Do we need new practices to direct change?

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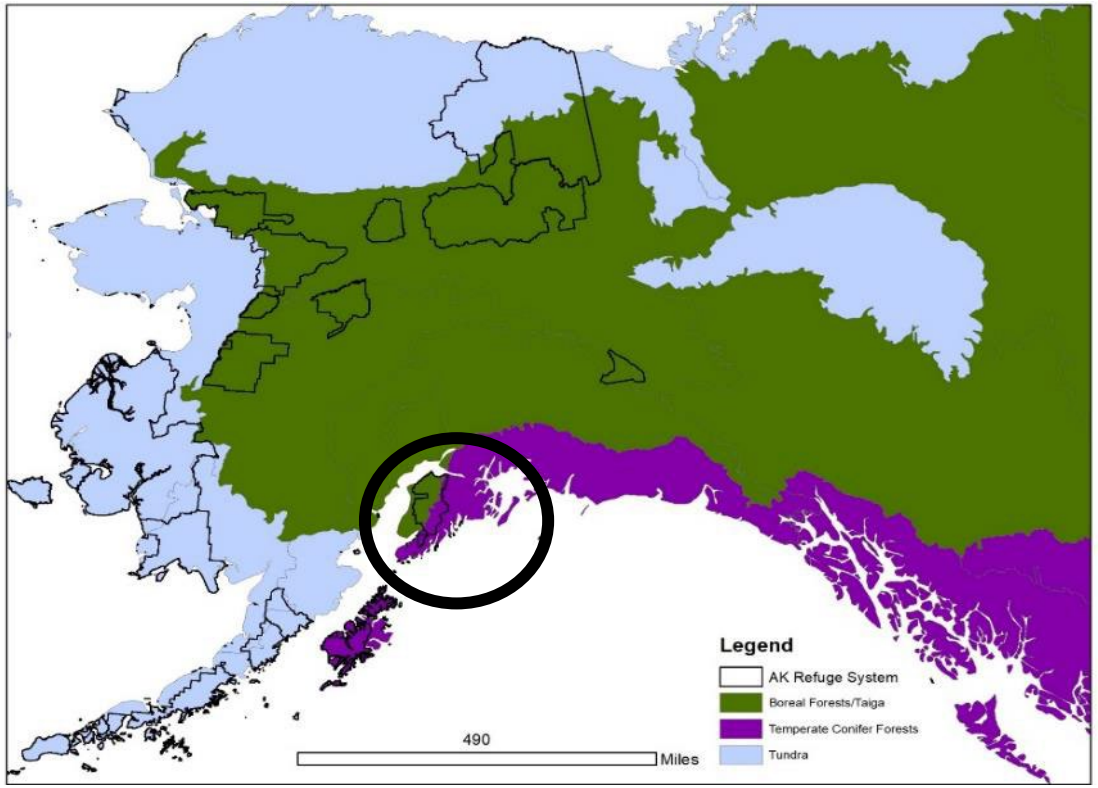
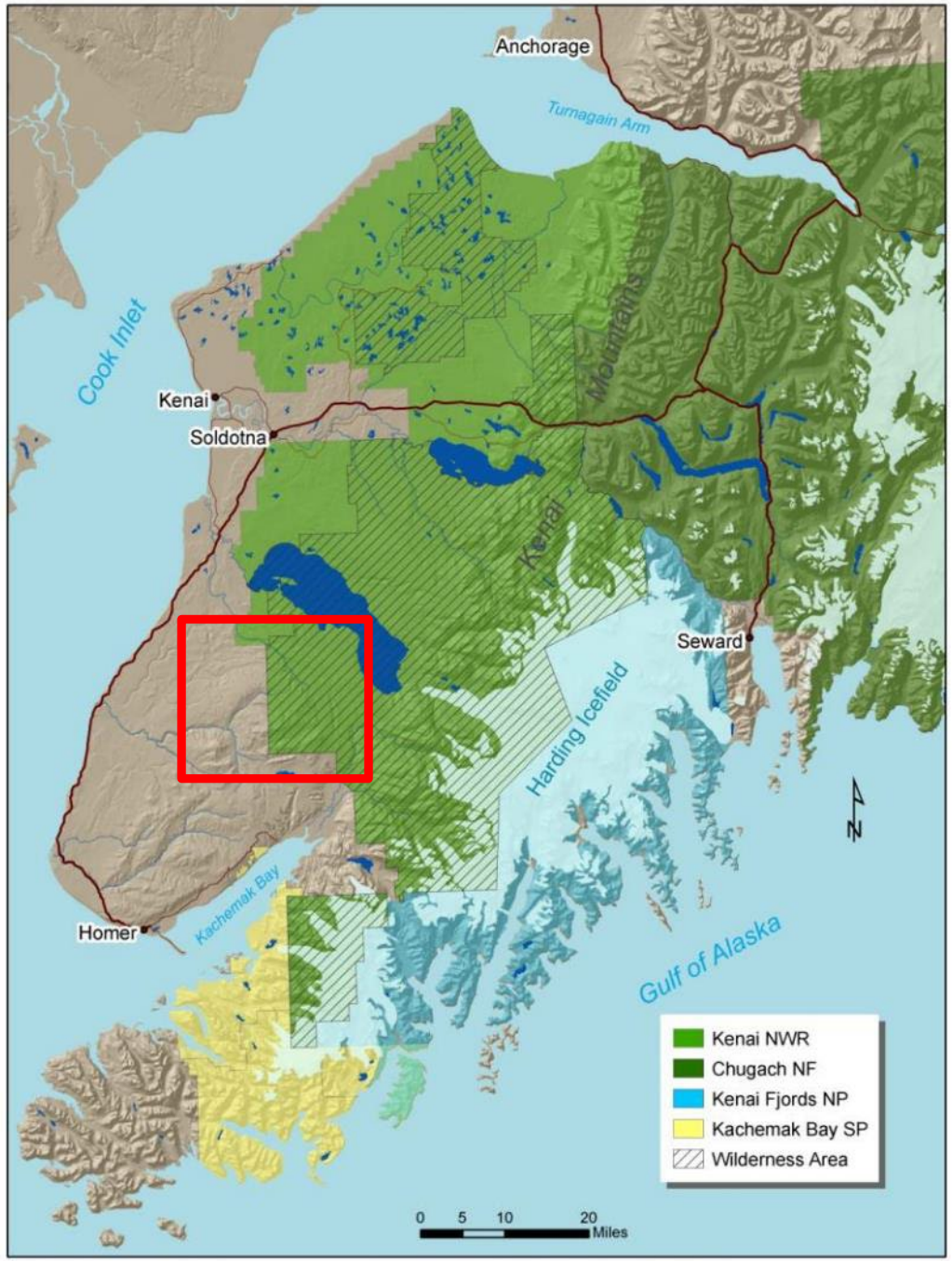
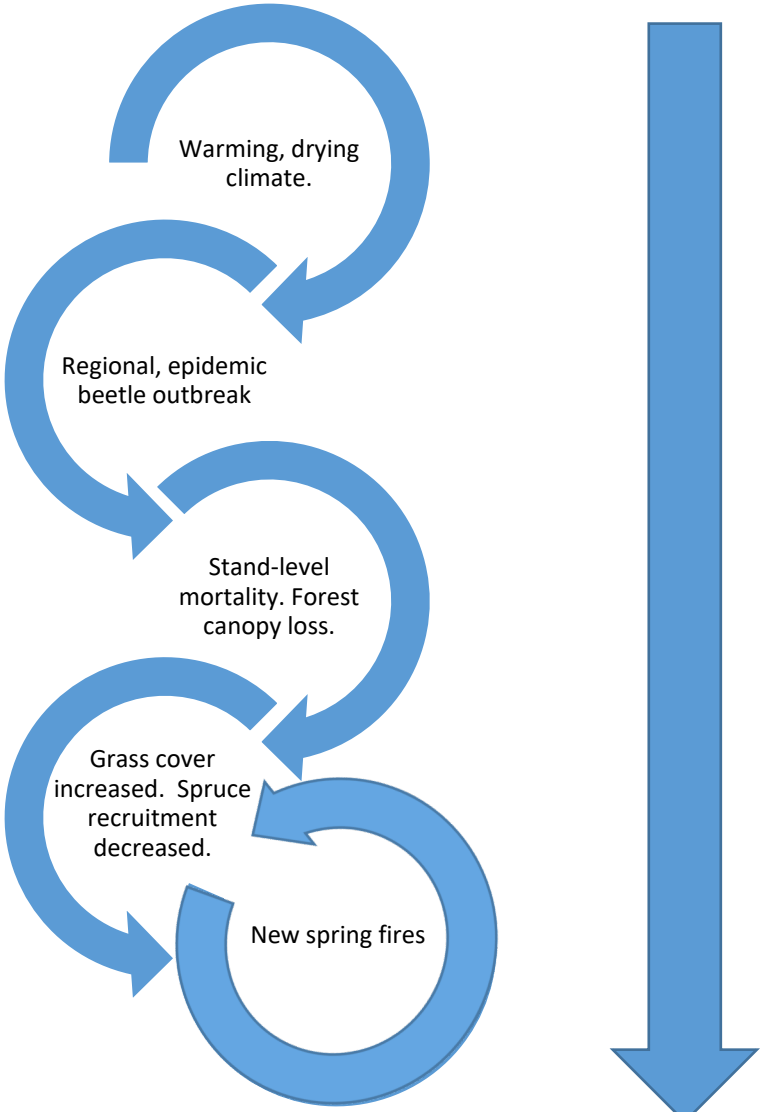
Thanks to the
Dena'ina and Alutiiq
people

