

Genetics of polar bears and cattle

- **Matt Cronin**
- **University of Alaska Fairbanks**
- **School of Natural Resources and Agricultural Sciences**

Cattle and Bison

**Compare genetic differences
between bison subspecies and
cattle breeds**

Chirikof Island Alaska Cattle



Chirikof Island Alaska

Island in the north Pacific ocean

44 square miles, about 10 X 4 miles

After purchase of the Territory of Alaska in 1867, Chirikof Island was federally managed by the Bureau of Land Management.

Cattle were first stocked in 1888 or later.

In 1980, Congress included Chirikof Island in Alaska Maritime National Wildlife Refuge.

The BLM grazing lease expired in 2000.

**Angus, Hereford, Highland, Shorthorn and perhaps others
Put on Chirikof Island in the 1900s**

Legends of Russian cattle on the island from before U.S. purchase

Chirikof Island from space





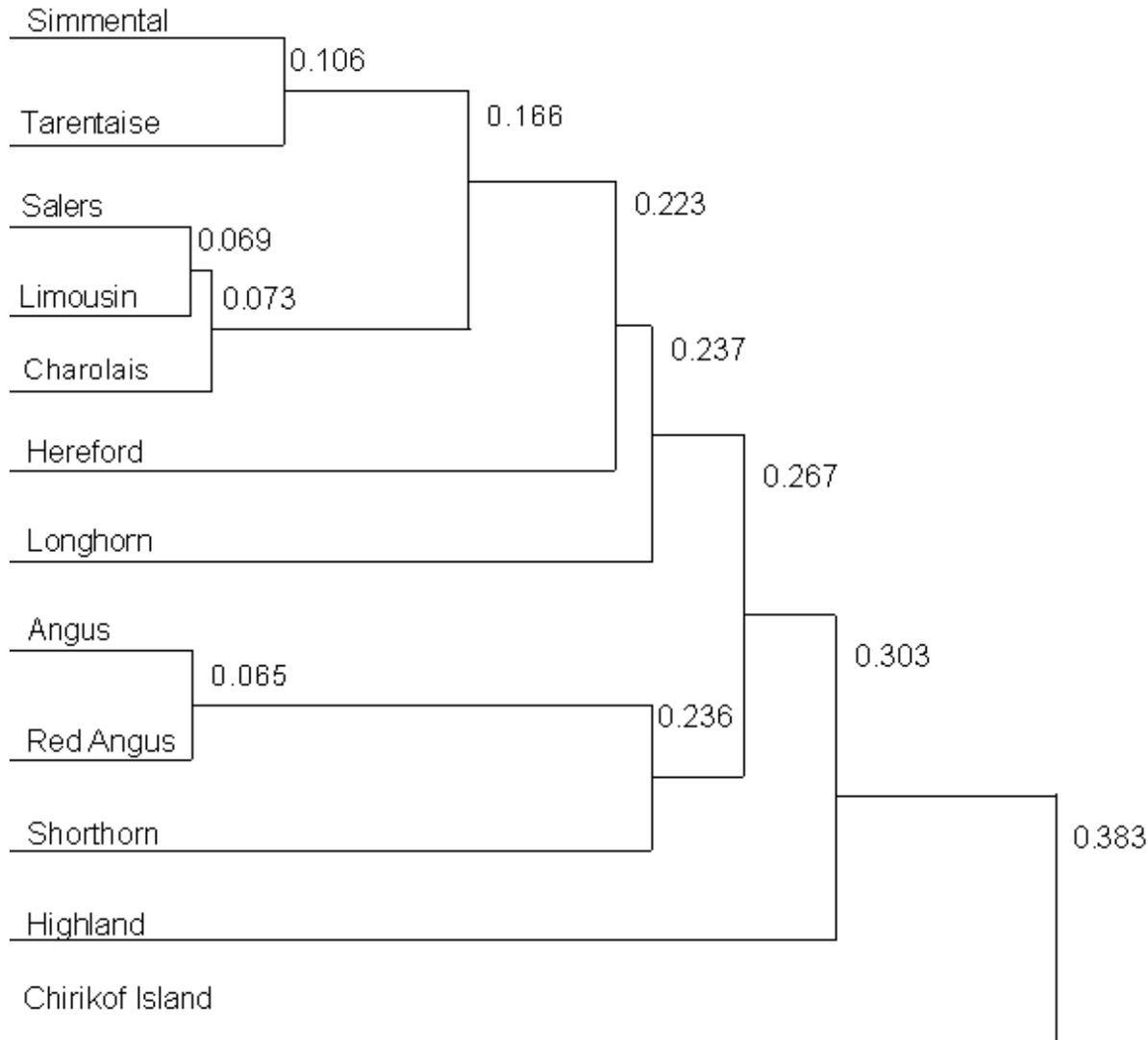








Cattle breeds genetic relationships



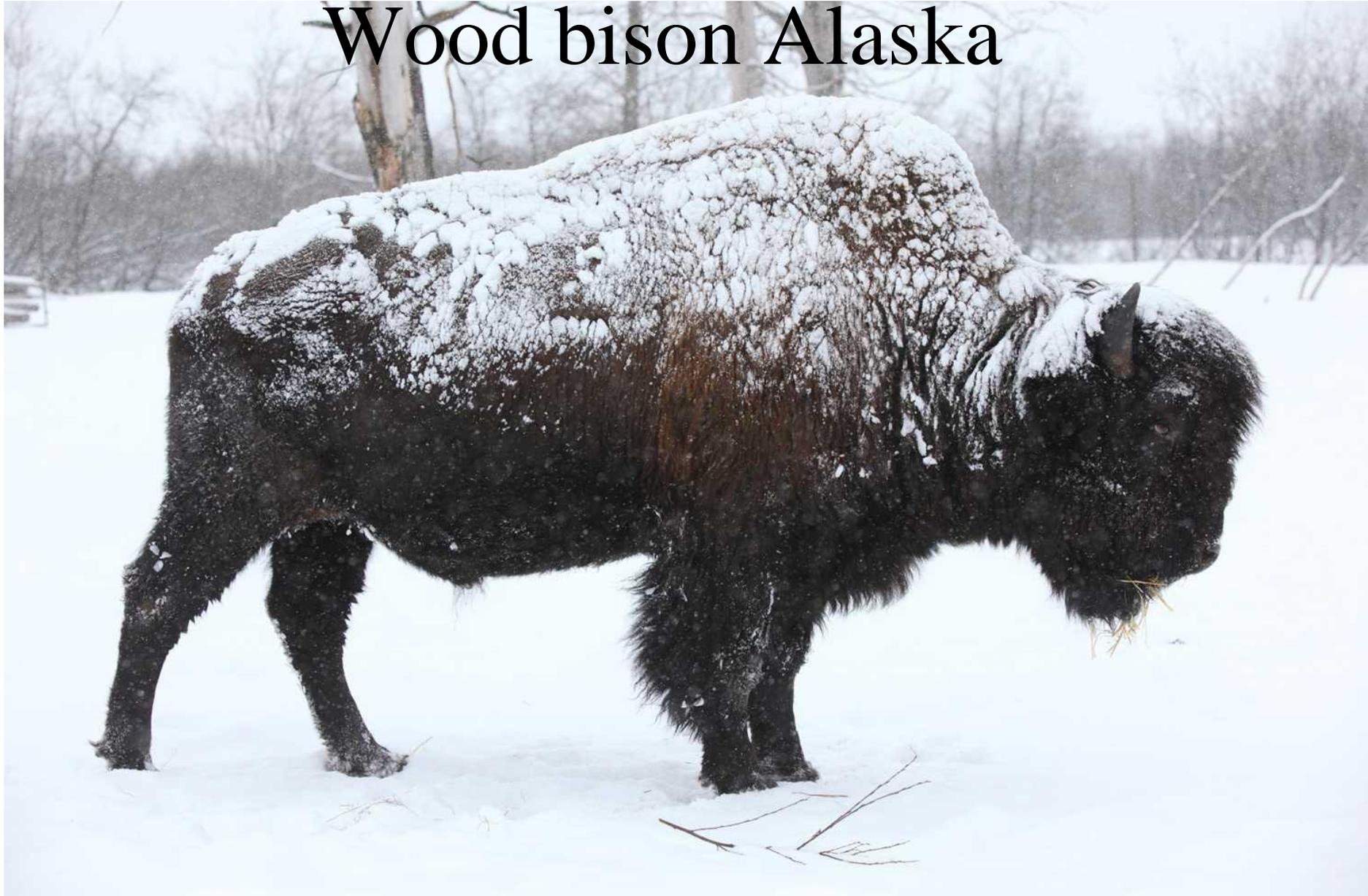
Bison in Alaska

- **Wood bison proposed to be introduced from Canada**
- **Plains bison introduced in 1928. Three hunted populations are doing well.**
- **Wood bison are on ESA list**
- **Plains bison proposed for the ESA list**

