Mission
Conserve native species and habitats through restoration, research, and education
Contact: info@appliedeco.org

Coping With Climate:
How our changing environment is affecting native plants and habitat restoration in the Pacific Northwest and beyond

Tom Kaye, PhD
Executive Director
Welcome to the Anthropocene
Rupp et al., 2016. Adapted for Oregon, Integrated Scenarios Project, Kathie Dello

Climatewizard.org, average annual temperature change by 2080s

Rupp et al., 2016. Adapted for Oregon, Integrated Scenarios Project, Kathie Dello
Solastalgia
Some effects of climate change on plants

- Loss of diversity
- Changes in phenology
- Range shifts
- Species extinctions
- Complex interactions with land use
Diversity is in decline because of climate change

Strong declines in northern and endemic species, shift to southern-type and south-facing communities

Revisited Robert Whittaker’s plots in southern Oregon

Shifting phenology in the PNW

4.4 days shift per 1°C

Kopp et al., 2020. *International Journal of Biometeorology*
Ranges may need to shift with climate change

Declined with heating and drought.

Improved with heating and drought beyond northern range limit

Trees may need to shift to survive and reproduce

Seedlings of 33 species prefer cooler temps than trees

Population extinctions are being driven by climate change, population size, and time

Site revisits: *Cypripedium fasciculatum*
Greene’s mariposa lily (*Calochortus greenei*)
Greene’s mariposa lily (*Calochortus greenei*)

**Top driver:** Minimum temperature in spring
Climate change
Past climate
herbivores present -- control

Climate change
Past climate
Sourcing plants for habitat restoration in a changing climate

- Local adaptation
- Future climate analogs
Local adaptation: Nonlocal types may fail in restorations

- Variation among populations (95%) from 305 studies
- Trait by environment variation (86%) from 161 studies
- Climate (75%)
- Local advantage: survival (67%), flowering (90%) from 24 and 10 studies

Baughman et al. 2019, *Ecology and Evolution*
Planning for climate change

- Changing climate means optimal environments for species may shift

- Strategies for obtaining seeds:
  - Strict local
  - Relaxed (mixed) local
  - Composite mix
  - Admixture (range-wide mix)
  - Predictive (matching to future climate)

Havens et al., 2015. *Natural Areas Journal*
Breed et al., 2013. *Conservation Genetics*
Composite mix

Local adaptation

Genetic diversity

Example: *Iris tenax*
Multiple collections from throughout an ecoregion
“Climate-Smart” Seedlot Selection Tool (SST)

- seedlotselectiontool.org
- US Forest Service, Conservation Biology Institute
- Identifies locations from which seeds may be moved to new site to match climate
- User specified past or future climate scenario
Seedlot selection tool

Climate admixtures of plant sources
Assisted migration trials

White alder (Alnus rhombifolia)
Beyond Assisted Migration: **Adaptive Sourcing**

- Diversity
- Adapted and Adaptable

Collect locally to leverage “home site advantage”

- Collect from adjacent future climate-analog locations, import needed genes
- Collect from multiple sites, including harsh locations and in bad years
Join us!

Institute for Applied Ecology

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