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ECNS 491

Draft Exploratory Analysis

For this project I wanted to look at Montana Fish, Wildlife and Parks public data to determine which hunting districts are the best for elk hunting. This project is important to me because I have always been an avid outdoorsman and since moving to Montana, it has been hard for me to put in the time and effort to scout every possible hunting unit to find the best places to hunt. For this project, I first want to complete a descriptive analysis of each of the different hunting districts and regions to first find which ones have the highest harvest rate for bull elk with over 6 points (mature bulls). After completing a descriptive analysis, I then want to merge the harvest reports with hunting district spatial data to find the hunting unit with the highest rate of harvest.

The units of analysis I looked at were the number of elk harvests, bull elk harvests, and bull elk with 6 or more points harvested in Montana hunting districts. In order to analyze this data, I needed to first process the data into a clean format. I first did this by loading both the Montana Fish, Wildlife and Parks Harvest report data from 2004 - 2021 into the RScript. This data was formatted in a list and separated by Resident, Nonresident and Total. This made it difficult to analyze, so I created a data frame for each year and each residency type. This resulted in 54 data frames with its own unique data from each of the 15 attributes (License Year, Hunting Districts, Residency, Hunters, Days, Days Per Hunter, Total Harvest, Bulls, Cows, Calves, Bow, Rifle, Spike Bull Elk, Less Than 6 Points, 6 Points or More). Given this project's time constraints, I choose to look at the total harvests from both Residents and Nonresidents. After creating the unique data frames, I needed to create a data frame that contained the spatial data

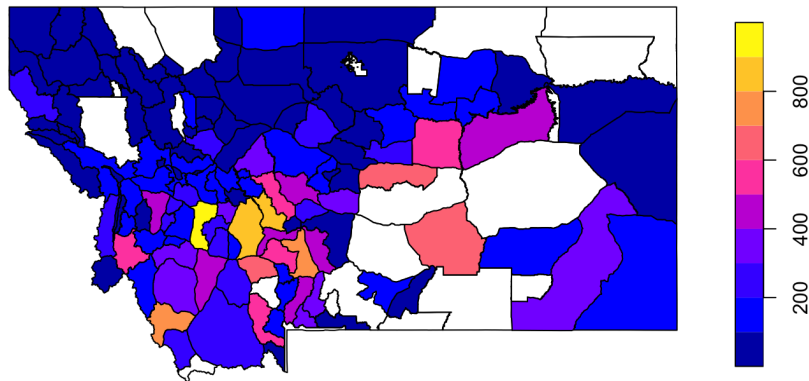
from each of the hunting districts, so I imported the Deer and Elk Hunting Districts from the Montana Wildlife, Fish and Parks database. This data frame contains geometric data that allows me to visually plot the data the same way we looked at the California data in the Spatial Analysis Lecture. In order to visually show the harvest districts with the most harvests of each of the three categories (Total Harvests, Bulls, Bulls with 6 or More Points), I needed to merge the harvest data with the geometric data from the hunting districts.

The first problem I ran into was that there was verifying hunting districts from each of the 18 years of data. This is due to the fact that hunting districts change in response to the herd management and regulations put in place by MFWP. To get around this problem, I needed to find which indices related to each of the districts from each of the different years and use those indices to index the correct instances from each of the attributes. I did this by creating a master index data frame that tracked the different indexes in each data frame that related to the hunting districts that I wanted to analyze. To merge the data sets, I created a new data frame for each of the attributes that I wanted to analyze, which were created from the original spatial data frame from the hunting districts. I then used the master index data frame to reference the correct columns from each of the 18 years and added those columns to the corresponding hunting districts. This gave me the

In conducting this analysis, I did not find a need to conduct any transformations. Since the data that I am analyzing is purely descriptive, it was best to keep the data as is. While I did not conduct any transformations, the data did contain missing values due to regions in Montana that do not allow hunting. These regions included Indian Reservations, National Parks and Lakes. This data shows as white on the plots. I also dealt with some years that didn't contain a whole attribute's data set. If that was the case, I choose not to use that year as a comparison.

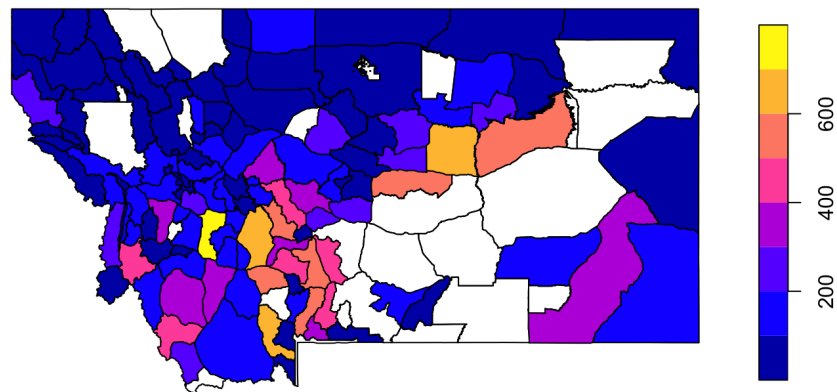
To complete the analysis, I compared the last five years of harvest data to determine which units presented the best opportunities for hunting. The findings from the total harvest analysis show that the top five units that outputted the highest harvest rates for 2017 in descending order were District 215, District 391, District 380, District 393, and District 329.

