Bison Relatedness Tool - Early Stages

Bison Genetic Diversity

54 million SNPs in 44 genome sequenced bison
vs 30 million SNPs in all cattle

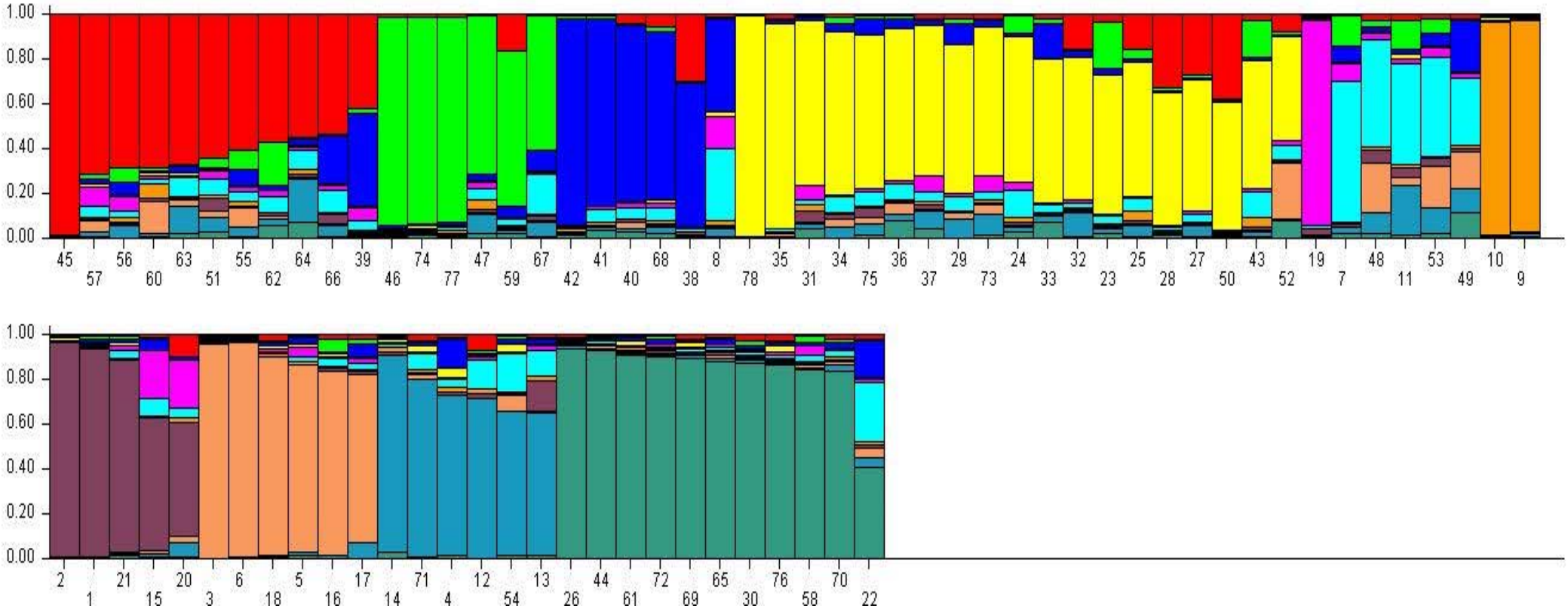
There are no genetic “relatedness tools” commercially available in cattle, but would it work in bison?

The goal is a substitute for a pedigree system

Even if we started a pedigree system now, there’s important information missing about bison lineages after the 1880s

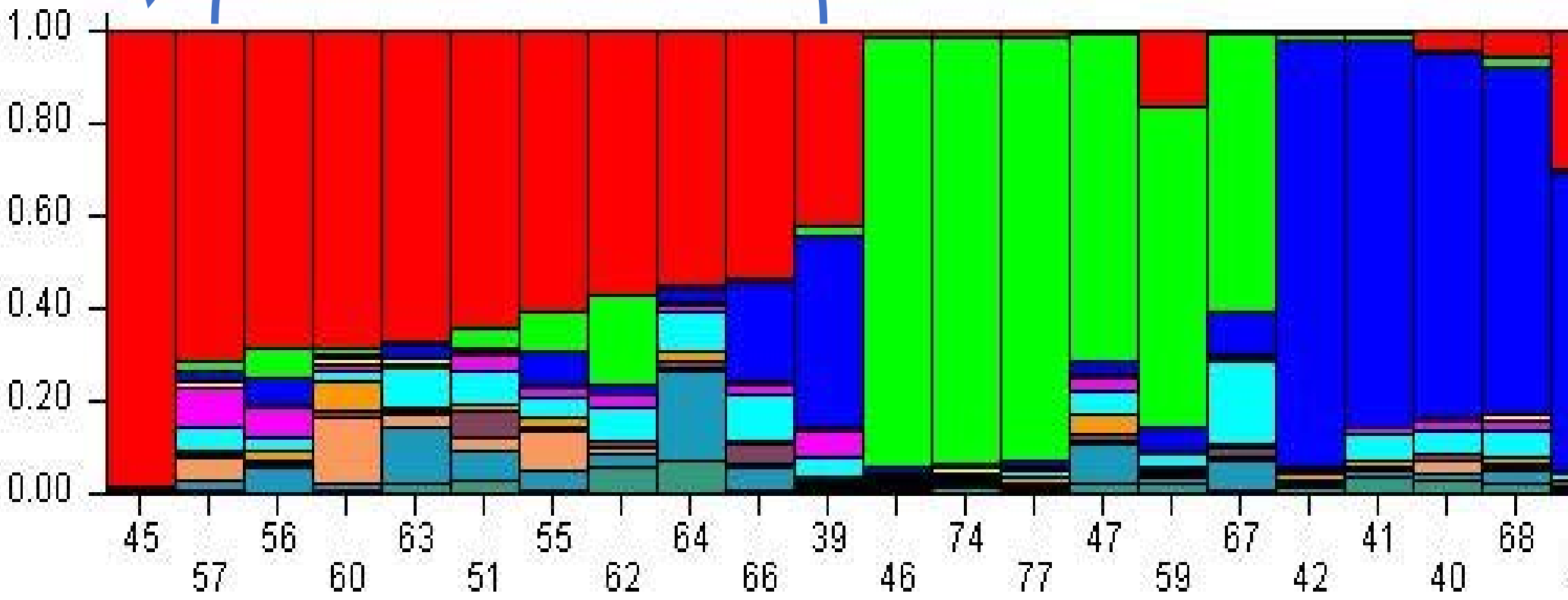
Structure software analysis using 182 parentage SNPs

78 total bison, 57 from Wigness bison
21 from genomics project



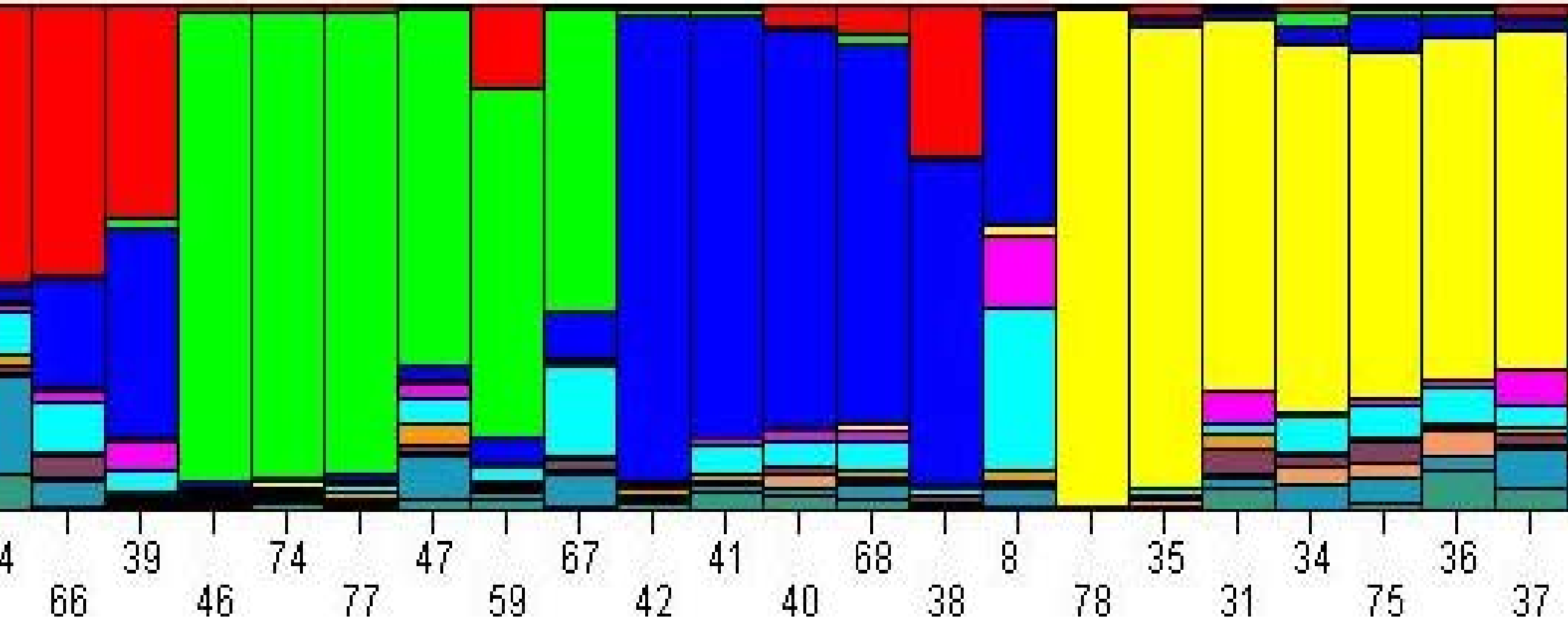
Samson Jr

Yellow tag females
Samson Jr daughters



Young bulls from herd we set up