Case study: Ecological transformation on the Kenai Peninsula



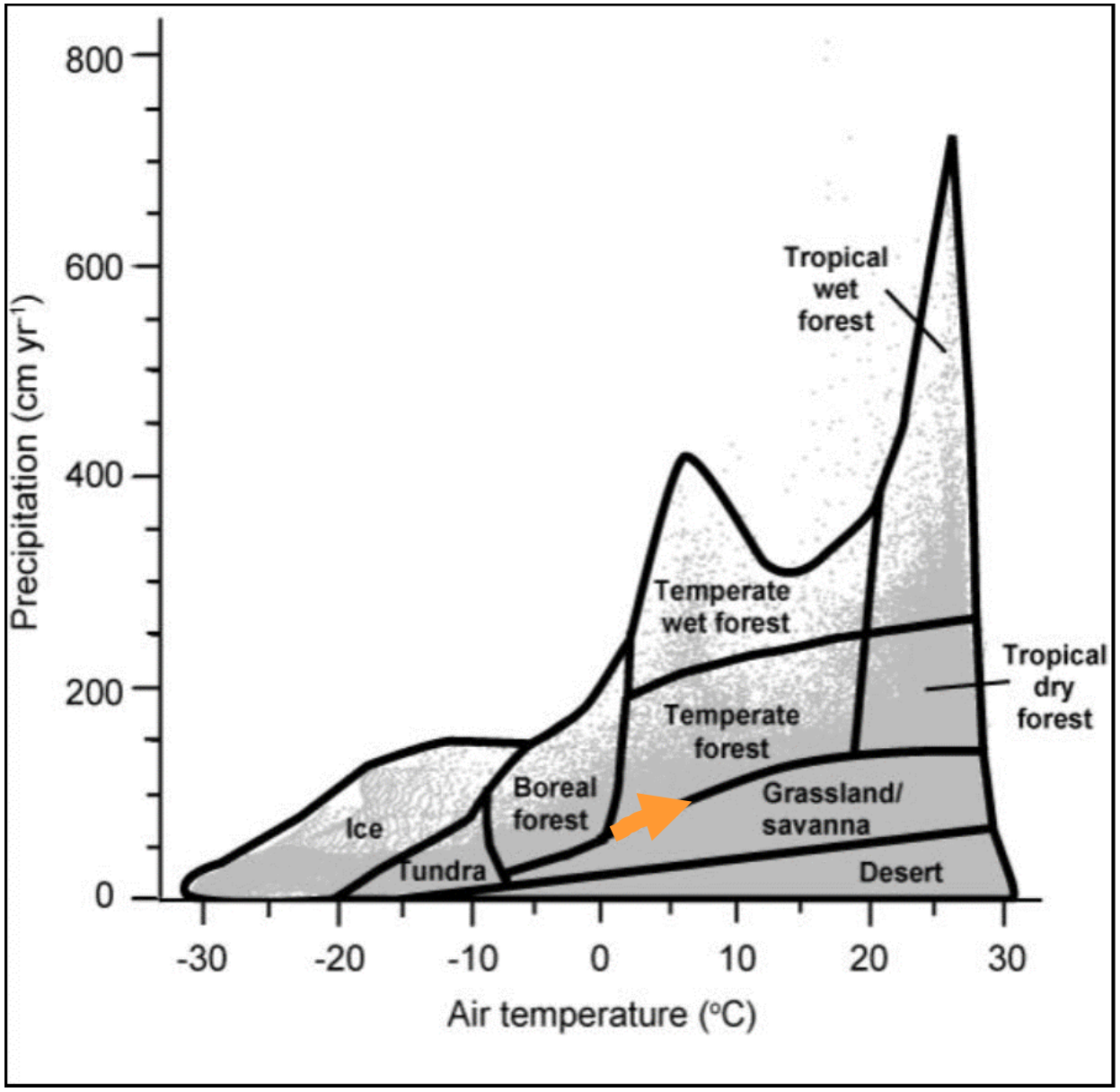


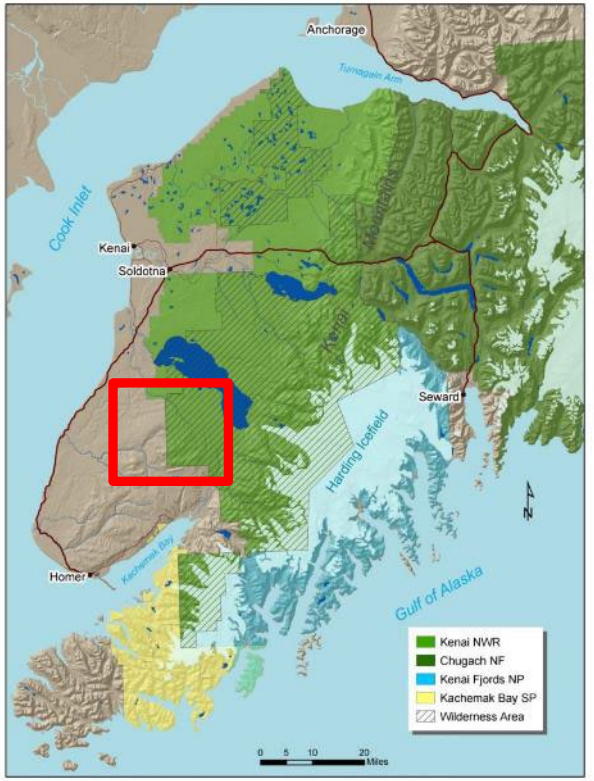
Ecological transformation on the Kenai



Caribou Hills Fire 2007

Tustumena Lake Fire 2019



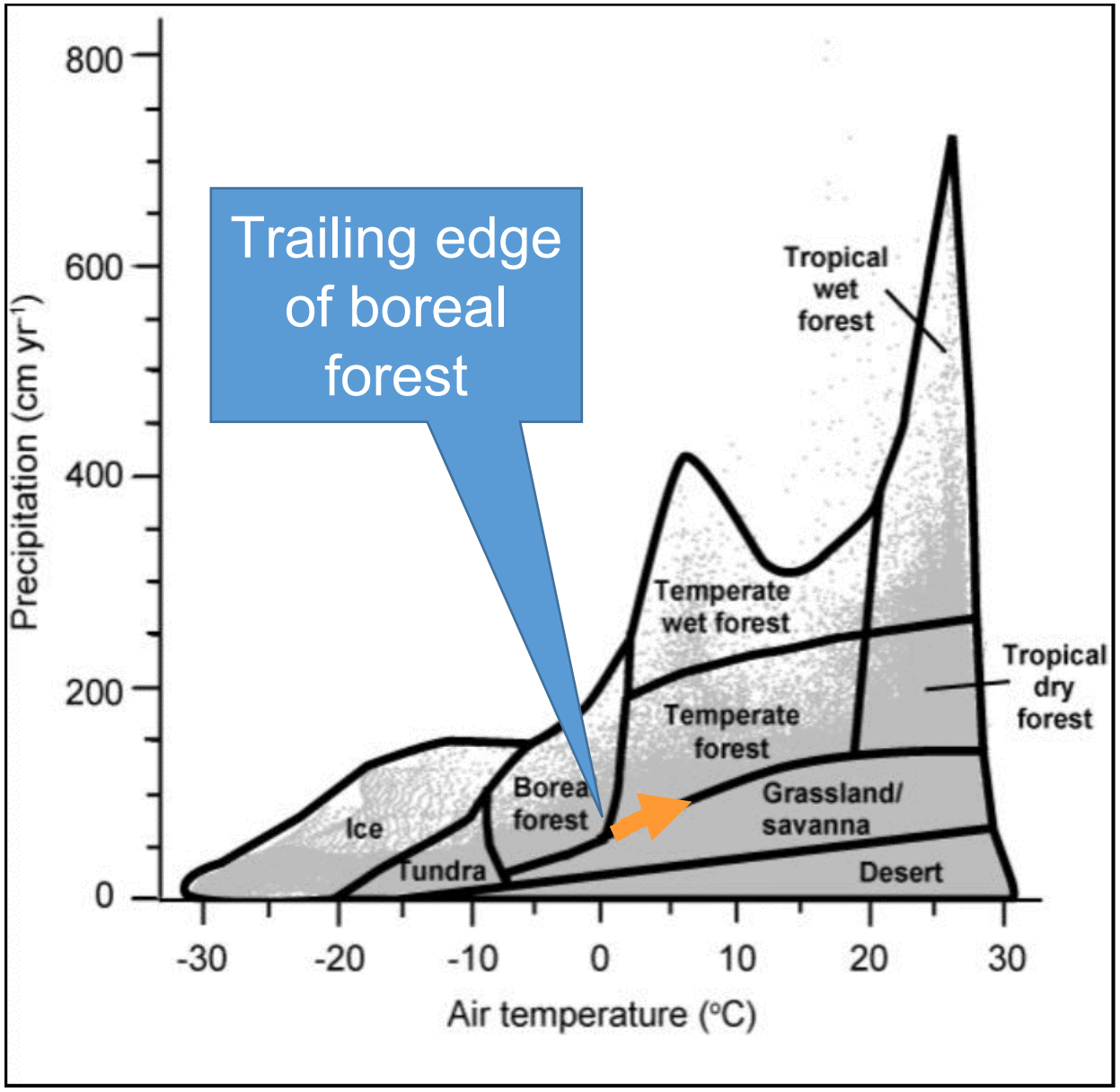


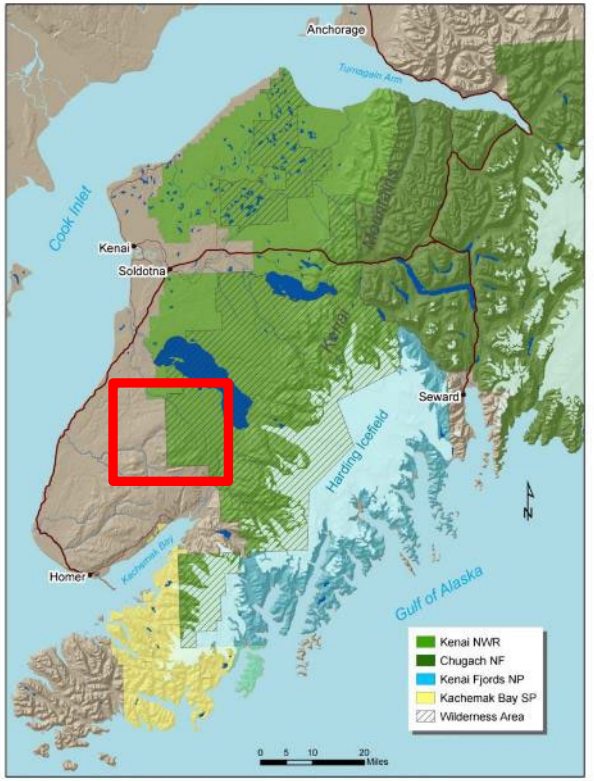
1900 - 68 cm, 2.3° C

1980 - 73 cm, 3.3 ° C

2090 - 84 cm, 6.8 ° C