Plains Bison



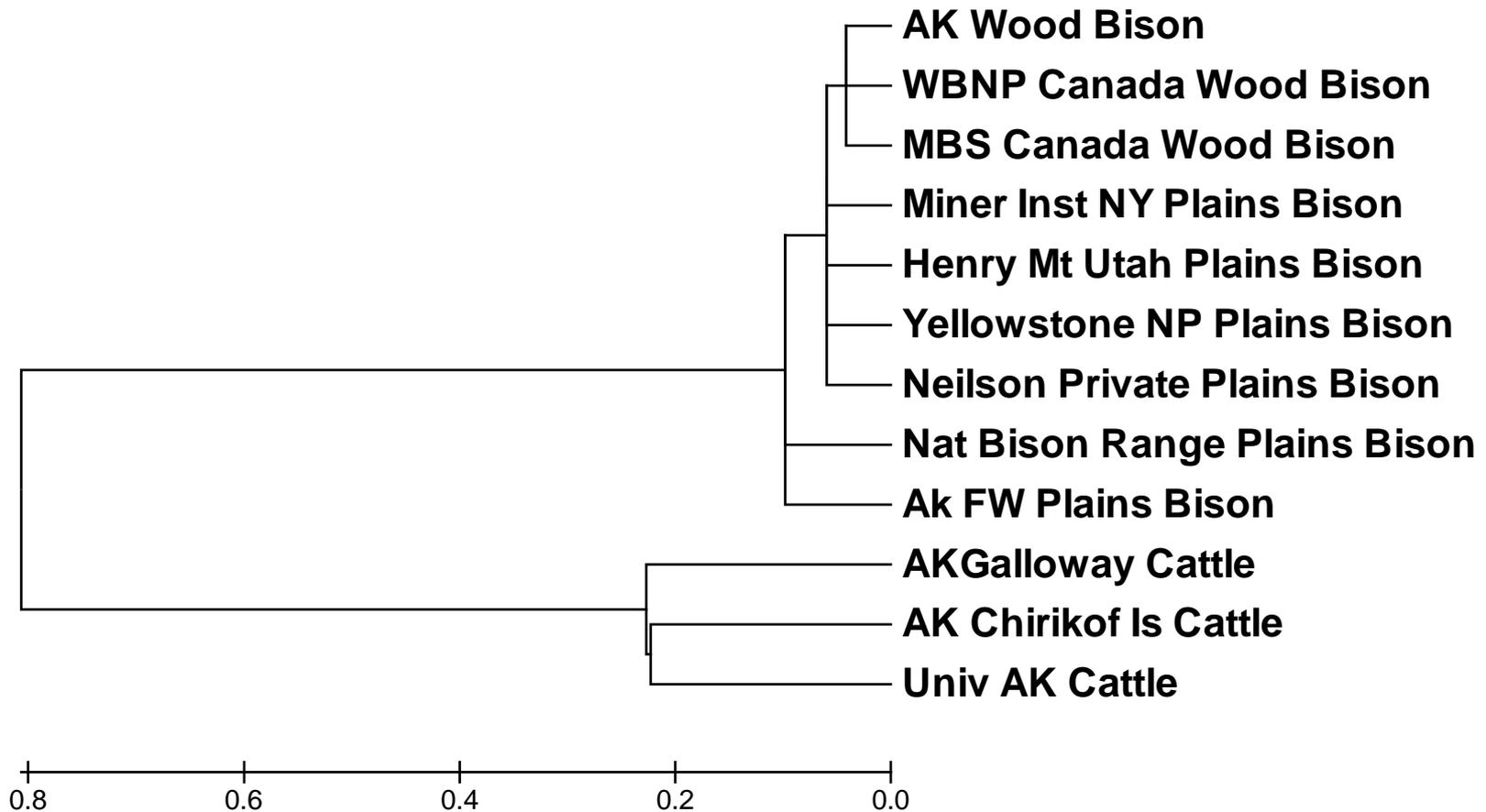
Wood bison Alaska



Wood bison Alaska



Bison and cattle genetic relationships



Genetics of polar bears and grizzly bears

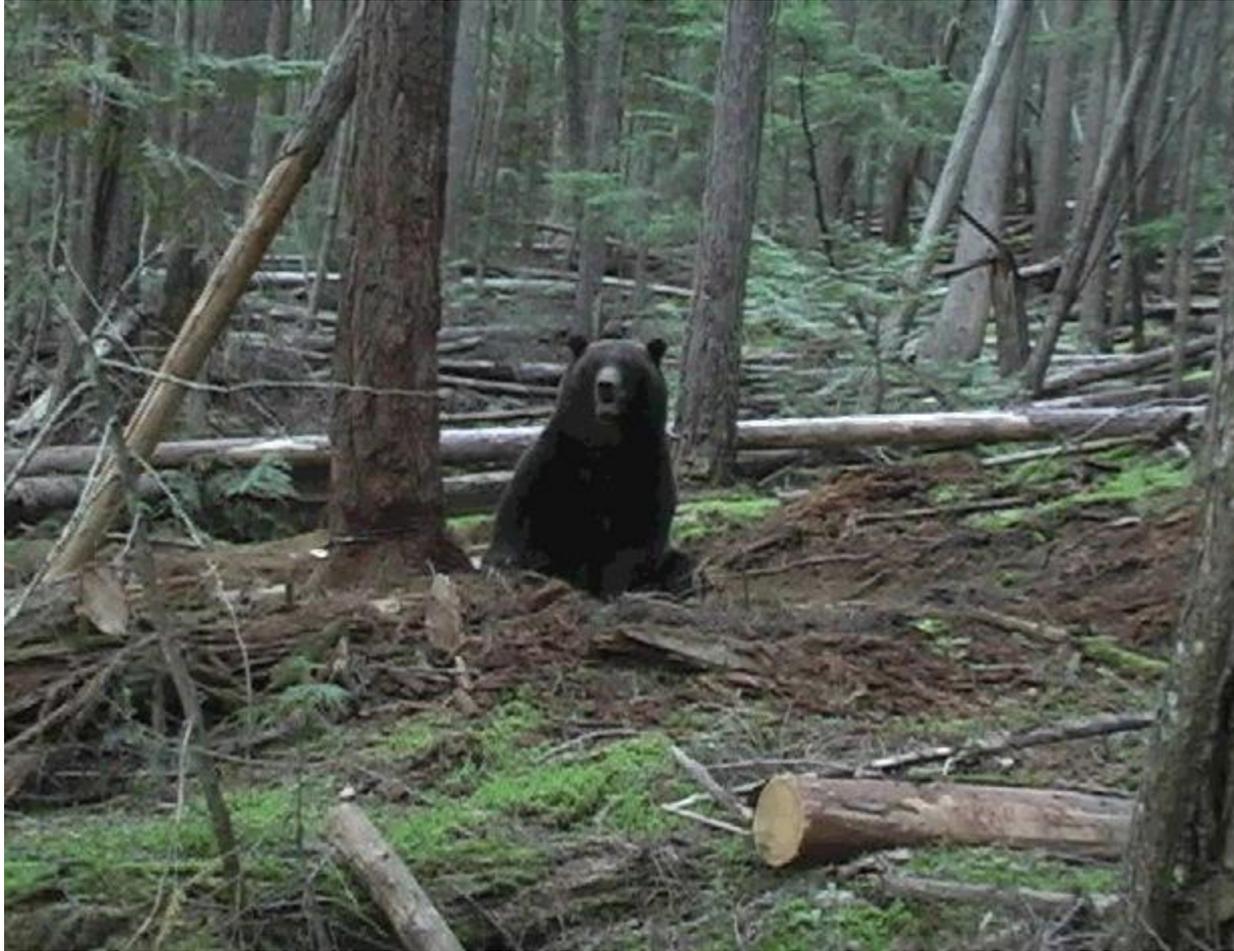
Polar Bear



Alaska Grizzly (Brown) Bear



Montana Grizzly Bear



Black Bear



Polar Bear

Polar bear

Environmental groups petitioned USFWS to list polar bears as endangered due to climate change impacts

May 2008, USFWS listed polar bears as threatened based on:

-Predictions from Models

-climate change will result in a decline of sea ice habitats

- lost habitat will threaten currently healthy populations with extinction over the next 50-100 years

Science

Number populations declining = 5

Number populations stable = 5

Number populations increasing = 2

Number population unknown = 7

Total number of worldwide populations = 19.



