

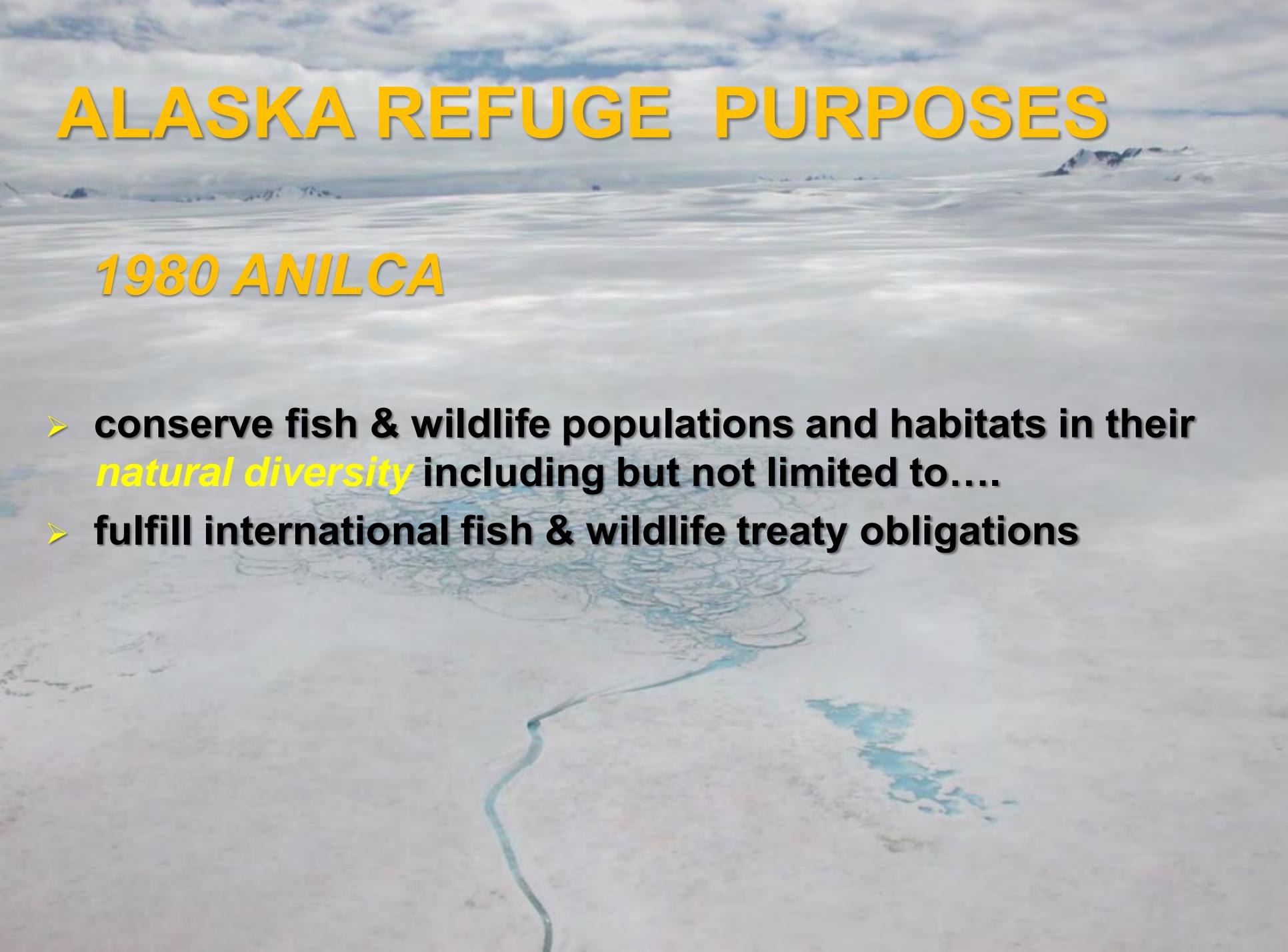
# Kenai National Bison Range?

**The Case for  
Stewarding Ecological  
Transformation**



**John Morton  
Kenai National Wildlife Refuge**

# ALASKA REFUGE PURPOSES

An aerial photograph of a vast, flat, snow-covered landscape, likely a tundra or coastal plain. A winding river or stream flows through the center of the image, creating a network of channels and pools. In the distance, there are low mountains and hills under a cloudy sky.

## 1980 ANILCA

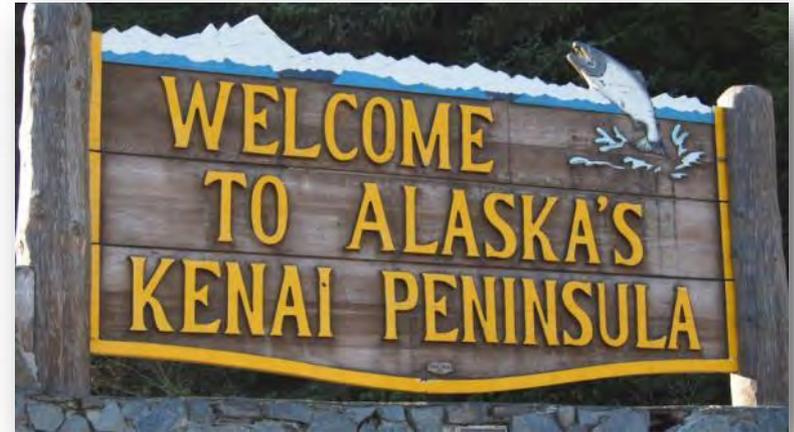
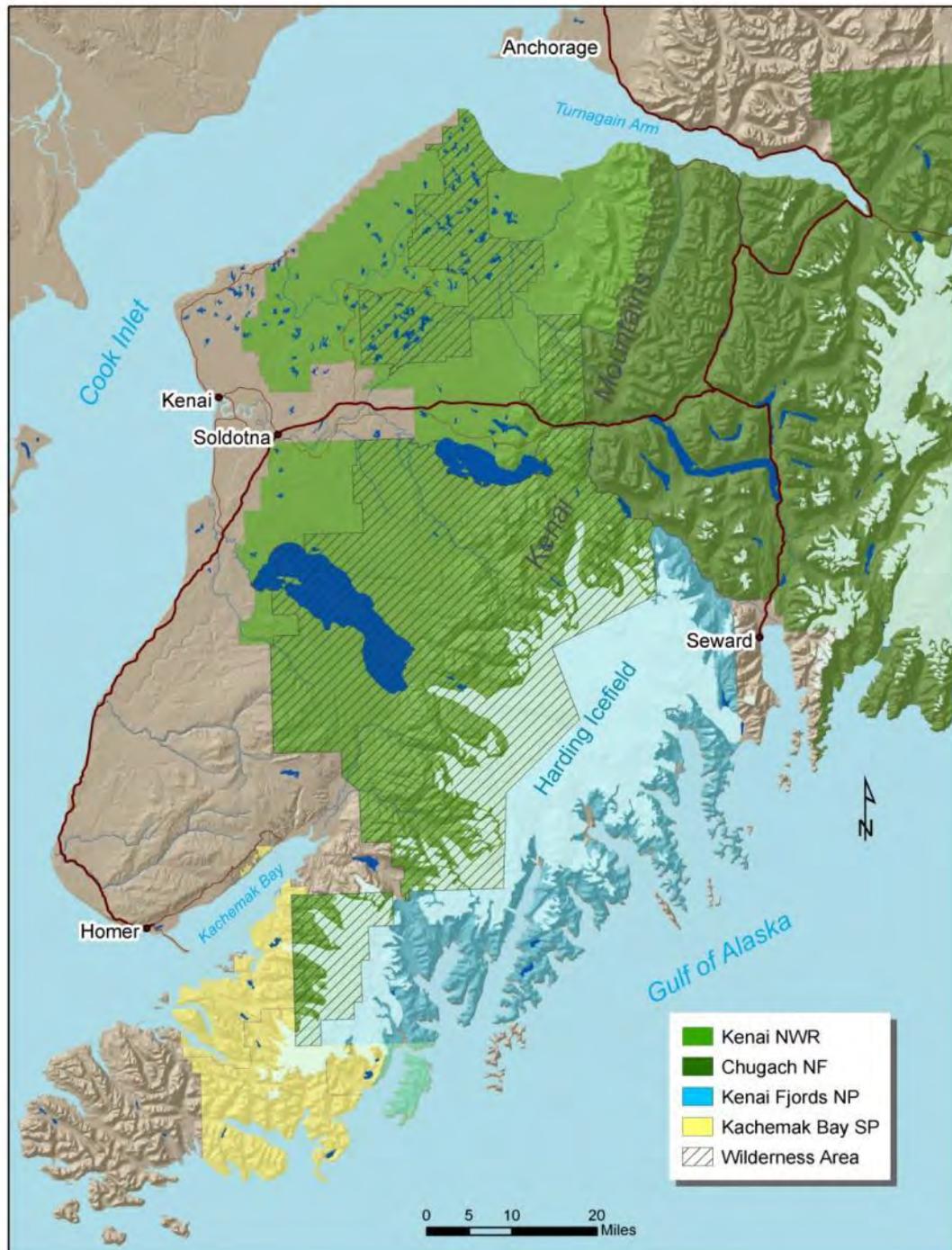
- **conserve fish & wildlife populations and habitats in their *natural diversity* including but not limited to....**
- **fulfill international fish & wildlife treaty obligations**

# ALASKA REFUGE PURPOSES

## 1980 ANILCA

- conserve ***fish & wildlife*** populations and habitats in their natural diversity including but not limited to....
- fulfill international fish & wildlife treaty obligations

***fish & wildlife*** = any member of the animal kingdom including without limitation any mammal, fish, bird, amphibian, reptile, mollusk, crustacean, arthropod or other invertebrate



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







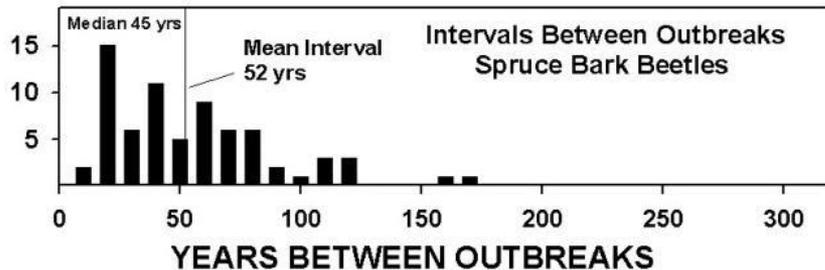
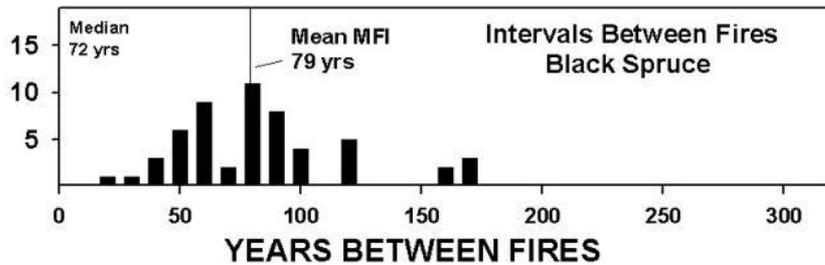
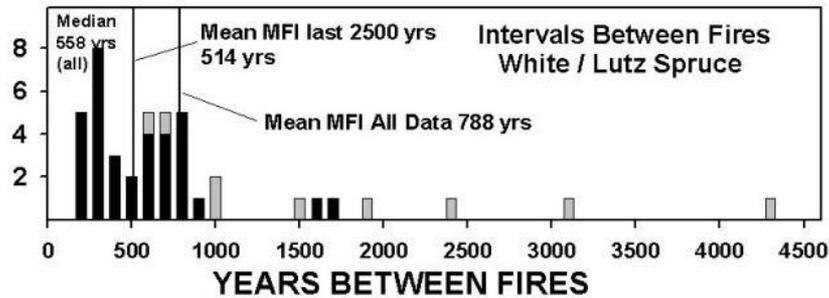
# Dramatic changes in last 50 years in response to warming and drying



- decreasing available water (60% 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)



# Official fire season is now April 1 instead of May 1



# Woody shrub encroachment into 8000 year old Sphagnum peatlands

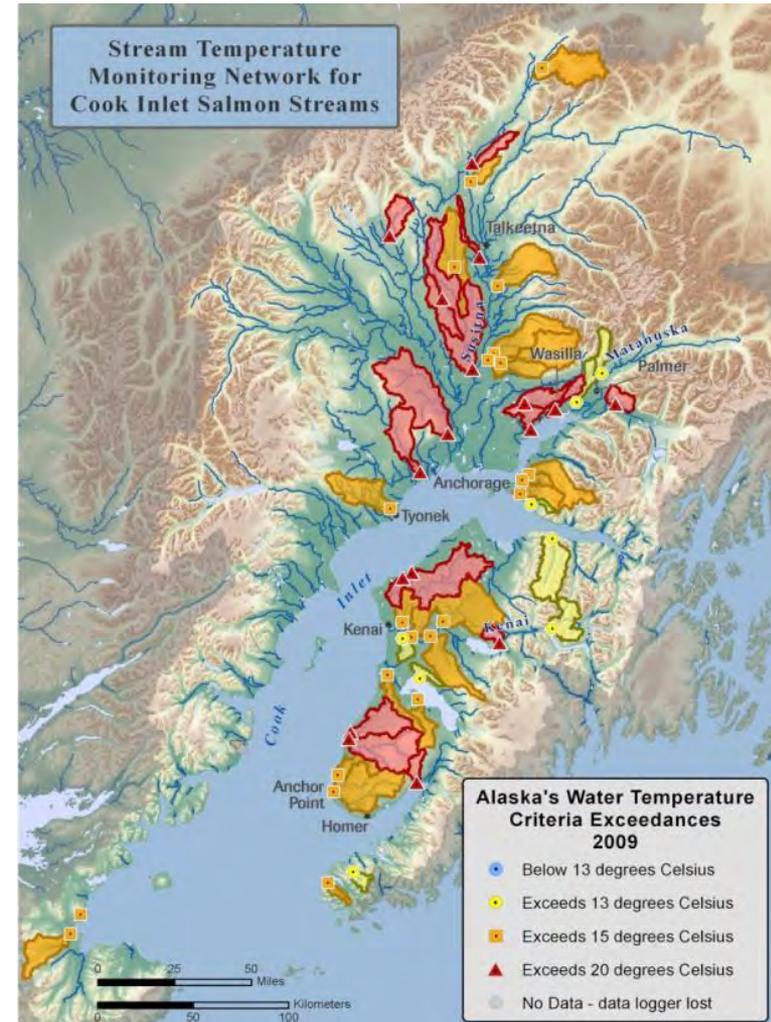


# Salmon in 47 of 48 non-glacial streams experience thermal stress in July



## Maximum temperatures not to be exceeded:

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



# Changing migration window in last decade

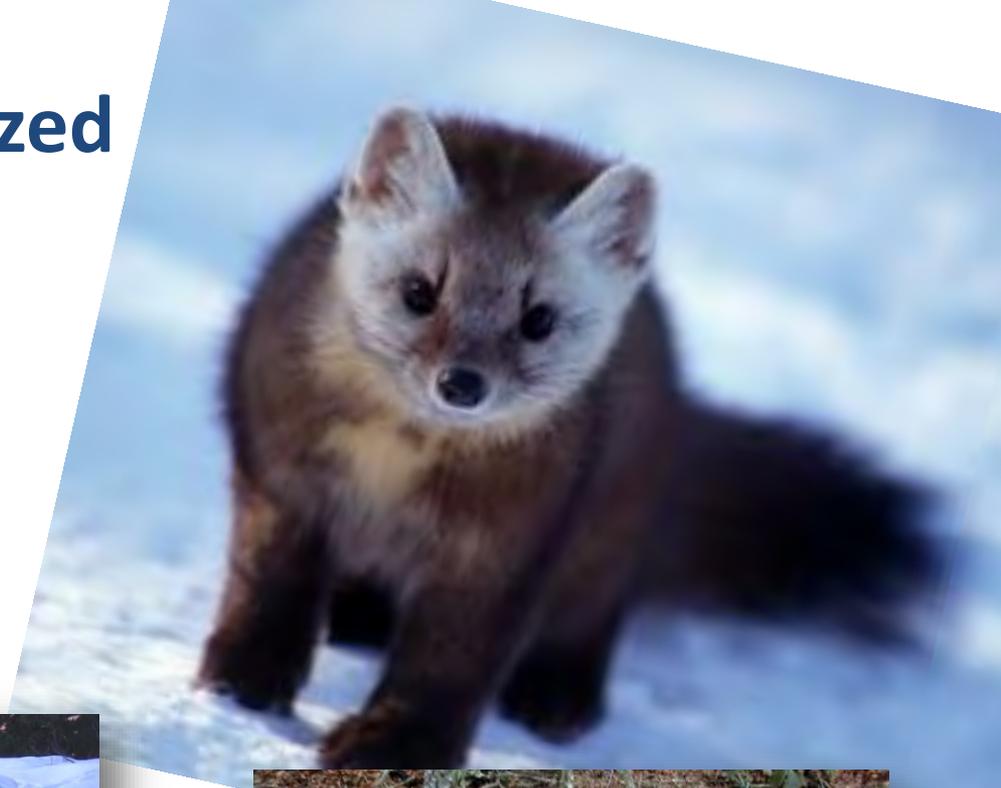


eBird data

- ✓ 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  
Wilson's phalarope  
Great egret  
Willet  
Red-footed booby  
Black guillemot  
Heerman's gull  
Lesser black-backed gull

# American marten colonized Kenai Lowlands ~2002

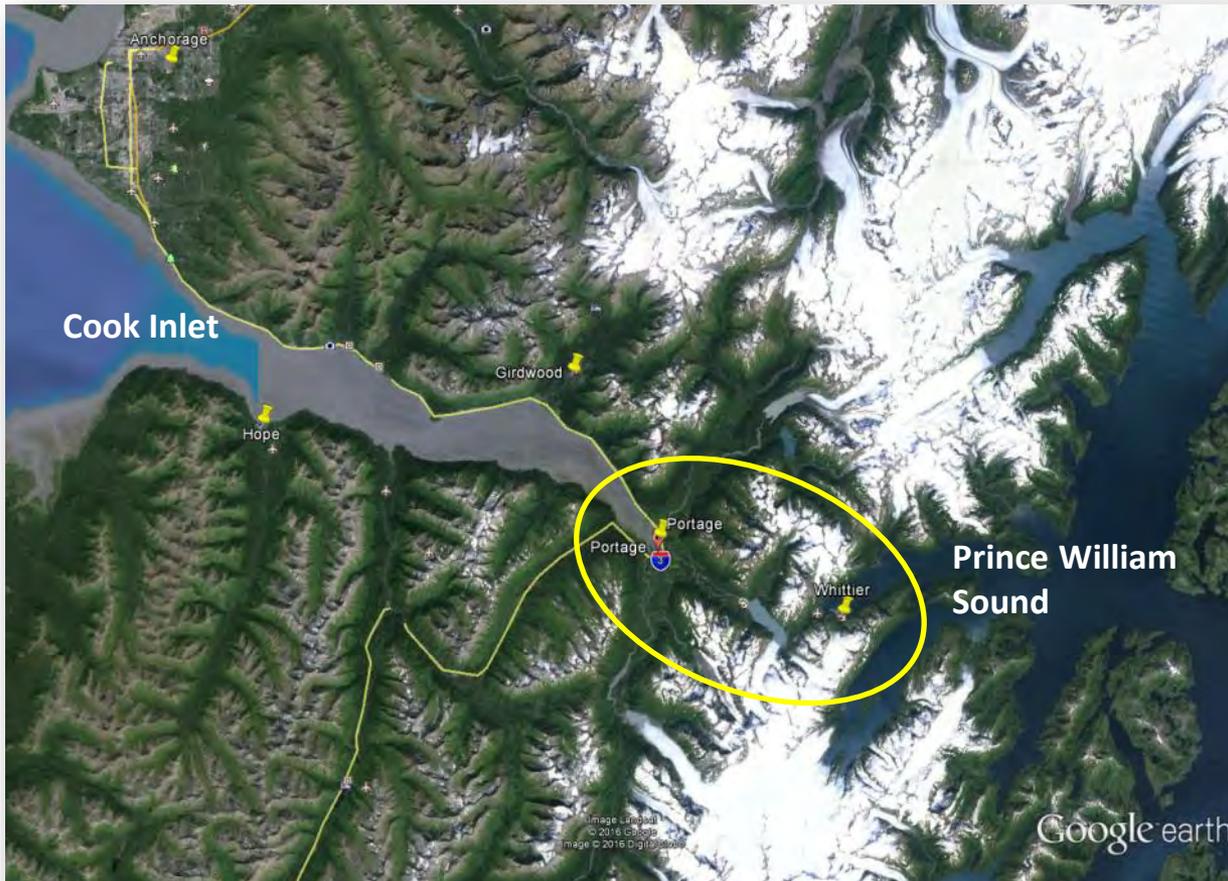


**Alpine rest sites**



**Lowland rest sites**

# 10-mile wide isthmus is a migration barrier



Wilson et al. 2015

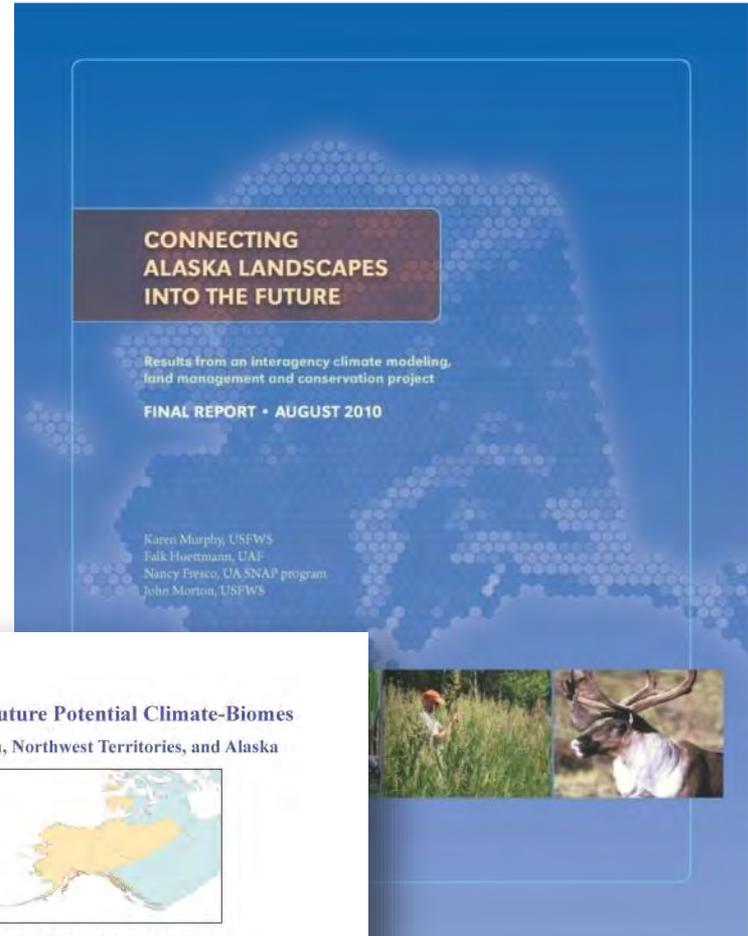


Tomasik and Cook 2005



Jackson et al. 2008

# 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*

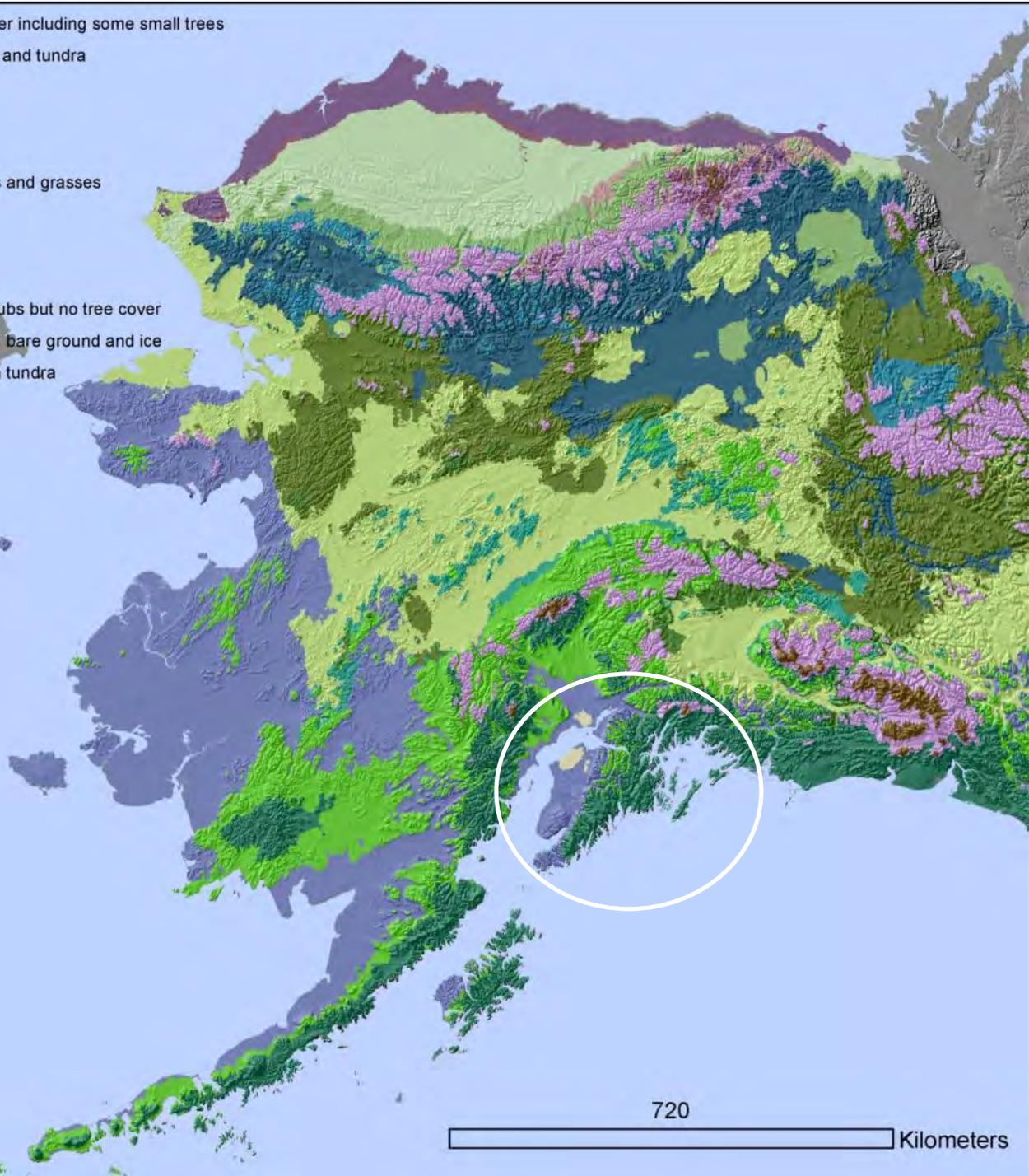
Prepared by the Scenarios Network for Arctic Planning  
and the EWHALE lab, University of Alaska Fairbanks