Staudinger et al. 2012. Impacts of Climate Change on Biodiversity, Ecosystems, and Ecosystem Services: Technical Input to the 2013 National Climate Assessment. Cooperative Report to the 2013 National Climate Assessment.





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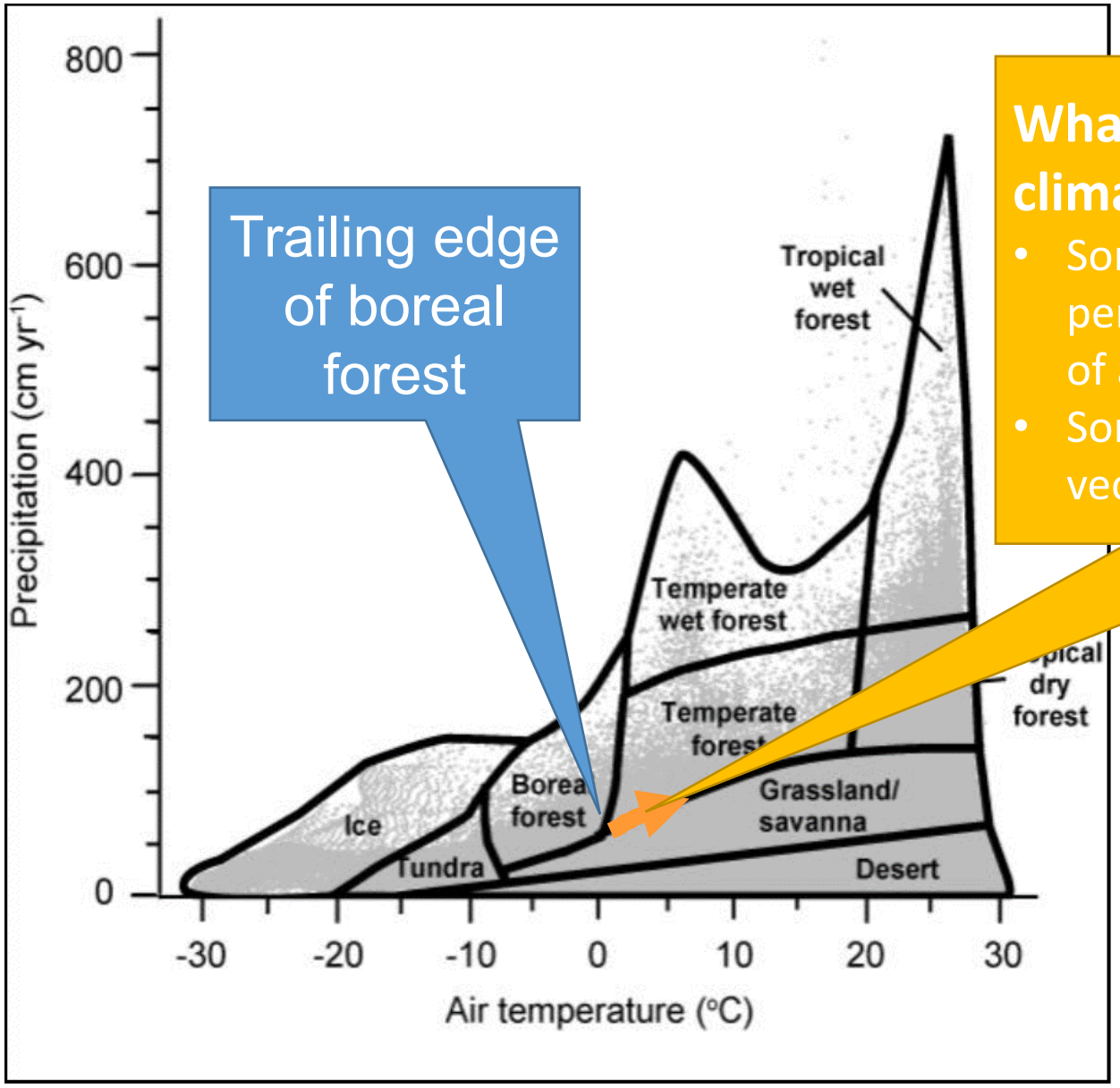
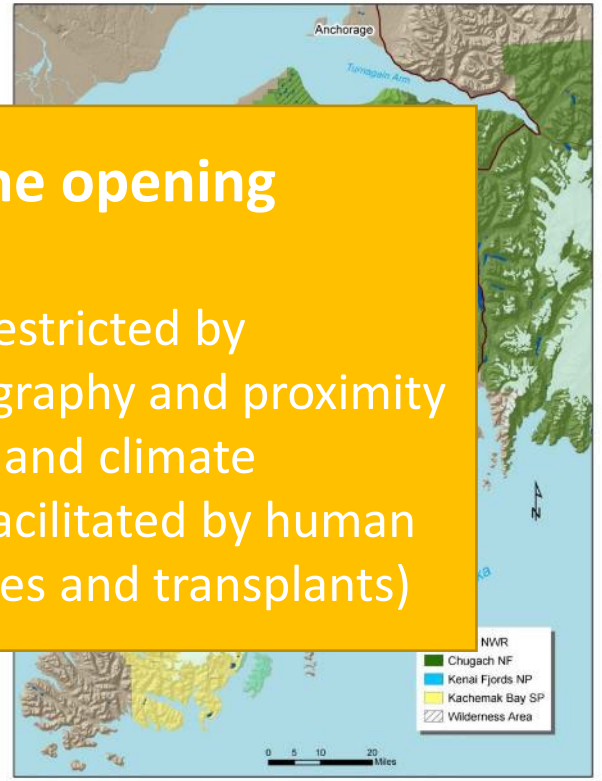


What can fill the opening climate niche?

