

December 21, 2018

Phone call (Jerod Merkle, Chris Geremia)

Events to Date

December 17, 2018: Geremia prepared annual GPS data (about 1.6 million records) and forwarded a R workspace to Jerod for analysis. This file contained all GPS locations from all bison collared to date Nov 2003 – Present. Likely, some data from store-on-board collars that have not yet been retrieved, is not included. (I was 3 months late on this data sharing request – I tentatively agreed to share data in early October after the science conference)

December 21, 2018: Jerod provided a preliminary figures showing each annual social network of bison based on year-round GPS data.

Notes from phone call

- Jerod has a background in network analysis from his phd work. This is really cool.

Diad pair analysis: The first analysis is based on individual diads – asking the question how much time each individual spends time with another individual (as a pair) within 200 m (in the same group). This is essentially the number of days an animal was within 200 m of another animal at some point during that day.

- Looked at entire year
 - Also looked at breeding season July 1 – August 30
 - Generally dealt with messy fix schedules: identified every hour of every year and linked up observations. Then for any given day – asked were these two animals within 200 m at some point during the day
 - Individuals >250 days in a year included
- There are network measures at the population level like modularity (there are two modules in all the breeding seasons). There is an index of within versus among. Let's look at modularity in years with a lot of data.
- Look at network measures at the individual level: are they a connected animal or not. Plot individual animals over time.
- There are measures of community detection algorithms (two communities, northern range and interior) once we identify these communities – we can ask how an individual animal changes over time.
- A key will be to look at how individuals move among breeding areas over the course of a generation – how many bison are switching breeding areas over a 5 or 10 year period?
- Another step: make the diad network figure 3 paneled: annual, breeding (July 1- Aug 30), and winter removal period (Nov 15 – Apr 1). Maybe stretch to May 1st and see if its widely different.
- Then try to continue to do community detection algorithms between wintering community and summering community.

Grazing area analysis:

- Used GPS data from years with a lot of collars and created kernel density estimates and identified 4 major use areas
- Identified 4 areas: blacktail, lamar, hayden, Firehole: There are 4 grazing areas. Extracted the data and identified movements between these areas within a given breeding season (July 1 – Aug 30) and year
- These are not individual specific: identified number of individuals moving between areas
- Size of circle is the amount of overall GPS points spent in the area
- Key: very little movement during breeding season; most movement during the rest of the year

Timeline:

1. Jerod will pick up in about 2 weeks
2. Jerod will pick up with population level and individual level measures of the network. Try to identify how much individuals are making changes between breeding areas *between* years
3. Also consider making a network diagram for the time period when bison are removed: Nov 15 – Apr 1. The goal will be to relate the social networks of breeding and wintering distributions and talk about selectively (or not selectively) removing bison from different breeding areas on each wintering area.
4. Geremia will work on developing a genetic characterization for each bison we have data for.
5. The last step could be to integrate the genetic data with the social networking in the beginning of a landscape genetic analysis of the population

Future CESU: