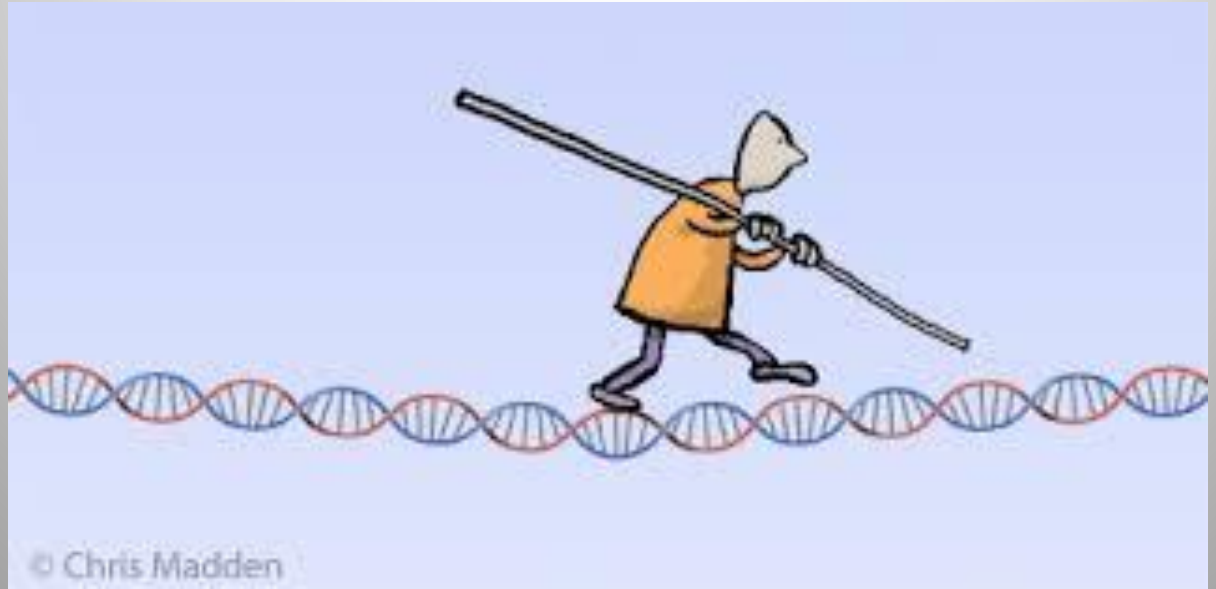
Genetic Studies of Yellowstone Bison



Project Objectives

(1)Better understand genetic diversity of mitochondrial DNA in Yellowstone bison

(2) Test the hypothesis that bison exhibiting mtDNA genotype with mutations have a reduced capacity to produce energy (Pringle 2011).

Collaborators

James Derr at Texas A&M University

DNA Technologies Core Laboratory
(AKA The Derr Lab)

Background

Ward et al. 1999 - 12 haplotypes (5 Yellowstone samples, 2 haplotypes)

Gardipee 2007 – Focused on Yellowstone bison (Hap 6=117, Hap 8 = 34)