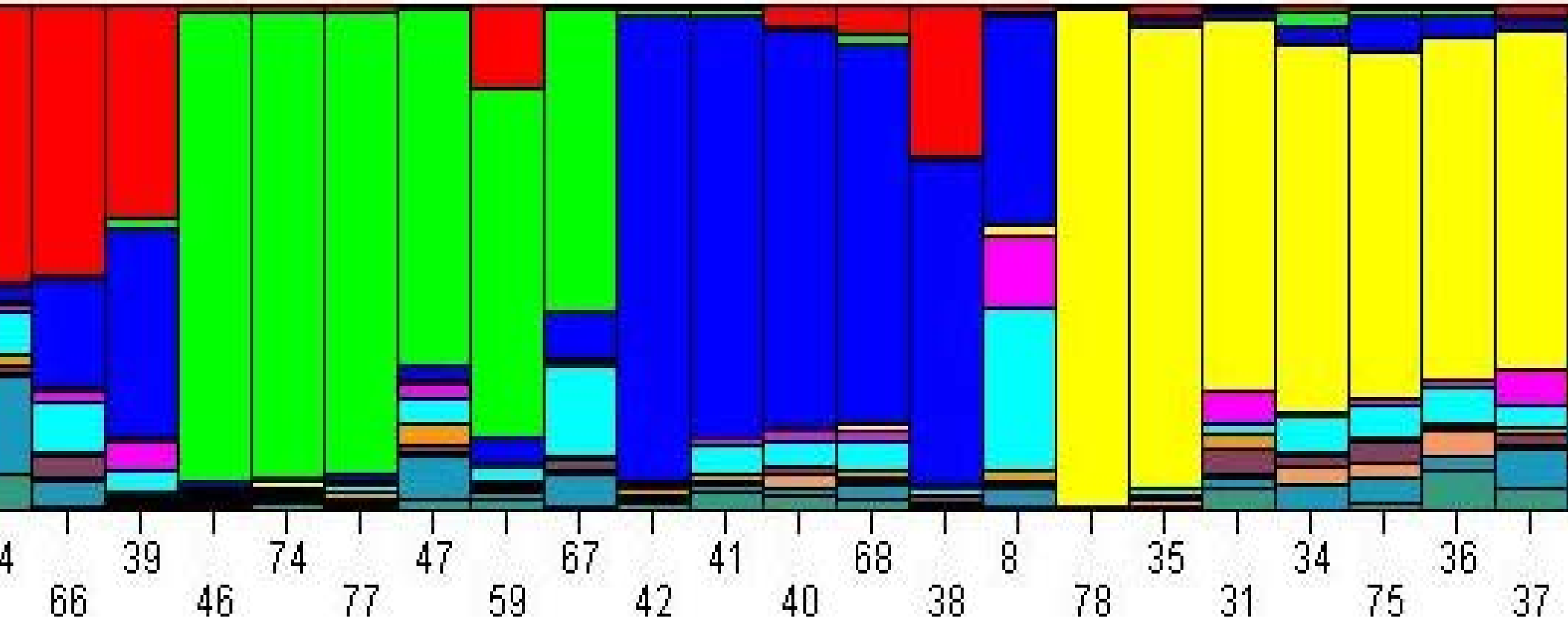
Blue tag females out of Mereks herd

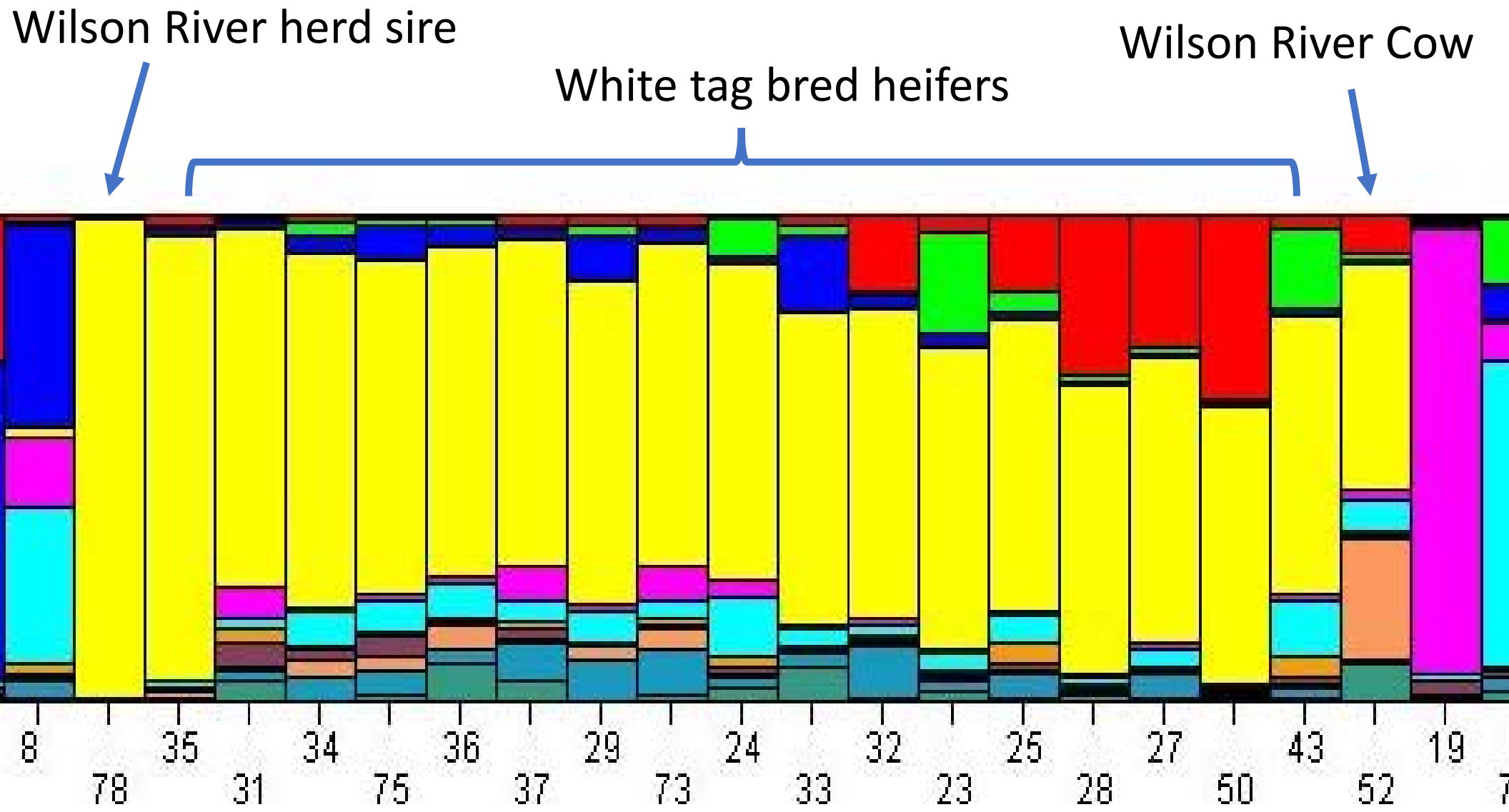


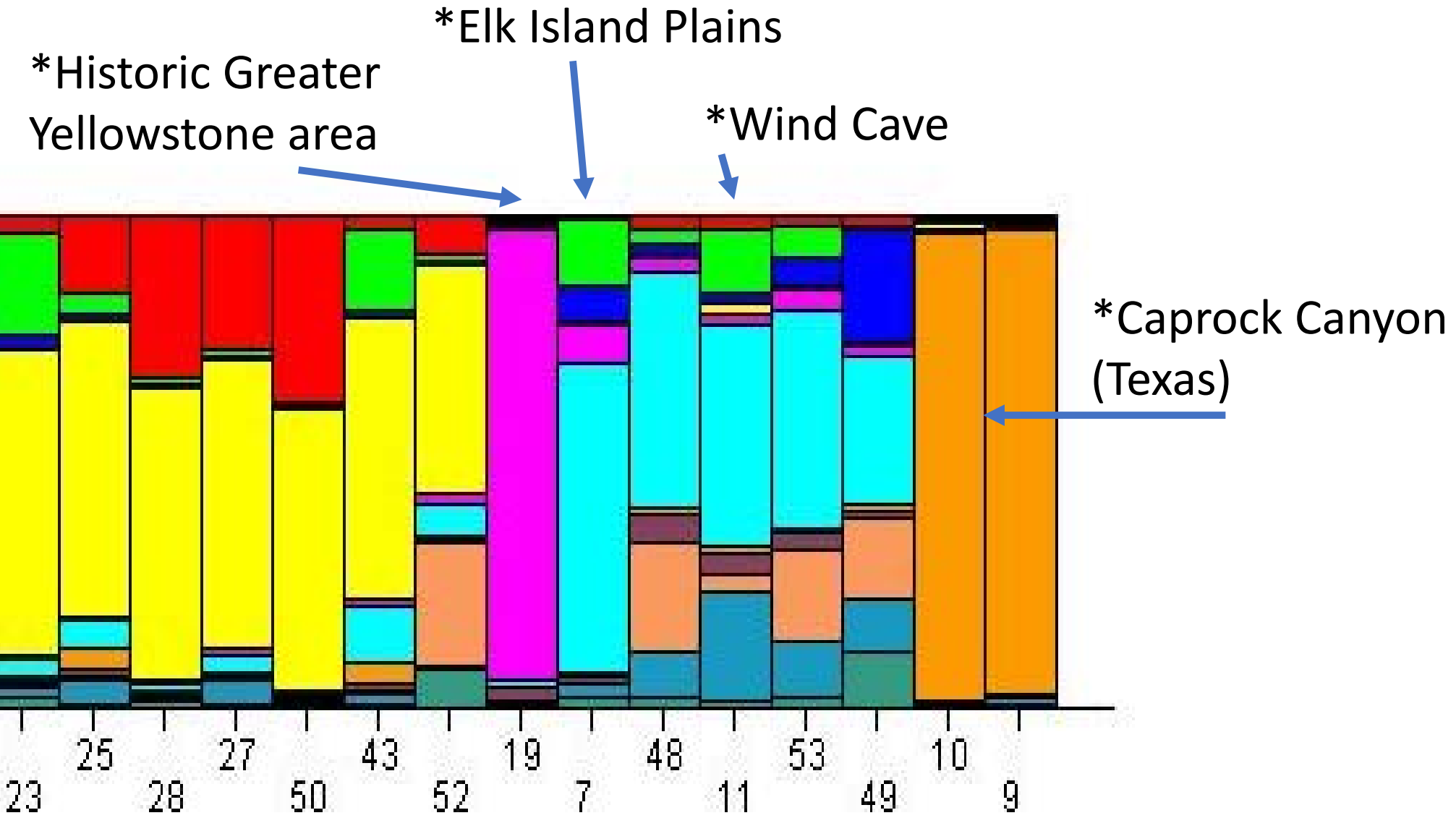
Yellow tag female – Samson Jr

