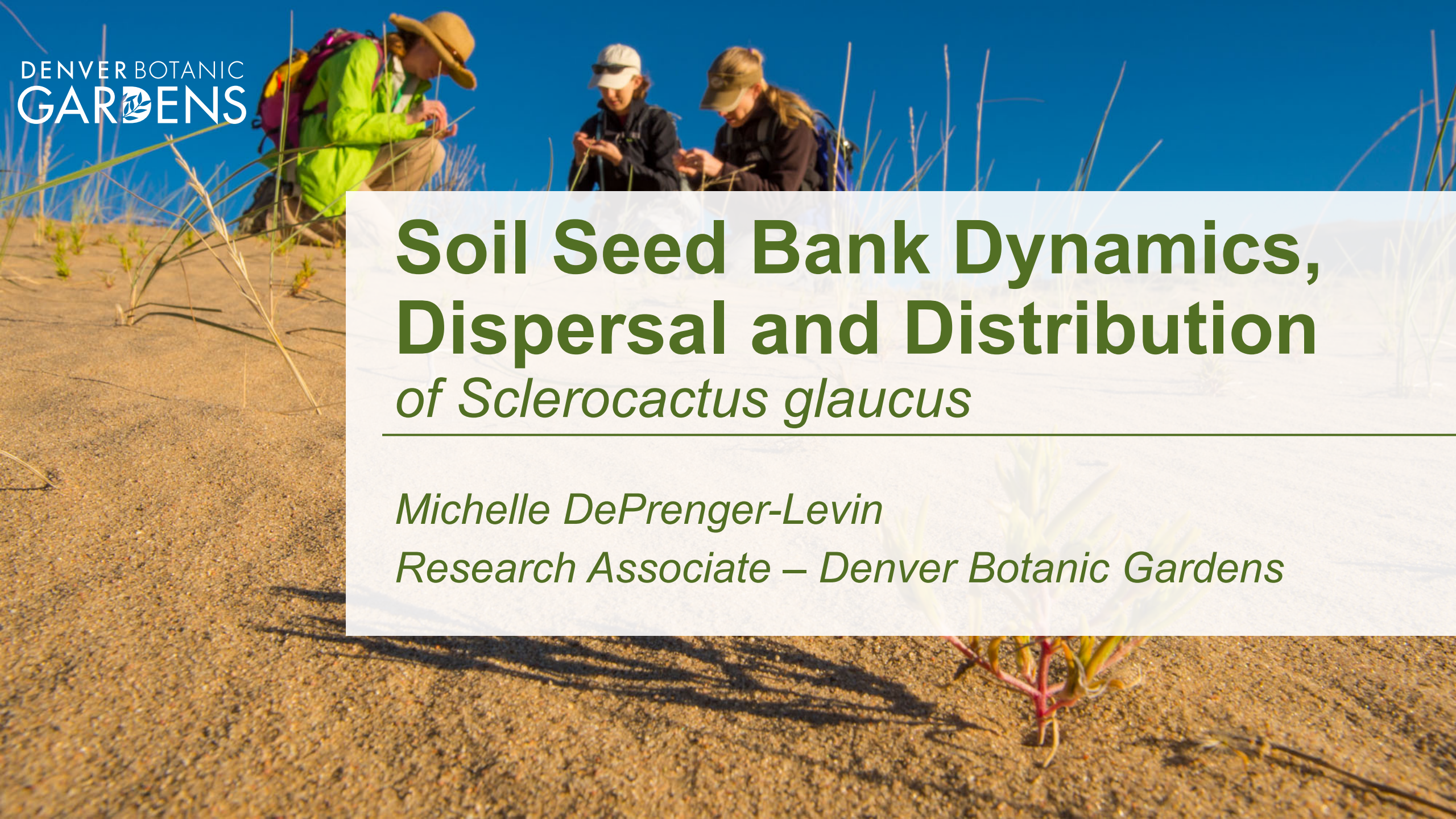

DENVER BOTANIC GARDENS

Soil Seed Bank Dynamics, Dispersal and Distribution

of Sclerocactus glaucus

Michelle DePrenger-Levin

Research Associate – Denver Botanic Gardens

DEAR
Desert Ecosystem Analysis & Restoration

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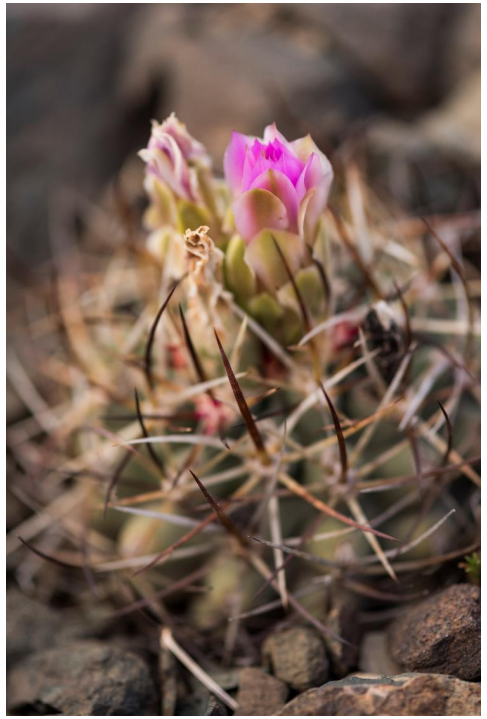
U.S. DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT

HENRY SHAW CACTUS AND SUCCULENT SOCIETY

Study aims

1. Risk of extinction
2. Range and Population size



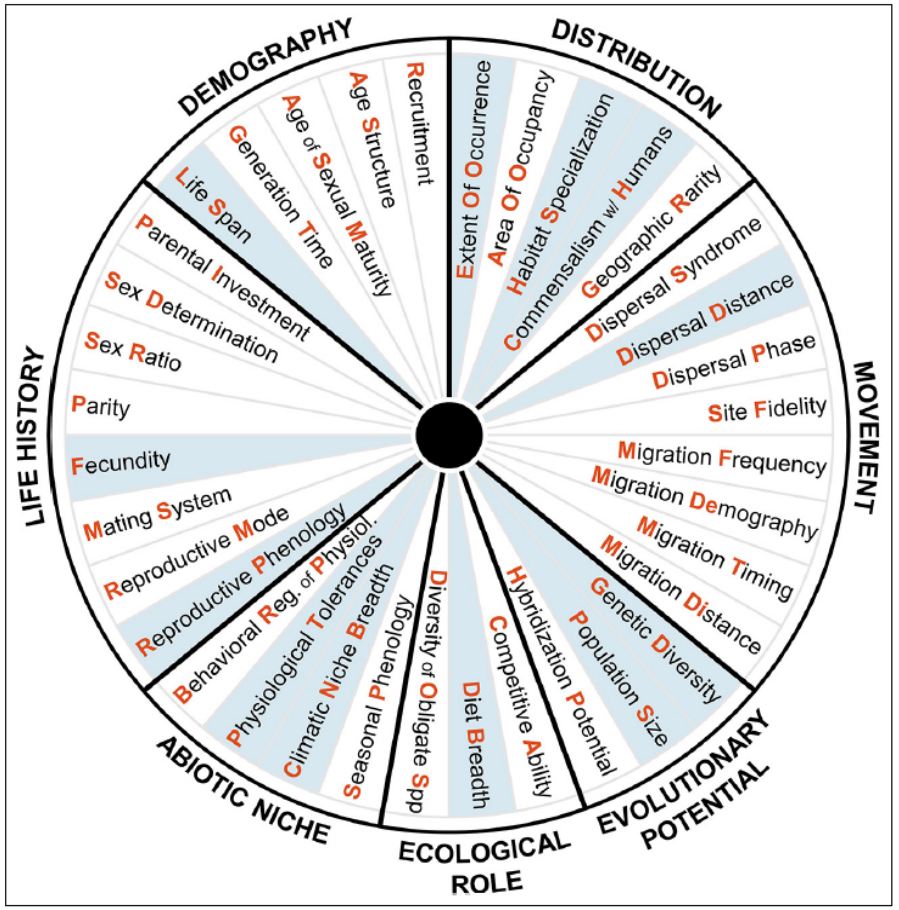
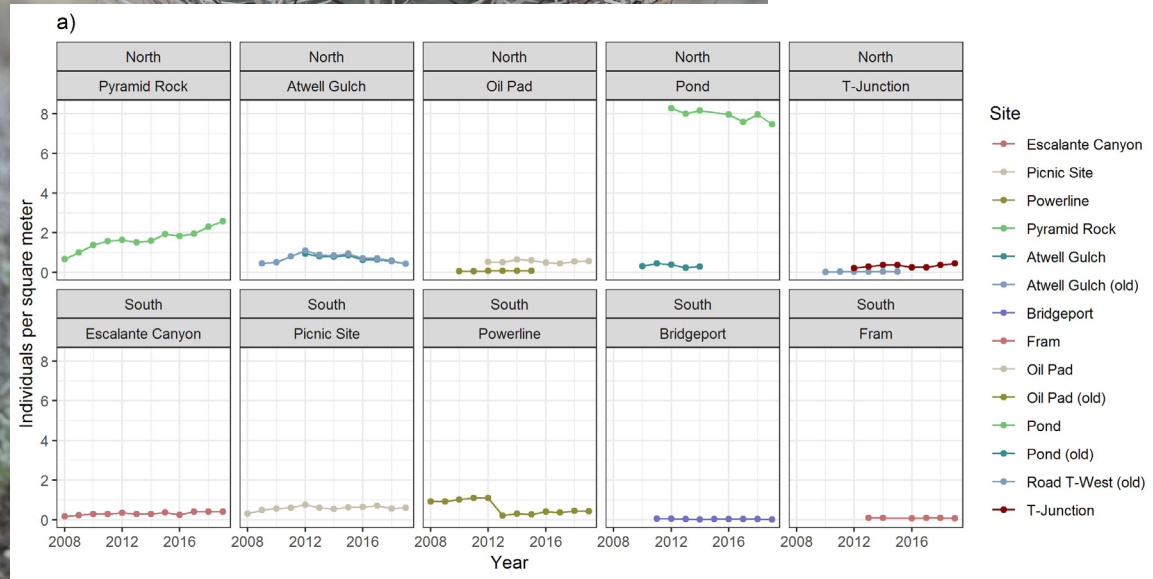


