

Genetic and Phenotypic Screening Throughout the Seed Increase Process

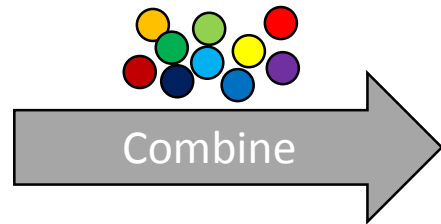
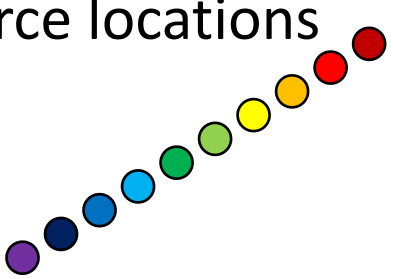
Brad Butterfield¹, Rob Massatti² and Liza Holeski¹

1. Merriam-Powell Center for Environmental Research
& Department of Biological Sciences
Northern Arizona University

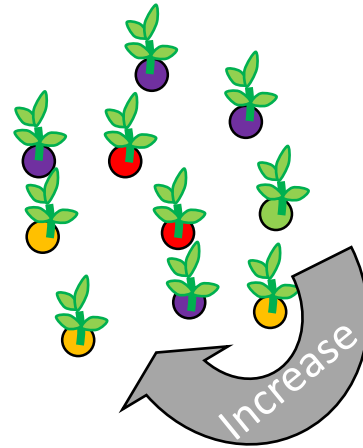
2. USGS Southwest Biological Science Center, Flagstaff AZ

Typical Seed Increase Process

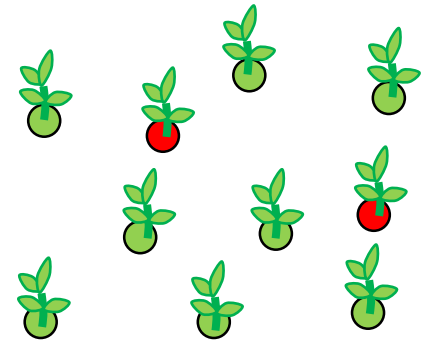
Collections (e.g. SOS) from known source locations



Agricultural Production

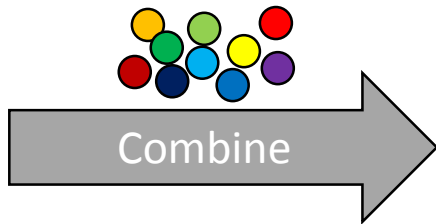
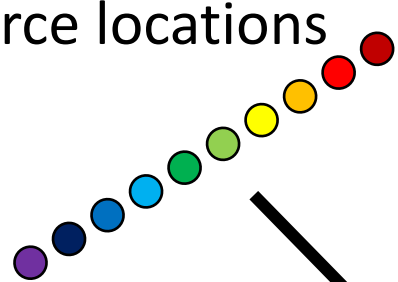


Restoration Treatment

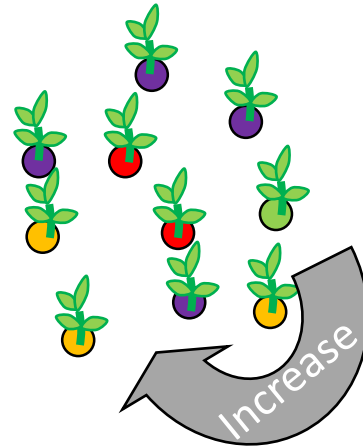


Production, Treatment and Testing in Parallel

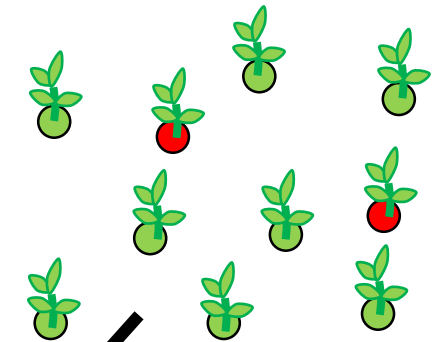
Collections (e.g. SOS) from known source locations



Agricultural Production



Restoration Treatment



Seed

Seed
and/or
tissue

Tissue and/or seed

Testing Program

- Genetic screening
- Phenotypic/performance screening

Genetic and Functional Consequences

Journal of Applied Ecology



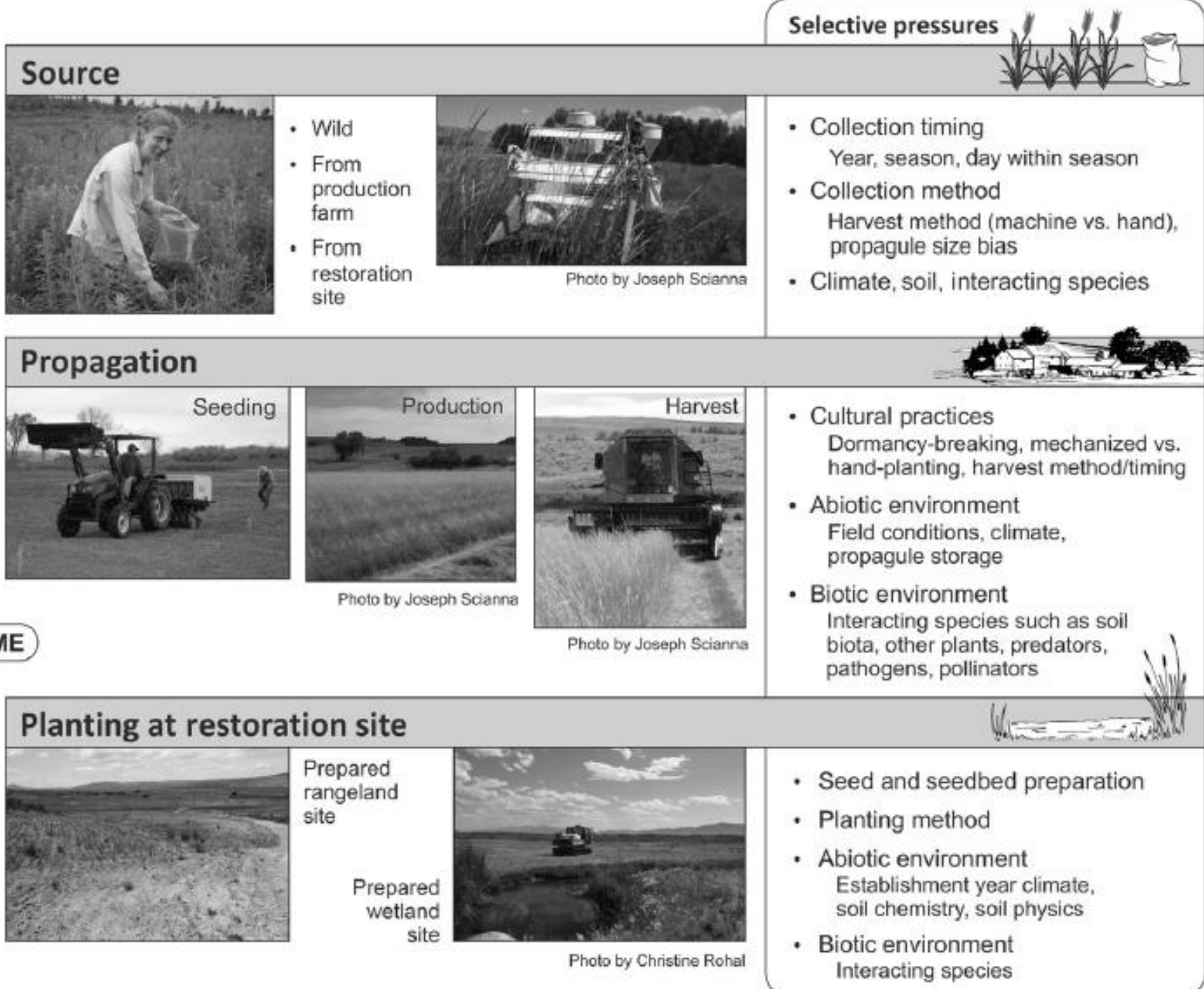
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REVIEW

Evolution of plant materials for ecological restoration: insights from the applied and basic literature

Erin K. Espeland^{1*}, Nancy C. Emery², Kristin L. Mercer³, Scott A. Woolbright⁴, Karin M. Kettenring⁵, Paul Gepts⁶ and Julie R. Etterson⁷



Not Just Genetic Changes

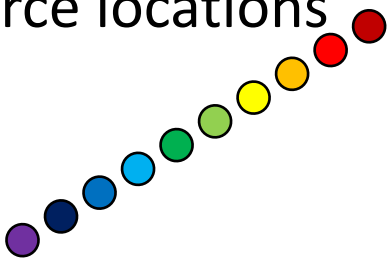
- Epigenetics

- Altered gene expression
- Can greatly impact initial generation (and possibly future generations) applied in a restoration setting

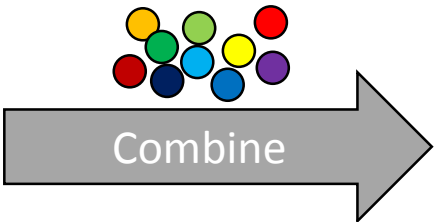
- Maternal effects

- Enhanced resource availability to seed
- Can alter dormancy/germination behavior

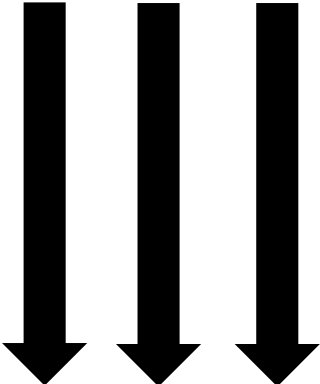
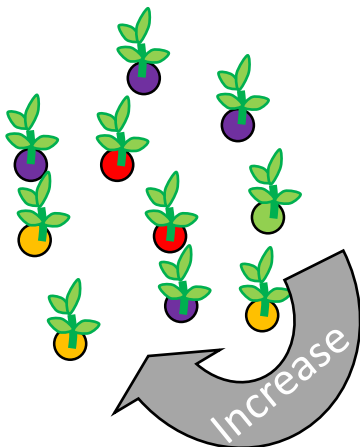
Collections (e.g. SOS) from known source locations



Source seed



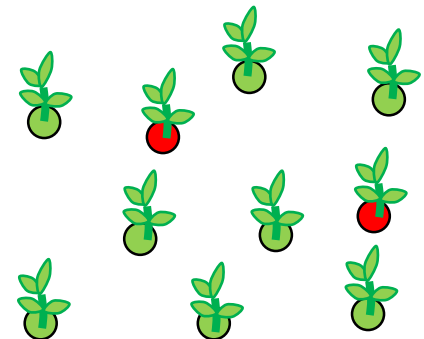
Agricultural Production



1° 2° n°

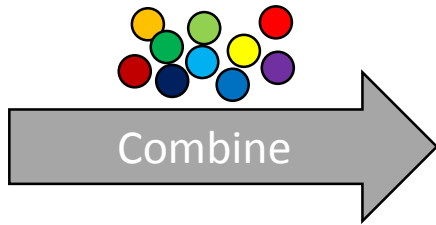
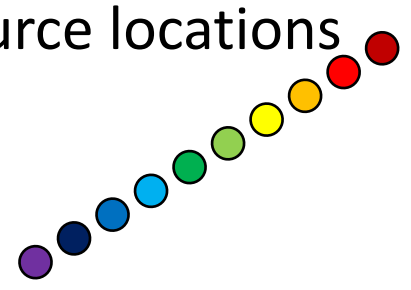