*Elk Island Plains

Young bulls



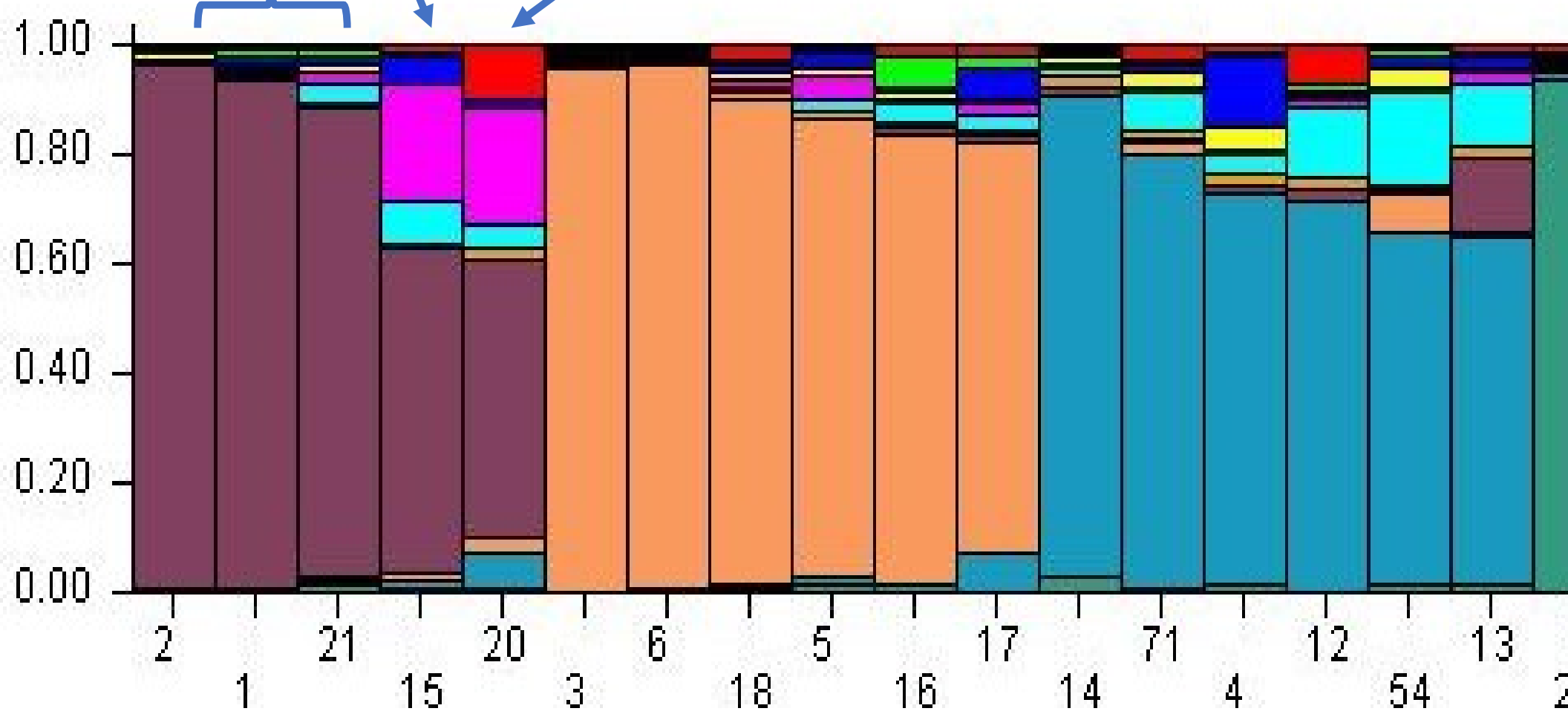

Wilson River herd sire
White tag bred heifers
Wilson River Cow
8
78
35
31
34
75
36
37
29
73
24
33
32
23
25
28
27
50
43
52
19

