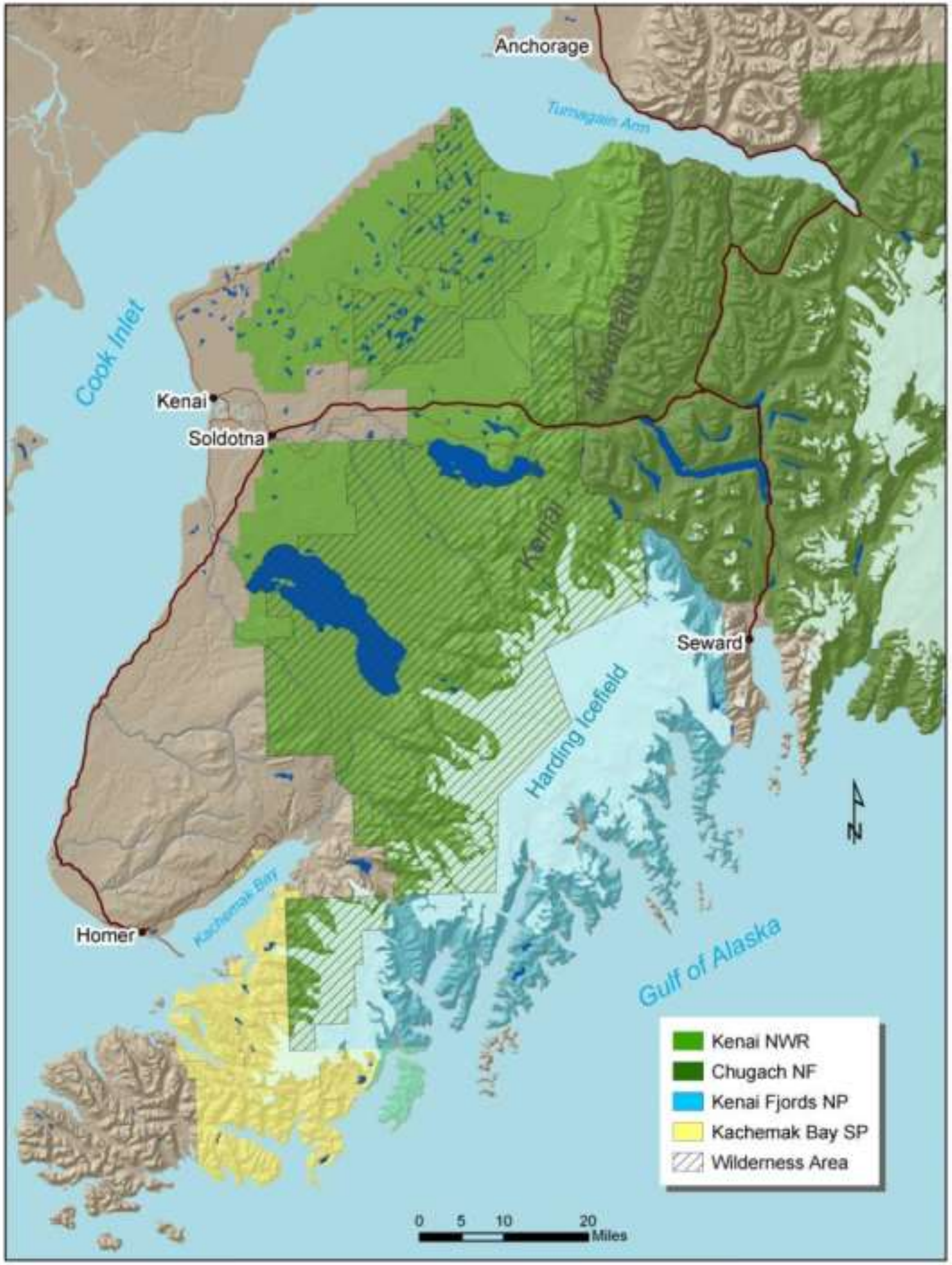
Which Kenai Peninsula?

The case for doing nothing versus doing something

John Morton

U.S. Fish & Wildlife Service

Alaska Wildlife Alliance



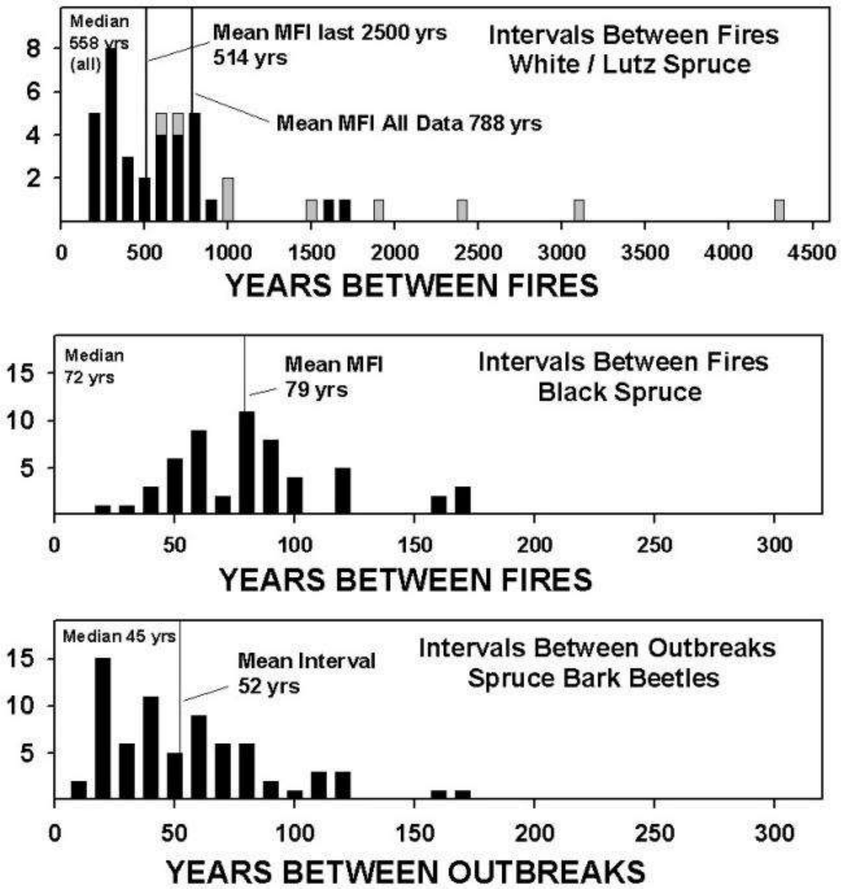
- ✓ **Alaska is warming at 2-3X Lower 48 rate**
- ✓ **Climate change effects are not masked by other anthropogenic drivers**
- ✓ **Kenai Peninsula may be best studied locale in AK outside of high arctic**

Dramatic changes in last 50 years in response to warming and drying

- **– decreasing available water (62% loss since 1968)**
- **– drying wetlands (6 – 11% per decade)**
- **– receding glaciers (11% surface area, 21m elevation)**
- **+ rising treeline (1m/yr) and shrubline (2.8m/yr)**
- **+ unprecedented SB beetle outbreak (triggered by 2 consecutive warm summers)**

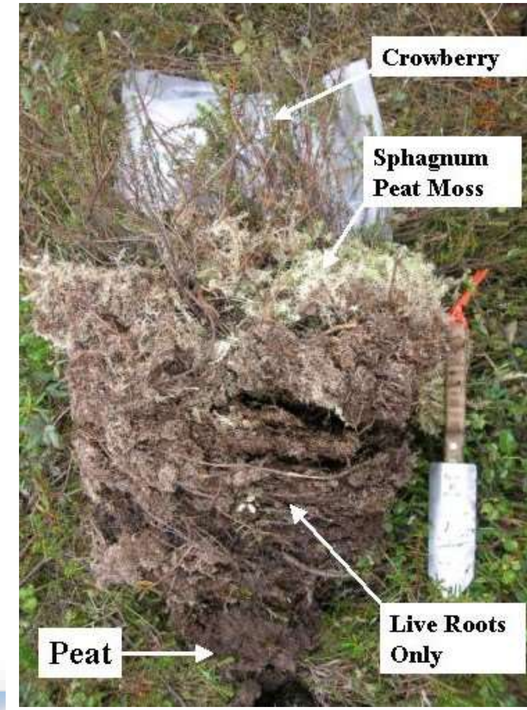
Adageirsdottir et al.1998; Berg et al. 2006,2009; Boucher & Mead 2006; Dial et al. 2007,2016; Klein et al. 2005, Rice 1987

Official fire season now April 1 instead of May 1



DeVolder 1999, Schoen et al. 2017

Woody shrub encroachment into 8000 year old Spagnum peatlands

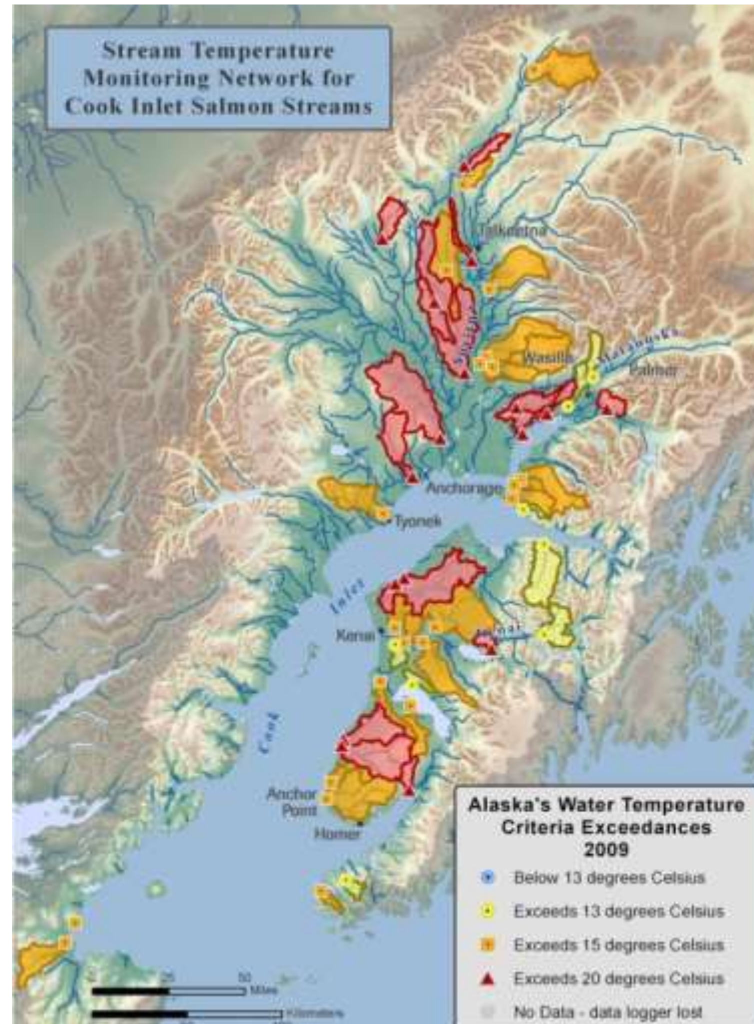


Berg et al. 2009

Salmon in 47 of 48 non-glacial streams experience thermal stress in July

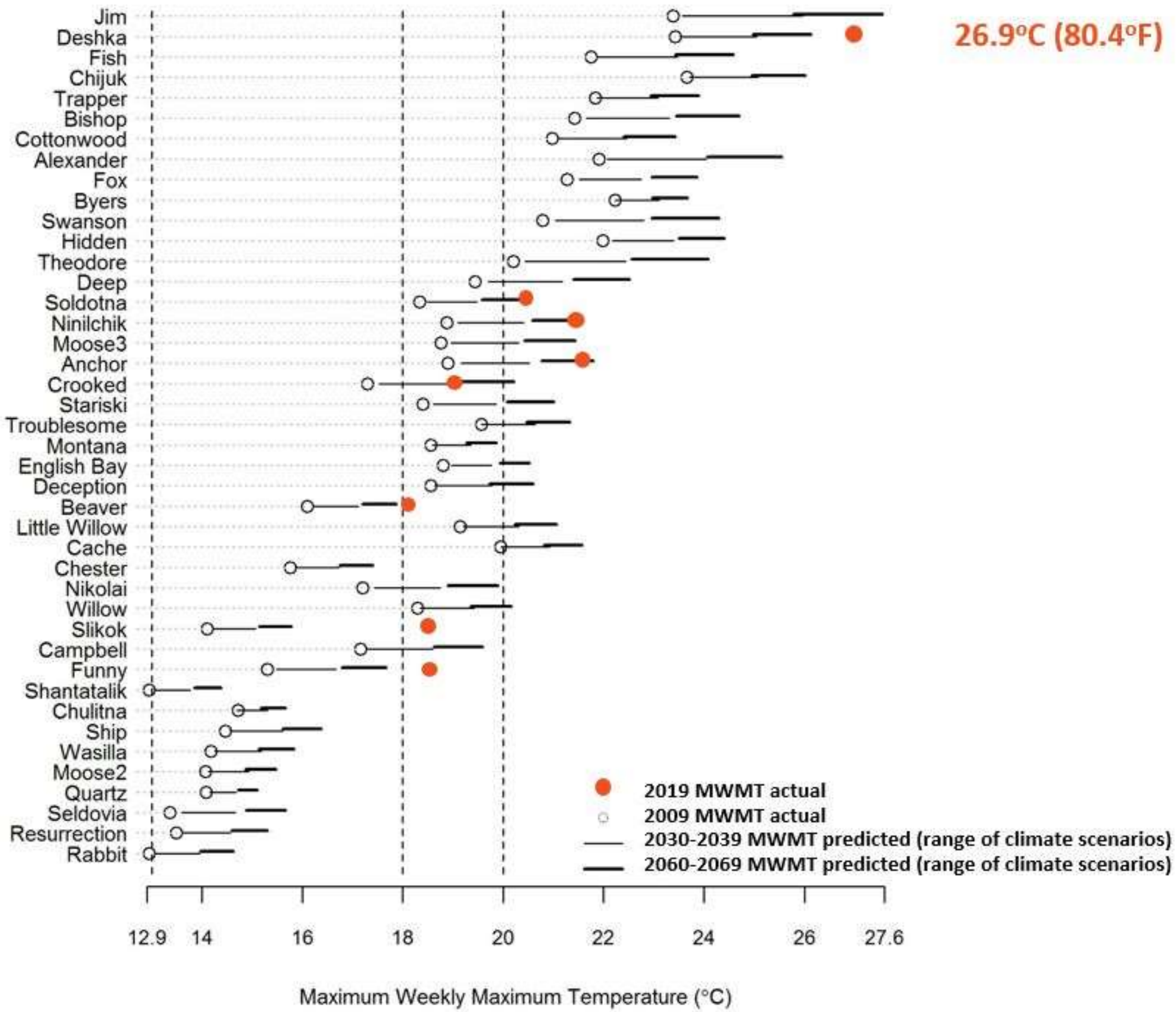
Maximum temperatures not to exceed:

- egg & fry incubation = 13°C
- spawning areas = 13°C
- migration routes = 15°C
- rearing areas = 15°C
- and not exceed 20°C at any time



Mauger 2011

Stream temperatures in 2019 exceeded 2069 forecasts!



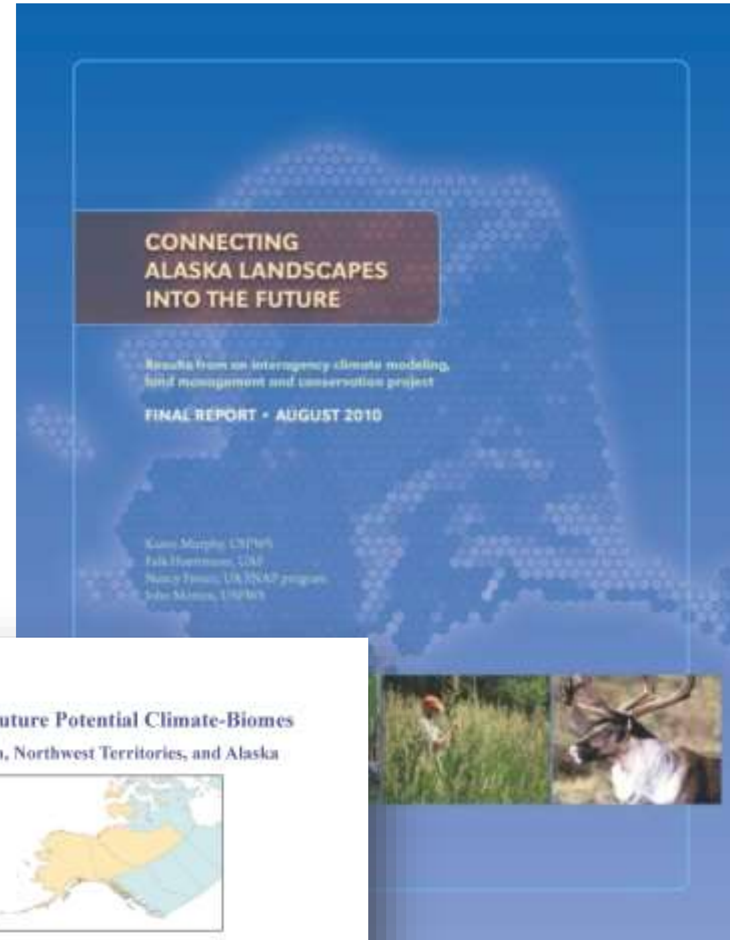
Changing migration window in last decade

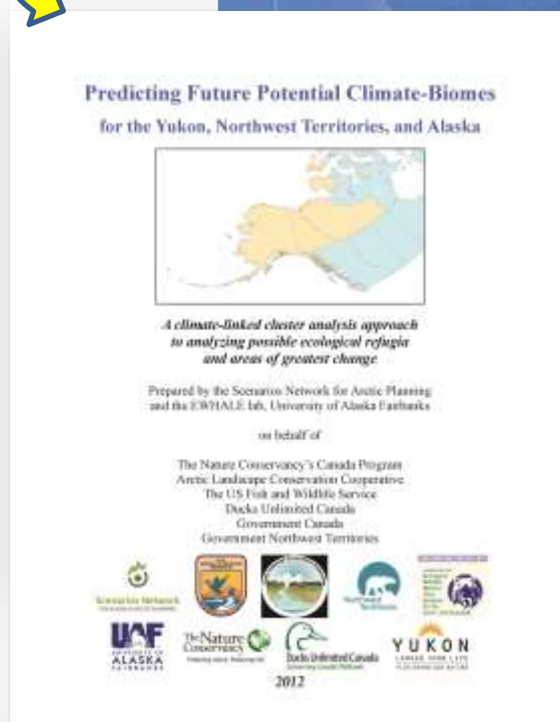
eBird data

- ✓ **Earlier arrival records for 33 species**
- ✓ **Later departure records for 38 species**
- ✓ **27 new species since 2007**

Eurasian-collared dove*
Redwing*
Jack snipe*
Skylark*
Long-billed murrelet*
Black-tailed godwit*
Northern mockingbird
Spotted towhee
Turkey vulture
Western kingbird
Western meadowlark
Willow flycatcher
Northern wheatear
Western tanager
Yellow-bellied sapsucker
Warbling vireo
Swamp sparrow
Tennessee warbler
Cape May warbler
Nashville warbler
Wilsons's phalarope
Great egret
Willet
Red-footed booby
Black guillemot
Heerman's gull
Lesser black-backed gull

Interagency effort to pioneer assessment of climate change effects on biome and species distributions using climate envelope models




Predicting Future Potential Climate-Biomes
for the Yukon, Northwest Territories, and Alaska

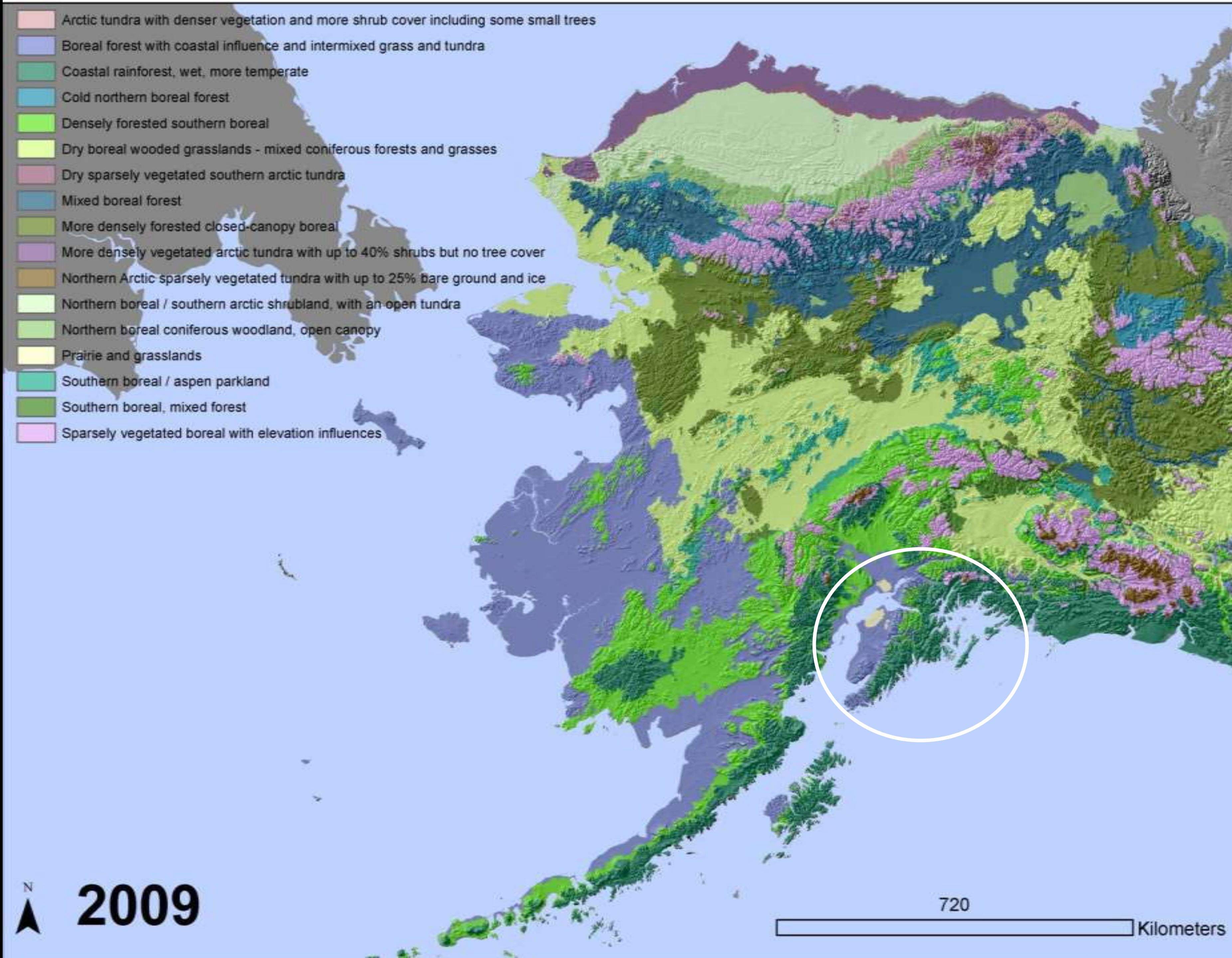
A climate-linked cluster analysis approach to analyzing possible ecological refugia and areas of greatest change

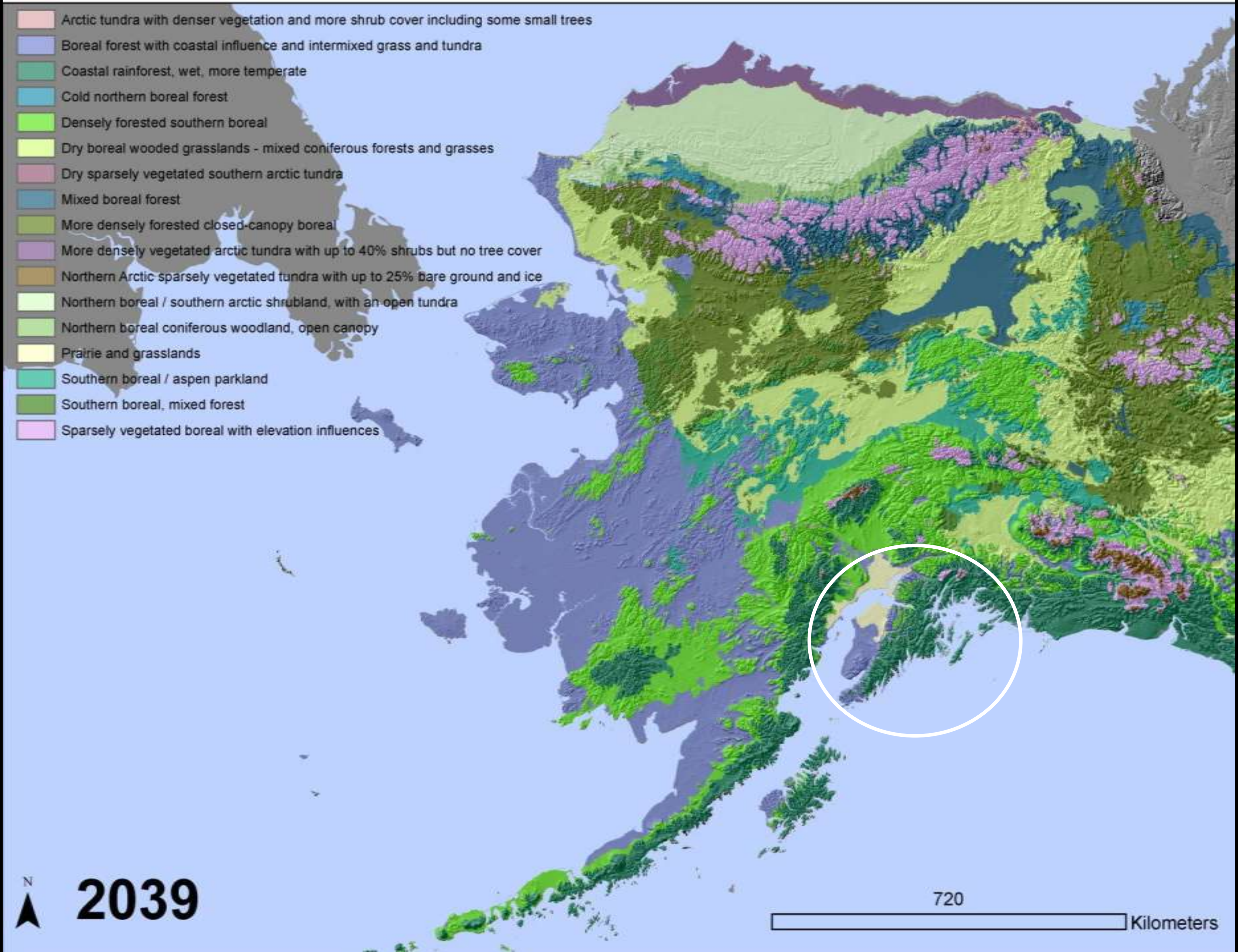
Prepared by the Scenarios Network for Arctic Planning and the EWHALE lab, University of Alaska Fairbanks

on behalf of

The Nature Conservancy's Canada Program
Arctic Landscape Conservation Cooperative
The US Fish and Wildlife Service
Ducks Unlimited Canada
Government Canada
Government Northwest Territories

2012


Arctic tundra with denser vegetation and more shrub cover including some small trees
Boreal forest with coastal influence and intermixed grass and tundra
Coastal rainforest, wet, more temperate
Cold northern boreal forest
Densely forested southern boreal
Dry boreal wooded grasslands - mixed coniferous forests and grasses
Dry sparsely vegetated southern arctic tundra
Mixed boreal forest
More densely forested closed-canopy boreal
More densely vegetated arctic tundra with up to 40% shrubs but no tree cover
Northern Arctic sparsely vegetated tundra with up to 25% bare ground and ice
Northern boreal / southern arctic shrubland, with an open tundra
Northern boreal coniferous woodland, open canopy
Prairie and grasslands
Southern boreal / aspen parkland
Southern boreal, mixed forest
Sparsely vegetated boreal with elevation influences
N
2009
720
Kilometers



