Shifting patterns of Chinook salmon natal origin distributions across Alaska’s largest river basins.

**Introduction:**

Motivating questions…

* Salmon resources are important in many dimensions
* Recent declines in AYK Chinook salmon have further highlighted a need to understand the ecology of Pacific salmon
* Understanding spatiotemporal patterns in habitat use/spatial ecology is key to

1. understanding the mechanisms of a \*relatively\* pristine salmon ecosystem
2. Identifying regions of high/low productivity
3. Targeting management which maintains population diversity over long timescales as opposed to management which favors highly productive tribs in one snapshot.

Hypotheses…

* Previous research (Sean, Brendan Connors, Rodgers, Daniel) has established the highly dynamic nature of salmon ecosystems (portfolio effect)
* However, this is relatively unexplored in the Yukon and Kuskokwim River basins (two of the largest salmon baring watersheds in the world.)
* As opposed to genetics, otolith-based provenance has come a long way and can now be combined with genetics to reasonably estimate provenance for exceedingly large river basins like the Yukon.
* We hypothesize that the same shifting habitat patterns seen in the Nush (Brennan 2019) are present in the Yukon/Kusko. But, this it hasn’t been quantified

**Methods:**

**MAPS**

**Annual production patterns (tributary)**

* Constructed at the tributary scale for 2015, 2016, 2021 Yukon and 2017,2018,2019,2020,2021 Kusko.
* ~250 otoliths over the full course of the run
* Weighted by proportion of CPUE/Proportion of otolith collected for each day
* For Yukon samples, genetics-based prior was added to constrain assignments.
* Minimum error and Stream order were chosen based on;
  + A qualitative analysis of the lowest error value before there were significant changes to the spatial patterns of production.
  + Stream orders expected to be well suited to spawners.
* USGS intrinsic potential values incorporated (for now, no)
* USGS survey data from (x,y,z) incorporated into the USGS intrinsic potential maps was used for mainstem and the next lowest stream order to turn off regions with no presence data for spawning chinook.

**Binning into HUC polygons**

* Binned into HUC sub-basins for more direct comparison of production patterns at the sub-basin scale
  + For now only HUC8, could do HUC10 but its very small.
* Assignments (both Trib and Huc) were constrained to the polygon with the greatest amount of production in the top 5% of all production, thereby constraining each individual assignment to a single region.

**ANALYSIS**

1. **Qualitative, descriptive analysis of changes among years**
2. **Hot spot analysis**

* Quantifies statistically significant regions of hot or cold production

<https://pro.arcgis.com/en/pro-app/latest/tool-reference/spatial-statistics/optimized-hot-spot-analysis.htm>

* Spatial statics/hotspot Analysis comparison then quantifies statistically significant shifts in these hot/cold spots and produced maps of the change among years.

https://pro.arcgis.com/en/pro-app/latest/tool-reference/spatial-statistics/hot-spot-comparison.htm

1. **Calculate CV at multiple spatial scales (by stream order, by HUC, etc.)**

**Results**

**Discussion**