Figure 1. The adaptive capacity (AC) "wheel", depicting 36 individual attributes organized by ecological complexes (or themes). Twelve core attributes, representing attributes of particular importance and for which data are widely available, are highlighted in light blue. Letters used in attribute abbreviations (which appear in Figures 4 and 5) are shown here in red font.

Thurman et al. 2020 Front Ecol Environ

Extinction Risk

- Population size



DePrenger-Levin 2019. Technical Report to Bureau of Land Management

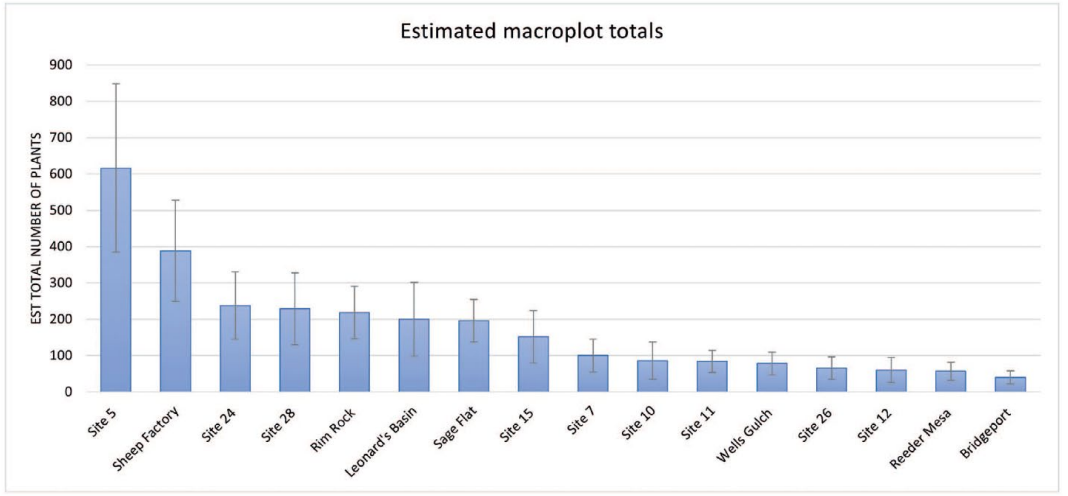
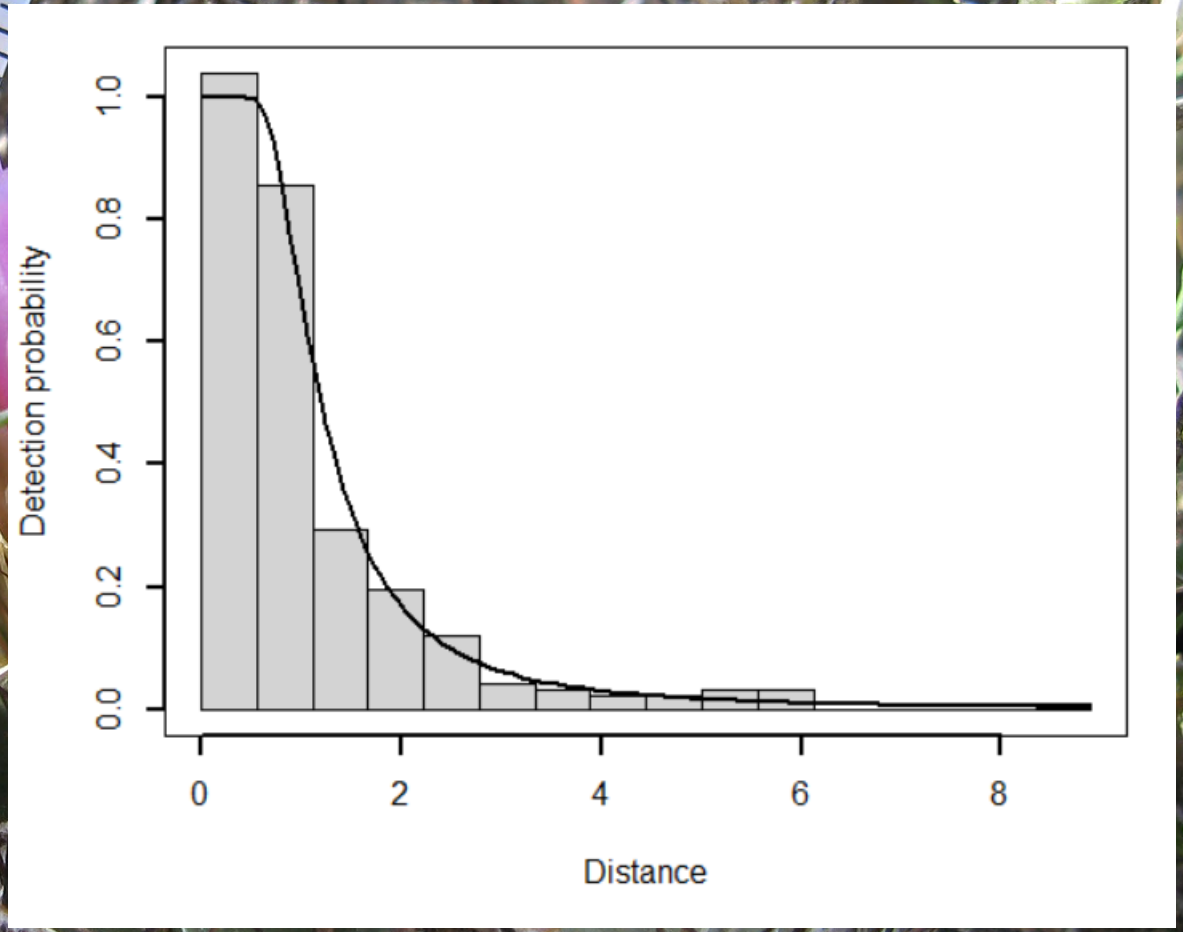


