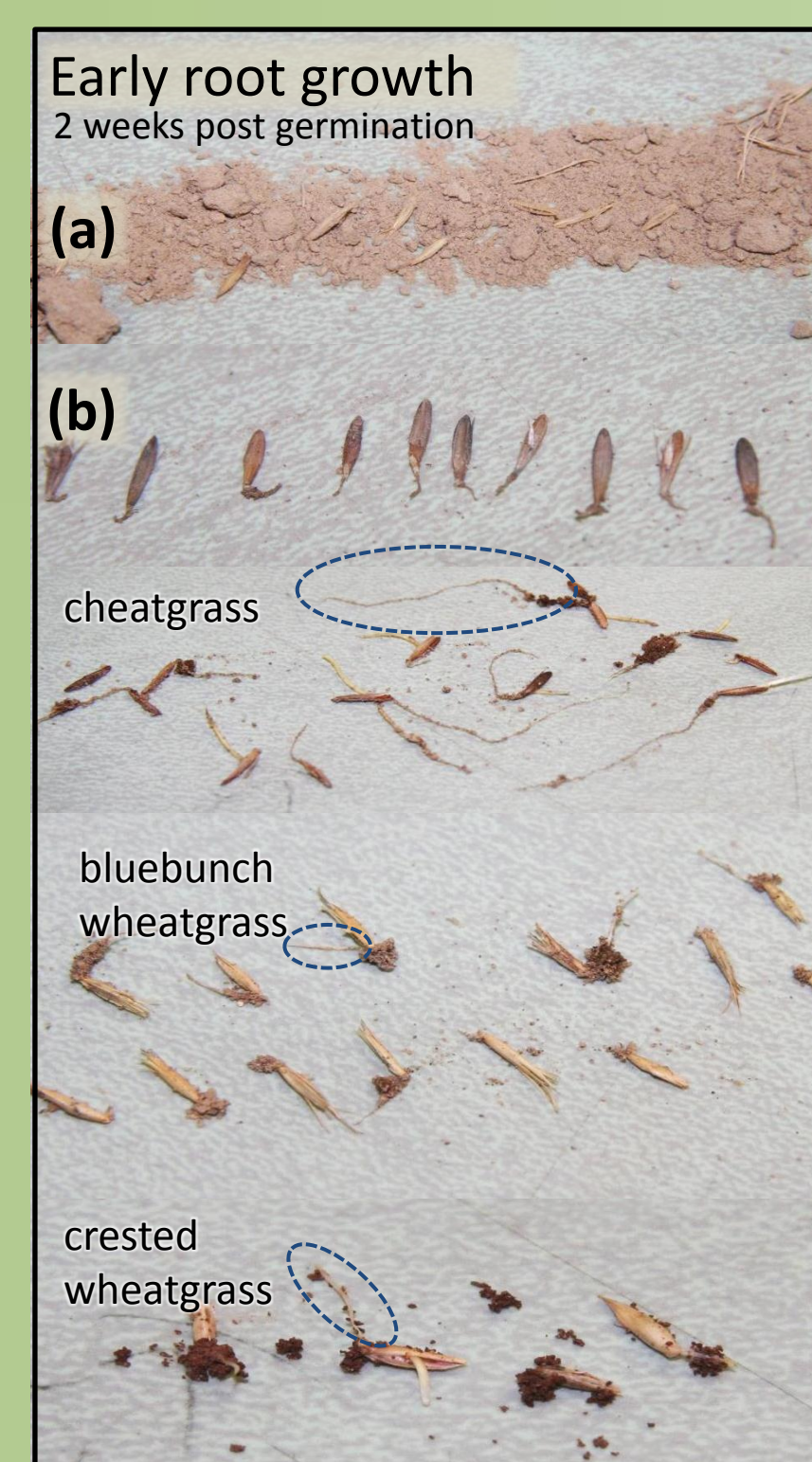
### METHODS



Using replicated soil boxes (9ft<sup>3</sup>)(field soil) we designed a test to monitor germination, emergence, and seedling die-off of four grass species  
**cheatgrass** (*Bromus tectorum*)  
**'hycrest' crested wheatgrass** (*Agropyron cristatum*X)  
**bluebunch wheatgrass** (*Pseudoroegneria