- KB Kane basin
- WH Western Hudson Bay
- VM Viscount Melville Bay
- GB Gulf of Boothia
- NW Norwegian Bay

Source : IUCN Polar Bear Specialist Group 1997.

Worldwide population number
has increased 2-3X in last 40
years

20,000-25,000 in 2006,
21,500-25,000 in 2002,
21,000-28,000 in 1995,
25,000 in 1984-1989,
8,000-10,000 in 1965-1970

Polar Bears

- Have polar bears survived previous warming periods?
- Can they adapt to a changed sea ice environment?
- What are appropriate population units?
- Will they hybridize with Grizzly bears?

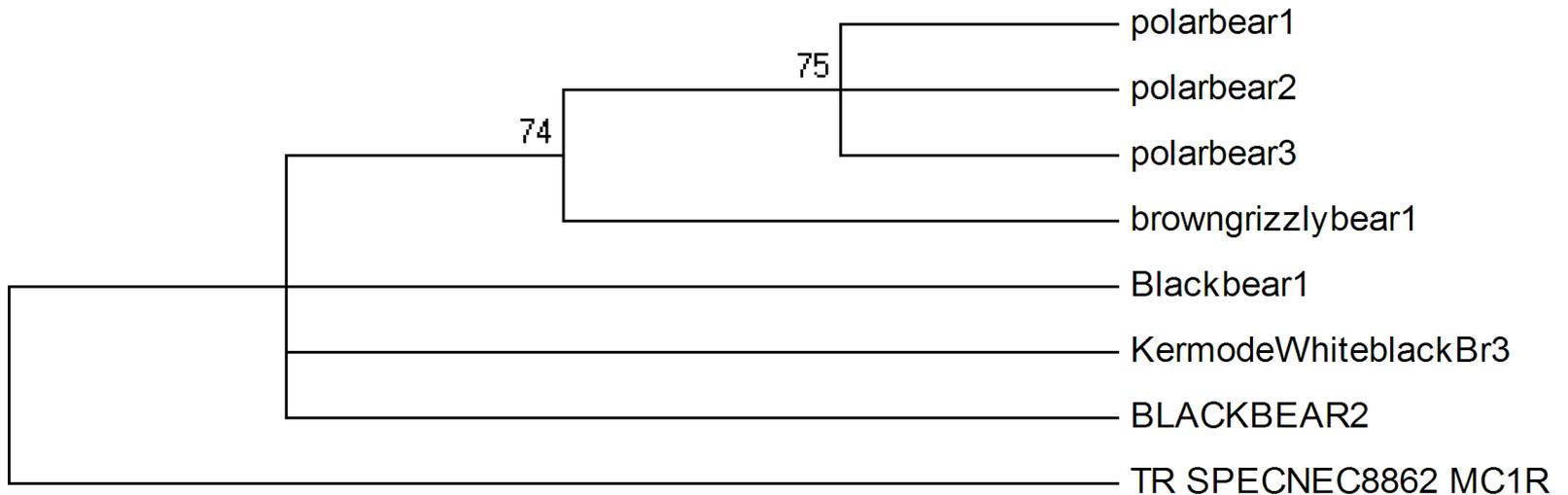


mtDNA of Bears

- ***** **Black Bear MT and OR**

- * ***** **Black Bear MT and OR**
- *
- *
- * * ***** **Alaska and Canada**
- * **Grizzly Bear**
- *
- ***** * ** ***** **Southeast Alaska ABC**
* **Islands Brown Bear**
- *
- *****
- ***** **Polar Bear**
- **0.05 0.03 0.01**
- **mtDNA Sequence divergence**

Mc1r DNA sequence



Polar bear Fossils

- Oldest is 110,000-130,000 years old
- Polar bears have been a species at least since then
- Polar bears have survived previous warming periods
- Is it legitimate to designate them an endangered species?