Figure 3.—Estimated macroplot totals for $n = 16$ Colorado hookless cactus macroplots. Error bars are 90% confidence intervals. The values corresponding with the lower limit of the confidence intervals were used in the ratio estimation procedure.

Krening et al. 2021. Natural Areas Journal 41(1): 4-10.

Distance sampling

N (in covered region):
1,478 (SE 133) individuals



DENVER BOTANIC GARDENS

Extinction risk

- Range size

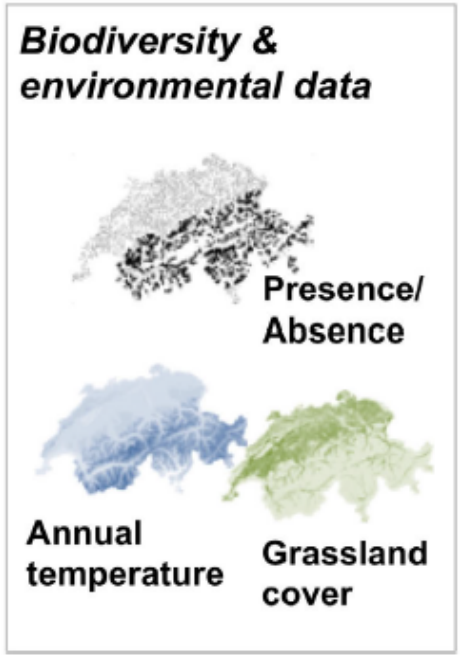
Table 2. Environmental variable contribution to the final *Sclerocactus glaucus* model.

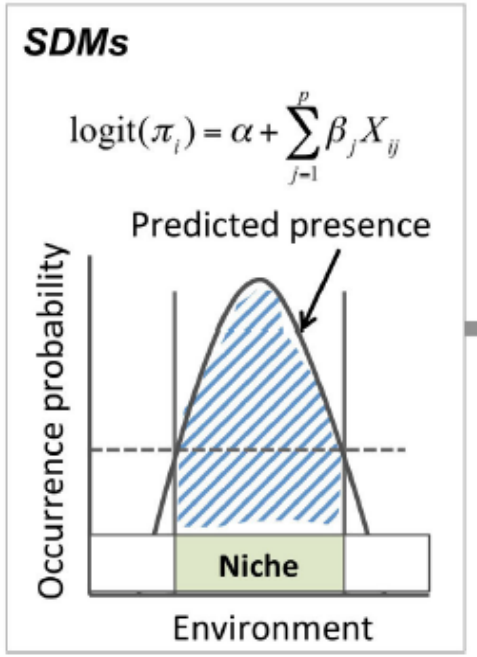
Variable	Percent Contribution
Summer precipitation (Jun-Jul-Aug)	29.1
Elevation	15.6
Average date of first frost in fall	13.1
Cold-desert shrub vegetation	11.0
Average date of last frost in spring	9.8
Average maximum temperature, summer	7.6
Slope	5.1
Surface geology	3.8