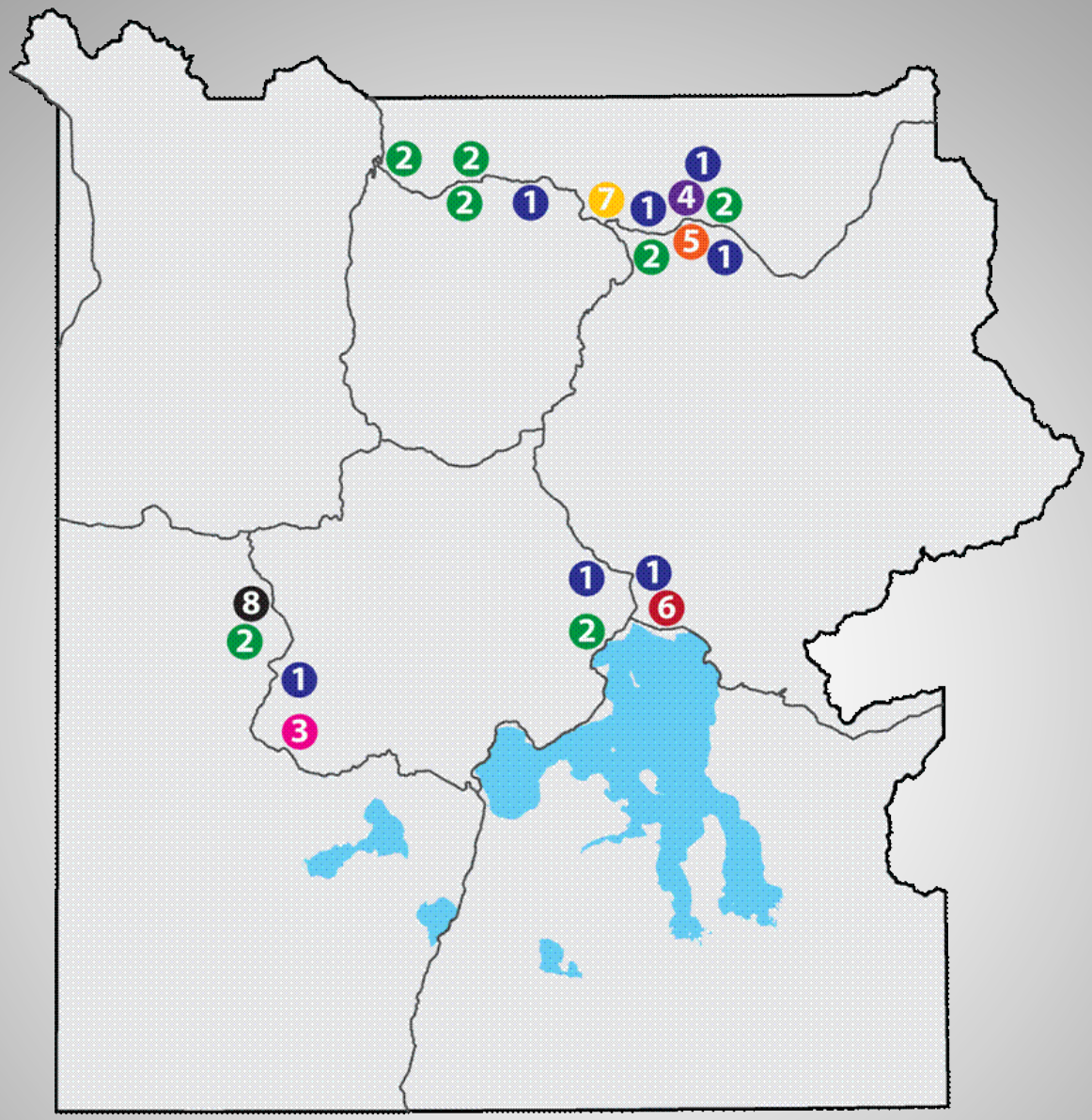
Douglas et al. 2011 – 17 haplotypes (1 Yellowstone sample)

Legend

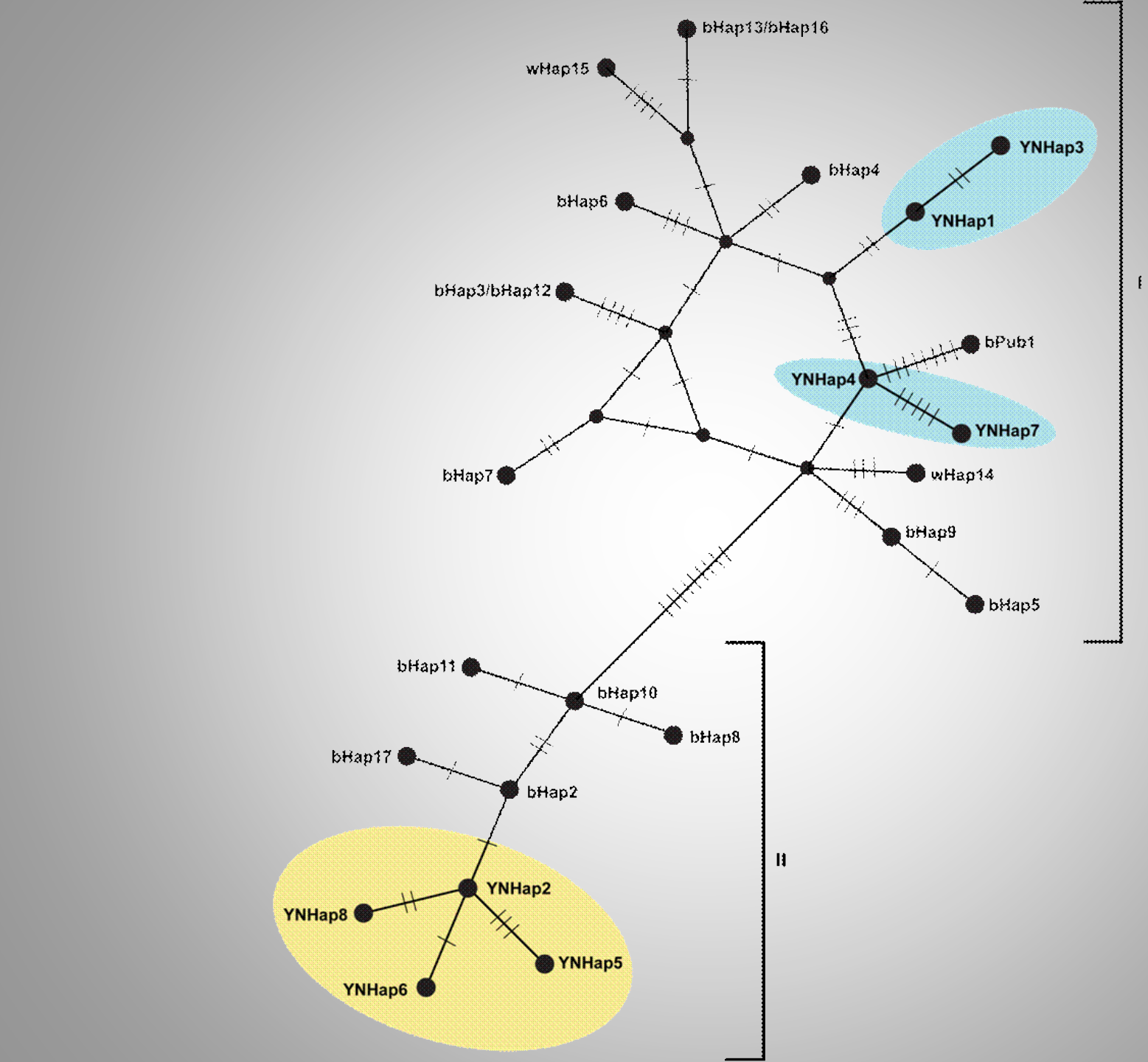
- ■ Central-Year Around
- ★ Central-winter migrant to north
- ▲ North-Year Around
- ◊ North-emigrant from central