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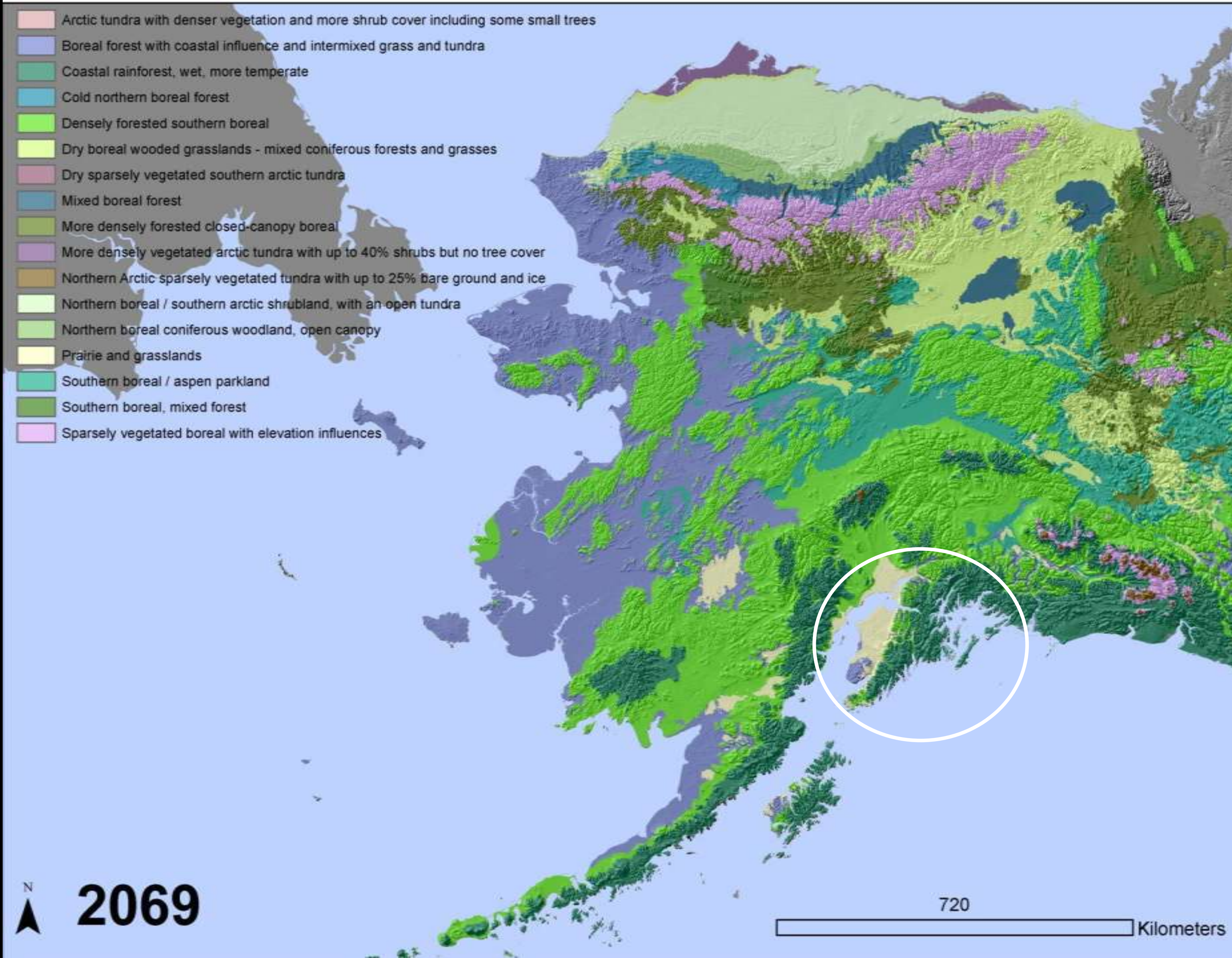
2039
720
Kilometers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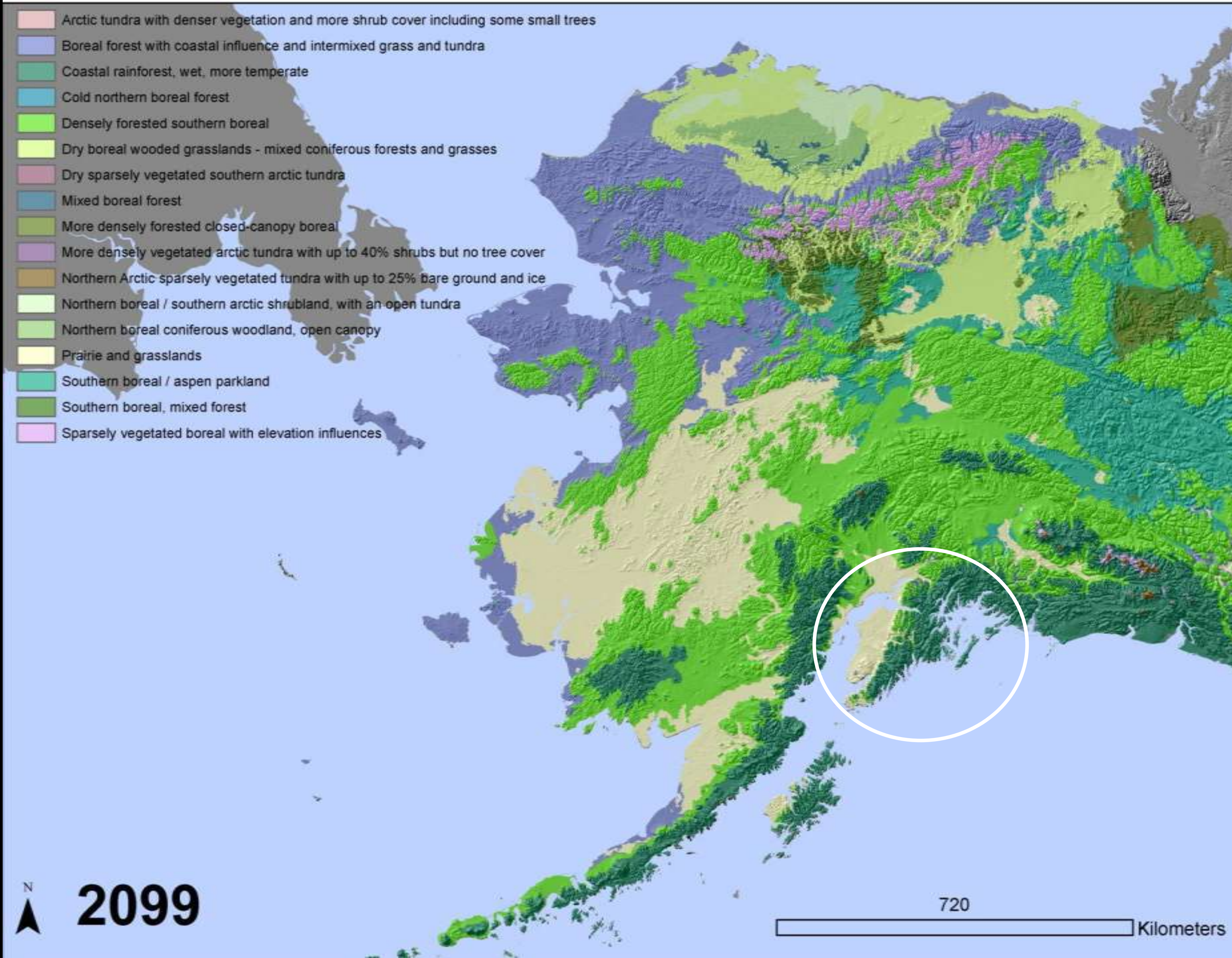
2069
720
Kilometers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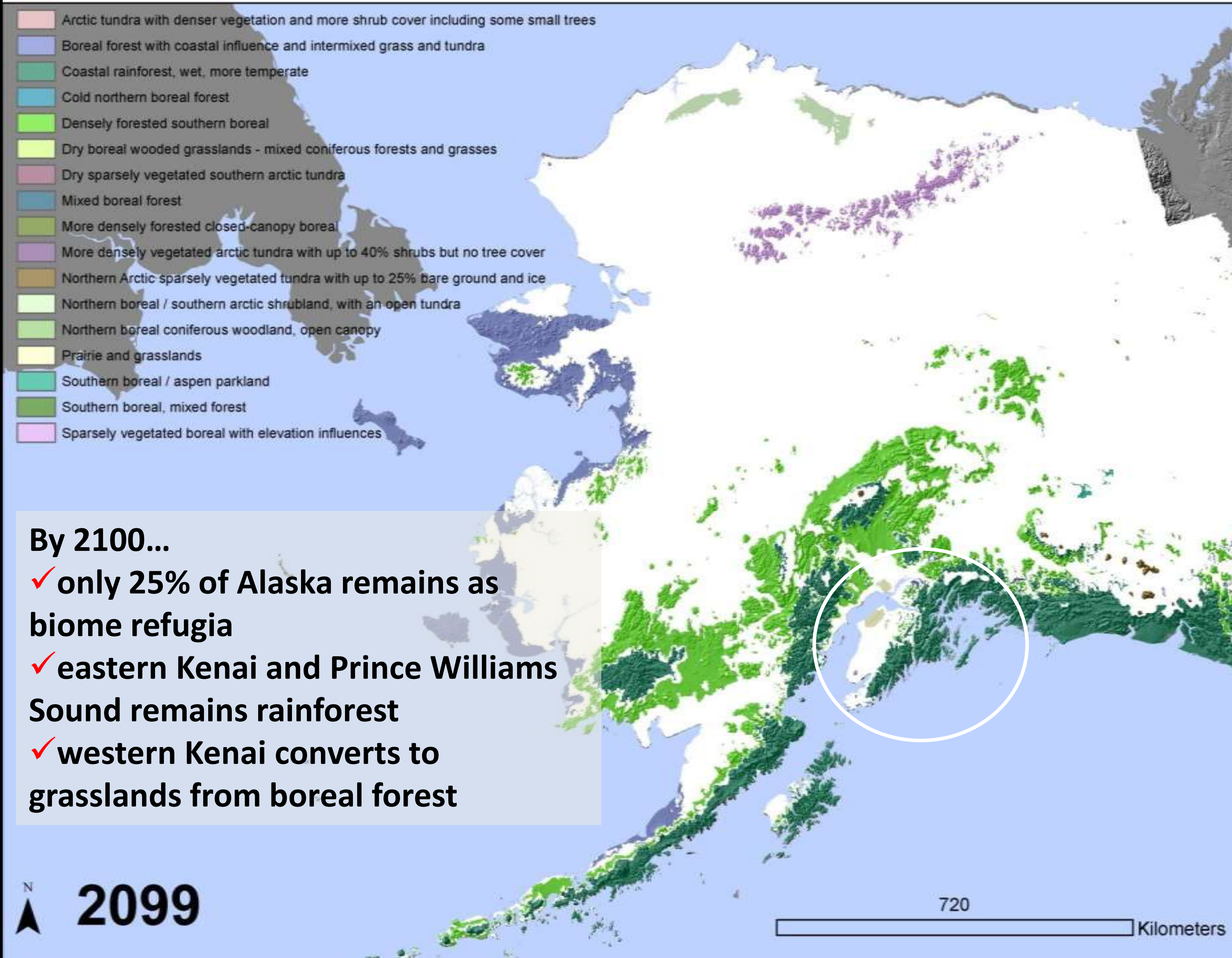
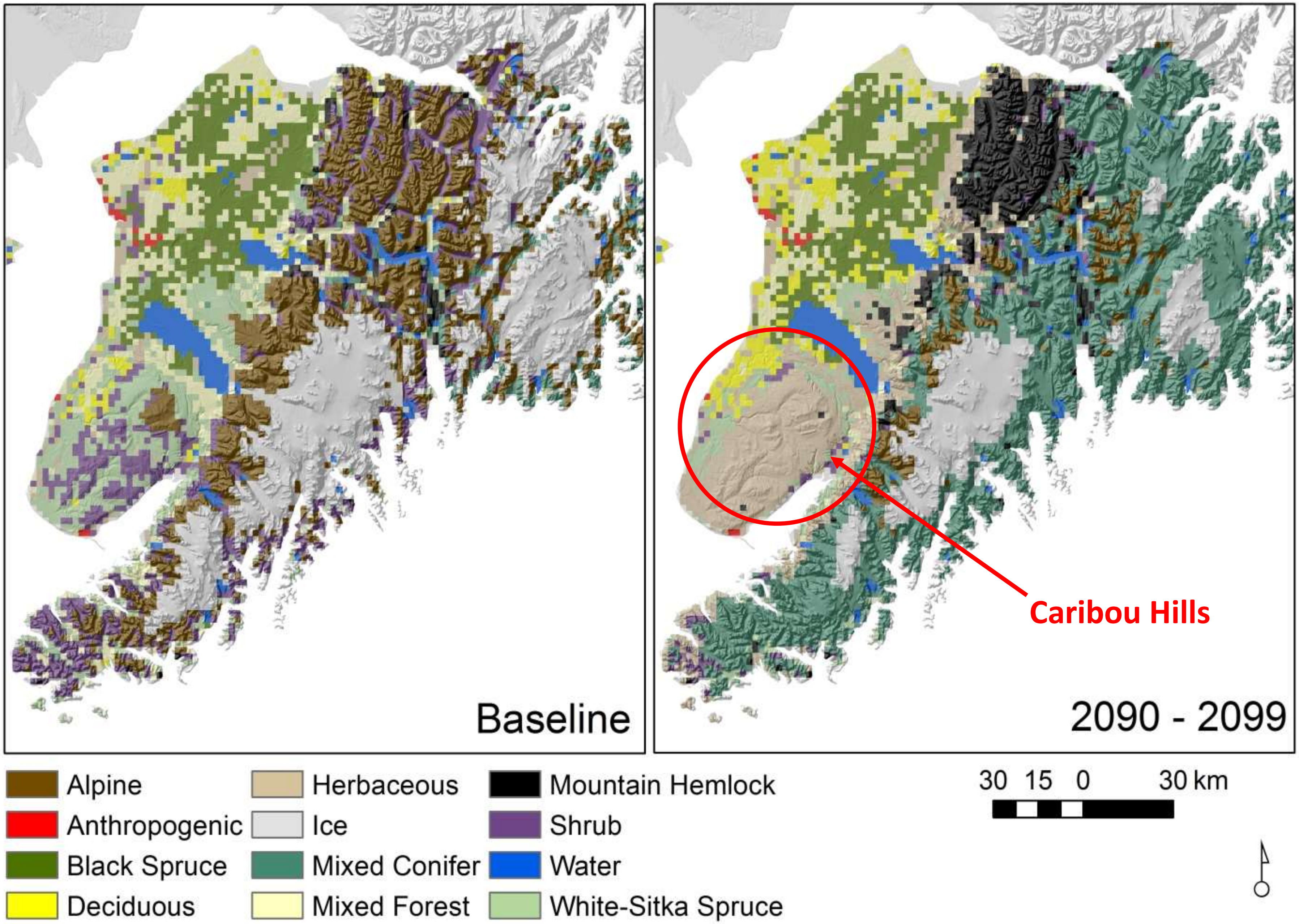
2099
720
Kilometers



