Species richness on coastal sand dunes at Ano Nuevo State Reserve

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Background and Insight
While out studying elephant seals. . .
Background and Insight

We noticed that the sand dune landscape provides an example of a dynamic ecological structure.

- Sand dunes vary in height, shape and orientation
- Some dunes vary greatly in species composition (richness and diversity)
- Harsh, changing, environment (abiotic stresses-wind and sun exposure)
Pattern

Among two facing sand dunes, the south facing slope contained one grass species while the north facing slope contained several non-grass species.

Inquiry

Why would species richness differ between dunes on such a small spatial scale?

Does slope orientation determine species composition?
Goal of Study

The object of this study is to determine how slope orientation affects species composition among the coastal sand dune ecosystem.

General Hypothesis #1

Differences in slope orientation cause differences in moisture availability. Less sun exposure on the north slope provides more moisture and thus more suitable environment for more species.
Specific Hypotheses General #1

Specific 1.) If we do a reverse transplant experiment, then species from north side will not proliferate on south side. However, south side grass species should do fine on north side.

Design
- two control plots for each slope
- two water addition plots on south side
- remove possible competition

Potential Results

Failure to reject null hypothesis
- Reverse transplant has no effect on species composition among slopes.

Reject null hypothesis
- Reverse transplant indicates that species from north side do not persist on south facing slope.
Specific Hypotheses for General #1

Specific #2.) If we do a single transplant of south slope grass onto north slope, competition on north side will eliminate south slope grass.

Design
- allow competition
- control plots

Potential Results

Failure to reject null hypothesis
Single transplant causes no change in species composition.

Reject null hypothesis
South slope species proliferates on north slope--competition limiting
General Hypothesis #2

Differences in slope orientation provide different amounts of sunlight that determines species composition on each slope.

Specific Hypotheses for General #2

Specific #1.) If we shade lower portion of south slope, grass species will not proliferate.

Design
- limit sun exposure
- controls (same shade structure-opaque material)
Potential Results

Failure to reject null hypothesis
__South slope grass species is unaffected by shade

Reject null hypothesis
__Shade removes grass from south slope

Specific hypotheses for General #2

Specific #2.) If we transplant north slope species onto south slope with shade, we expect north species to proliferate.

Design
- half transplant is shaded, other half opaque
Potential Results

Failure to reject null hypothesis
   - Shade has no effect on north slope species

Reject null hypothesis
   - Shaded regions contain north slope species while non-shaded do not