Restoration Treatment

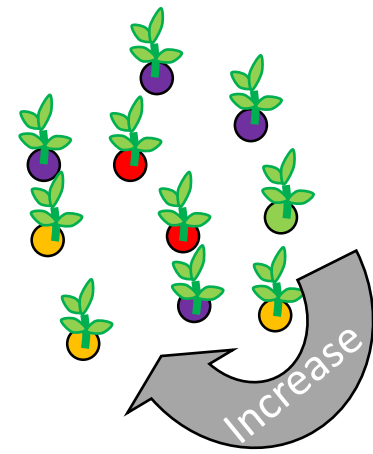


Successful

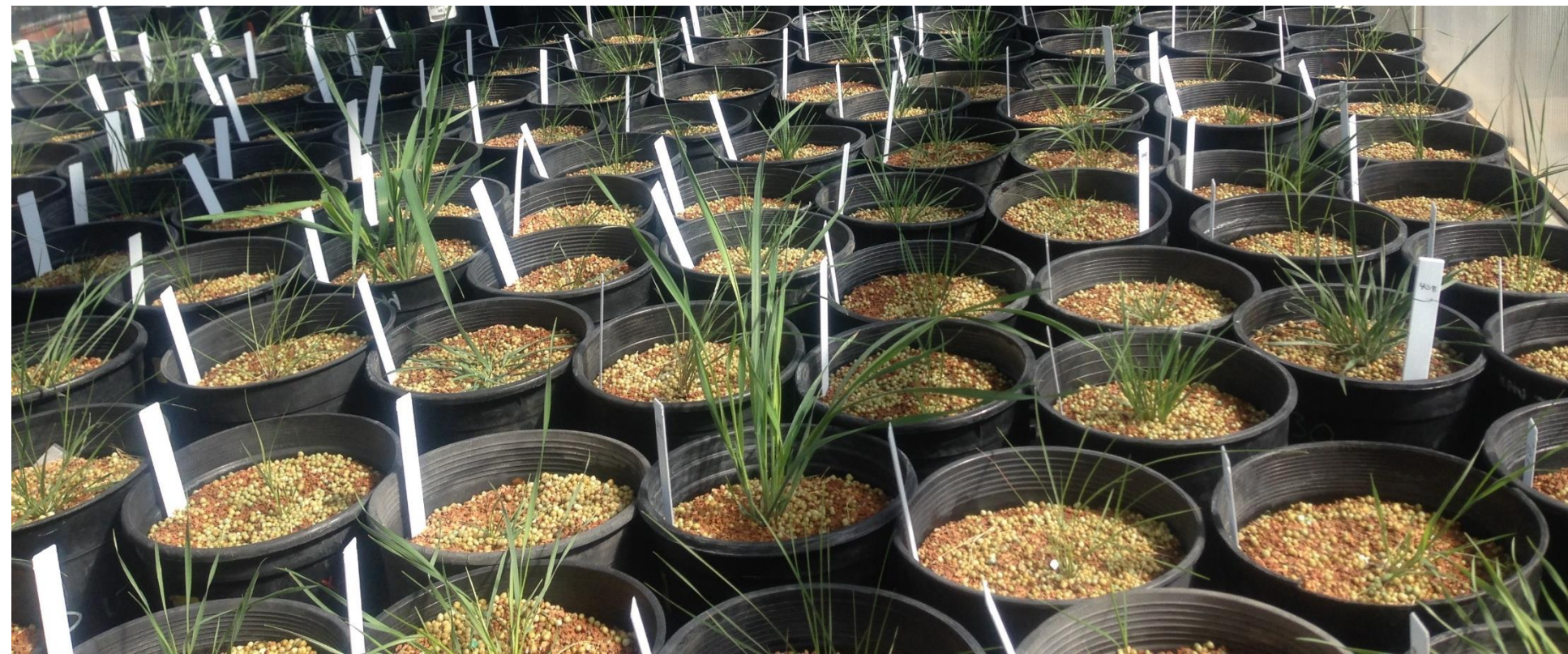
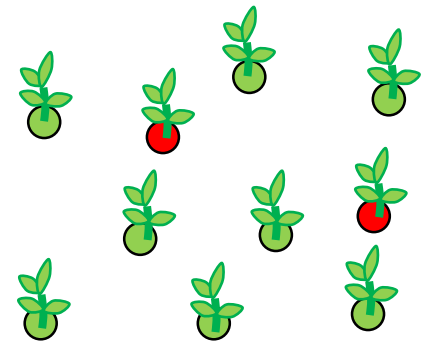
Collections (e.g. SOS) from known source locations