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



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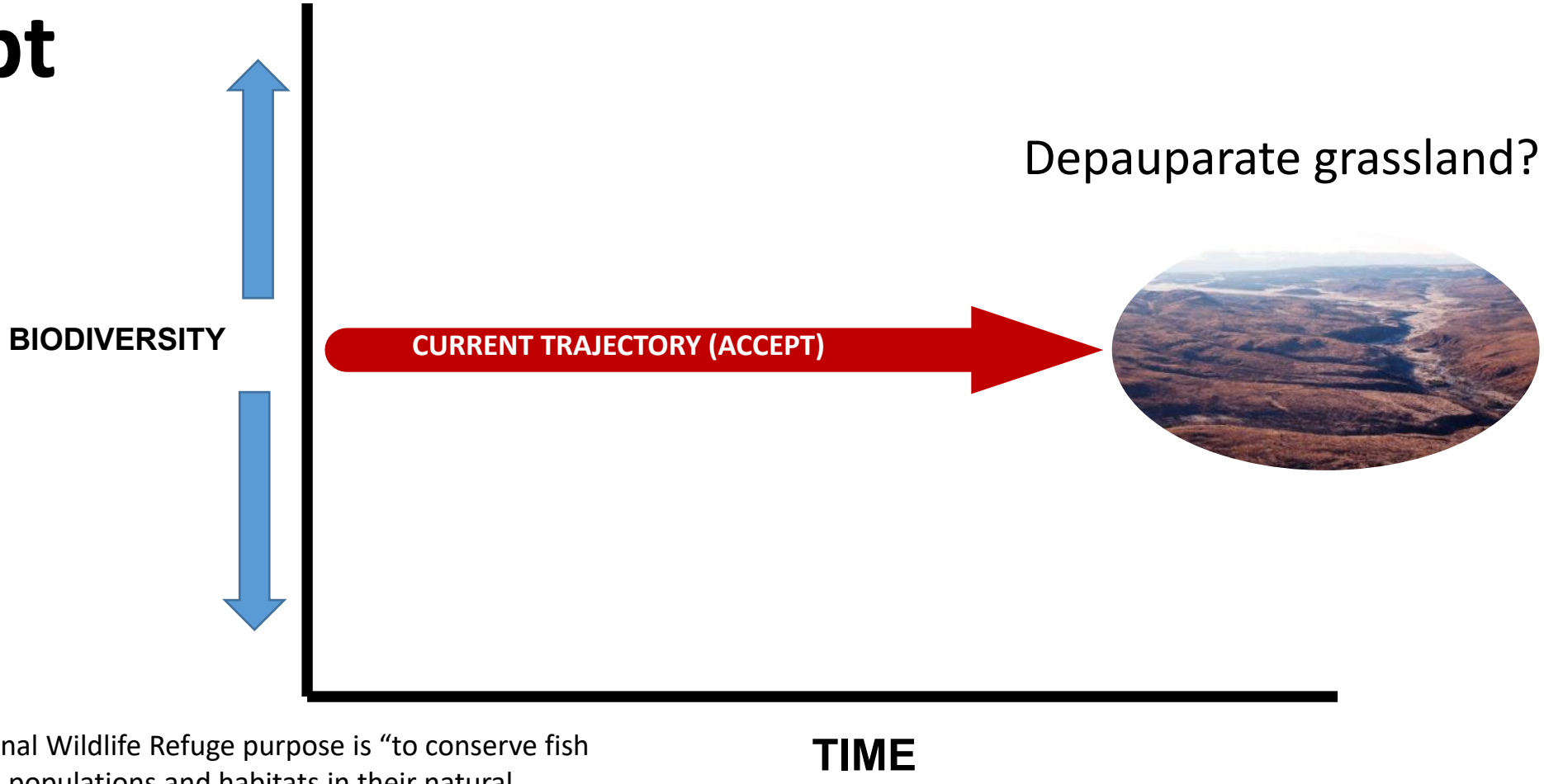
What, if anything, should we do?

Naturalness response?

Accept



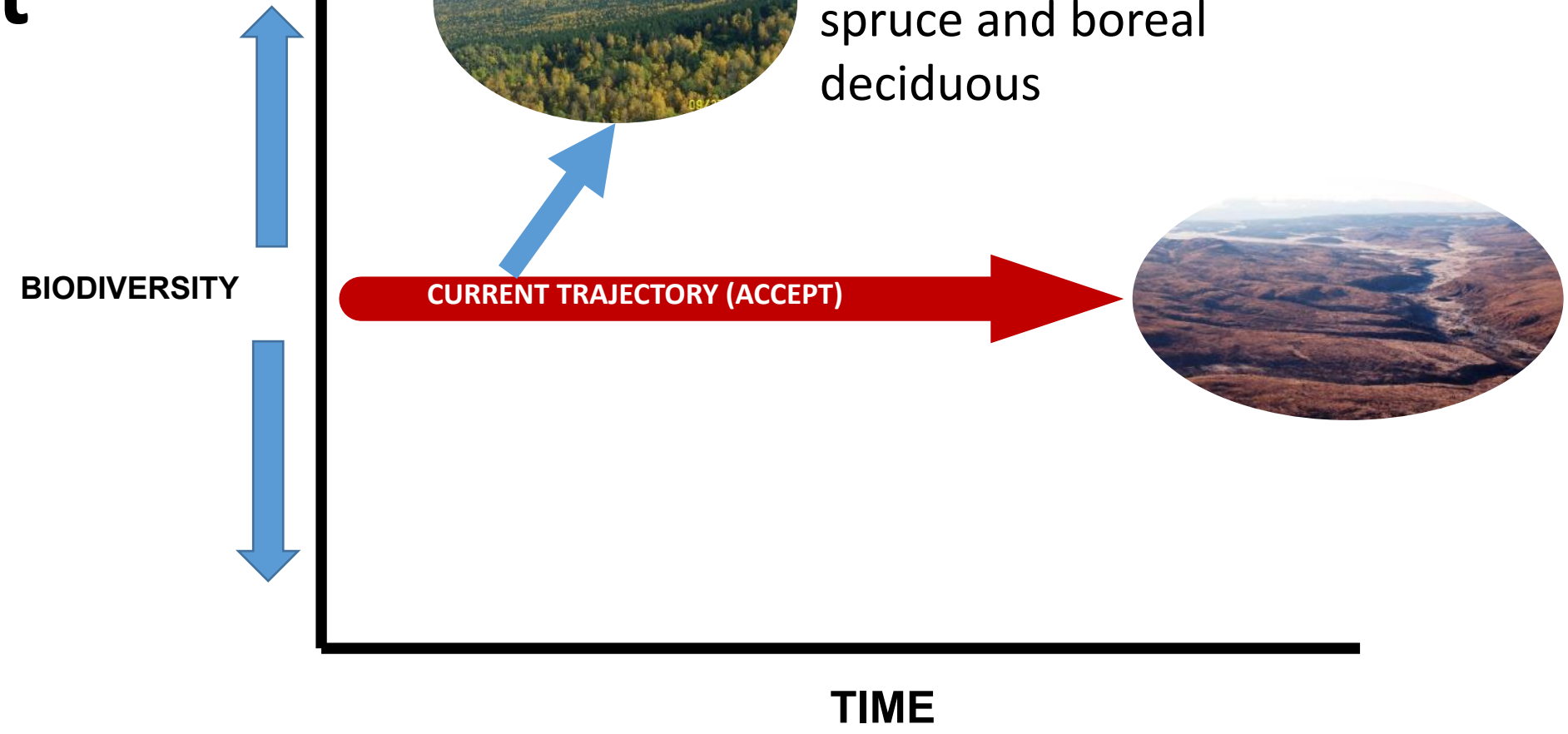
Depauparate grassland?

Kenai National Wildlife Refuge purpose is “to conserve fish and wildlife populations and habitats in their natural diversity”

Historical Condition Response?