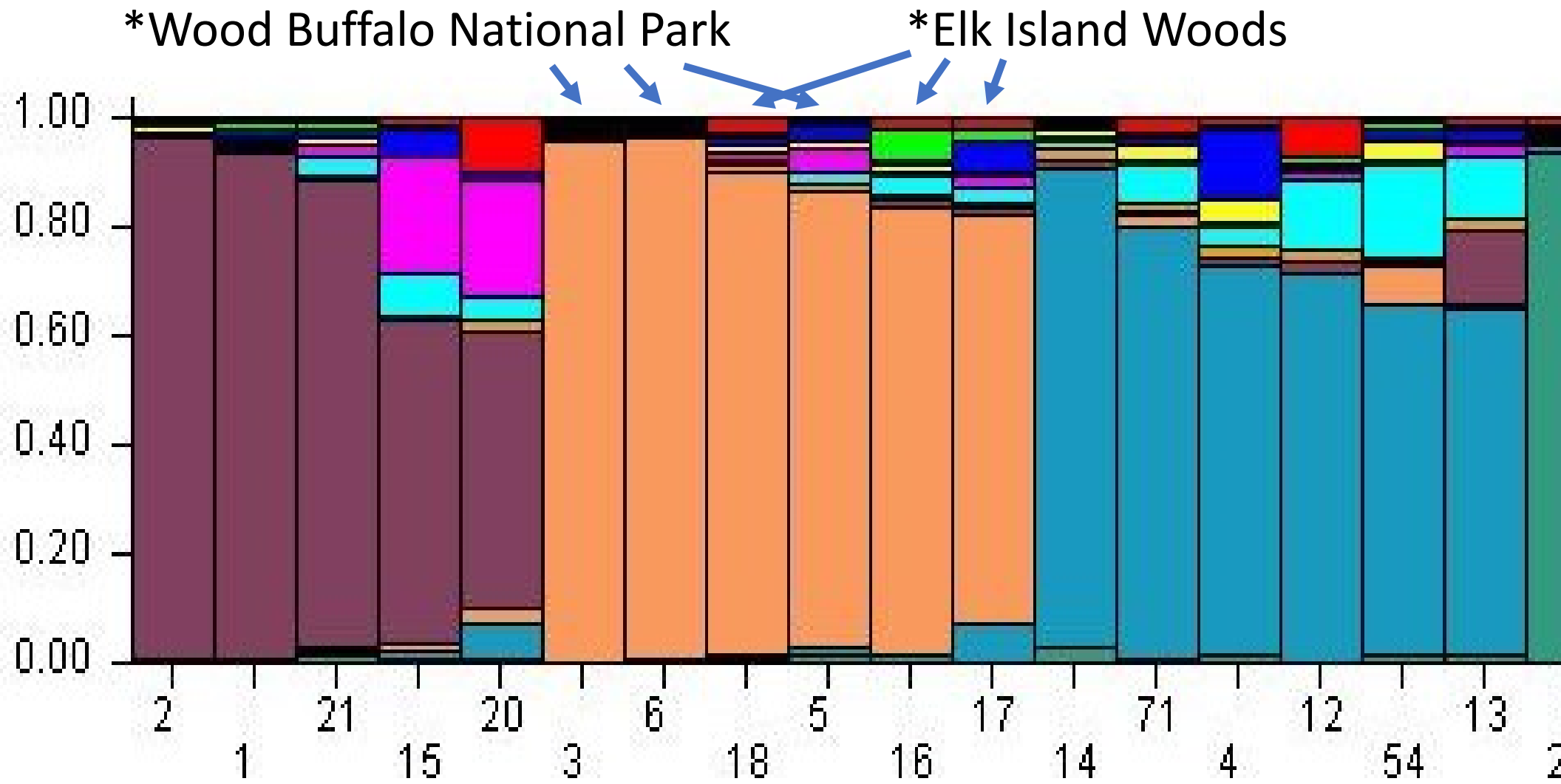

*Historic Greater Yellowstone area
*Elk Island Plains
*Wind Cave
*Caprock Canyon (Texas)
23
25
28
27
50
43
52
19
7
48
11
53
49
10
9