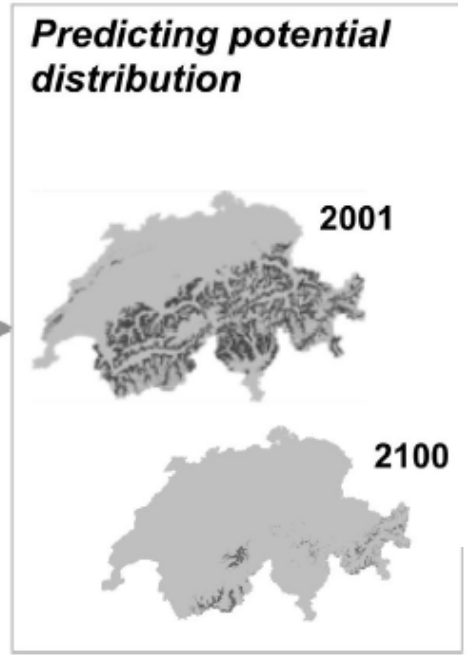
Decker, K. 2016.

Species distribution models

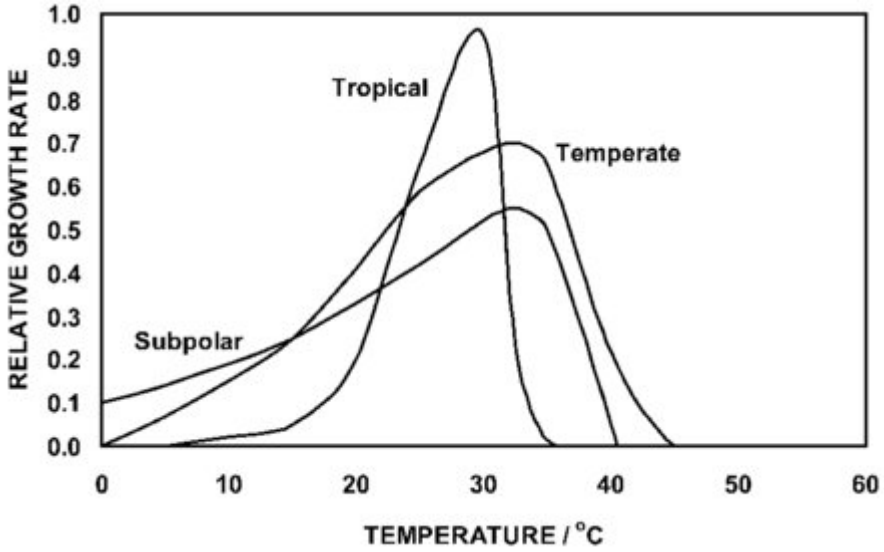
- Correlation based
- Process based





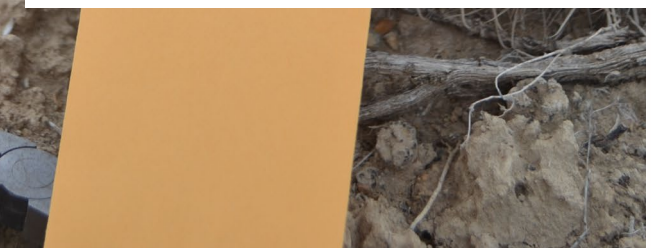


SDM in R: Zurell



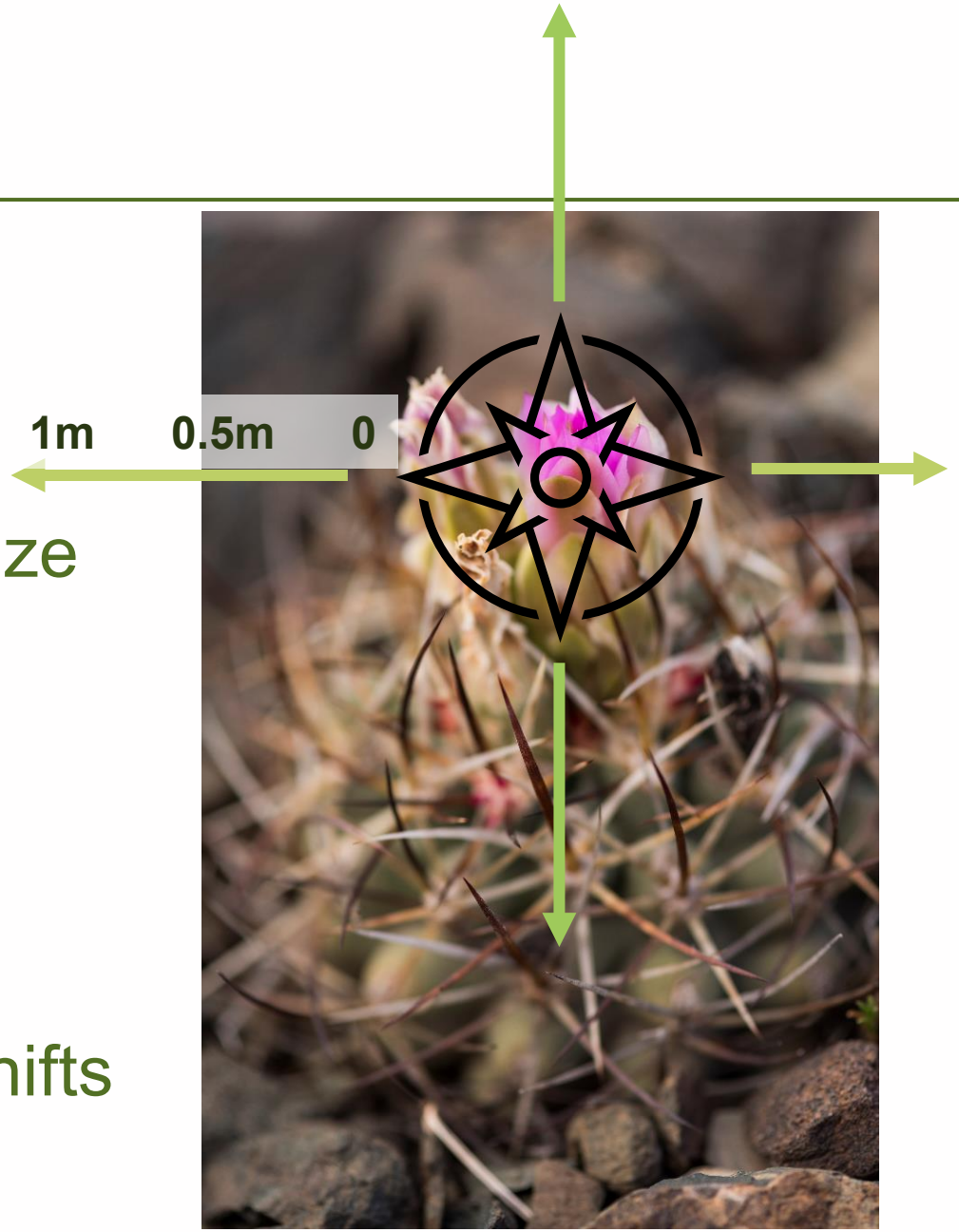
https://damariszurell.github.io/SDM-Intro/

Criddle et al 2009 “Thermodynamic law for adaptation of plants to environmental temperatures”



Methods

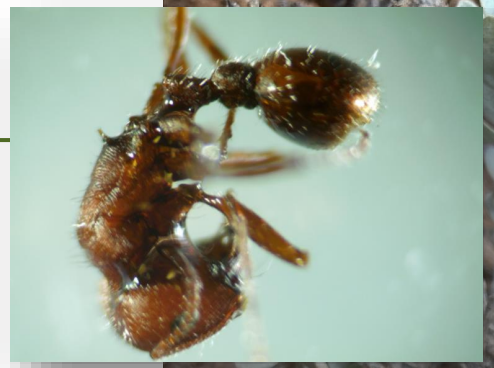
1. Risk of extinction
2. Range and Population size
3. Dispersal
4. Soil seed bank
5. Vegetation community shifts