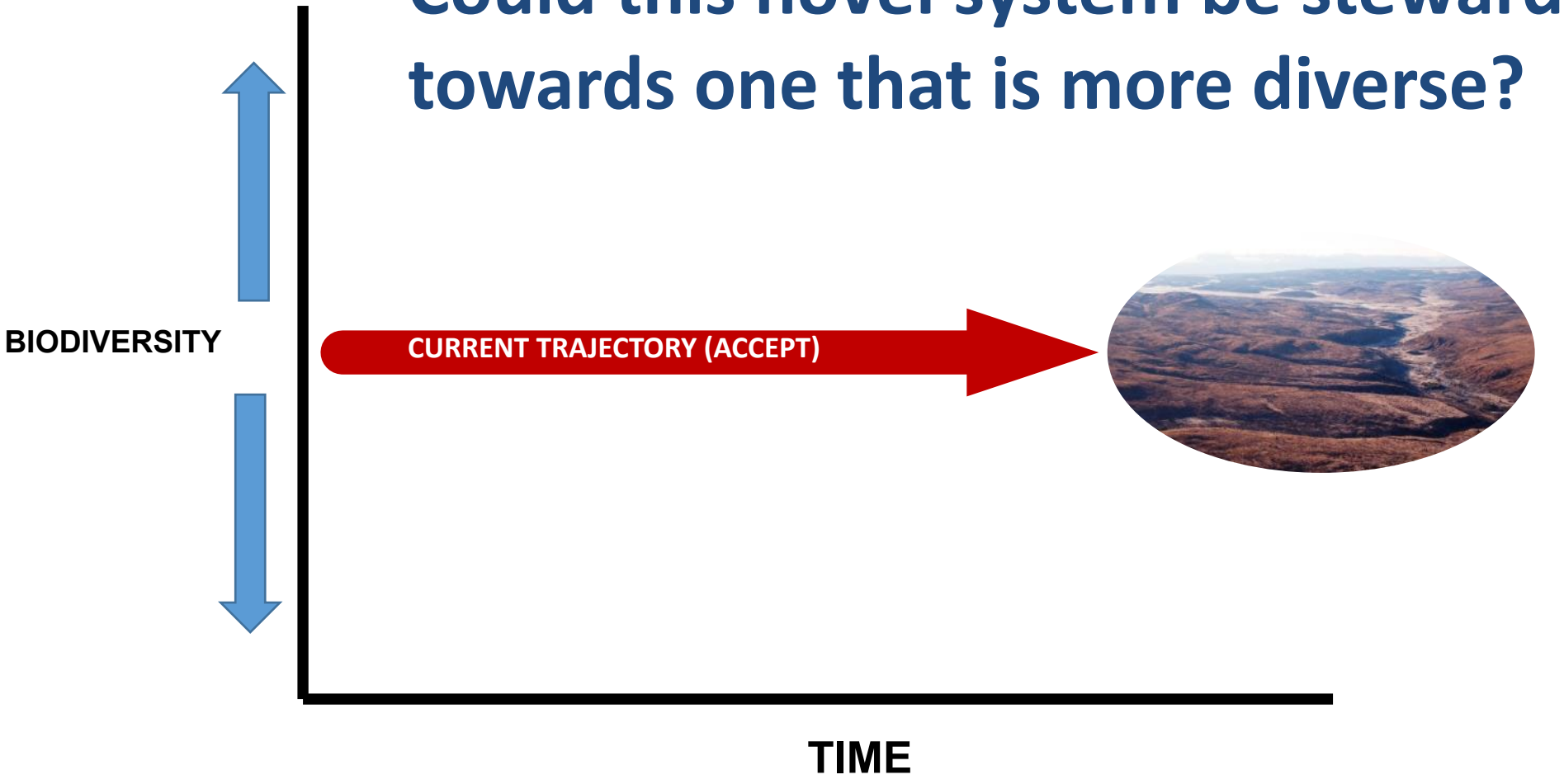
Resist

Plant beetle and drought resistant spruce and boreal deciduous



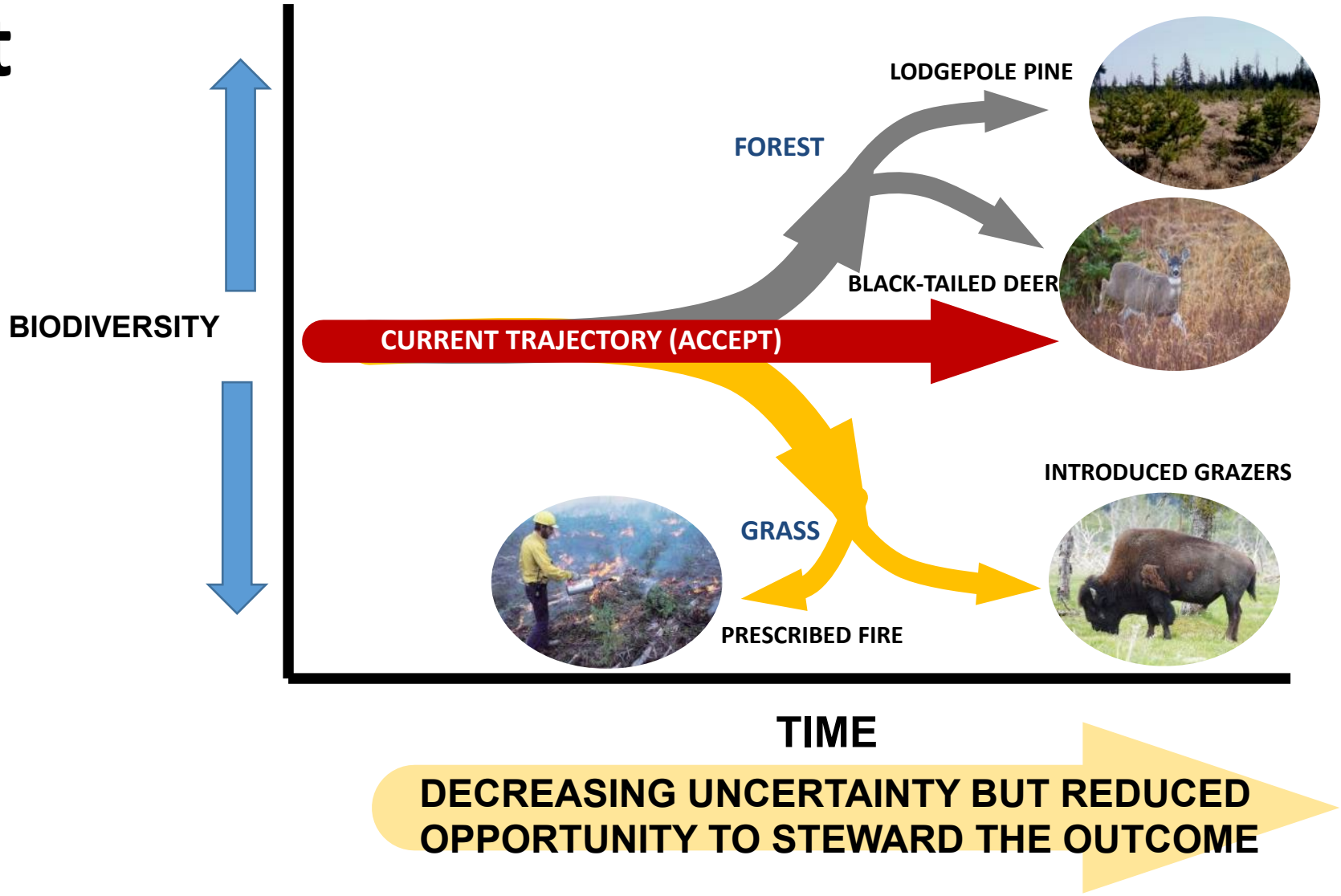
How to Shape the Future? Our refuge purpose is Natural Diversity….

Could this novel system be stewarded towards one that is more diverse?



Direct novel grassland or novel forest?