By 2100…

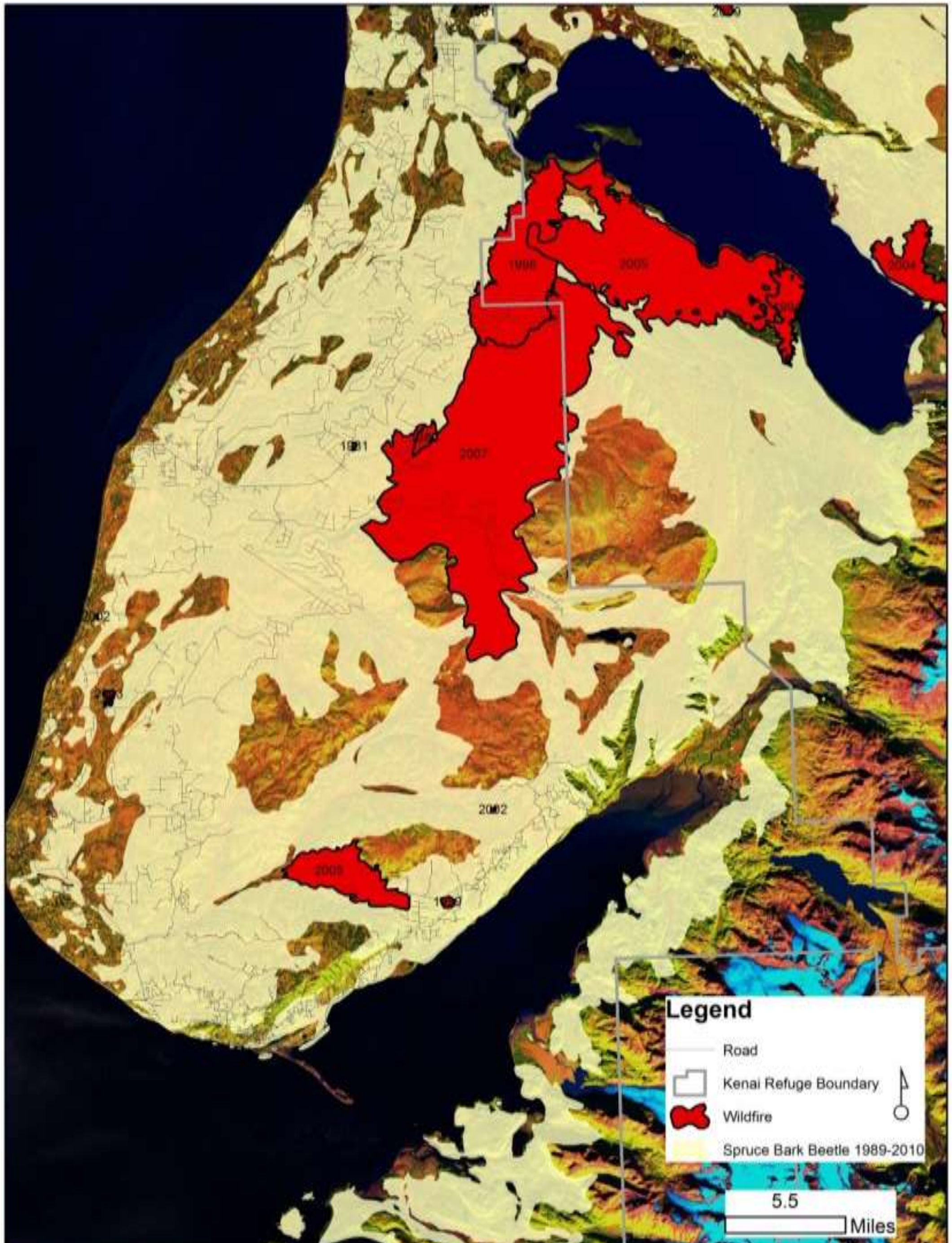
- ✓ **only 25% of Alaska remains as biome refugia**
- ✓ **eastern Kenai and Prince Williams Sound remains rainforest**
- ✓ **western Kenai converts to grasslands from boreal forest**


Baseline
2090 - 2099
Caribou Hills
Alpine
Anthropogenic
Black Spruce
Deciduous
Herbaceous
Ice
Mixed Conifer
Mixed Forest
Mountain Hemlock
Shrub
Water
White-Sitka Spruce
30 15 0 30 km

SEPT 1985

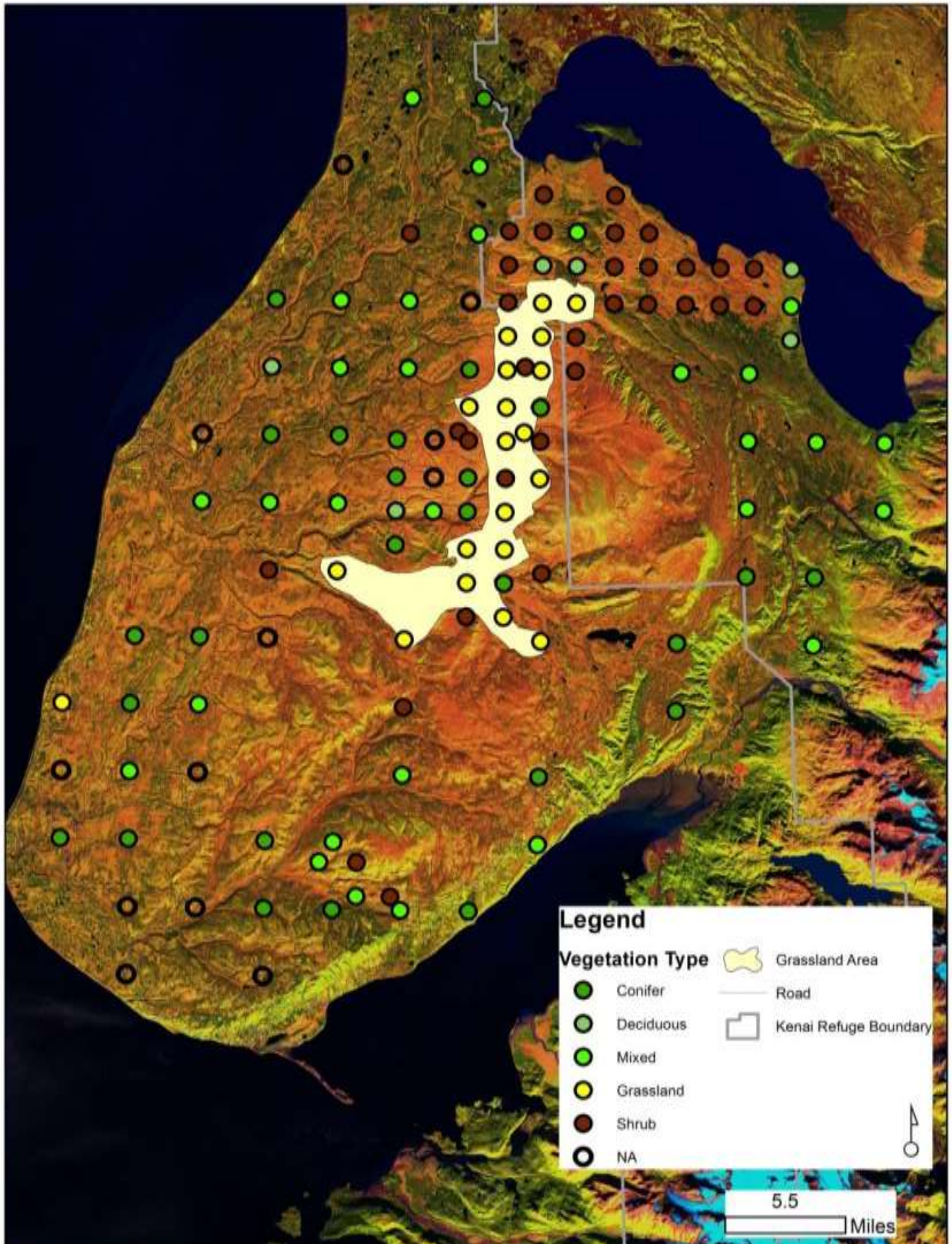
SEPT 2014

Spruce Bark Beetle Mortality (1989-2010)



Wildfires (1994–2007)