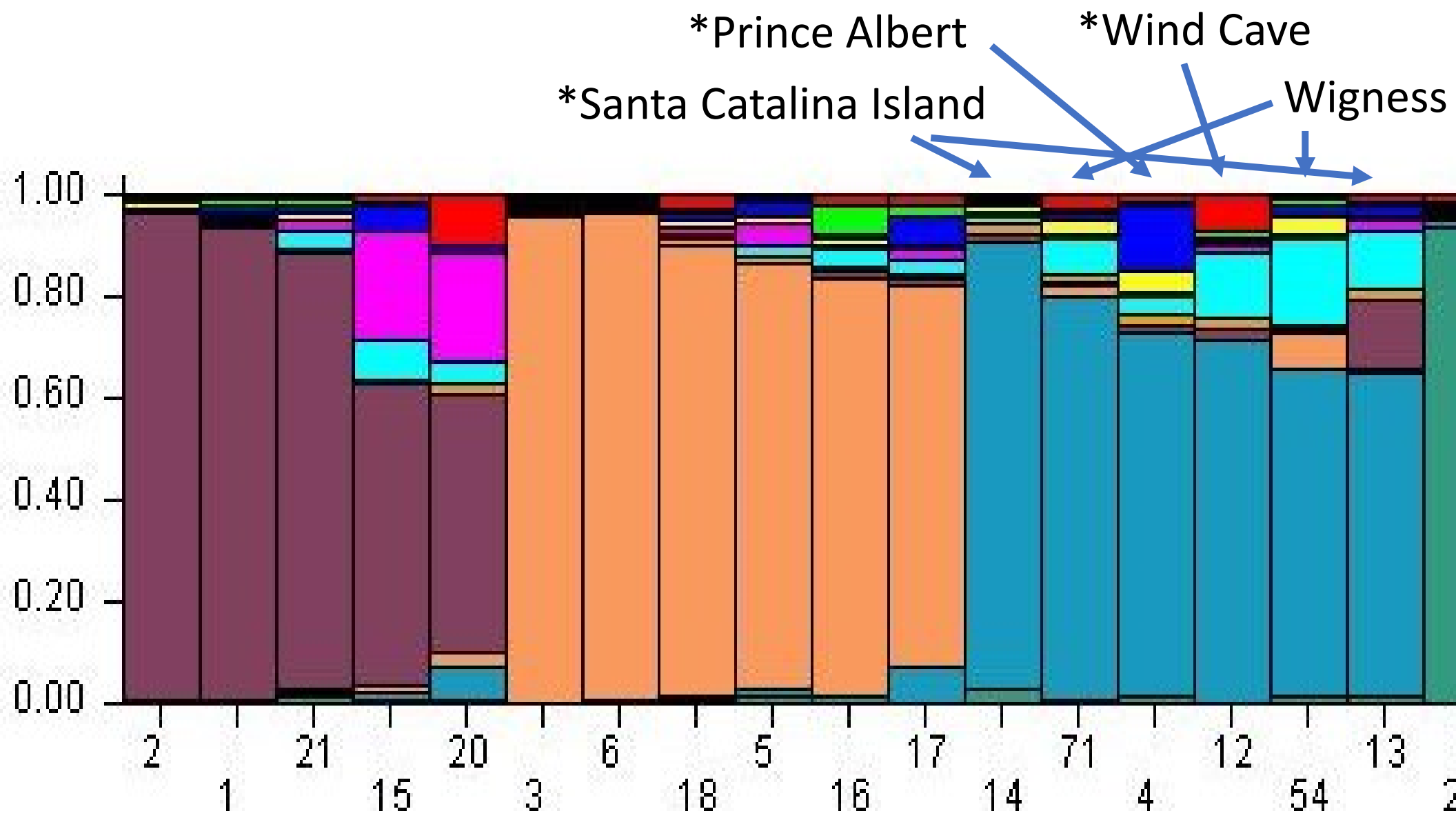
*Historic Greater Yellowstone area

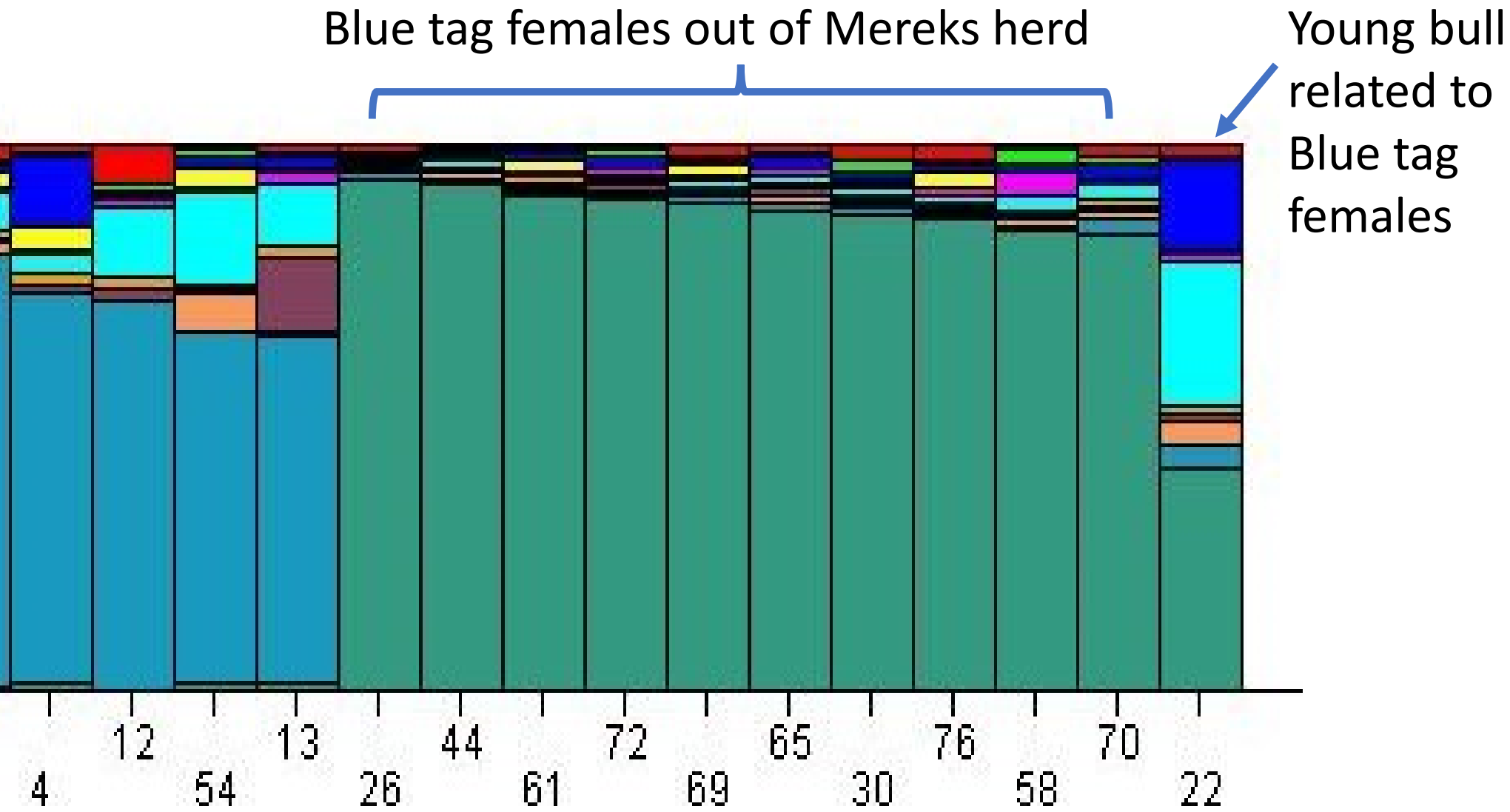
*Yellowstone

*Yellowstone 1856

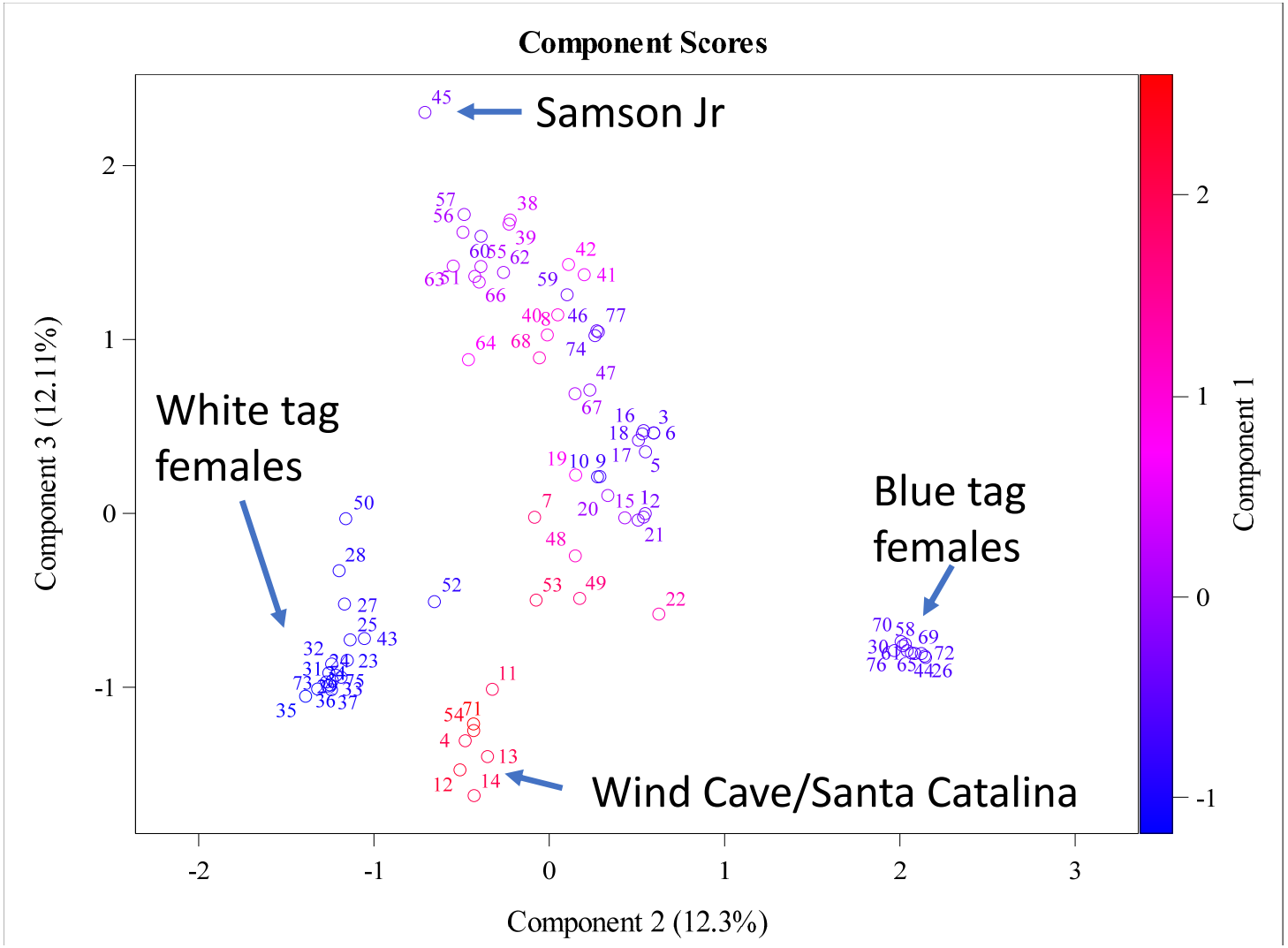



*Wood Buffalo National Park
*Elk Island Woods
1.00