Direct



Adaptive management loops

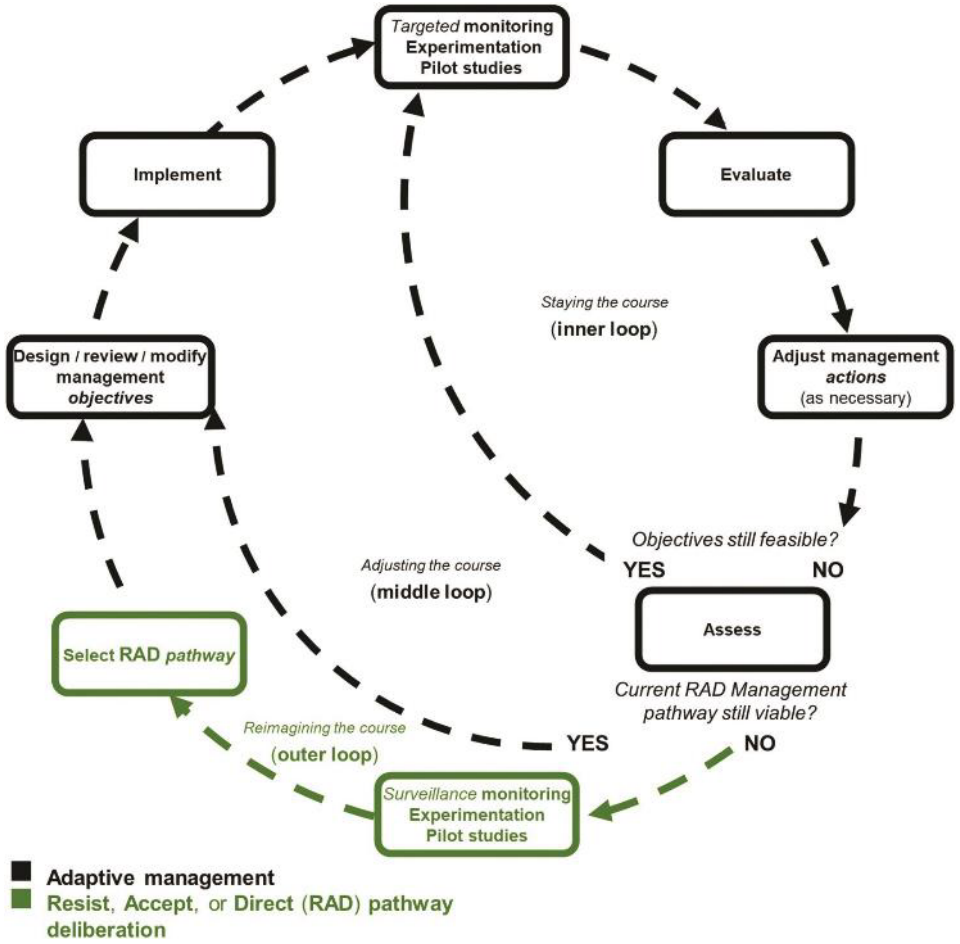


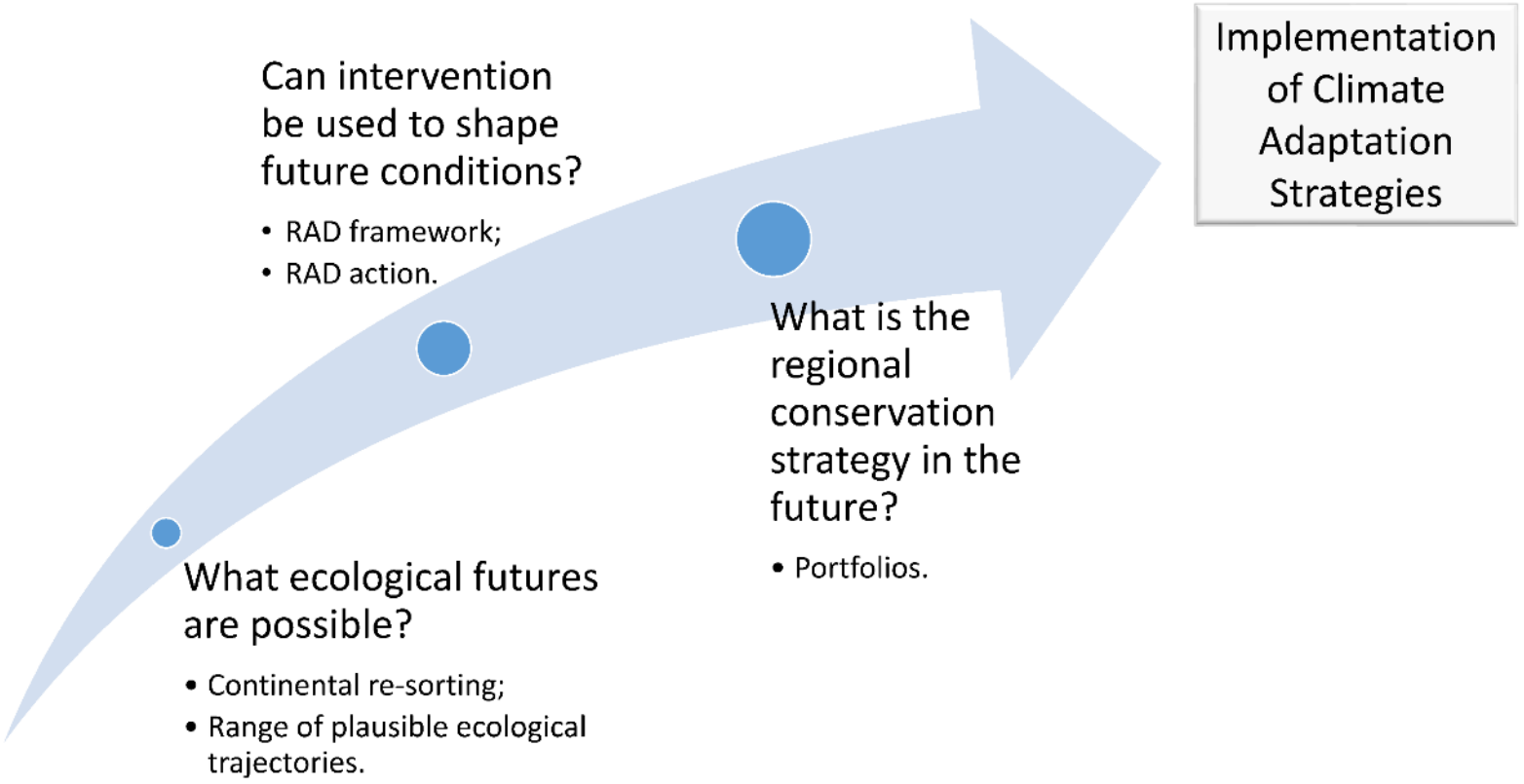
Table 1. Loops within the resist–accept–direct (RAD) adaptive-management framework with their purpose, typical actors, iteration frequency, and potential information-gathering approaches that can be used for navigating the loops.

Loop	Purpose	Actors	Relative iteration frequency	Information gathering approaches
Outer Reimagining the course	Navigate the existing knowledge base to identify desired ecosystem futures and relevant RAD strategies given ecological, economic, and social constraints	Policy makers, stakeholders, managers		*Surveillance* monitoring to refine plausible future trajectories, experiments and pilot studies to examine potential RAD pathway changes
Middle Adjusting the course	Develop management objectives under the current RAD pathway in order to achieve desired ecosystem futures	Stakeholders, managers		*Targeted* monitoring to identify ecological tipping points, experiments to examine system thresholds
Inner Staying the course	Implement, monitor, evaluate, and adjust actions to iteratively improve management effectiveness and achieve management objectives	Managers		*Targeted* monitoring to evaluate progress toward management objectives, pilot studies and experimentation to test alternative management actions

Note: Although we depict iterations occurring at regular frequencies, the middle- and outer-loop iterations may be triggered by regular revisit schedules, detected by crossed thresholds, or linked to contingencies defined through planning processes.

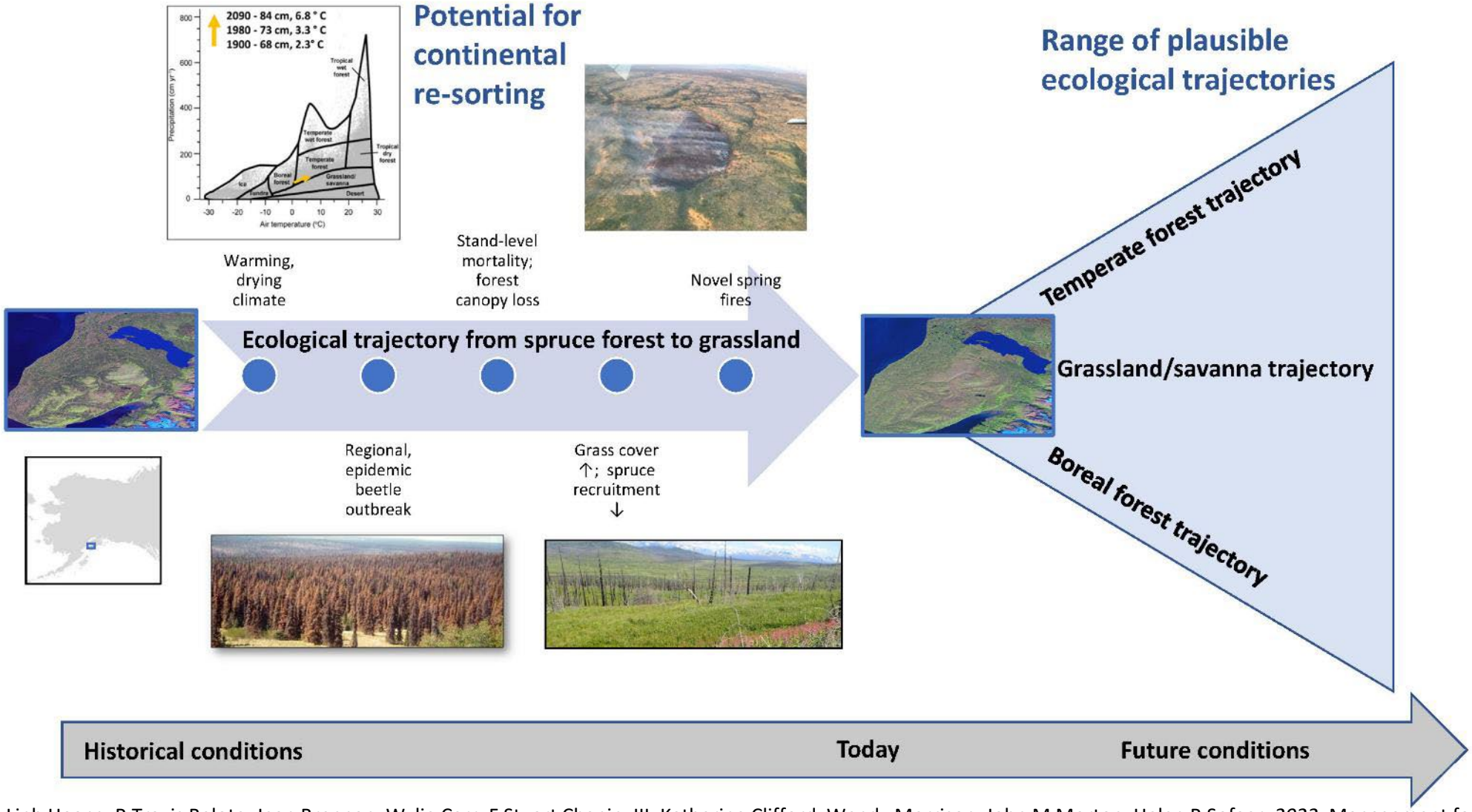
Lynch, Abigail J., Laura M Thompson, John M Morton, Erik A Beever, Michael Clifford, Douglas Limpinsel, Robert T Magill, Dawn R Magness, Tracy A Melvin, Robert A Newman, Mark T Porath, Frank J Rahel, Joel H Reynolds, Gregor W Schuurman, Suresh A Sethi, Jennifer L Wilkening, RAD Adaptive Management for Transforming Ecosystems, BioScience, Volume 72, Issue 1, January 2022, Pages 45–56, https://doi.org/10.1093/biosci/biab091

What do we need to direct change? Preparation for the outer loop



Magness, Dawn R., Ella Wagener, Emily Yurcich, Ryan Mollnow, Diane Granfors, and Jennifer L. Wilkening. 2022. "A Multi-Scale Blueprint for Building the Decision Context to Implement Climate Change Adaptation on National Wildlife Refuges in the United States" *Earth* 3, no. 1: 136-156. https://doi.org/10.3390/earth3010011

What ecological futures are possible?



