Assisted Colonization

Travel

Special Low Rates to CapiSTRANO

3. What do you think about the idea of rewilding? Give one argument in favor and one argument against.
Vocab: Donlan / Hoegh-Guldberg
Building Ecological Resistance & Resilience to Climate Change

• Building resistance requires reducing other global change threats to ecosystems
  – Land use land cover change
  – Invasive species
  – Nutrient pollution
Building Ecological Resistance & Resilience to Climate Change

• Building resilience (*ability to recover from change*) helps ecosystems to change and adapt to climate change
  
  – Non-static ecosystem
  
  – Need different goals than specific species conservation
Increase resilience by increasing diversity

• Types of biological diversity:
  – Species
  – Growth Form
  – Functional (e.g., seed dispersal)
  – Phylogenetic
  – Age
  – Phenology
  – Genetic (within a species)
Increase resilience by increasing connectivity

- Allows for large species movement
- Recolonize small patches (island biogeography)
Increase resilience through replication and redundancy

Preserve multiples of the same ecosystem:

– Range of genetic diversity
– Range of future climate conditions
– Less risk of catastrophic loss
– Opportunities for different management decisions
Assisted Colonization Synonyms

• Managed relocation
• Managed introduction/reintroduction
• Assisted migration
• Assisted translocation
What is Assisted Colonization?

Map based on climatic suitability

Kueppers et al., 2005
What’s wrong with normal migration?

Barriers prevent movement
What’s wrong with normal migration?

Barriers prevent movement

Climate is changing too fast for normal dispersal
Considerations for Assisted Colonization

• Risks to species
  – How likely is extinction?
  – How culturally important is the species?
  – How unique is the species (physiology, functionally, phylogenetically)

American alligator (threatened)  Sandplain agalinis (threatened)
Considerations for Assisted Colonization

• Risks to species

• Risks to recipient ecosystem
  – Will introduction be successful?
  – How unique is the recipient ecosystem?
  – How culturally important is the recipient ecosystem?
  – How likely are negative impacts on the recipient ecosystem?
Species translocations impact recipient ecosystems

Movement within a continent or continent to coastal island (C-CI) has lowest risk

But, still a risk: 15% of species moved within a continent caused a decline of one or more species in the recipient ecosystem.

Ricciardi & Simberloff, 2009
We will make mistakes

Pine marten populations declining in Newfoundland

American red squirrel introduced as food

Squirrel eats spruce cones

Red crossbill nears extinction due to loss of food source
No Action is a management choice

- Habitat Loss
- Extinctions
- Invasion by non-natives
- Change in ecosystem processes

Risk from Not Acting

- Wrong target species
- New invasive species
- Increased disturbance
- Change in ecosystem processes

Risk from Acting
Considerations for Assisted Colonization

• Risks to species
• Risks to recipient ecosystem
• Feasibility & Acceptability
  – Can the target species be easily grown/bred and transplanted/transported?
  – Are there available recipient ecosystems?
  – What cost is involved?
  – Is there public support or opposition?
Visualizing Considerations

What sorts of species do we lose by considering acceptability?

Bay checkerspot butterfly

Richardson et al., 2009
Assisted Migration is Happening

Rewilding *Torreya taxifolia* to Waynesville, North Carolina, July 2008

31 potted seedlings planted into natural forest habitats

photo-essay by Connie Barlow

Feature Article
Audubon Magazine
May/June 2010:
"Guardian Angels"
Assisted colonization on private lands

Native range of Rock soapwort (*Saponaria ocymoides*) in Europe

- Nurseries selling that plant in Europe

Van der Veken et al., 2008
Assisted colonization on private lands

- Expanded ranges for ornamental plants (many non-native)
- We can plant whatever we want on private land

Expanded north via horticulture

Van der Veken et al., 2008
Assisted colonization on public lands?

• Endangered Species Act (ESA) focuses Federal conservation efforts on specific species

• How might ESA affect assisted colonization?

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<tr>
<th>Acceptability</th>
<th>Feasibility</th>
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<td>Risk to species</td>
<td>Risk to recipient ecosystems</td>
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Pleistocene Rewilding of N. America

Large Mammals of Pleistocene North America

Xenarthra
- Glyptodont (Glyptotherium floridanum)
- Harlan's ground sloth (Paramylodon harlani)
- Jefferson's ground sloth (Megalonyx jeffersonii)
- Shasta ground sloth (Nothrotheriops shastensis)

Carnivores (Carnivora)
- Dire wolf (Canis dirus)
- Gray wolf (Canis lupus)
- Black bear (Ursus americanus)
- Brown bear (Ursus arctos)
- Giant short-faced bear (Arctodus simus)
- Saber-toothed cat (Smilodon fatalis)
- American lion (Panthera leo)
- Jaguar (Panthera onca)
- American cheetah (Miracinonyx trumani)
- Mountain lion (Puma concolor)

Elephants (Proboscidea)
- American mastodon (Mammut americanum)
- Columbian mammoth (Mammuthus columbi)
- Dwarf mammoth (Mammuthus exilis)
- Woolly mammoth (Mammuthus primigenius)

Horses (Perissodactyla)
- Mexican horse (Equus conversidens)
- Western horse (Equus occidentalis)
- Other extinct horses and asses (Equus spp.)

Even-Toed Ungulates (Artiodactyla)
- Western camel (Camelops hesternus)
- Long-legged llama (Hemiauchenia macrocephala)
- Long-nosed peccary (Mylolhyus nasutus)
- Flat-headed peccary (Platygonus compressus)
- Mule deer (Odocoileus hemionus)
- White-tailed deer (Odocoileus virginianus)
- Mountain deer (Navahoceros fricki)
- Woodland caribou (Rangifer tarandus)
- Moose (Alces alces)
- Wapiti (Cervus elaphus)
- Pronghorn (Antilocapra americana)
- Harrington's mountain goat (Oreamnos harringtoni)
- Mountain goat (Oreamnos americanus)
- Bighorn sheep (Ovis canadensis)
- Shrub ox (Euceratherium collinum)
- Bonnet-headed musk ox (Bootherium bombycinos)
- Bison (Bison bison)
- Extinct bison (Bison spp.)

Red = extinct
Wild Animal Park + Conservation Science?

How much do we love large animals?
Endangered species: Gray wolf

• Conflict with cattle and sheep ranchers over livestock kills
• Delisted in 2011 in ID, MT, and parts of OR, WA & UT
Conflicts with Megafauna – what are we willing to give up for animals?

Crops destroyed by elephants in Sumatra

Human elephant conflict in Sri Lanka
Book recommendation

What sorts of wilderness do we want?
Discussion: When is assisted colonization acceptable?

![Decision Tree](chart.png)

Hoegh-Guldberg et al., 2008