Working Across Time:

climate change, novel ecosystems, and goal setting

In the coming decades, climate change will make "restoration" even more of a moving target. What are the challenges of setting goals for stewardship? Are "novel ecosystems" a helpful concept?

Moderator: Katie Suding, UC Berkeley

Panelists: *Karen Holl, UC Santa Cruz Rob Klinger, USGS Western Ecological Research Center Jutta Burger, Irvine Ranch Conservancy Lisa Micheli, Pepperwood Preserve John Knapp, Native Range, Inc. Sandra DeSimone, Audubon Starr Ranch Sanctuary*

"The big picture: all is change"

-- Earl Ellis

Ellis EC, Klein Goldewijk K, Slebert S, Lightman D, Ramankutty N. 2010. Anthropogenic transformation of the biomes, 1700 to 2000 Global Ecology and Biogeography 19:589-606.





Ellis, E. C., E. C. Anill, and H. Kreft. 2012. All is not loss: plant biodiversity in the Anthropocene PLoS ONE 7:e30535.



Anthropogenic Species Increase (ASI/N)



"The New Normal"

-- Conservation Magazine

- Novel ecosystems(Richard Hobbs, 2006)
 - novelty, in the form of new species combinations and the potential for changes in ecosystem functioning
 - human agency, in that these ecosystems are the result of deliberate or inadvertent human action.



Karen Holl Professor of Restoration Ecology University of California Santa Cruz

Novel Ecosystems aren't a Novel Concept

Restorationists have always aimed to restore pre-disturbance condition, but we have long recognized that we're not going to be able to replicate the prior ecosystem for a number of reasons.

The questions we're faced with aren't new, but have become increasingly important and challenging.

- 1. Importance of goal setting
- 2. Challenge of deciding how to allocate scarce restoration resources
- 3. Controversy of moving species and genotypes assisted migration/managed translocation

No easy answers. Need to make decisions thoughtfully and consciously.

Robert Klinger Research Ecologist, USGS Western Ecological Research Center

- 1. Novel (and hybrid) ecosystems are not that novel and are a human concept
 - Climate dynamics
 - Disturbance regime shifts
 - Human alteration
 - What is your point of reference?
 - Moving future targets
- 2. Restoration or ecosystem creation?
 - If you recognize it as "novel" it is probably too late for "restoration"
 - Create and/or maintain desired ecosystem properties
- 3. Ecological ecosystem/community stability
 - Resistance
 - Can you move the ecosystem or community to another state?
 - Resilience
 - Will the undesired ecosystem or community return?
 - Variability
 - How extensive and heterogenous will the desired ecosystem or community properties be?
 - Persistence
 - Can you maintain the desired ecosystem or community properties?







Jutta Burger Senior Ecologist Irvine Ranch Conservancy Orange County

Novel ecosystems are not a lost cause

Our reserves are finite areas often without buffers
Shifts in priorities have implications rarely recognized up front
Novel and hybrid ecosystems provide great opportunities for active and passive restoration experimentation



Lisa Micheli Executive Director Pepperwood Foundation Sonoma County

Due to the coastal-inland pattern, rising temperatures will create novel climates throughout the Bay Area



Several independent approaches to vegetation modeling agree: future climates favor shrub and grassland at the expense of forest TBC3.org

'Random forest' model of CalVeg types 800 m resolution, UCSC regional climate model



Predictive vegetation modeling of Bay Area vegetation 270 m downscaled climate, GFDL mid-century future



Will Cornwell et al. in prep. (UC Berkeley)

Product of July 2010 Pepperwood Meeting

Diana Stalberg et al. 2010 PLoS ONE (PRBO)

The vulnerability of vegetation types is very patchy: high probabilities of change occur where vegetation patches are near the edge of their climate envelope



Land management will determine whether we experience transitions to new native vegetation assemblages vs. alien invasions

Our response to

disease will make

fires, floods,

the difference

vegetation transitions depend on:

- 1) mortality of existing mature plants
- 2) propagule sources for new species







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John Knapp President, Native Range Inc. Santa Barbara

Ecological vs. Conservation Timeline How long did all the King's horses and men "try" to put Humpty back together again?

BEFORE







Sandy DeSimone Director, Research and Education Starr Ranch Sanctuary Orange County

Audubon Starr Ranch"Annual grasses are our friends"1. Coastal sage scrub – model for current decision making. We measure time and
cost effective parameters in experiments and monitoring



2. Grassland - hybrid ecosystem. Justification:

- Annual grass control = new dicot invasives
- Persistence of grasses and songbirds

<u>Goals</u> – enhance to optimum for songbirds <u>Actions</u> – (seasonal field crew)

- a. Monitor long term
 - 1. Plant species richness
 - 2. Stipa pulchra cover and density
 - 3. Two songbird indicators of grassland habitat quality
- b. Mowing experiments
- c. Ongoing nonchemical control dicot non-natives





Where do we go from here?