- Magness, Dawn R., Linh Hoang, R Travis Belote, Jean Brennan, Wylie Carr, F Stuart Chapin, III, Katherine Clifford, Wendy Morrison, John M Morton, Helen R Sofaer. *2022.* Management foundations for navigating ecological transformation by resisting, accepting, or directing social-ecological change. Bioscience 71.30-44 https://doi.org/10.1093/biosci/biab083
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Can interventions be used to shape future conditions?

RAD Framework & RAD Action

Management Trigger	Tips Toward
Fire return interval drops below 30 years	Grassland trajectory
Seedling or sapling mortality event	Grassland trajectory or temperate forest trajectory
Sitka black-tailed deer establish population	Temperate forest trajectory

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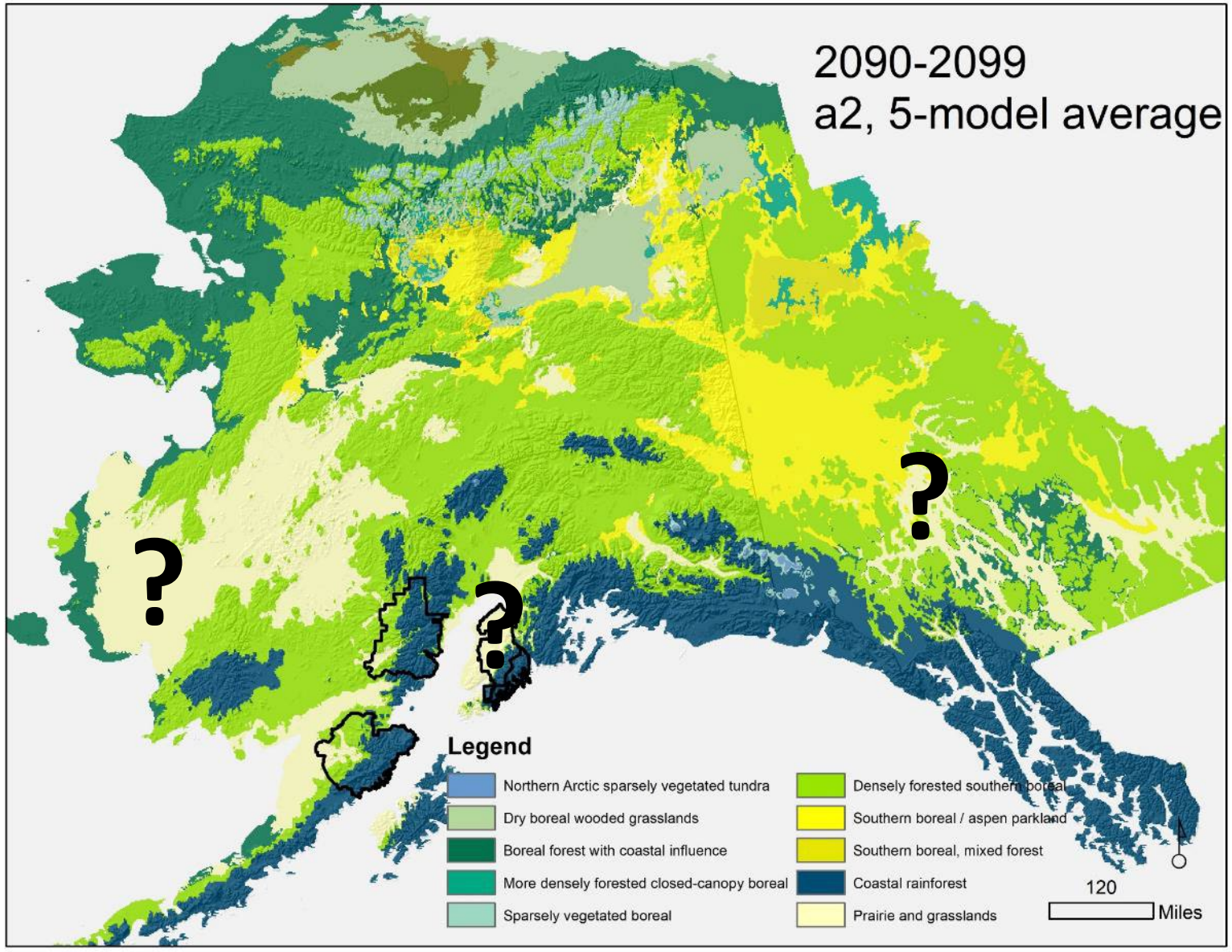
What is the regional conservation strategy in the future ?

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



SNAP-EWHALE. Predicting future potential climate-biomes for the Yukon, Northwest Territories and Alaska [Internet]. University of Alaska Fairbanks, Fairbanks: Scenarios Network for Arctic Planning, and Ecological Wildlife Habitat Data Analysis for the Land and Seascape Laboratory; 2012. Available from: http://www.snap.uaf.edu/attachments/Cliomes-FINAL.pdf

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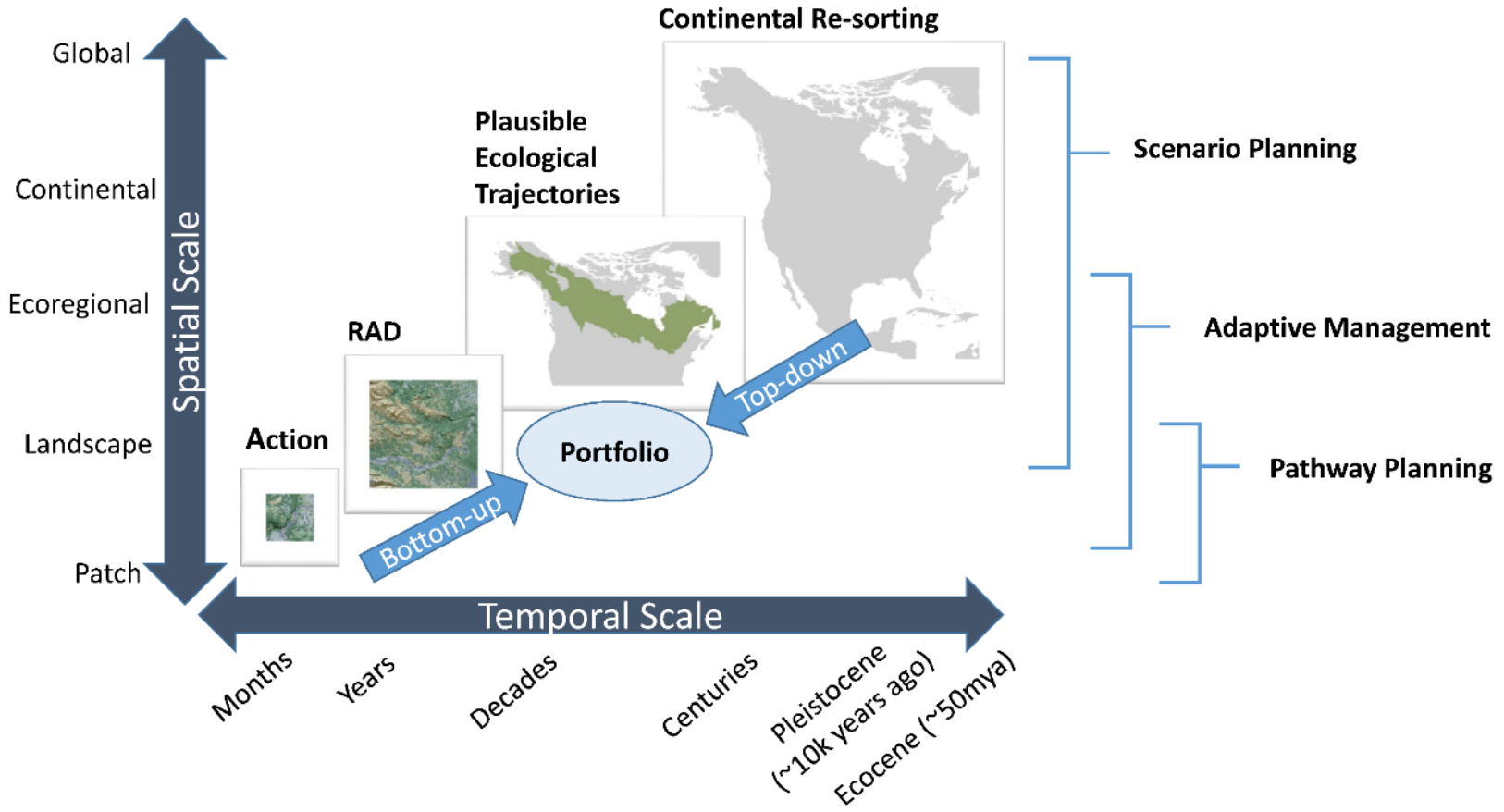