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



- 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



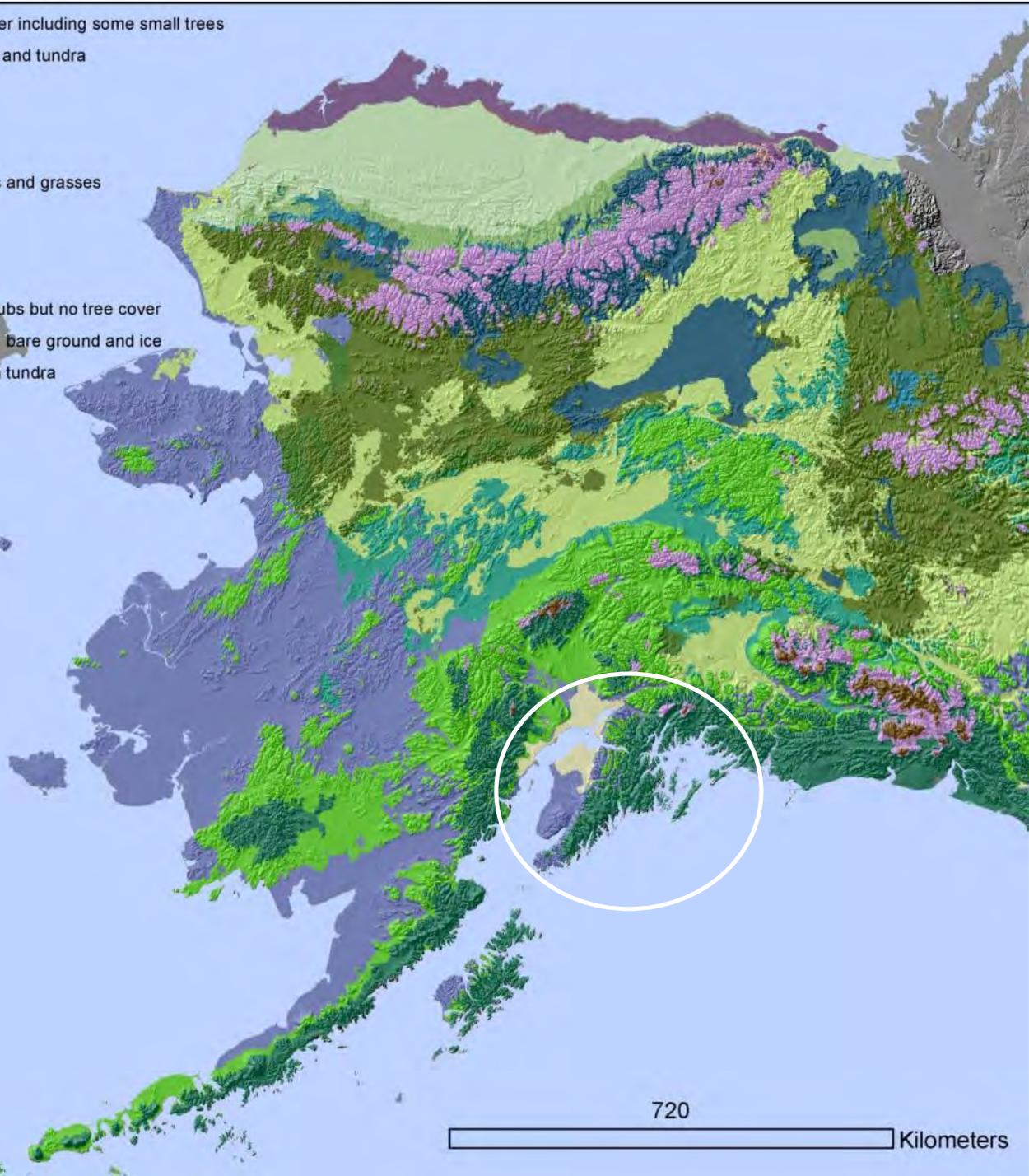
**2009**

720 Kilometers

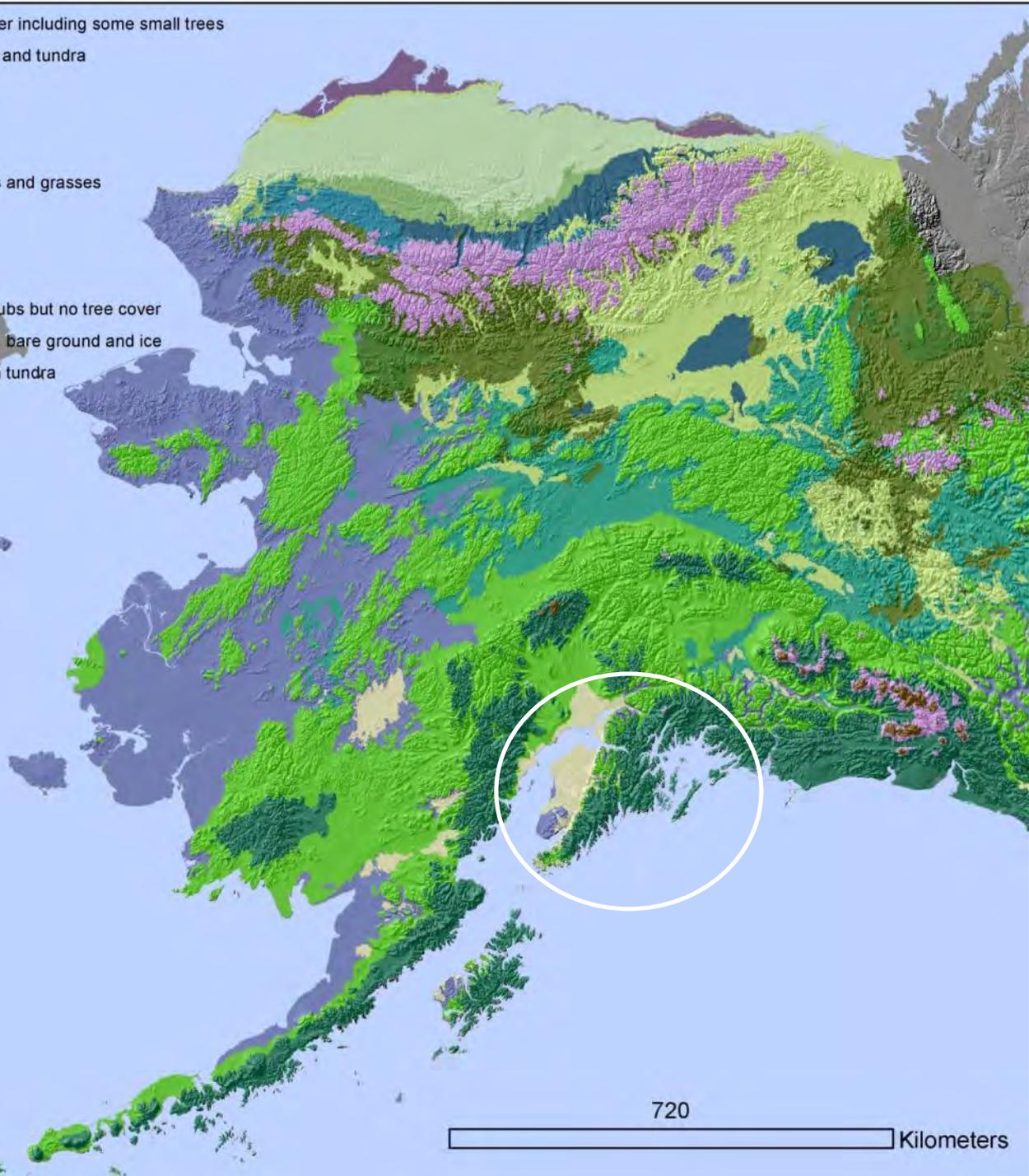
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**2039**

720 Kilometers



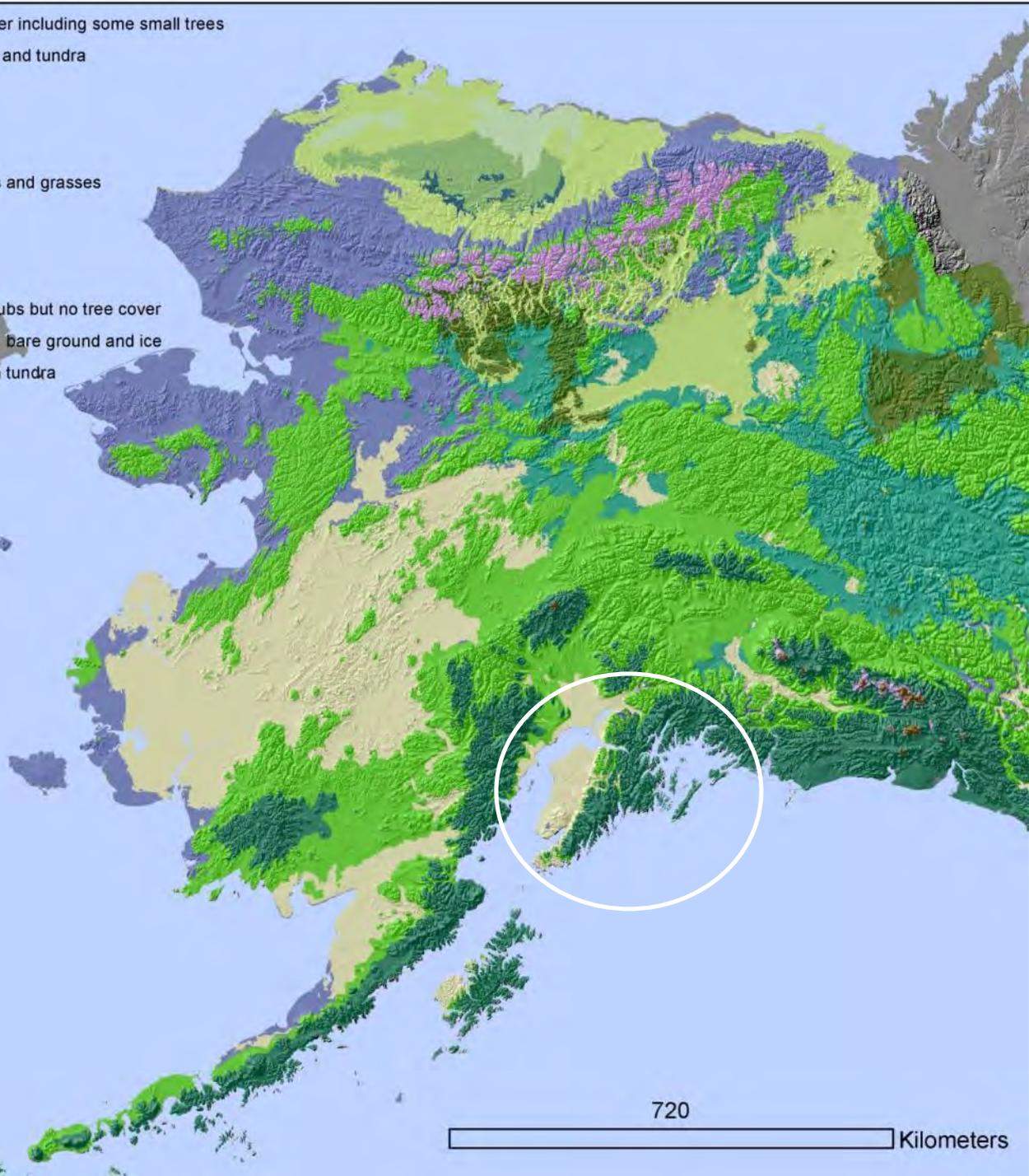
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**2069**