0.80
0.60
0.40
0.20
0.00
2
1
21
15
20
3
6
18
5
16
17
14
71
4
12
54
13

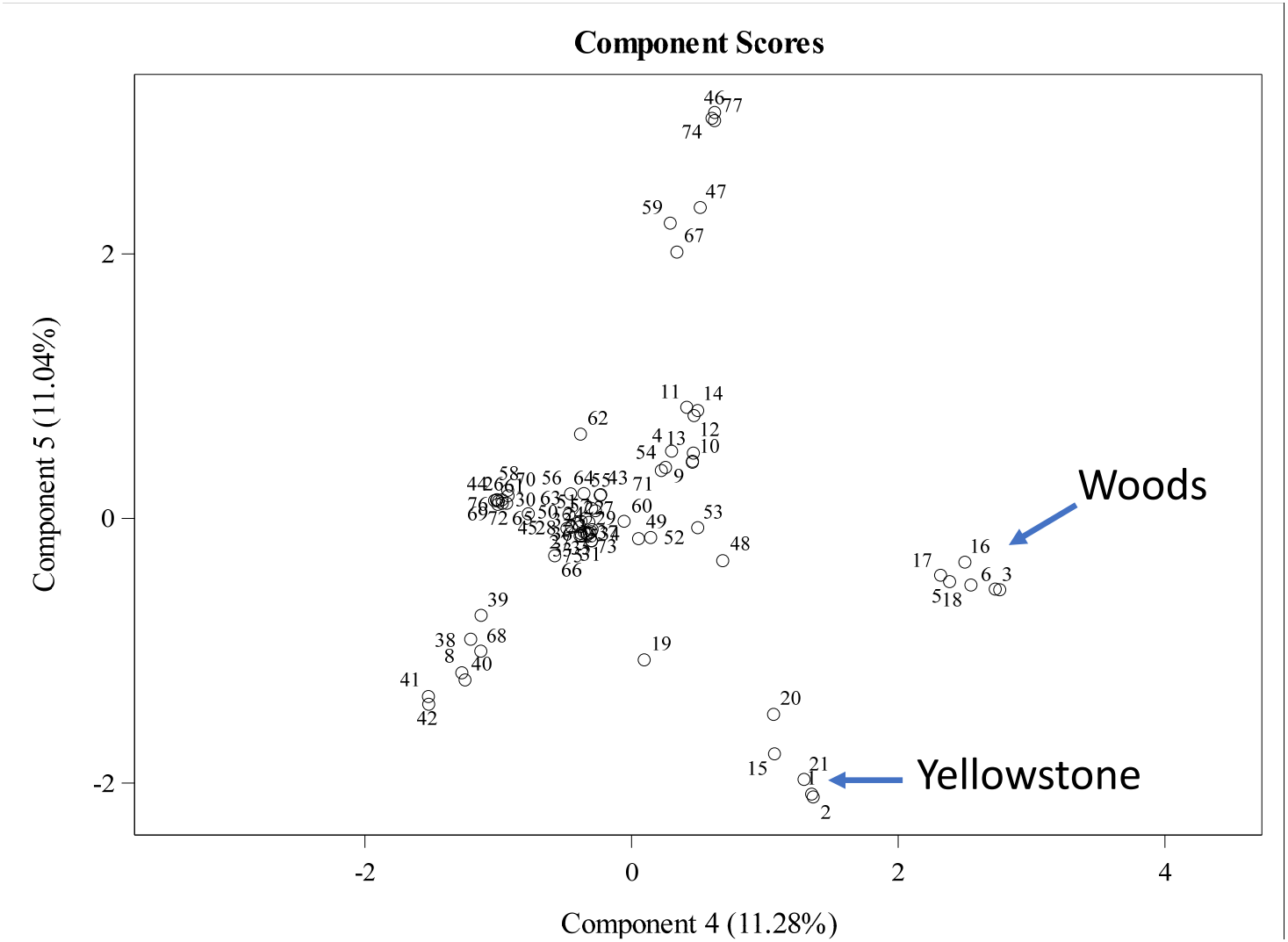

*Prince Albert
*Wind Cave
*Santa Catalina Island
Wigness
1.00
0.80
0.60
0.40
0.20
0.00
2
1
21
15
20
3
6
18
5
16
17
14
71
4
12
54
13