spicata*)  
**squirreltail** (*Elymus elymoides*)

Seeds were planted October 12 2011

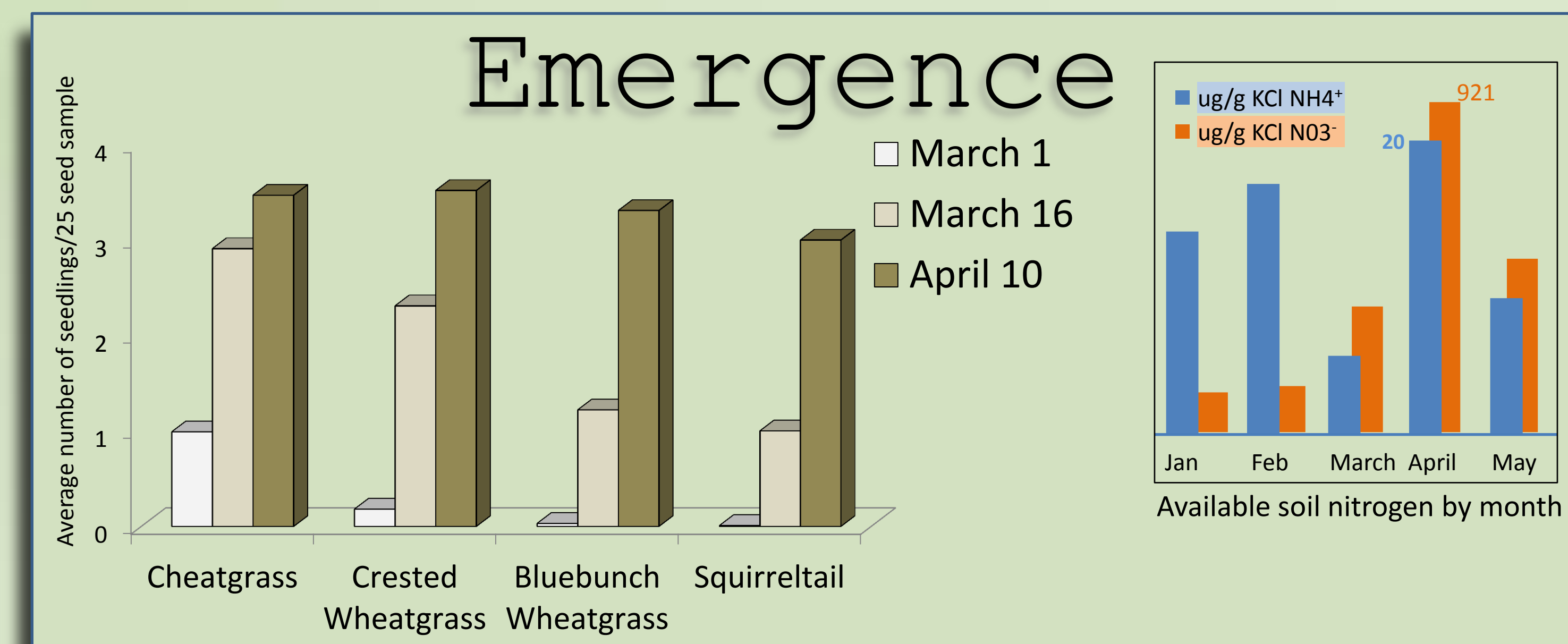
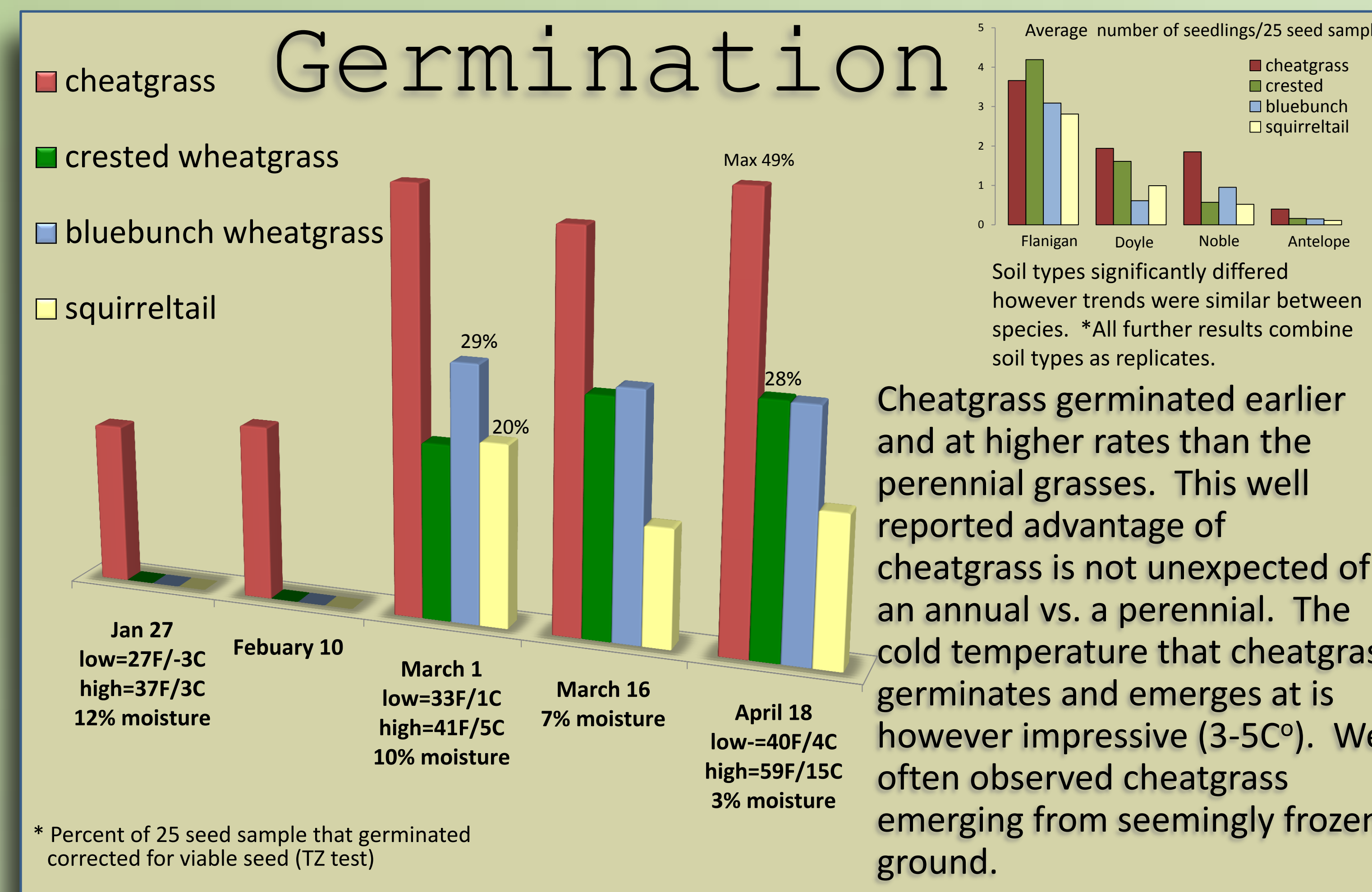
Germination, emergence and seedlings were observed every 2 weeks



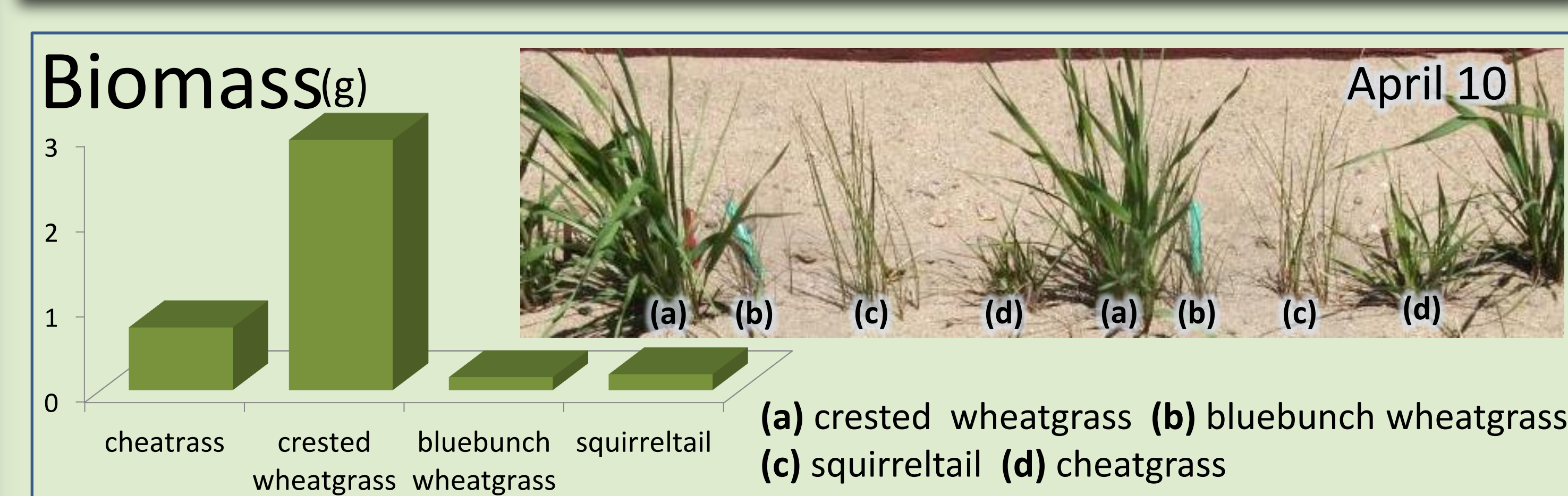
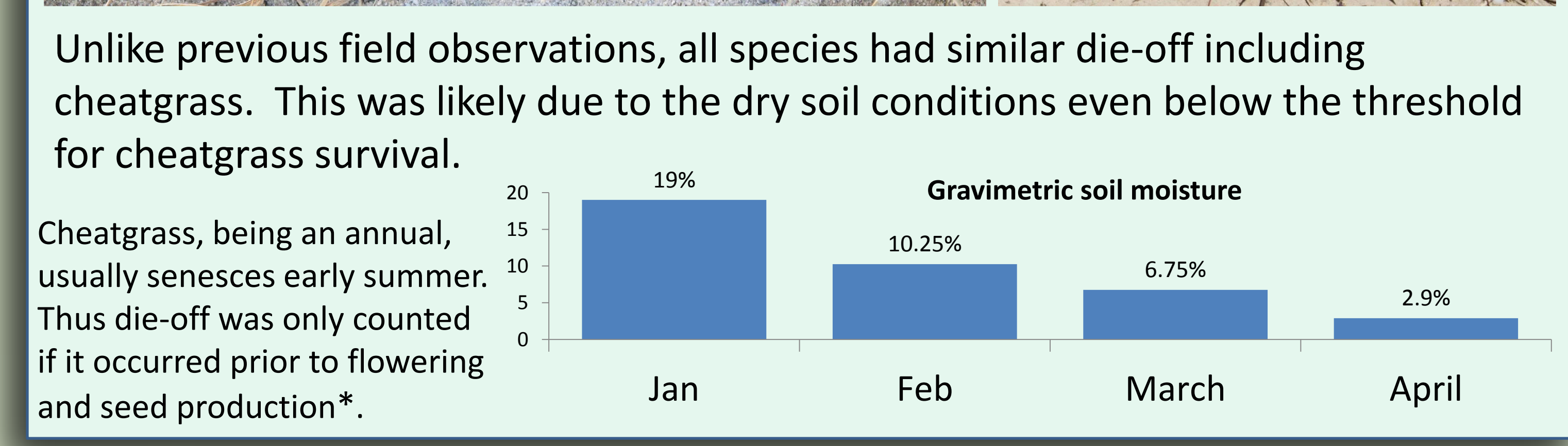