720 Kilometers

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**2099**

720 Kilometers

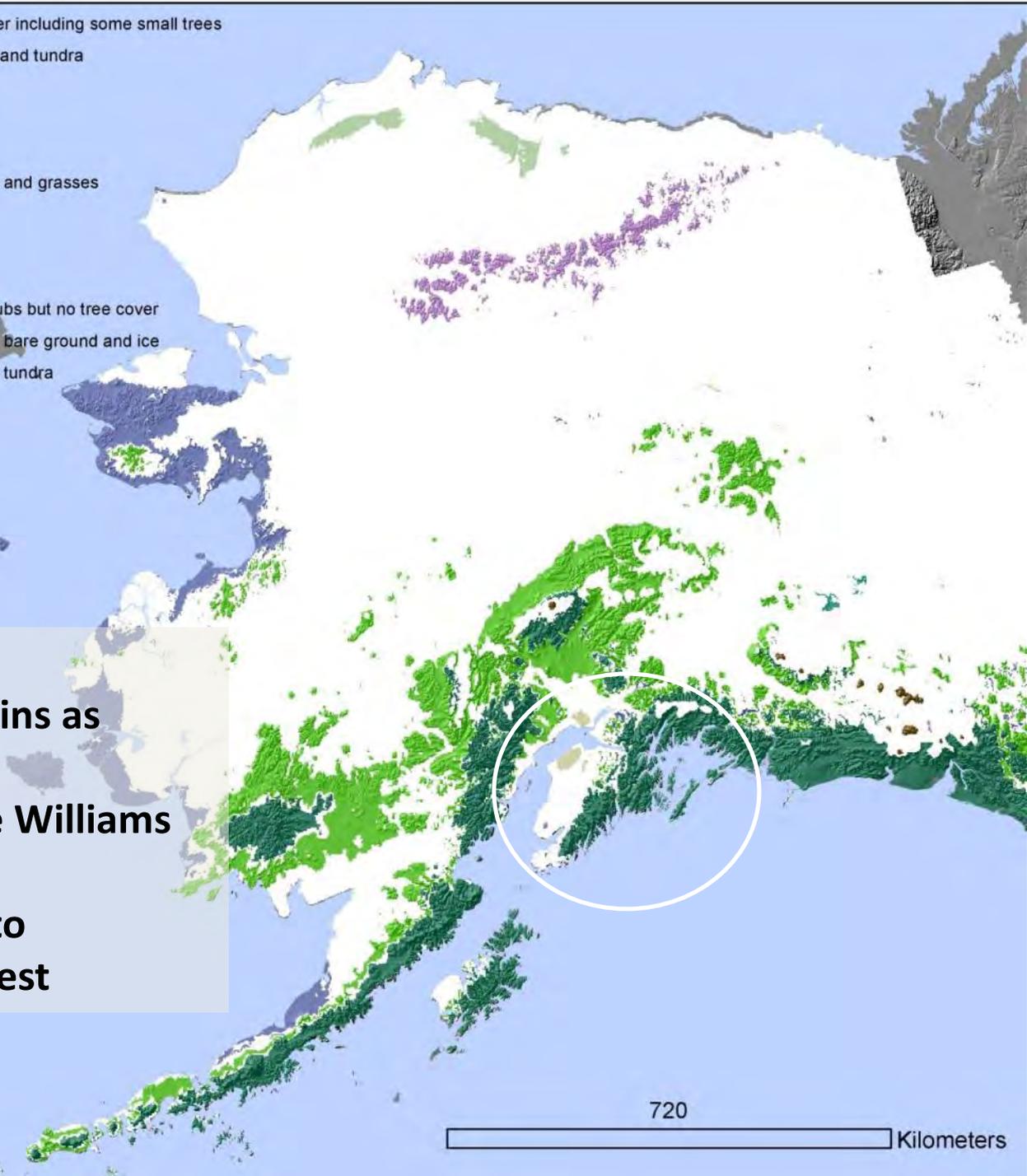
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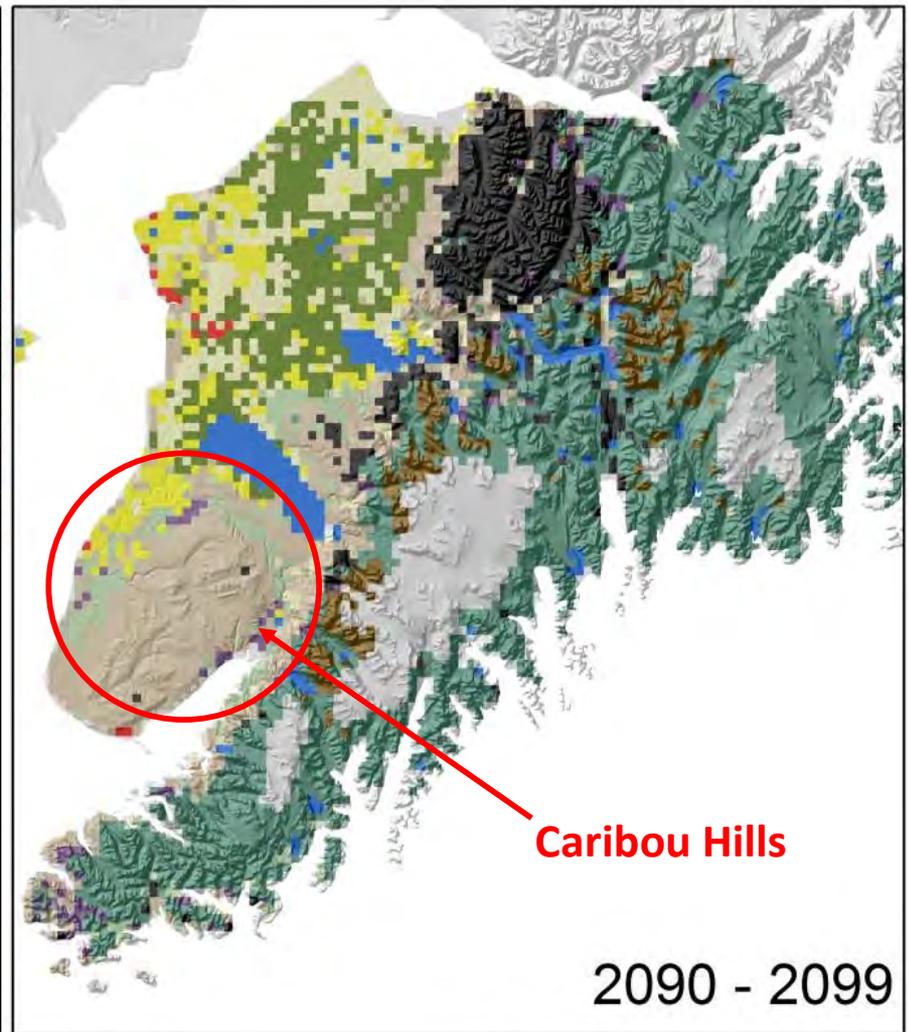
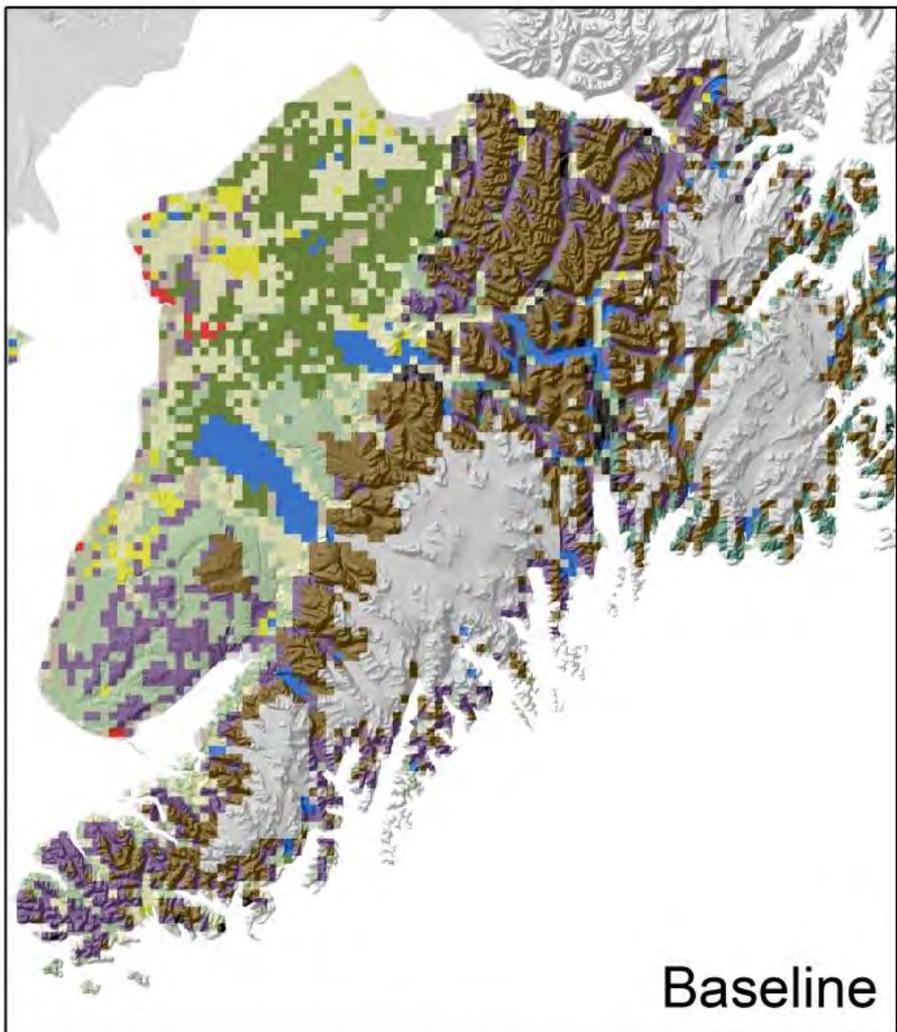
**By 2100...**