1994 Windy Point
1996 Crooked Creek
2005 Glacier Creek
2005 Fox Creek
2005 Tracy Avenue
2007 Caribou Hills

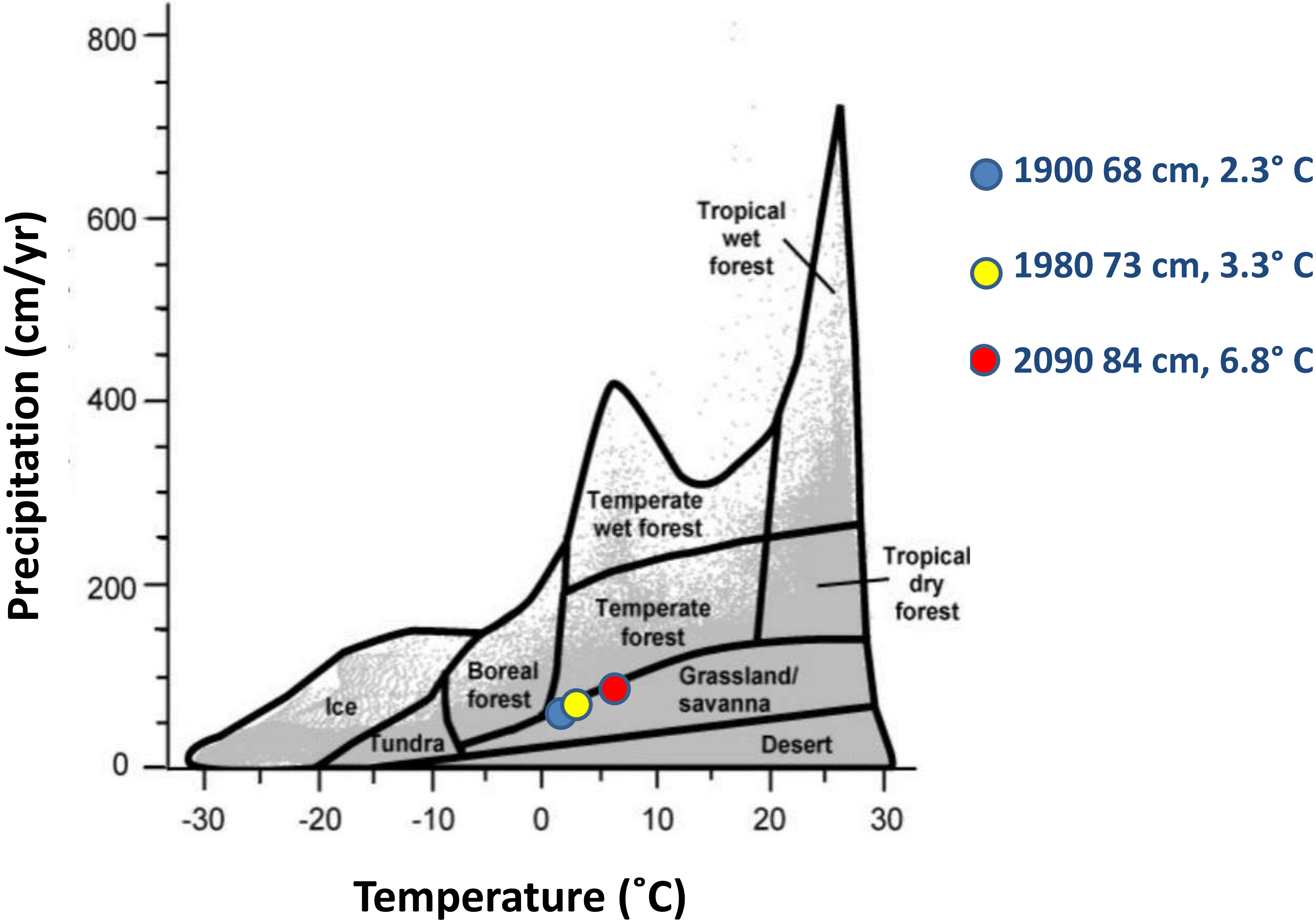


40,000-acre contiguous grassland polygon in 2015

2002 imagery

- **Forest 55%**
- **Other 40%**
- **Herbaceous 5%**


2015/07/19



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

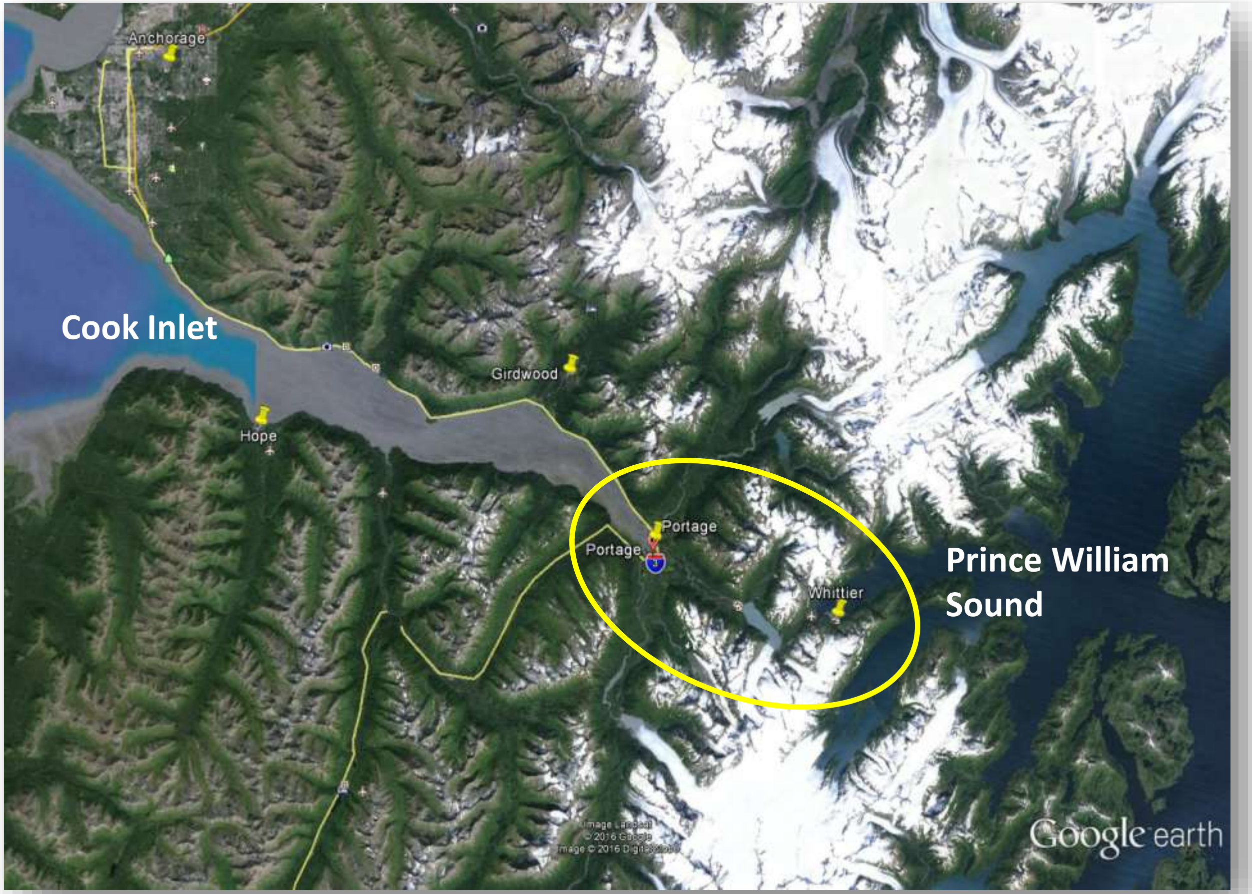
2 questions we need to ask ourselves….

What's the risk of doing nothing?

What's the risk of doing something wrong?

----Rosa Meehan
10 Feb 2010

10-mile wide isthmus is a migration barrier



Wilson et al. 2015

Tomasik and Cook 2005

Jackson et al. 2008


PALEOECOLOGY PALEOECOLOGY PALEOECOLOGY 475

Novel climates, no-analog communities, and ecological surprises

John W Williams[1*] and Stephen T Jackson[2]

No-analog communities (communities that are compositionally unlike any found today) occurred frequently in the past and will develop in the greenhouse world of the future. The well documented no-analog plant communities of late-glacial North America are closely linked to "novel" climates also lacking modern analogs, characterized by high seasonality of temperature. In climate simulations for the Intergovernmental Panel on Climate Change A2 and B1 emission scenarios, novel climates arise by 2100 AD, primarily in tropical and subtropical regions. These future novel climates are warmer than any present climates globally, with spatially variable shifts in precipitation, and increase the risk of species reshuffling into future no-analog communities and other ecological surprises. Most ecological models are at least partially parameterized from modern observations and so may fail to accurately predict ecological responses to these novel climates. There is an urgent need to test the robustness of ecological models to climate conditions outside modern experience.

Front Ecol Environ 2007; 5(9): 475–482, doi:10.1890/070037

In a nutshell:

www.frontiersinecology.org

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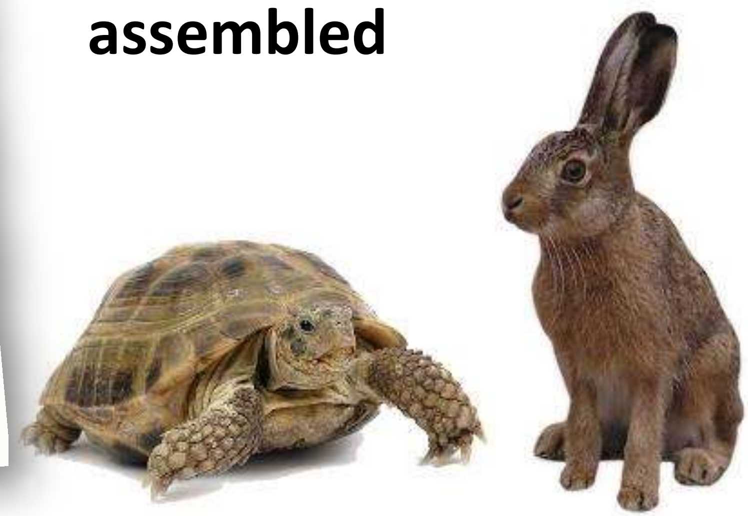
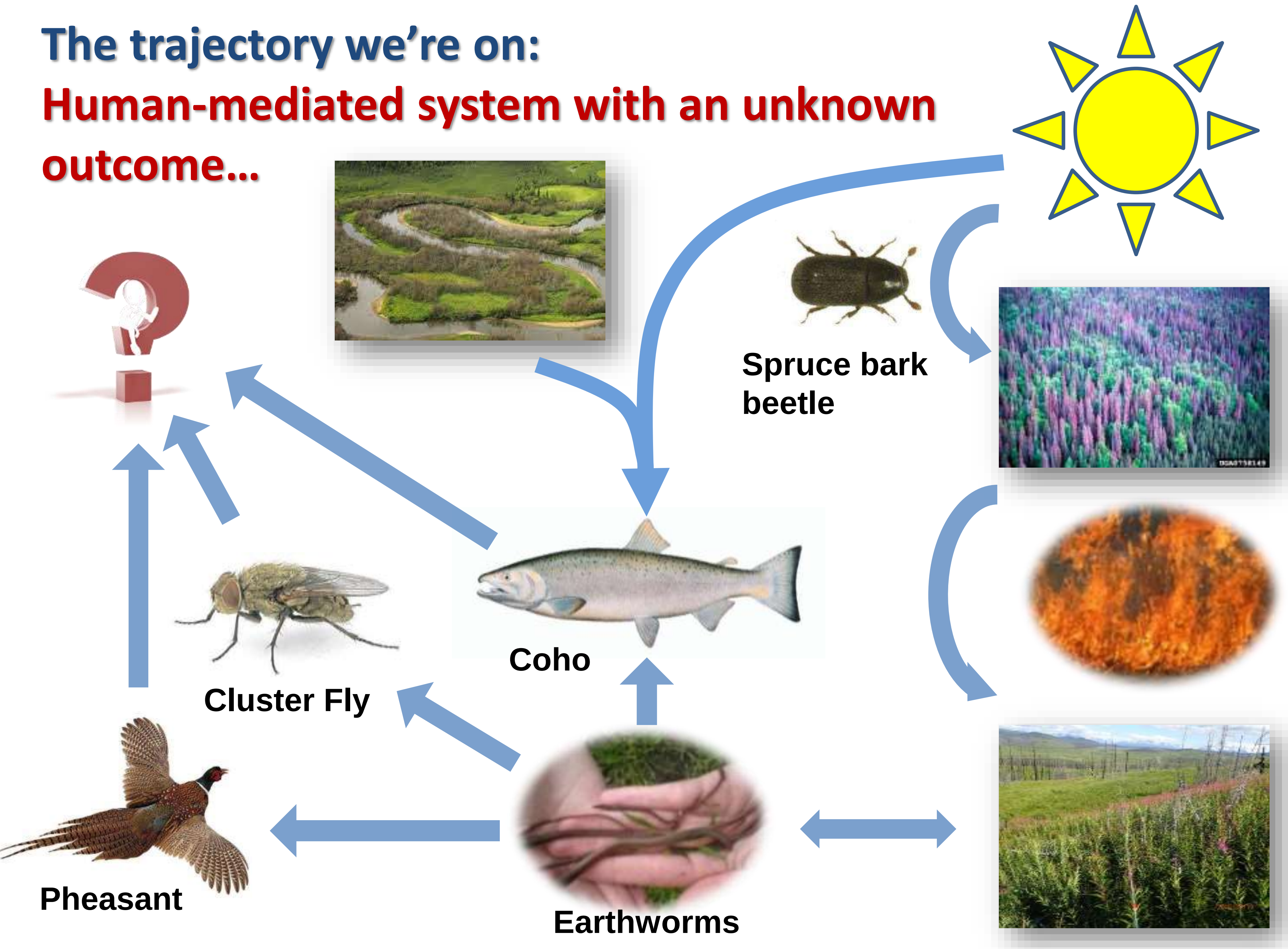
So which species will compose novel assemblages in dynamic systems?

