Questions for April 11 Meeting

* In the original code, is there a mistake in which ZZ is applied to which mu?
* Region specific beta coefficients?
* Linking growth between total harvest, wingbee, and chukar site abundance

Notes on Readings

* Bayesian Structural Equation Modelling

<https://academic-oup-com.wv-o-ursus-proxy02.ursus.maine.edu/condor/article/123/1/duaa065/6053195?login=true>

<https://mcusercontent.com/71d4ba85fe261d411f0d2a098/files/f4ffb14d-14ee-8d1b-4359-e937646e50de/2021_NV_Chukar_Forecast.pdf>

Hey Matt and Erik,

I've gathered some of the remaining data sets that we talked about (and tried to resolve some lingering locality issues). Attached to this email is the 1) sage-grouse lek count database (updated 2021), 2) the sage-grouse wing-bee database (circa 2004 - 2020); and 3) a minorly edited chukar brood survey database.

Feel free to poke around with the lek database to your heart's content, but some careful thought will be required if we decide to use sage-grouse leks in regards to how to partition the data across space and time.

For the wing-bee data (SG\_wingdata), the total database is on the 2004-2020 tab, and I have tried to set a hierarchy of spatial organization that can be used to relatively seamlessly connect the wing data, the lek counts, the chukar covey counts, and the total upland harvest data together (depending on the respective grain size for each data type). Another piece of information that may be informative is that it is possible to coarsely determine female reproductive success from the sage-grouse wing-bee data as females that terminate reproductive activities earlier in the season are further along in their molt cycle than females that may be tending to broods. Thus, during the wing-bees, biologists record whether the 9th/10th primaries are fully developed (unsuccessful) or not (successful), which is used to infer reproductive success. It's not perfect, and the raw ratios are sensitive to harvest susceptibilities biases, but it is something to consider using. If we were interested in correcting for harvest susceptibility, our options are limited as there are only really two datasets out there that could reasonably do this at the moment. A 4-5 year band-recovery data set from central Nevada from the early 2000's and a 20 year band-recovery data set from North Park, Colorado (this is brownie example from Program Mark). If we decide that the reproductive status information would improve inference, we can think more about how to correct for some of the biases associated with it.

Lastly, I updated the chukar survey data to include the population management units/biological management units that I think each area fell into. As Erik mentioned on the zoom, there are new surveys being conducted using different methods at different locations (some overlap). We may need to link these data sets together spatially, which may require asking Shawn to let us know what hunt unit each of these surveys were previously conducted in to see if they are relatively match the new survey locales.

Here is a good starting point for structural equation models

<https://jslefche.github.io/sem_book/index.html>

and a less user-friendly crash course on splines

<http://ce.esalq.usp.br/sites/default/files/Crash_course_handout.pdf>

I am searching for what sources I based my spline code on. I will get back to you on that!

-Dan