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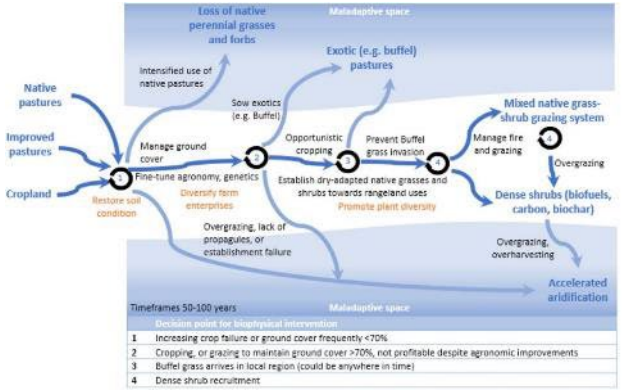
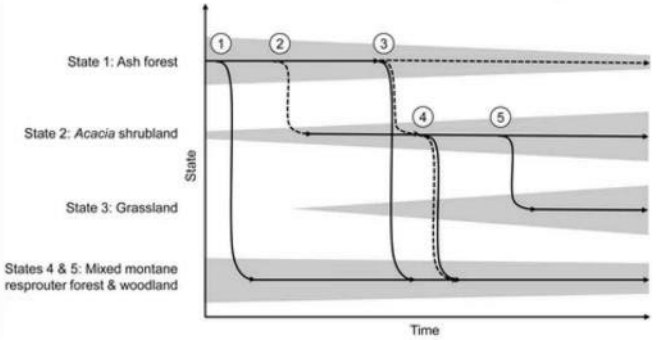
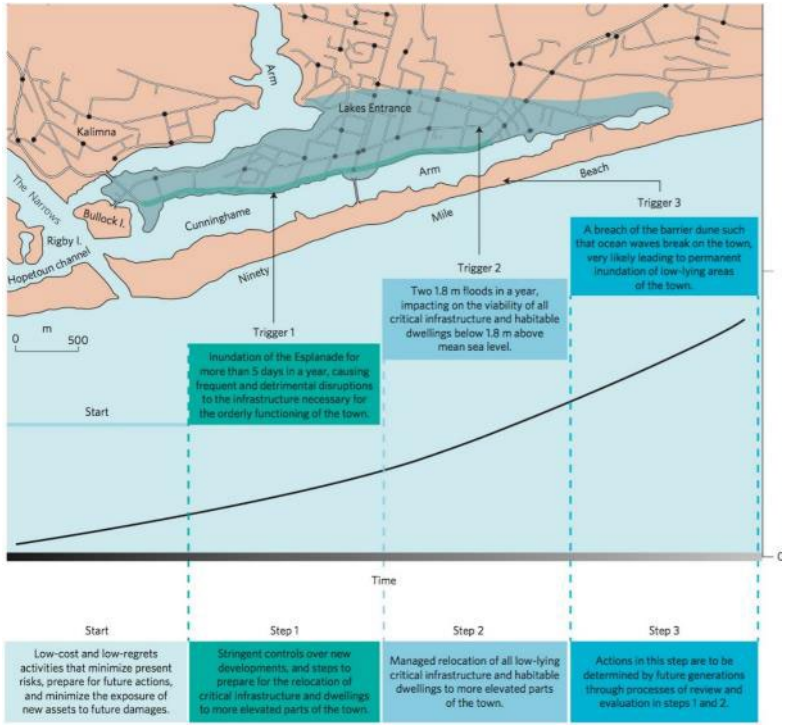
Pathway planning





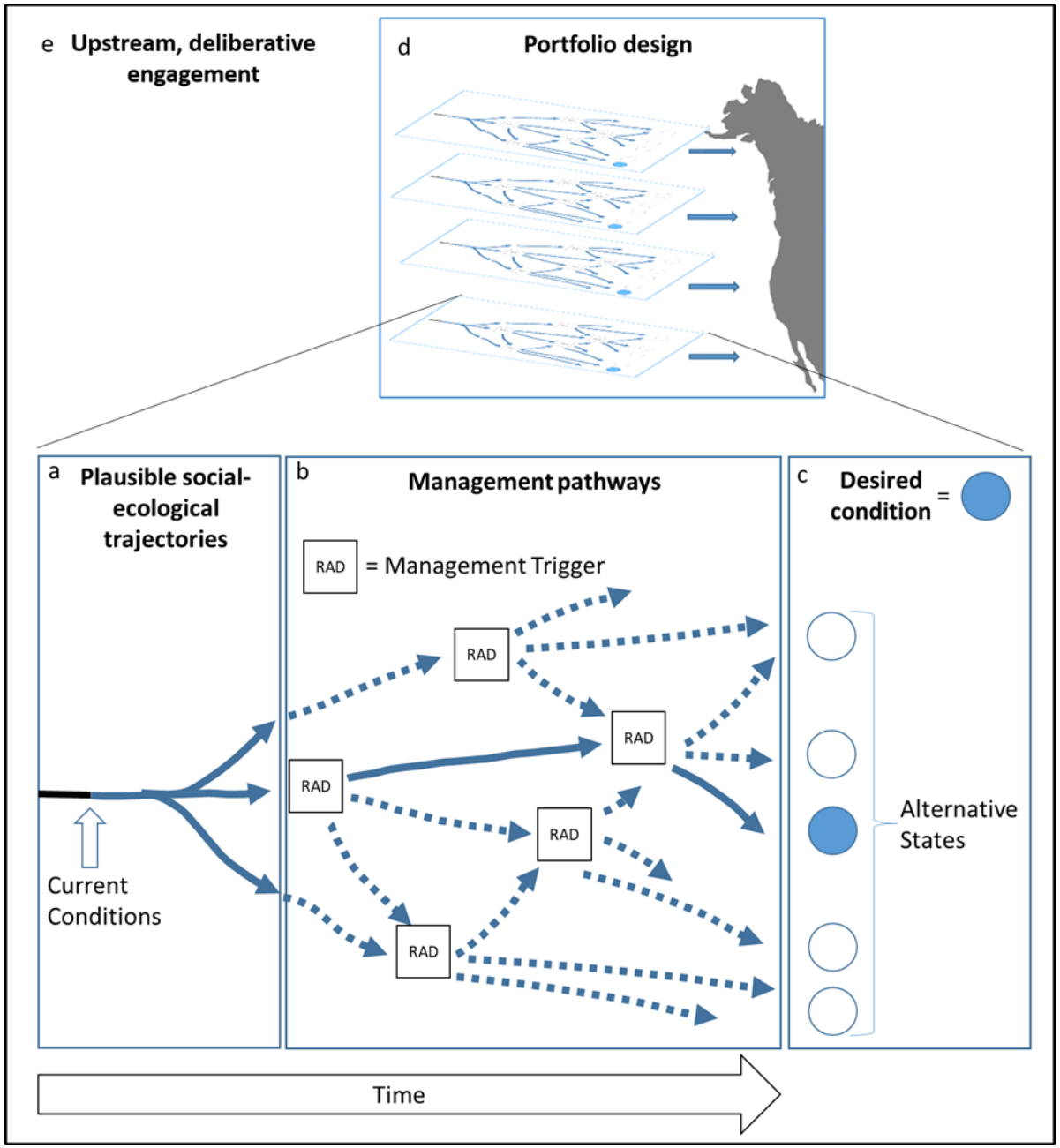
- Identify triggers for action
- Identify the political, legal, economic, technical, and other barriers to action so that they can be proactively addressed
- Identify steps needed to get to desired future or avoid maladaptive outcome
- Explore how choices today limit future options
- Identify transformative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



Werners, S.E., Wise, R.M., Butler, J.R., Totin, E. and Vincent, K., 2021. Adaptation pathways: A review of approaches and a learning framework. Environmental Science & Policy, 116, pp.266-275.

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)



Actual picture of me considering how to choose something other than historical condition

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