The ones that are there when its being assembled



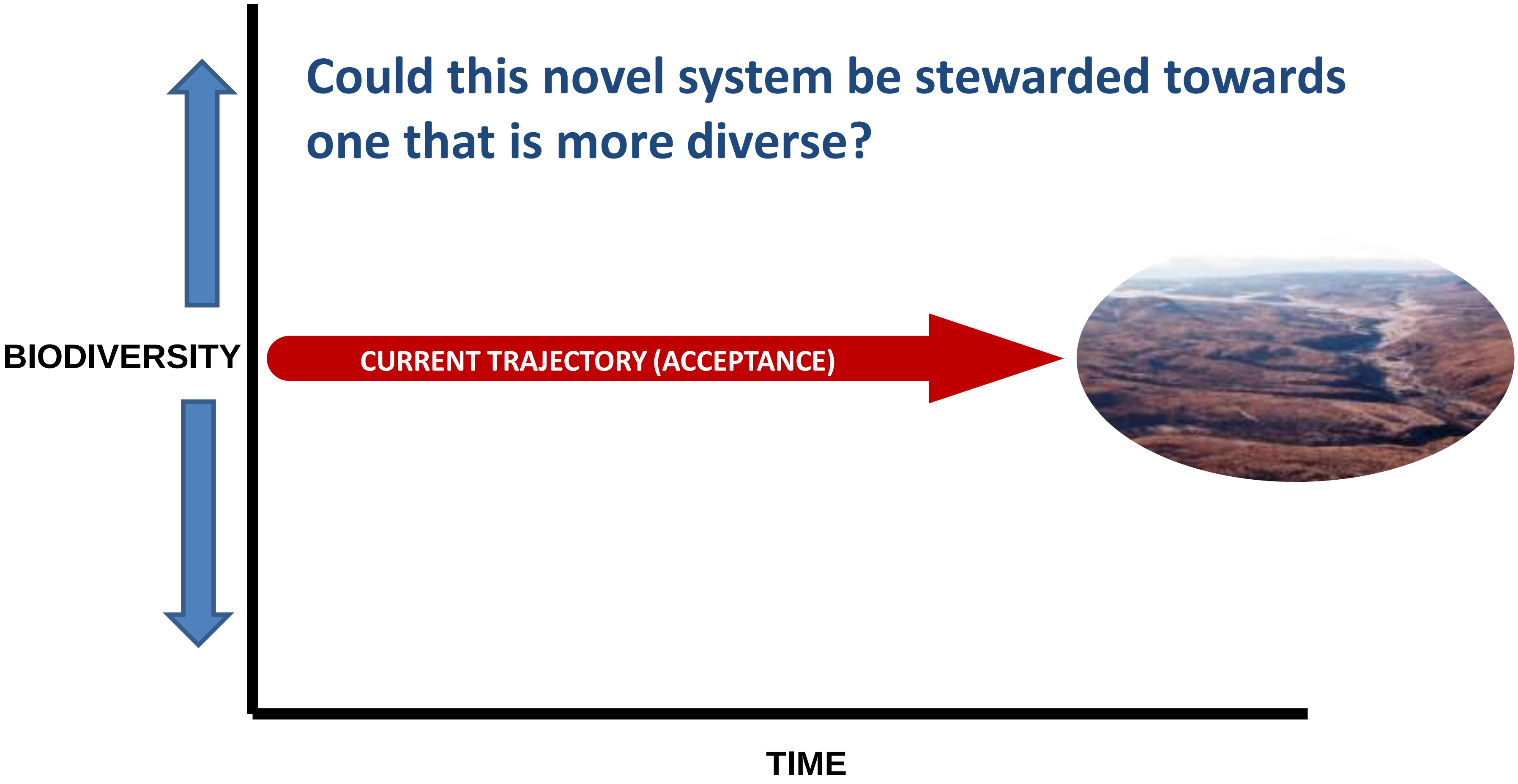
> 138 exotic species of flora (108) and fauna (30) occur on the Kenai Peninsula and are poised to fill novel assemblages

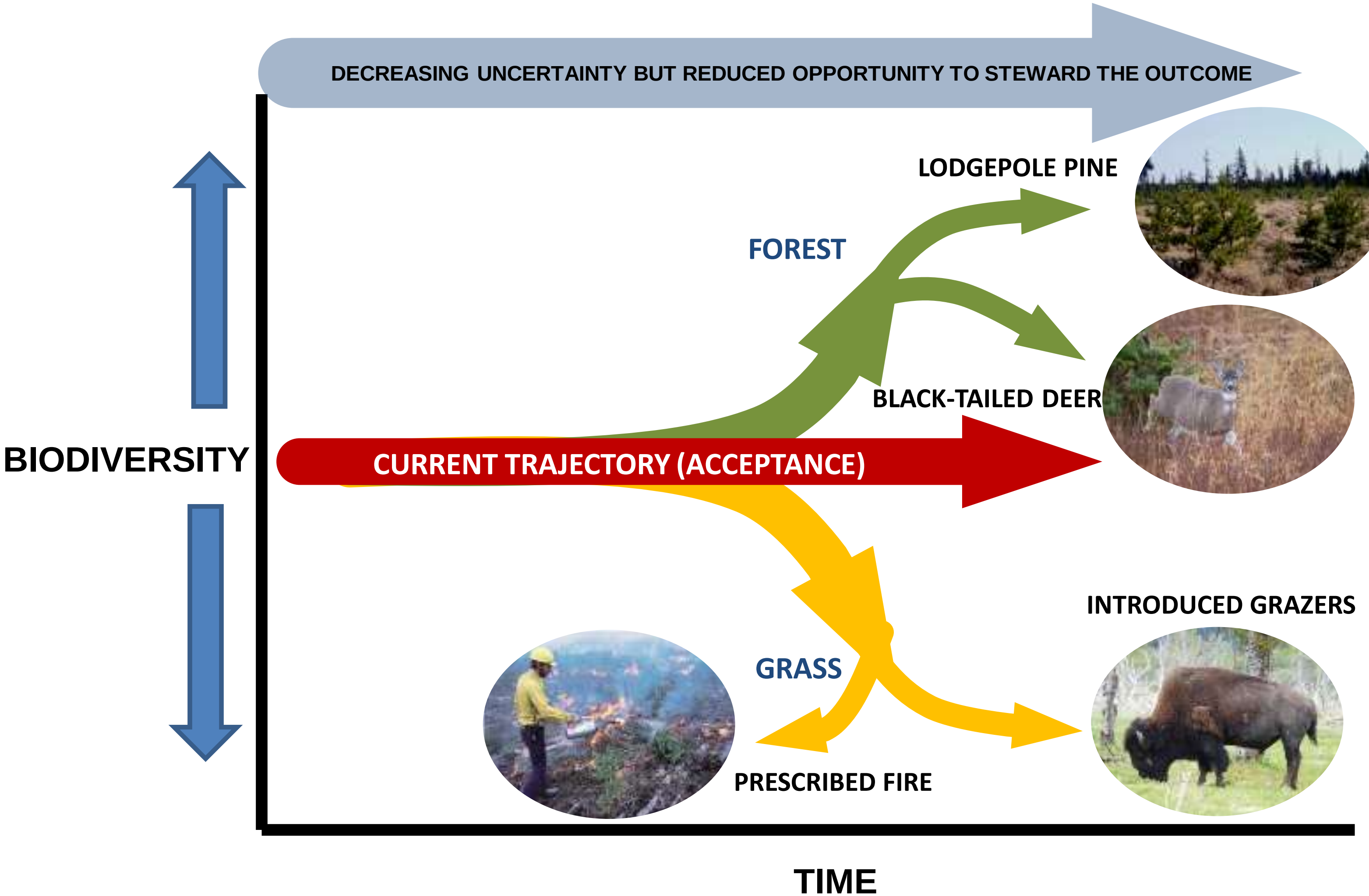
The trajectory we're on:
Human-mediated system with an unknown outcome…

