Using hunter and population survey data to investigate shared drivers of upland game bird populations and forecast future hunting conditions in Nevada.

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**Project Summary:** Upland game birds are popular quarry among hunters, but have traditionally received less monitoring attention than other game such as waterfowl or big game. The dynamics of many upland game populations are poorly understood as a result, which both complicates management and provides a dearth of information to stakeholders, including hunters, about population status. In Nevada, annual surveys of hunters provide information on hunter effort and total harvest for each of the state’s upland game species. For a few species, specifically chukar and greater sage-grouse, detailed historic population survey data also exist. If upland game bird populations respond similarly to background environmental factors (e.g. presence of drought conditions) among species, it is likely this suite of data can be used to infer historic population dynamics and predict future patterns based on environment-covariate relationships and shared variance among data sources. Here, we proposed to 1) investigate patterns in upland game bird harvest and hunter effort and ask whether each covaries among species; 2) relate species-specific population survey data with measured weather conditions; 3) link species-specific harvest data with population-weather relationships, taking advantage of interspecific covariance patterns; and 4) ask whether harvest or populations have changed over the last 40+ years in Nevada. Based on these assessments, we plan to 5) develop a predictive model that can forecast likely annual populations and hunter success based on conditions experienced prior to the hunting season.

**Project Update:** At this stage of the project, we are focused on data curation and model development. Specifically, the data collected or maintained by NDOW (e.g., Chukar brood surveys, upland harvest reports and hunter numbers) has been requested and received by the project personnel, which will serve as the basis for model design. Likewise, a preliminary model focused on exploring the extent we can make predictions regarding future conditions (e.g., numbers of hunters, numbers of harvest upland quarry) based on how these features have (co)varied through time. Preliminary results (Figure 1) are promising as it suggests that reliable predictions are possible based on the data available, which should only be strengthened with the inclusion of other data sources (e.g., survey data).

**Next Steps:** Moving forward, we plan to incorporate additional years of harvest data (i.e., 2018–2020), as well as upland gamebird survey data (e.g., chukar covey counts, sage-grouse lek counts) to improve both the predictive accuracy and spatial resolution of the model. Specifically, for widespread and popular quarry, such as chukar, our goal is to create predictive forecasts at the sub-regional level (e.g., counties or ranges), which we believe represents the interests of the upland hunting community in Nevada. Additionally, we will be focusing on assessing model predictive performance in order to provide some metric of certainty for each annual forecast.

**Figure 1.** Preliminary results from a predictive model that used data from Nevada’s upland harvest reporting from 1976–2016 to predict the average number of upland birds (and rabbits) harvested per hunter (forecasted: black objects with error bars; observed: red objects) based on the forecasted number of upland quarry harvest (forecasted: black text, observed: red text) and hunters (not pictured) in 2017 for the eastern (circles) and western (triangles) regions.

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