Do we need new practices to direct change?

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Thanks to the Dena’ina and Alutiiq people
Case study: Ecological transformation on the Kenai Peninsula
Ecological transformation on the Kenai

Warming, drying climate.
Regional, epidemic beetle outbreak
Stand-level mortality. Forest canopy loss.
Grass cover increased. Spruce recruitment decreased.
New spring fires

Lutz Spruce forest

Bluejoint grassland
Tustumena Lake Fire 2019
1900 - 68 cm, 2.3° C
1980 - 73 cm, 3.3° C
2090 - 84 cm, 6.8° C

1900 - 68 cm, 2.3° C
1980 - 73 cm, 3.3 ° C
2090 - 84 cm, 6.8 ° C
What can fill the opening climate niche?

- Some species restricted by peninsular geography and proximity of analog grassland climate
- Some species facilitated by human vectors (invasives and transplants)

What, if anything, should we do?
Kenai National Wildlife Refuge purpose is “to conserve fish and wildlife populations and habitats in their natural diversity”
Historical Condition Response?

Resist

Plant beetle and drought resistant spruce and boreal deciduous

CURRENT TRAJECTORY (ACCEPT)
How to Shape the Future? Our refuge purpose is Natural Diversity.

Could this novel system be stewarded towards one that is more diverse?
Direct novel grassland or novel forest?

**Direct**

- **CURRENT TRAJECTORY (ACCEPT)**
  - FOREST
  - LODGEPOLE PINE
  - BLACK-TAILED DEER
  - INTRODUCED GRAZERS
  - GRASS
  - PRESCRIBED FIRE

**TIME**

- **DECREASING UNCERTAINTY BUT REDUCED OPPORTUNITY TO STEWARD THE OUTCOME**

**BIODIVERSITY**
Adaptive management loops

What do we need to direct change?

Preparation for the outer loop

Can intervention be used to shape future conditions?
- RAD framework;
- RAD action.

What is the regional conservation strategy in the future?
- Portfolios.

What ecological futures are possible?
- Continental re-sorting;
- Range of plausible ecological trajectories.

Implementation of Climate Adaptation Strategies

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What ecological futures are possible?

Can interventions be used to shape future conditions?

### RAD Framework & RAD Action

#### Management Trigger

<table>
<thead>
<tr>
<th>Management Trigger</th>
<th>Tips Toward</th>
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<tbody>
<tr>
<td>Fire return interval drops below 30 years</td>
<td>Grassland trajectory</td>
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<tr>
<td>Seedling or sapling mortality event</td>
<td>Grassland trajectory or temperate forest trajectory</td>
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<tr>
<td>Sitka black-tailed deer establish population</td>
<td>Temperate forest trajectory</td>
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**RAD Framework**

- **RESIST**
  - Black-tailed deer
  - Current trajectory (deforestation)
- **ACCEPT**
  - Situation or temperate forest trajectory
- **DIRECT**
  - Sitka black-tailed deer establish population
  - Introduced grazers
  - Prescribed fire

**References**


What is the regional conservation strategy in the future?

Is the “prairie and grassland” climate signal a local anomaly or regional trend?

Scanning the future for options to build an adaptation portfolio as change unfolds.
What is the regional conservation strategy in the future?

Pathway planning

- Identify triggers for action
- Identify the political, legal, economic, technical, and other barriers to action so that they can be proactively addressed
- Identify steps needed to get to desired future or avoid maladaptive outcome
- Explore how choices today limit future options
- Identify transformative options

Four “Foundations” for managing change

1. the range of plausible ecological trajectories (a) – *What ecological futures are possible?*

2. pathway planning to achieve **desired conditions** (b, c) – *Can intervention be used to shape future conditions?*

3. portfolio design (d) – *What is the regional conservation strategy in the future?*

4. upstream, deliberative engagement (e)

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