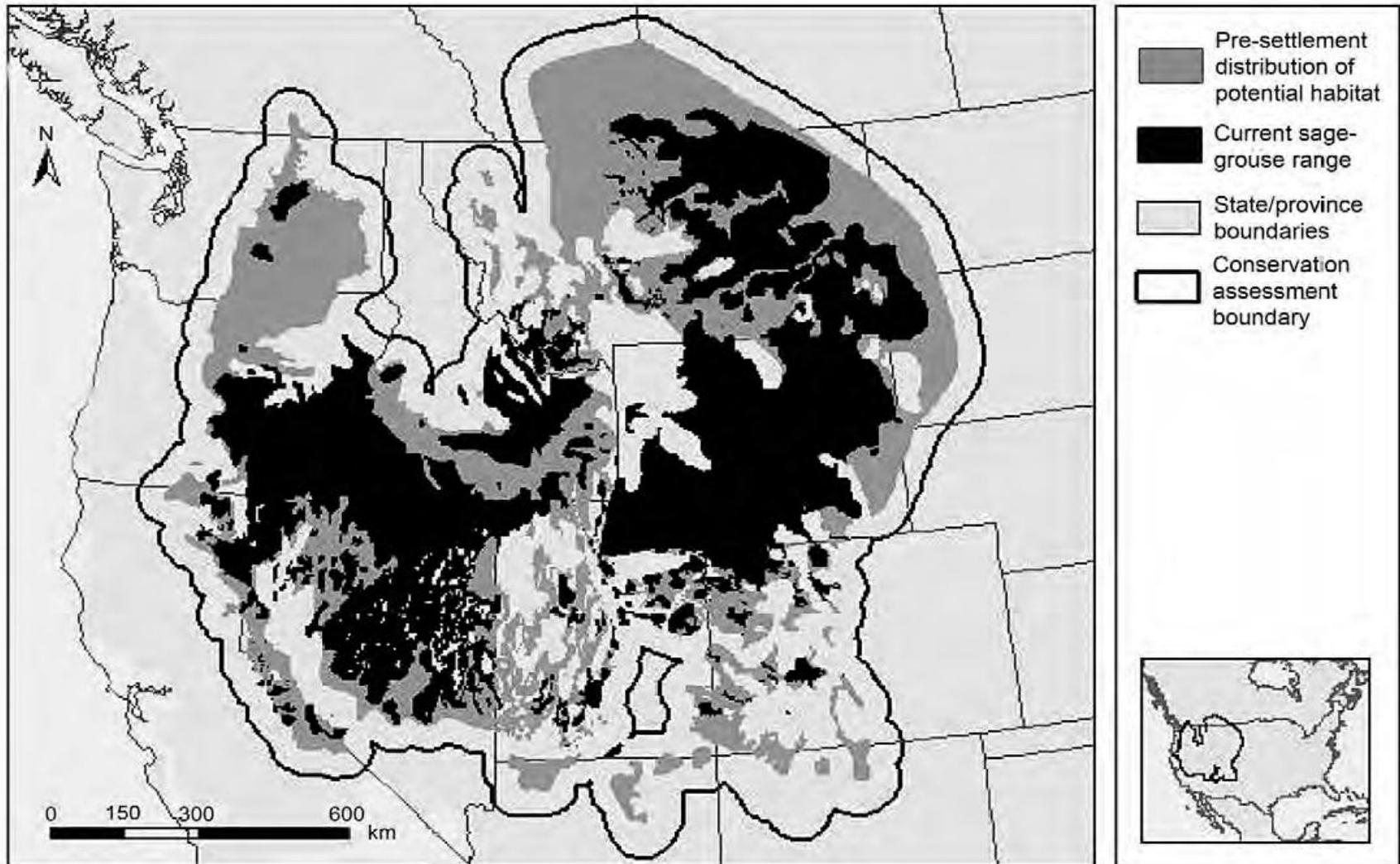
Current project

- Quantify genetic divergence of brown bears and polar bears with genome comparisons to refine estimates of the species divergence time
- Assess Paleo environments regarding sea ice, sea levels and past polar bear habitats over the last 500,000 years
- Assess polar bears survival in past warming and cooling periods and relevance to current changes