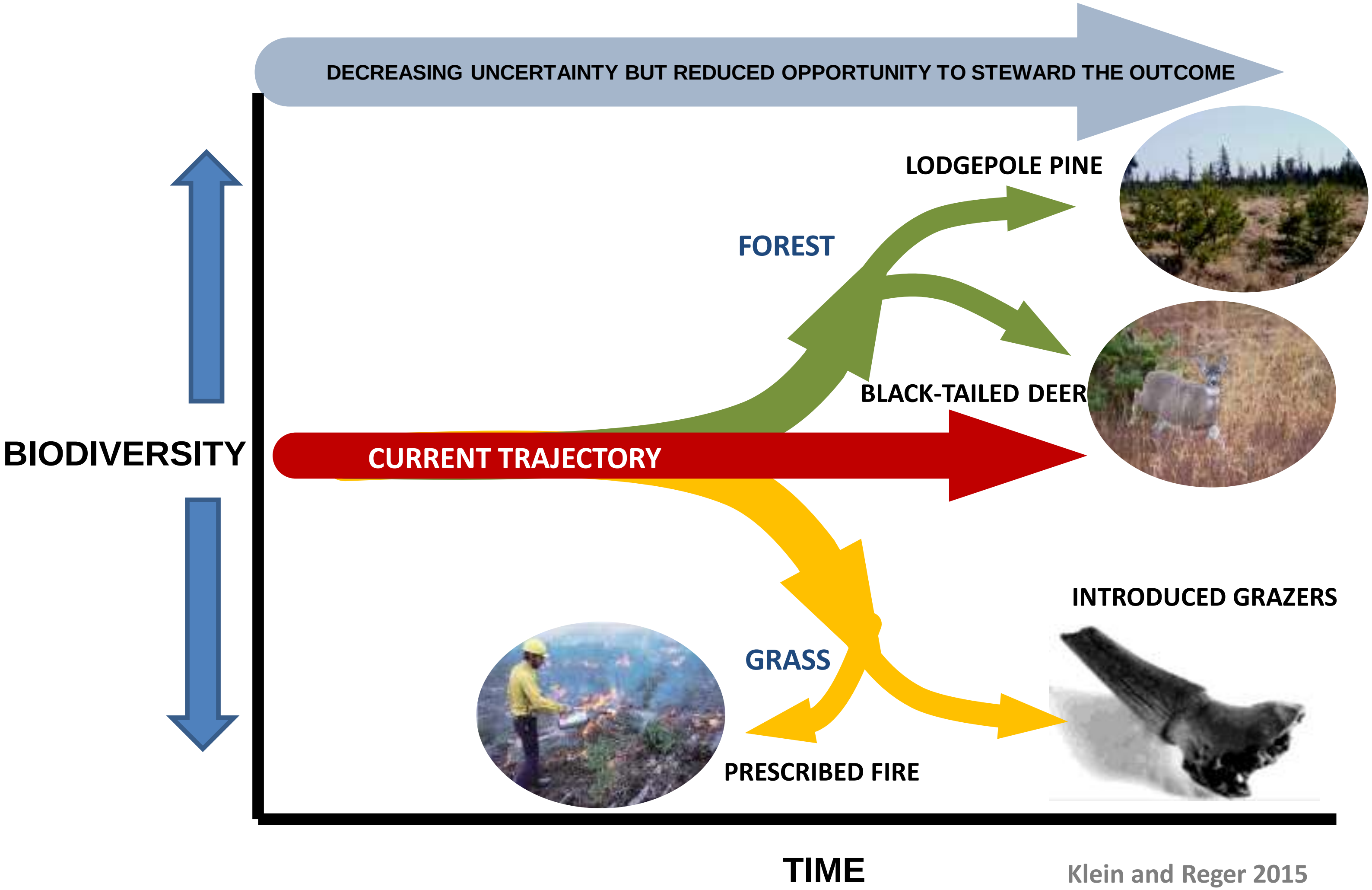


Doing nothing is really doing something… just incoherently and haphazardly

- ✓ Kenai Peninsula is already responding to a changing climate and forecasted to continue doing so
- ✓ Latitudinal migration is constrained by the isthmus and rainshadow of Kenai Mountains
- ✓ Novel assemblages ≠ simple re-shuffling of native flora and fauna
- ✓ Many exotic species already introduced and more enroute
- ✓ And we squander our early opportunities to steward outcomes!


Could this novel system be stewarded towards one that is more diverse?
BIODIVERSITY
CURRENT TRAJECTORY (ACCEPTANCE)
TIME


DECREASING UNCERTAINTY BUT REDUCED OPPORTUNITY TO STEWARD THE OUTCOME
LODGEPOLE PINE
FOREST
BLACK-TAILED DEER
BIODIVERSITY
CURRENT TRAJECTORY (ACCEPTANCE)
INTRODUCED GRAZERS
GRASS
PRESCRIBED FIRE
TIME



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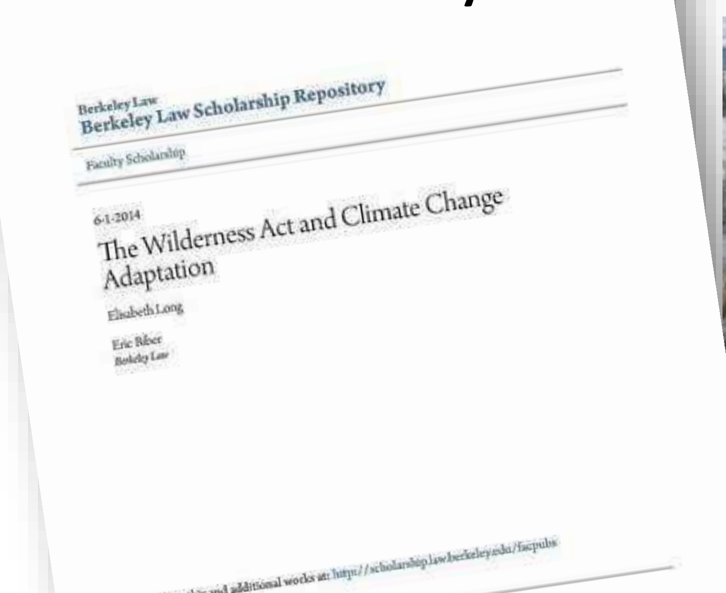
LODGEPOLE PINE
FOREST
BLACK-TAILED DEER
BIODIVERSITY
CURRENT TRAJECTORY
INTRODUCED GRAZERS
GRASS
PRESCRIBED FIRE
TIME
Klein and Reger 2015

Constraints on moving forward…

- There is still some uncertainty about the ecological trajectory
- But…scientific uncertainty is NOT the deterrent to adaptation that many think
- We need different goals (but who is the authority?)
- We need more exploratory manipulative field studies
- We need different data, not necessarily more data
- We need to challenge existing policy constraints
- Personal values of "-ologists" are constraining novel approaches
- Decisions are being made by agencies and private citizens…
  sometimes without climate change as context,
  but always without a comprehensive and coherent strategy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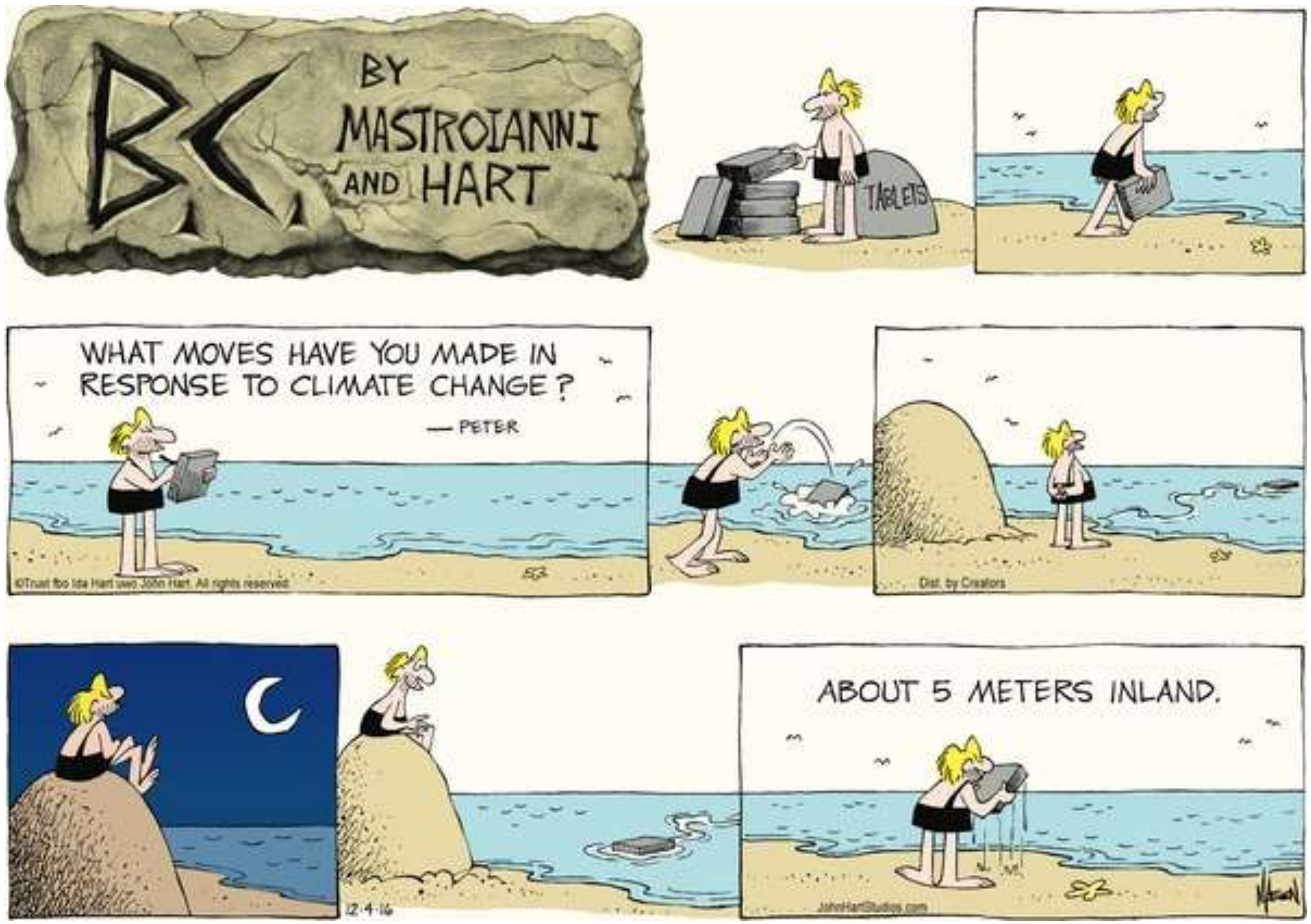
The Wilderness Act and Climate Change Adaptation

Elisabeth Long

Eric Biber
Berkeley Law

Questions????


B.C.
BY MASTROIANNI AND HART
TABLETS
WHAT MOVES HAVE YOU MADE IN RESPONSE TO CLIMATE CHANGE?
— PETER
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12-4-16
ABOUT 5 METERS INLAND.
JohnHartStudios.com