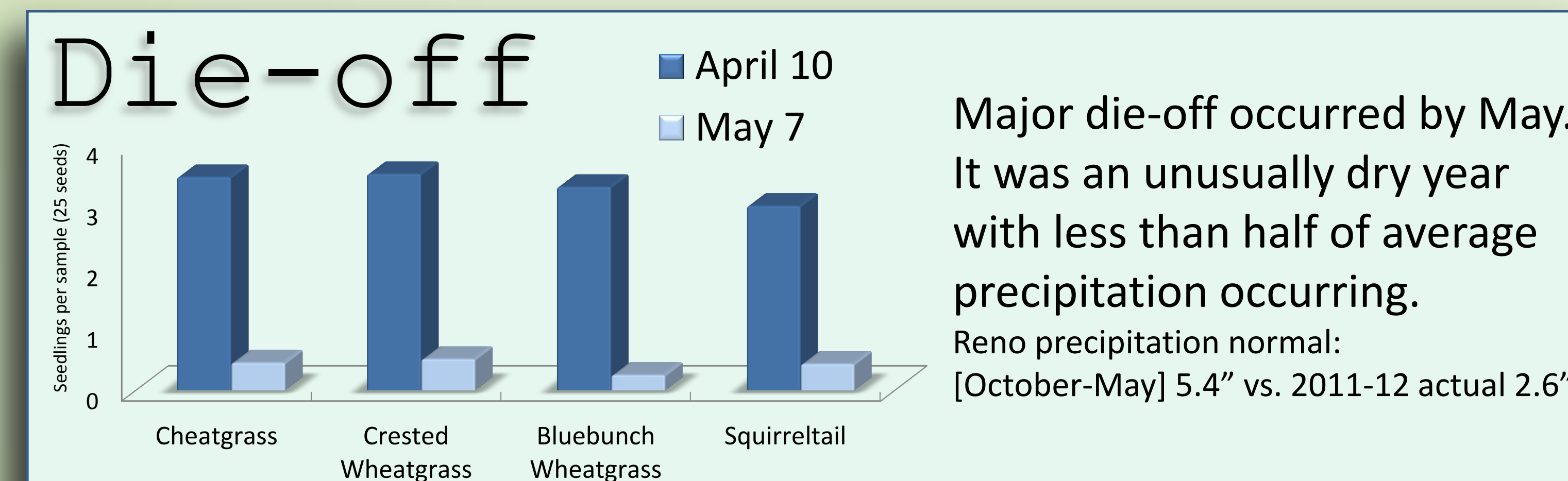
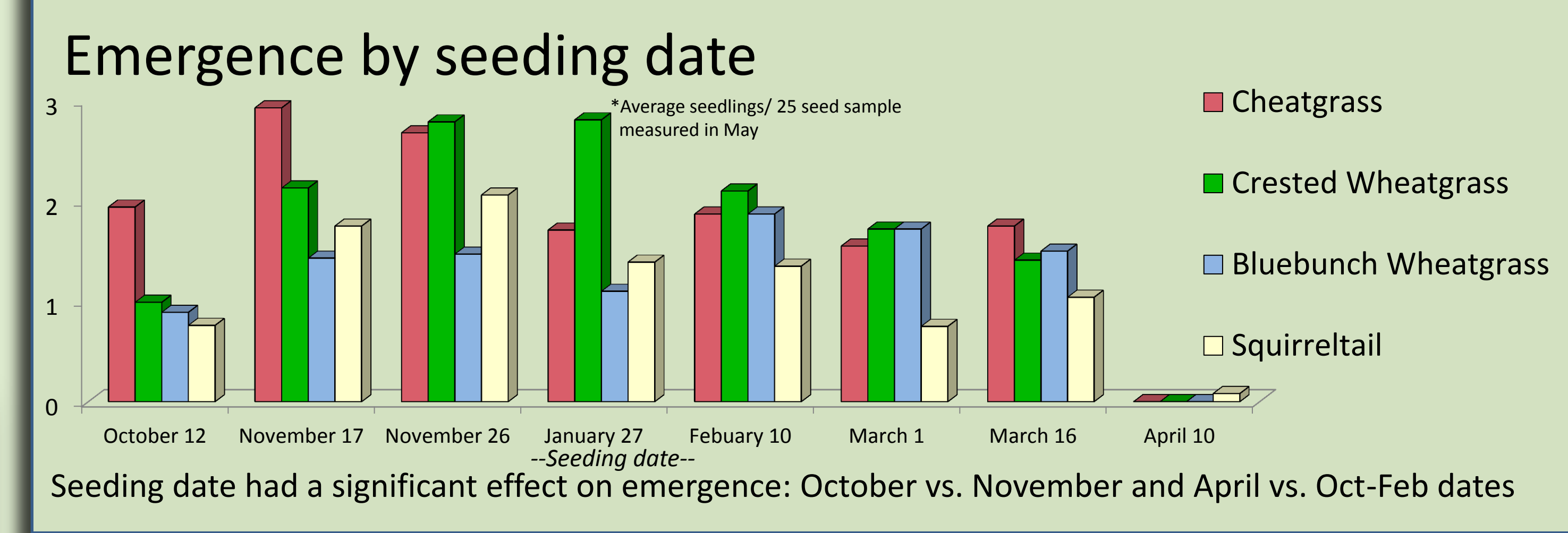
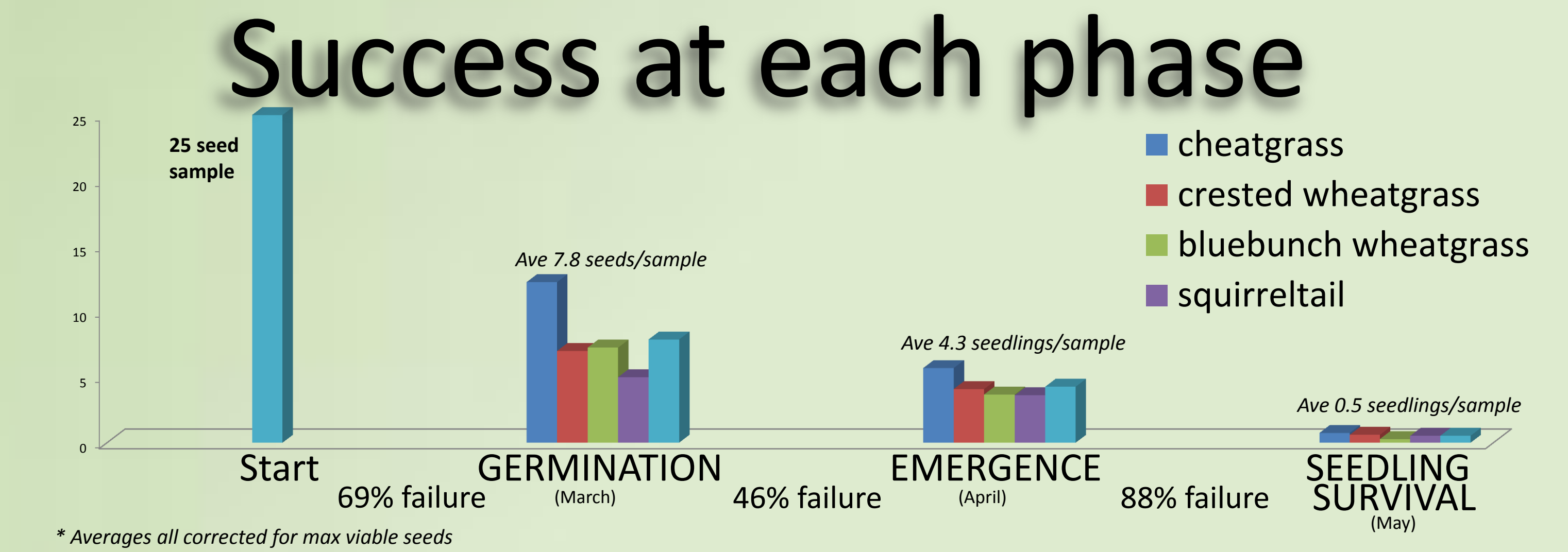
Seeds were planted at a 3cm depth (25 seeds/sample). At 2 week intervals samples were dug up<sup>(a)</sup> and checked for germination<sup>(b)</sup>. Removed seed samples were replaced to test the effect of seeding date on emergence. Soil moisture and temperature were recorded throughout the experiment.



10 samples/soil type(4)x 3 reps=[120 samples per species]  
Using species as the dependent variable, germination, emergence and seedling die-off were compared using JMP software.



Similar to germination, cheatgrass emerged earlier than the perennials. The difference however was minor compared to germination and by April the number of seedlings per 25 seed sample was similar between species.



## Conclusion

Based on the results, we find our hypothesis supported. The largest contributor to failure was seedling mortality ("Success at each phase" Failure percent: Germination 69%, Emergence 46%, Seedling die-off 88%). Perennial grass establishment (~10 plants/m<sup>2</sup>) is currently the only reliable method to suppress cheatgrass densities. The reoccurring fire cycle fueled by cheatgrass must be stopped in order to restore ecosystem function to invaded rangelands. Only then can succession lead to shrub dominance and a more diverse community.