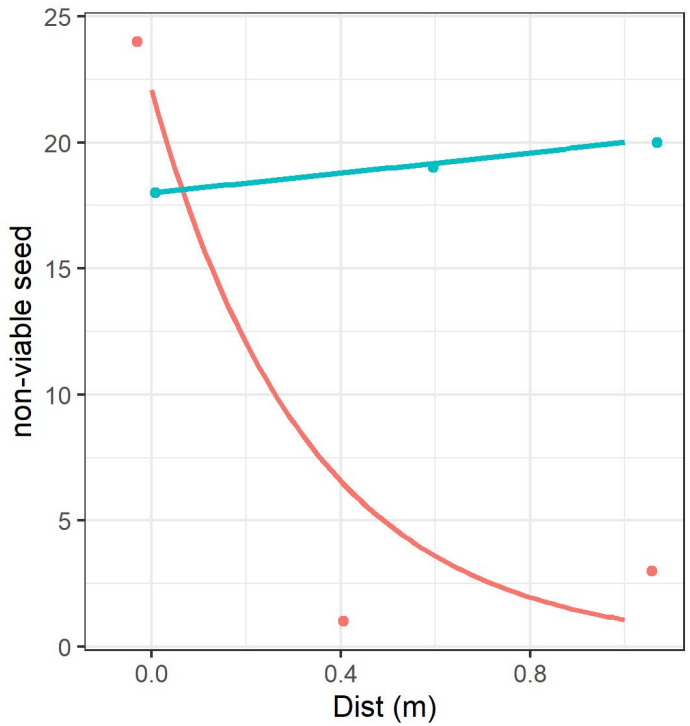


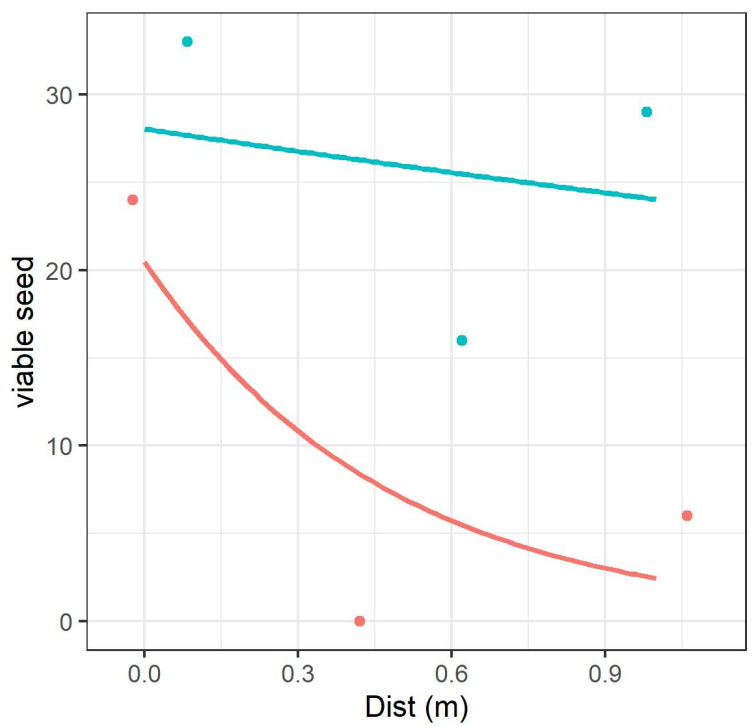
DENVER BOTANIC GARDENS

Dispersal

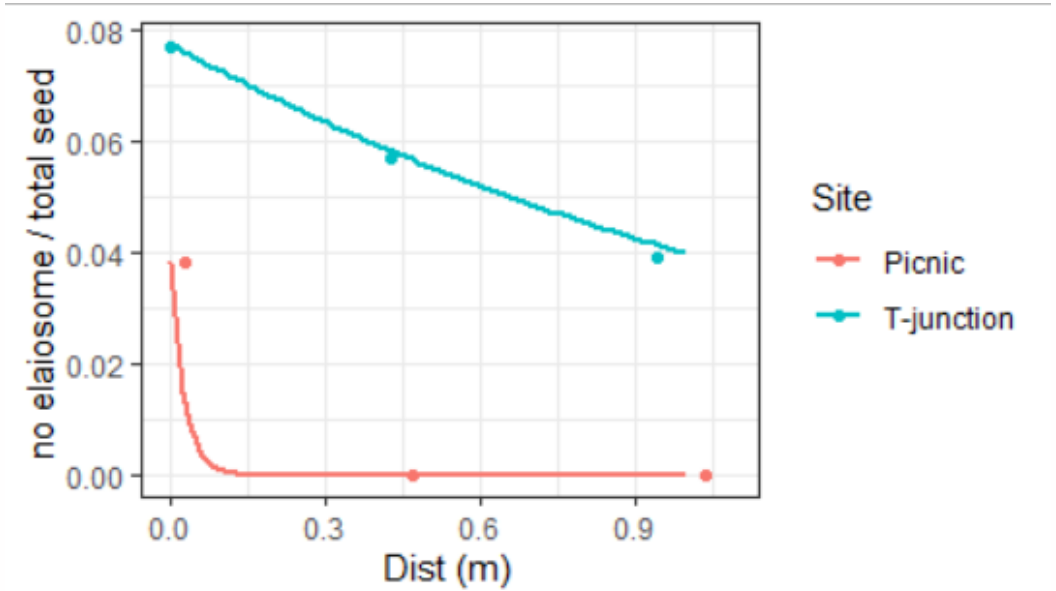
- Water and gravity
- Ants

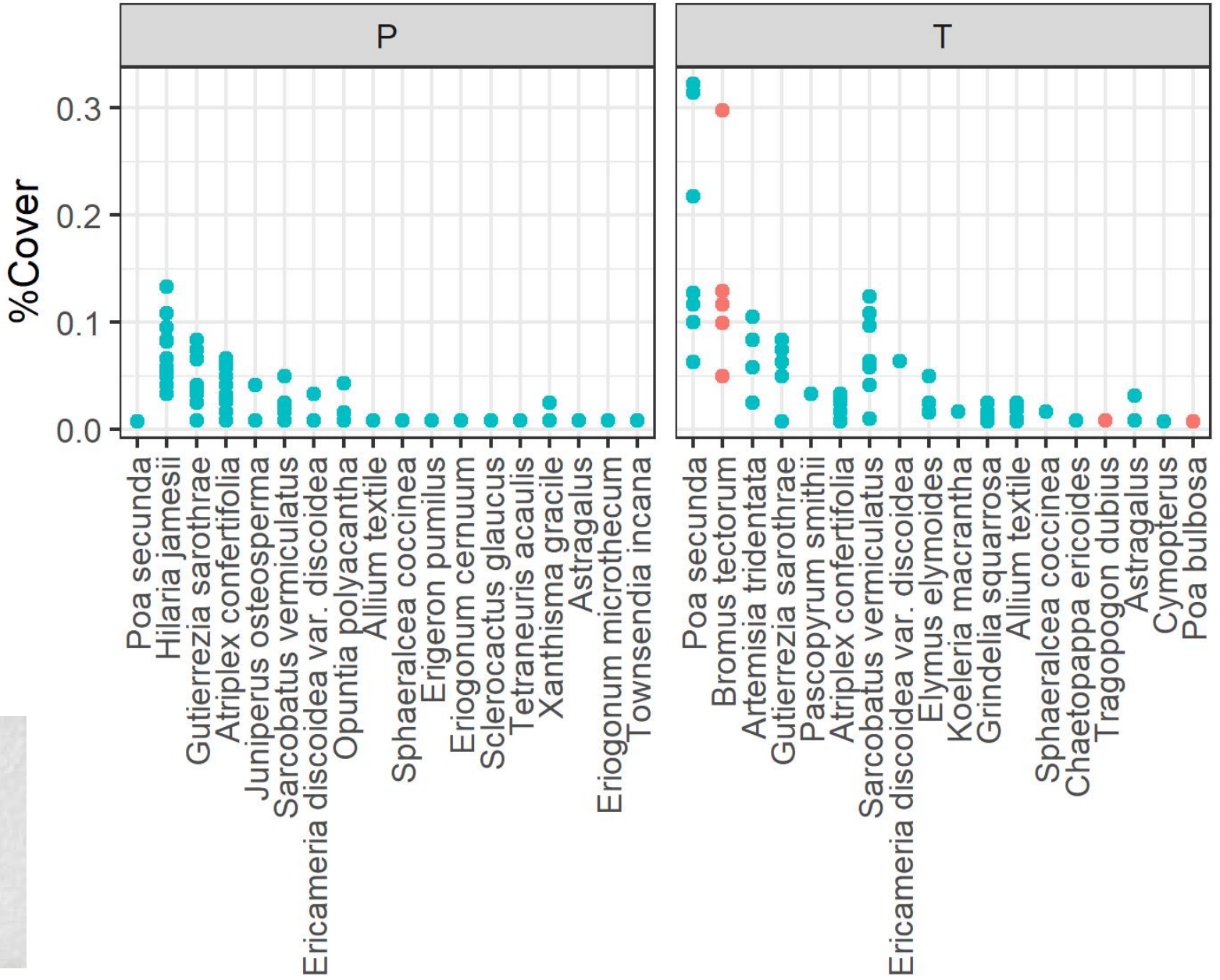



non-viable seed
25
20
15
10
5
0
0.0
0.4
0.8
Dist (m)


viable seed
30
20
10
0
0.0
0.3
0.6
0.9
Dist (m)


Site
Picnic
T-junction


no elaiosome / total seed
0.08
0.06
0.04
0.02
0.00
0.0
0.3
0.6
0.9
Dist (m)
Site
Picnic
T-junction


P
T
%Cover
0.0
0.1
0.2
0.3
Poa secunda
Hilaria jamesii
Gutierrezia sarothrae
Atriplex confertifolia
Juniperus osteosperma
Sarcobatus vermiculatus
Ericameria discoidea var. discoidea
Opuntia polyacantha
Allium textile
Sphaeralcea coccinea
Erigeron pumilus
Eriogonum cernuum
Sclerocactus glaucus
Tetraneuris acaulis
Xanthisma gracile
Astragalus
Eriogonum microthecum
Townsendia incana
Poa secunda
Bromus tectorum
Artemisia tridentata
Gutierrezia sarothrae
Pascopyrum smithii
Atriplex confertifolia
Sarcobatus vermiculatus
Ericameria discoidea var. discoidea
Elymus elymoides
Koeleria macrantha
Grindelia squarrosa
Allium textile
Sphaeralcea coccinea
Chaetopappa ericoides
Tragopogon dubius
Astragalus
Cymopterus
Poa bulbosa
Native.Status
Introduced
Native

Questions

deprengm@botanicgardens.org

Decker, K. 2016. Predictive habitat model for Colorado hookless cactus (*Sclerocactus glaucus*). Colorado Natural Heritage Program, Warner College of Natural Resources, Colorado State University, Fort Collins, Colorado 80523.

Krening, P., Dawson, C., Holsinger, K., and Willoughby, J. 2021. A sampling-based approach to estimating the minimum population size of the federally threatened Colorado hookless cactus (*Sclerocactus glaucus*). Natural Areas Journal 41(1): 4-10.