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

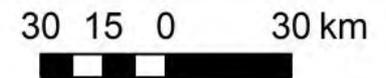
**2099**

720 Kilometers



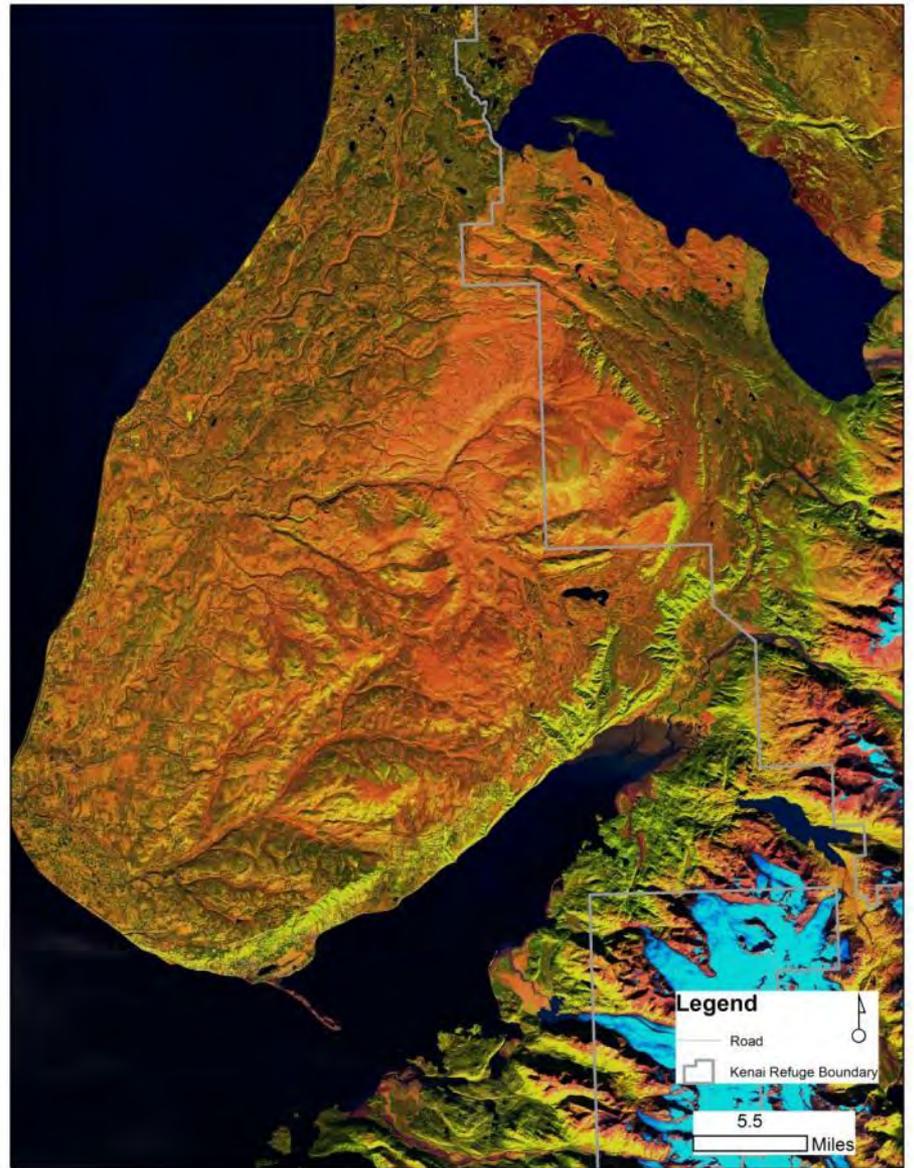


- |               |               |                    |
|---------------|---------------|--------------------|
| Alpine        | Herbaceous    | Mountain Hemlock   |
| Anthropogenic | Ice           | Shrub              |
| Black Spruce  | Mixed Conifer | Water              |
| Deciduous     | Mixed Forest  | White-Sitka Spruce |





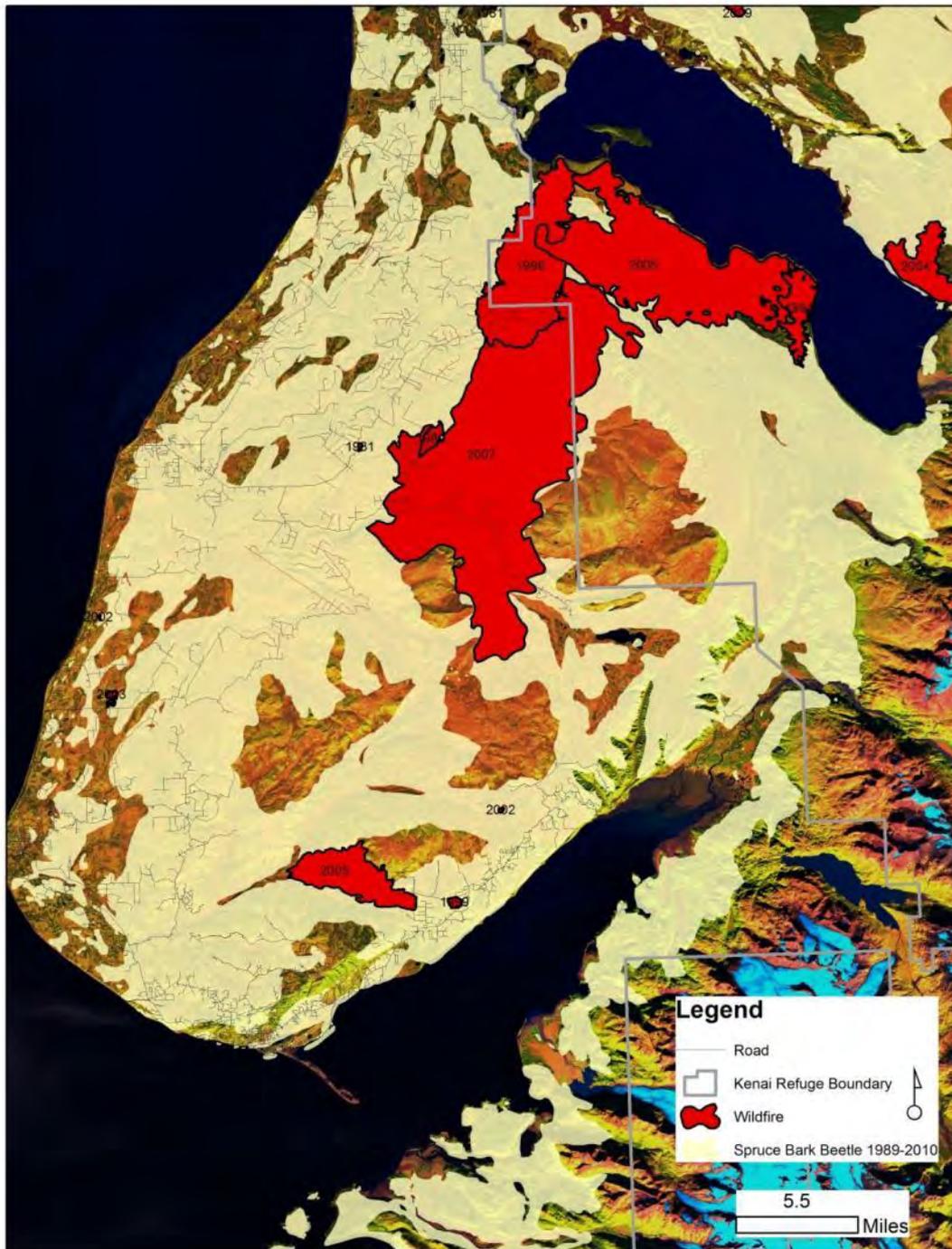
**SEPT 1985**



**SEPT 2014**



## Spruce Bark Beetle Mortality (1989-2010)



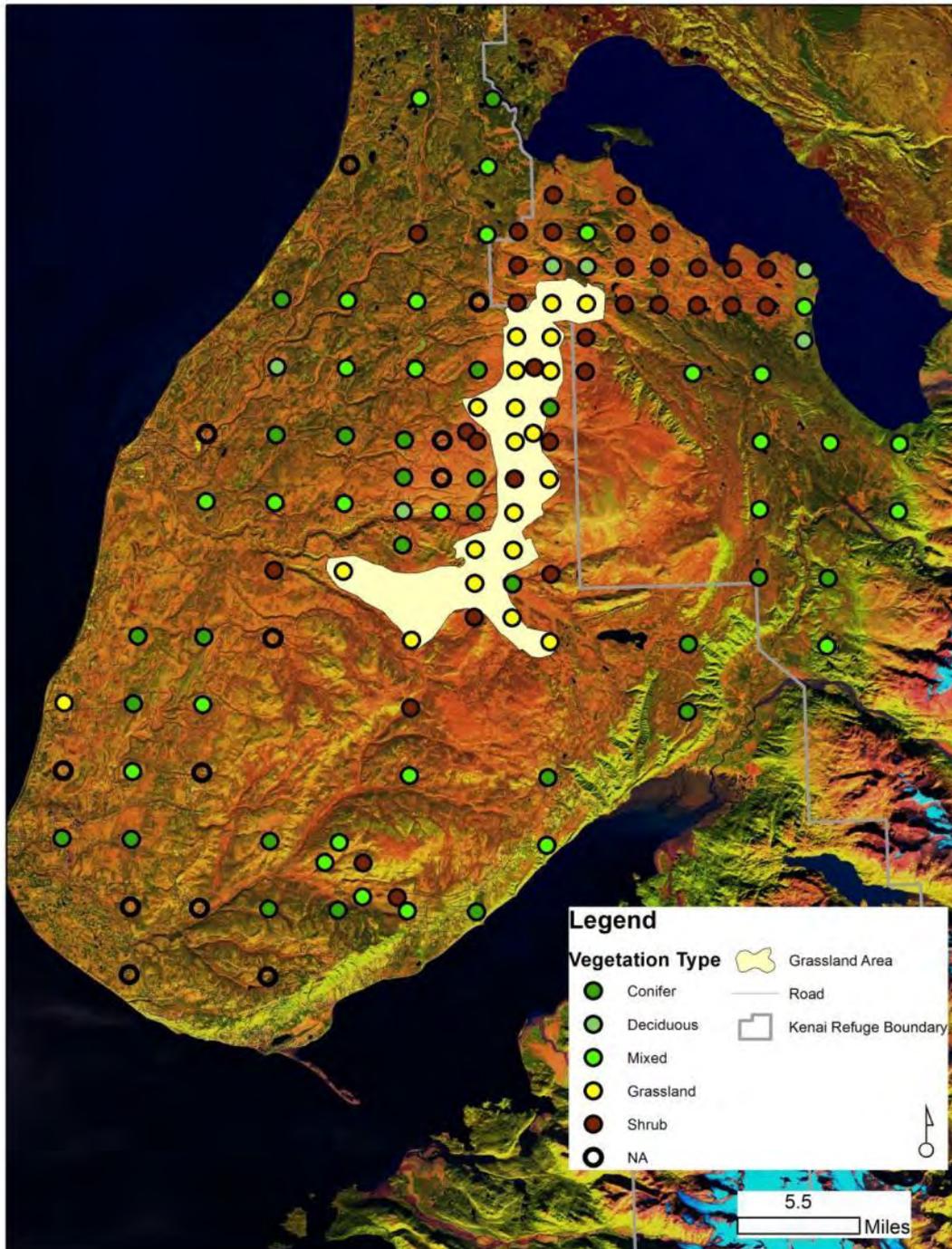
## Wildfires (1994–2007)

- 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%

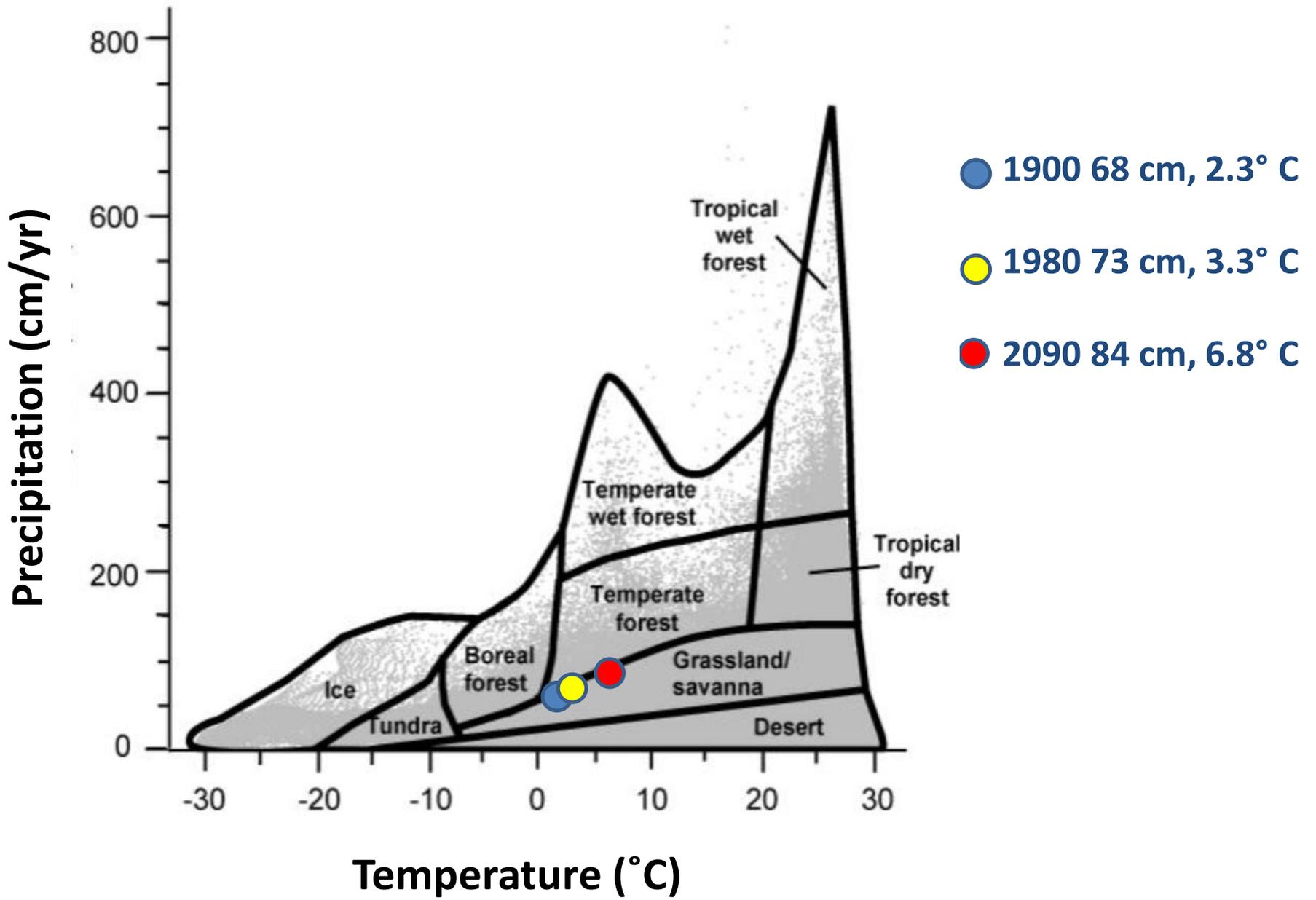




2015/07/19







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





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



# Hardwoods

- Ash (green)
- Birch (Rocky Mountain white, weeping)
- Elm (Siberian)
- Linden (big leaf, little leaf)
- **Maple (Amur, Norway, red, silver, Tatarian)**
- Mountain ash (European/S. aucuparia)
- Oak (Burr, Red)
- Russian olive
- Poplar (Norway)
- Willows (11 species)
- Many fruit tree varieties (e.g., Bird's cherry)



# Softwoods

- Cedar (Western red, white)
- **Dawn redwood (Metasequoia)**
- Fir (balsam, Douglas, grand, Korean, Sakhalin, Shasta red, silver, subalpine, white)
- Hemlock (Eastern)
- Juniper
- Larch (Alaska, Dahurian, Siberian, Western)
- Pine (Austrian, bristlecone, Eastern white, lodgepole, limber, Manchurian, Mugo, Ponderosa, Scotch, Siberian, Western white)
- Spruce (Black Hills, blue, dwarf Alberta, Englemann, Norway)



A photograph of a beach at sunset. The sky is a mix of blue, purple, and orange. The ocean is calm and reflects the sky. In the foreground, there is a dark, sandy beach. In the middle ground, several polar bears are standing on the beach, some looking towards the water. There are also many seagulls scattered across the beach and in the water. One seagull is flying in the sky on the left side.

# 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

# 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 isthmus and rainshadow of Kenai Mountains
- ✓ Novel assemblages ≠ simple re-shuffling of native flora and fauna
- ✓ Many exotic species already introduced and more *en route*
- ✓ And we squander our early opportunities to steward outcomes!

DECREASING UNCERTAINTY BUT REDUCED OPPORTUNITY TO STEWARD THE OUTCOME

FOREST

LOGEPOLE PINE

BLACK-TAILED DEER

CURRENT TRAJECTORY



TIME

DECREASING UNCERTAINTY BUT REDUCED OPPORTUNITY TO STEWARD THE OUTCOME

CURRENT TRAJECTORY

FOREST

LOGEPOLE PINE

BLACK-TAILED DEER



GRASS

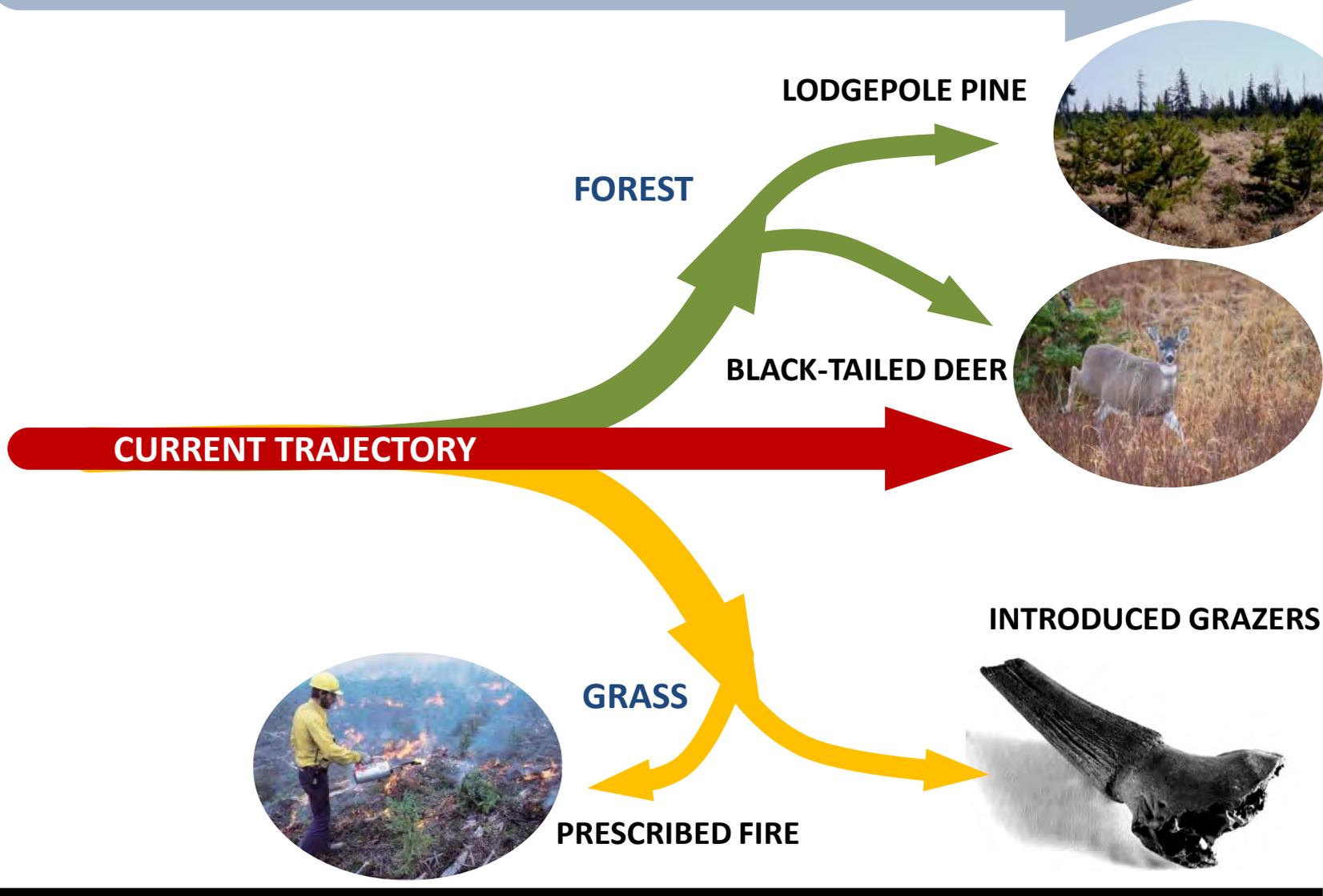
PRESCRIBED FIRE

INTRODUCED GRAZERS



TIME

DECREASING UNCERTAINTY BUT REDUCED OPPORTUNITY TO STEWARD THE OUTCOME



**TIME**

Klein and Reger 2015

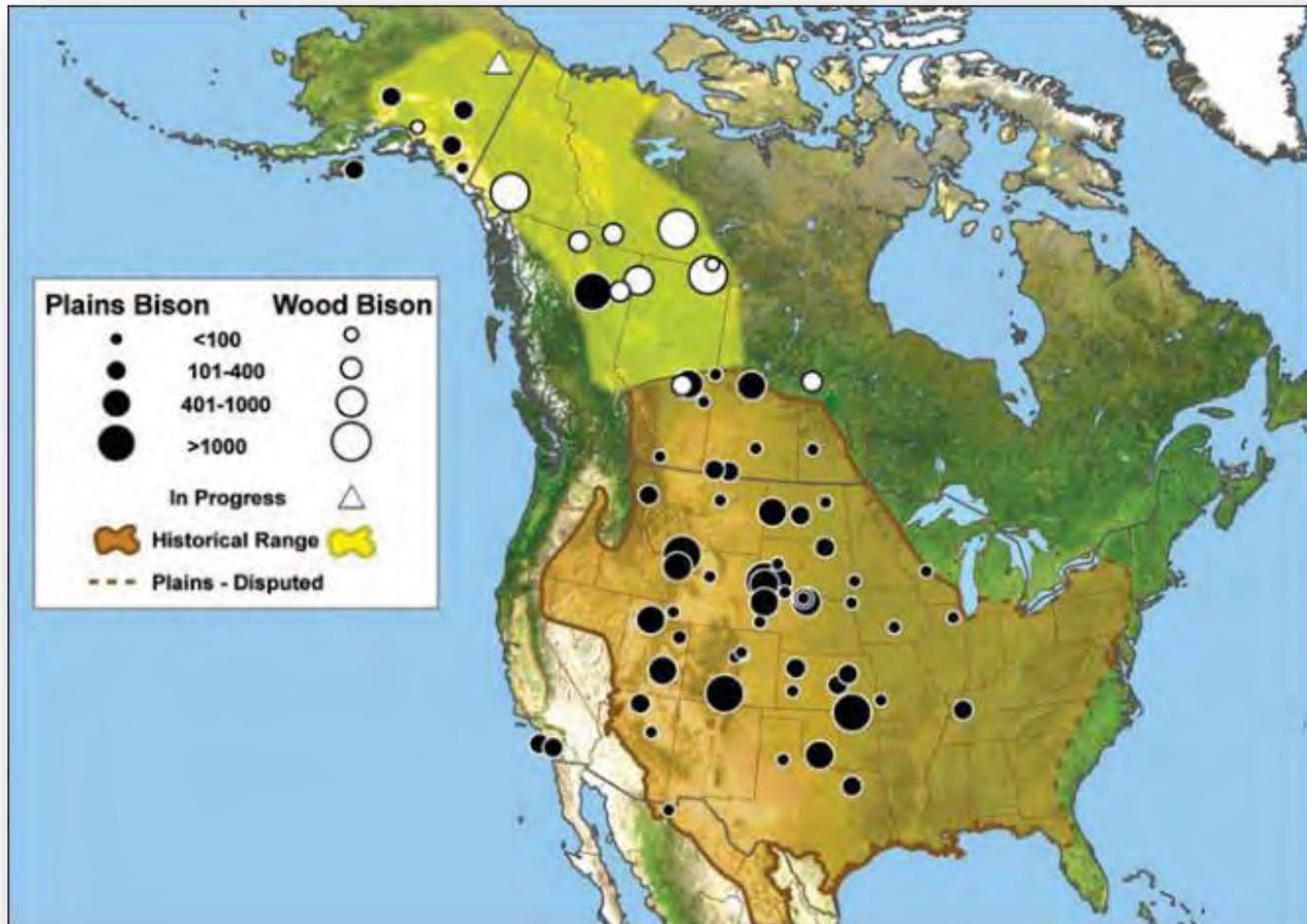


## We have tools for stewarding ecological transformation



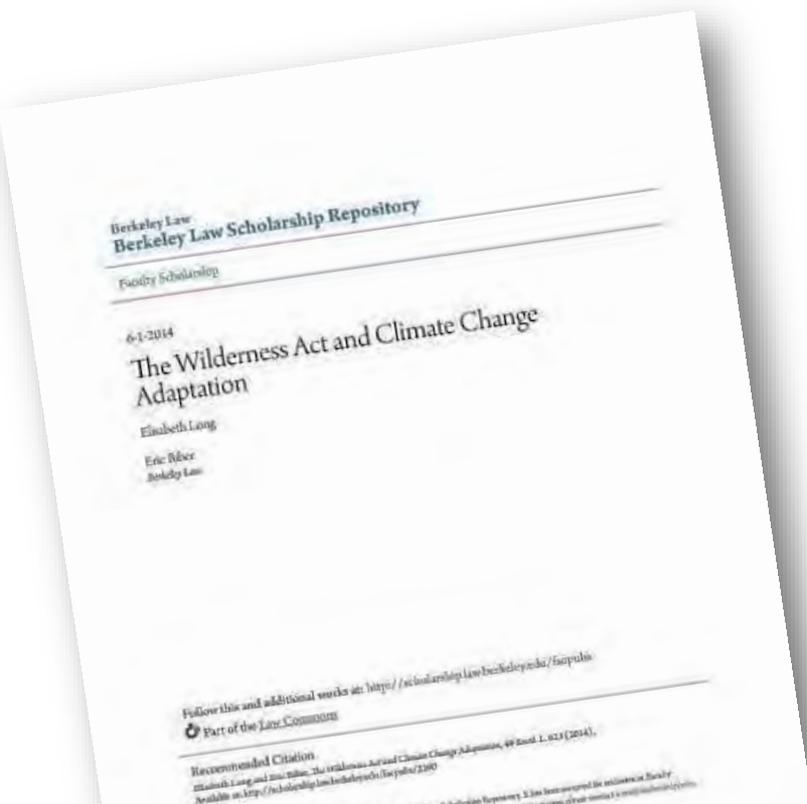
# Considerations as we move forward...

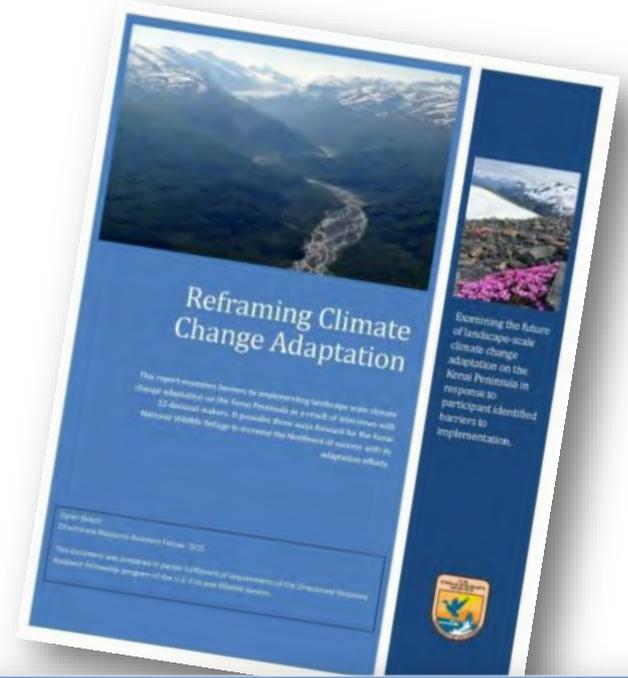
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- But...scientific uncertainty is NOT the deterrent to adaptation that many think
- We need different goals (but who is the authority?)



# Considerations as we move 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**





## Perceptions of Climate Change

Institution	Unit or Division	Climate change ranking	Does climate change exist?	Is climate change being accelerated by humans?	Do humans have a moral obligation to adapt?
USFS	Chugach National Forest	5	Yes	Yes	No
USFWS	Kenai National Wildlife Refuge	7.5	Yes	Yes	Yes
*NPS	Kenai Fjords National Park	-	Yes	Yes	Yes
*NPS	Kenai Fjords National Park	-	Yes	Yes	Yes
USFS	Chugach National Forest	8	Yes	Yes	Yes
NPS	Kenai Fjords National Park	7.5	Yes	Yes	-
USFWS	Kenai National Wildlife Refuge	9	Yes	Yes	Yes
Alaska DNR	Alaska State Parks	2.5	Yes	Yes	Yes
Alaska DNR	Mining, Land, and Water	-	-	-	-
CIRI	Land and Resources	2	Yes	-	Yes
KPB	Land Management Division	4	Yes	-	Yes
KPB	Mayor's Office	-	Yes	Yes	Yes
KPB	The Donald E. Gilman River Center	4	Yes	Yes	-

# Considerations as we move 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 already being made by agencies and private citizens...  
sometimes without climate change as context,  
but always without a comprehensive and coherent strategy**



# Questions????

