Outline for Annual Movements Research Questions presentation

**Objective: Describe the spatio-temporal patterns of IP swan movement during the non-breeding season (i.e. annual movements but not the breeding season).**

1. **Migration Phenology**

* What are the dates that swans leave their breeding/summer territory in the fall, and arrive back in the spring?
  + No arrival/departure of overwintering area b/c that is not necessarily stable for the entire winter
  + Anchor to the breeding site since overwintering site is not as good of a reference
  + Could consider stopover use dates, but stopover vs overwintering can get pretty squishy with a short-distance migrant
  + Might want to use a different term than “migration” phenology if we’re talking about swans that may leave their annual territory but only make a very small movement away (e.g. Grass Lake swan in Bemidji)

1. **Migration Extent and Duration (Extent-> Distance, Duration-> Time)**

* For a descriptive plot, I could run all (or some) of the swans through NSD, then either plot them all with a high alpha for overlap (and skinny line width) or pick out a few examples (e.g. a total resident, a clear migrant, and one with several plateaus that hops around during the winter season)
* Could also show the plot of distance moved vs breeding latitude, or to follow up from that, could lump into 3 categories based on latitude and then show boxplots or violinplots of distance moved.
  + Or should this be an example of showing variation based on breeding latitude?