Agricultural Production



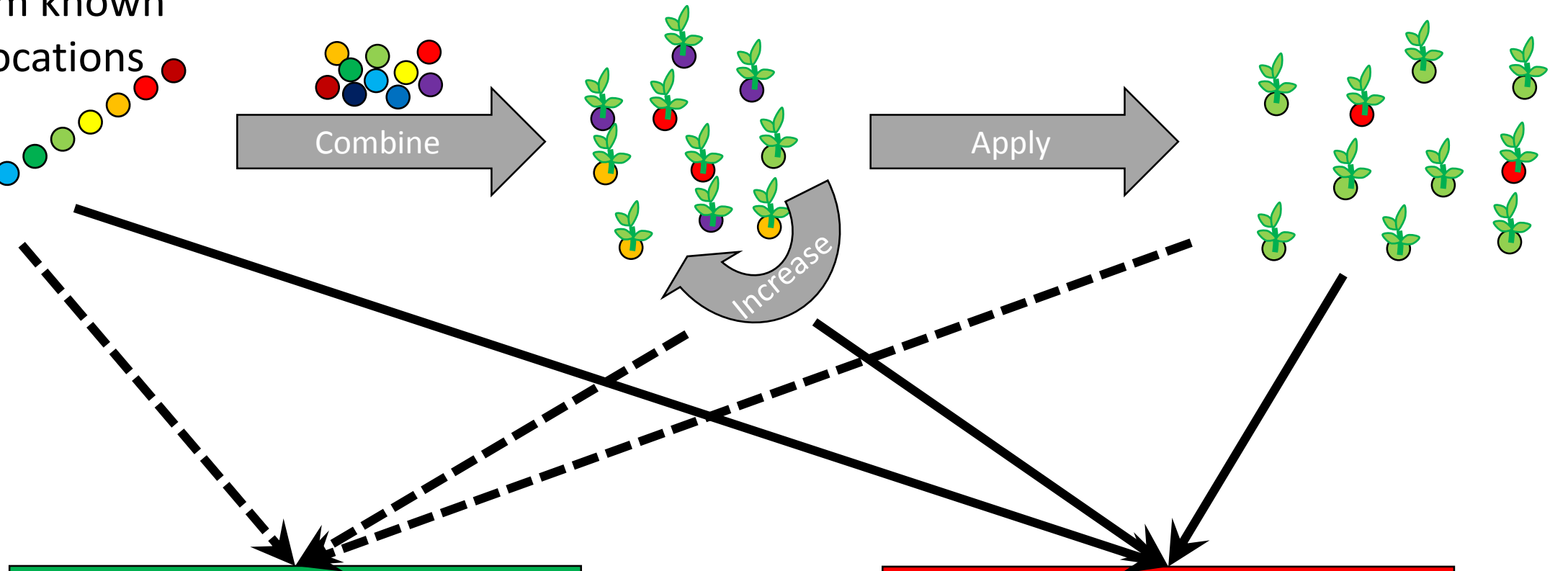
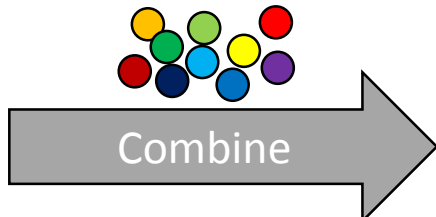
Restoration Treatment



Collections (e.g. SOS) from known source locations

Agricultural Production

Restoration Treatment



Seed Development Guidance

- Too pool or not to pool?
- Bias initial pool
 - Focus on more arid-adapted initial sources?
- Mitigating undesired selection
 - Introduce additional wild sources during increase?
 - More acreage, less output per plant during increase?

What Would a Testing Program Look Like?

- Centralized, distributed, or a hybrid?
 - Expertise/facilities for genetic and trait screening
 - Incentives for collaboration
- Standardized measurements
 - Minimum set to be informative
 - Longer wish list for targeted species
- Frequent synthesis and feedback through integration with trait database
 - Working group from across NPP
 - Producers, managers, researchers

Thanks!

- CPNPP
- Restoration Assessment and Monitoring Program for the Southwest (RAMPS)
- NAU/USGS Dryland Ecology Lab Group