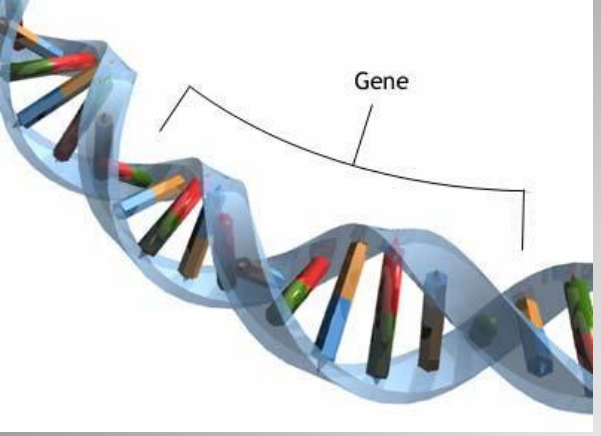
Haplotype	Central Year around	Central Winter migrant North	North Year around	North Emigrant from Central	Total
1	1	2	4	0	7
2	2	1	1	3	7
3	1	0	0	0	1
4	0	0	0	1	1
5	0	0	0	1	1
6	1	0	0	0	1
7	0	0	1	0	1
8	0	1	0	0	1
Total	5	4	6	5	1

Yellow = Endemic Genome Blue = Introduced Genome



Produced by the Yellowstone Spatial Analysis Center 307-344-2246 in March 2015; modified at Texas A&M University in April 2015.


bHap13/bHap16
wHap15
YNHap3
bHap4
YNHap1
bHap6
bHap3/bHap12
bPub1
YNHap4
YNHap7
bHap7
wHap14
bHap9
bHap5
I
bHap11
bHap10
bHap8
bHap17
bHap2
YNHap2
YNHap8
YNHap5
YNHap6
II

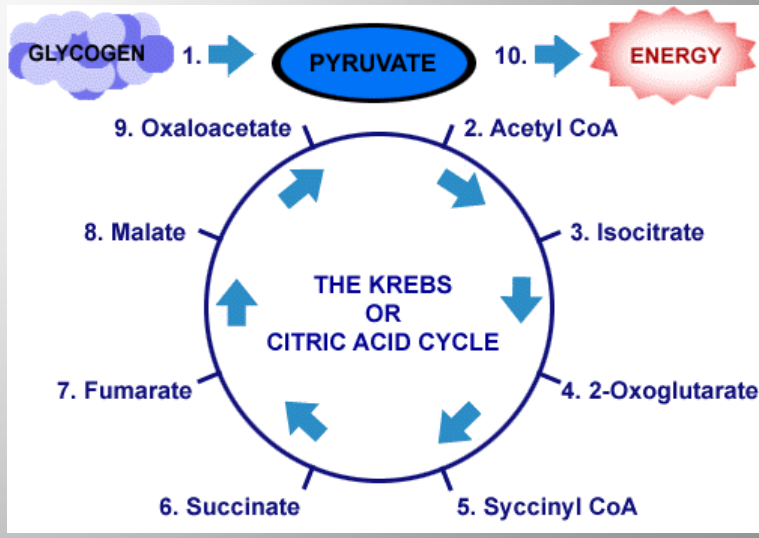


Pringle Hypothesis

Widespread mitochondrial disease in North American bison

Two Mutations , both in the Ward Haplotype 6 genotype. In humans these mutations cause reduced energy production

No difference in ability to produce energy between bison with and without the Pringle mutations



Pringle mutations

Yellowstone bison have both or none of the mutations

Both mutations N = 10
Neither mutation N = 10

What next?

- Repeat with 80 more samples to identify additional haplotypes existing in Yellowstone bison

- Develop a shortcut procedure for haplotype identification

- Collect samples from 100-200 additional Yellowstone bison to estimate mtDNA diversity existing today

<u>Also</u>

- Conduct a larger evaluation of the genotyping error rate expected from the collection of fecal DNA

- Eventually conduct a population viability assessment


Questions?