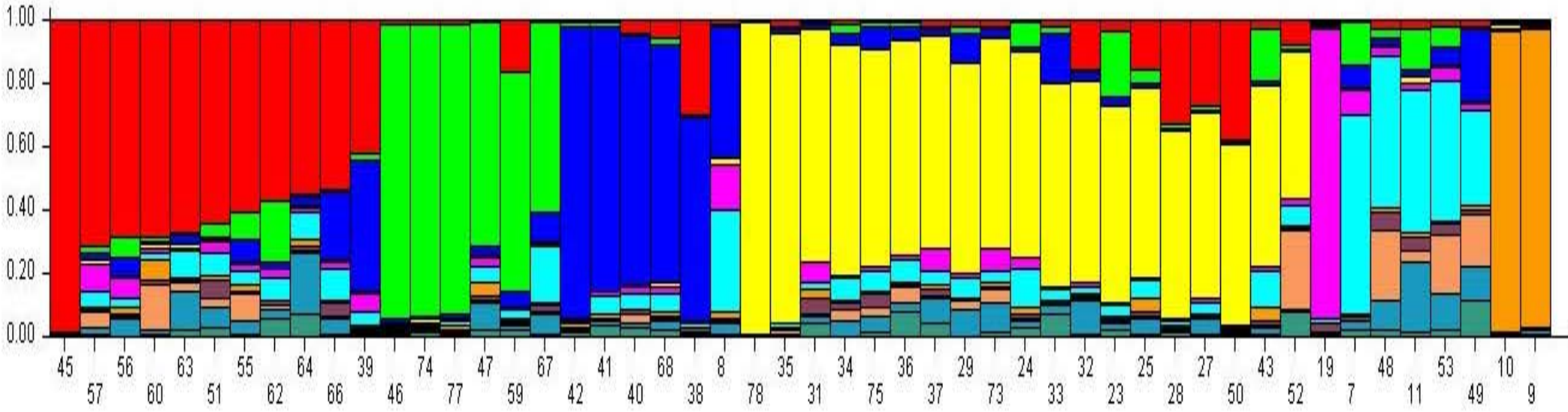

Blue tag females out of Mereks herd
Young bull related to Blue tag females
12
13
44
72
65
76
70
4
54
26
61
69
30
58
22

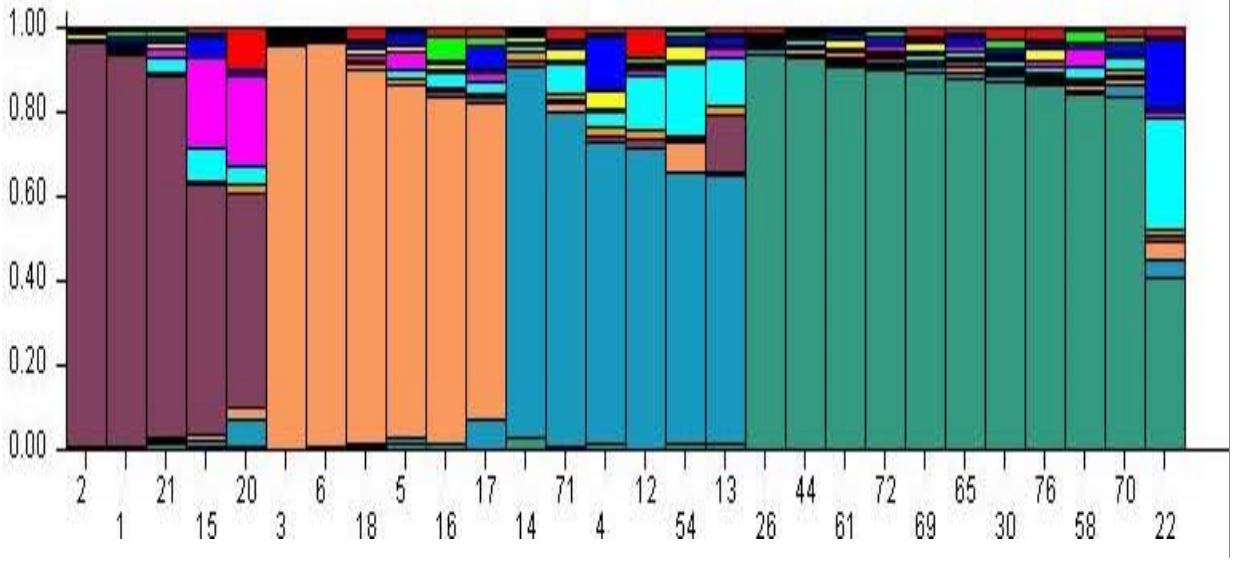
Principal Component Analysis - view 1

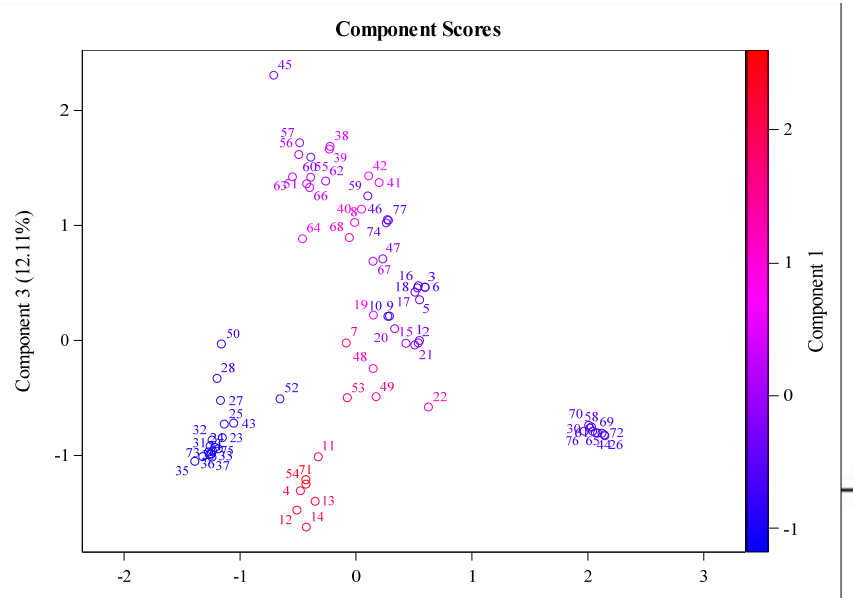


Principal Component Analysis - view 2




1.00
0.80
0.60
0.40
0.20
0.00
45 56 63 55 64 39 74 47 67 41 68 8 35 34 36 29 24 32 25 27 43 19 48 53 10
57 60 51 62 66 46 77 59 42 40 38 78 31 75 37 73 33 23 28 50 52 7 11 49 9


1.00
0.80
0.60
0.40
0.20
0.00
2 21 20 6 5 17 71 12 13 44 72 65 76 70
1 15 3 18 16 14 4 54 26 61 69 30 58 22


Component Scores
Component 3 (12.11%)
Component 1
2
1
0
-1
-2
3

Herd management and sales

When buying herd sires – confirm unrelated, use PCA to find outcross

Operations with multiple herds and genetics – keep things strait

Operations with big herds that sell breeding stock, could sell unrelated bulls and females

Bison industry is using ranch names instead of bull names like cattle

Keep things strait in the future as some popular lines become common

Assessing Diversity

Diversity is important for conservation of Bison, but also for making breeding decisions

Woods – Plains is good example of value of diversity

Valuable tool for pure woods breeders or Parks Canada

This analysis was done as a proof of concept and is not currently available

Any feedback would be appreciated

Questions or Comments?