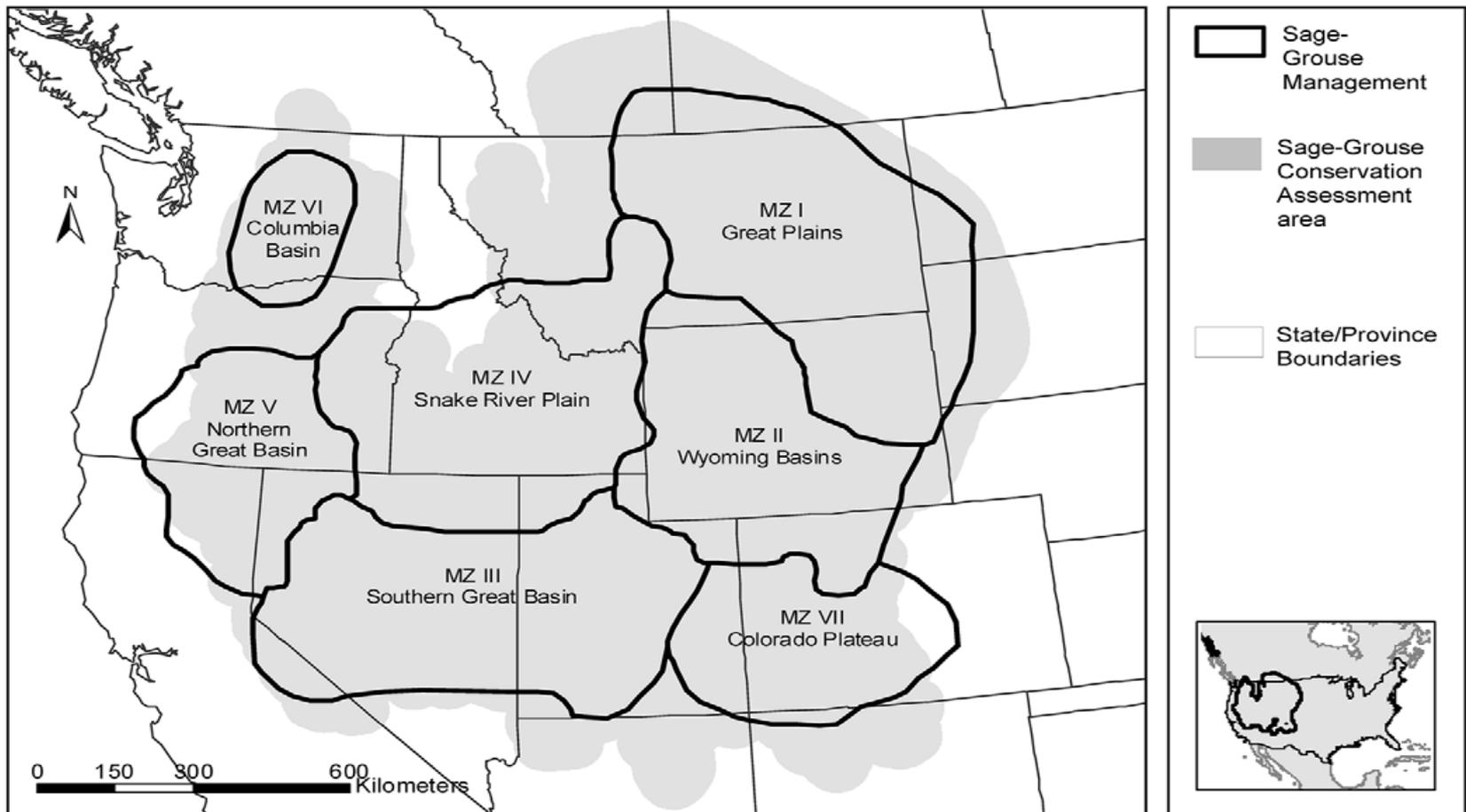
Other Endangered Species Issues

- Wolf
- Grizzly bear
- Sage Grouse

Sage grouse range



Sage-Grouse Management Zones within the Sage-Grouse Conservation Area



ESA Deference to federal agency (by federal court)

- **Page 4 of 116:** “Although plaintiffs have proposed many alternative conclusions that the agency could have drawn with respect to the status of the polar bear, the Court cannot substitute either the plaintiffs’ or its own judgment for that of the agency. Instead, **this Court is bound to uphold the agency’s determination that the polar bear is a threatened species as long as it is reasonable, regardless of whether there may be other reasonable, or even more reasonable, views.**
- From: UNITED STATES DISTRICT COURT FOR THE DISTRICT OF COLUMBIA RE: POLAR BEAR ENDANGERED SPECIES ACT LISTING