Total_Harvests_2017



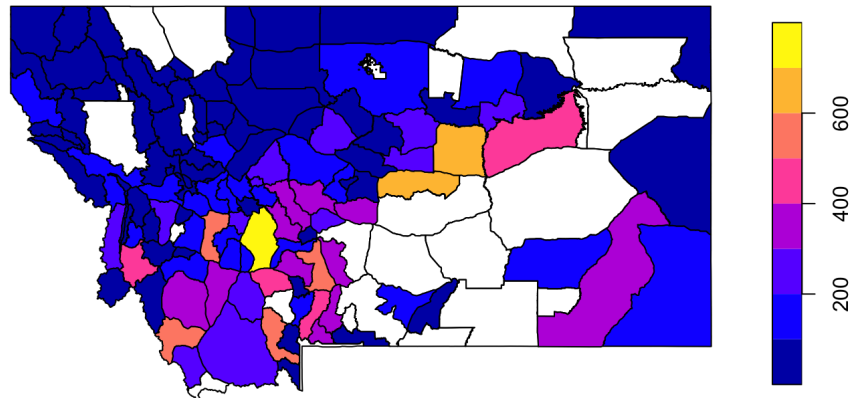
The findings from the total harvest analysis show that the top five units that outputted the highest harvest rates for 2018 in descending order were District 215, District 410, District 380, District 360, and District 393.

Total_Harvests_2018



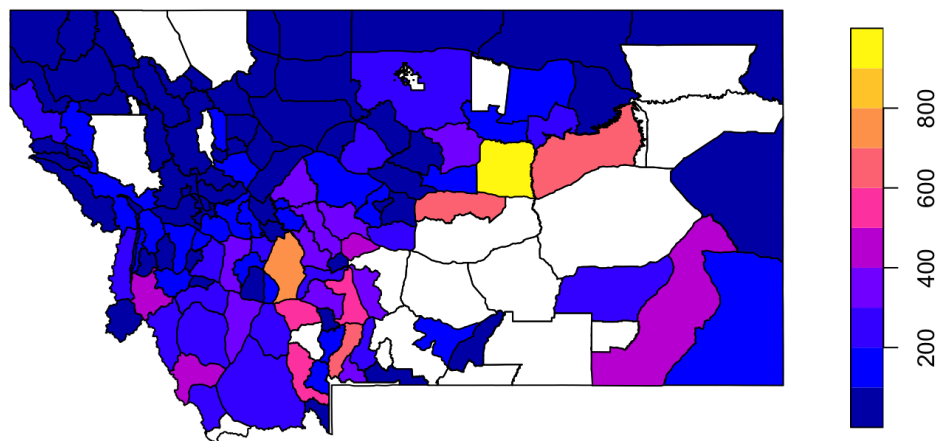
The findings from the total harvest analysis show that the top five units that outputted the highest harvest rates for 2019 in descending order were District 380, District 410, District 411, District 360, and District 393.

Total_Harvests_2019



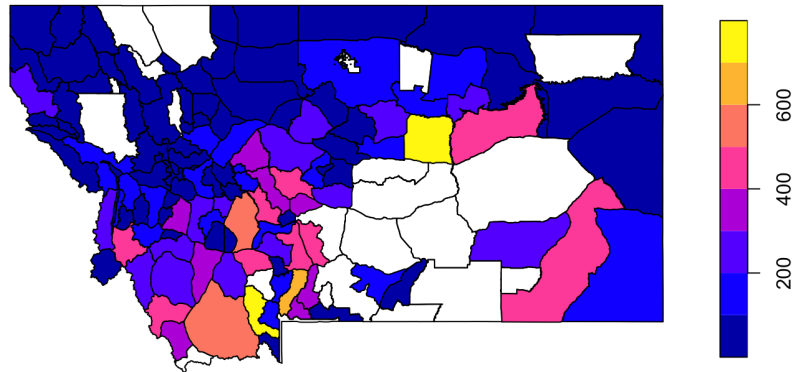
The findings from the total harvest analysis show that the top five units that outputted the highest harvest rates for 2020 in descending order were District 410, District 380, District 411, District 314, and District 700.

Total_Harvests_2020



The findings from the total harvest analysis show that the top five units that outputted the highest harvest rates for 2021 in descending order were District 360, District 410, District 314, District 380, and District 322.

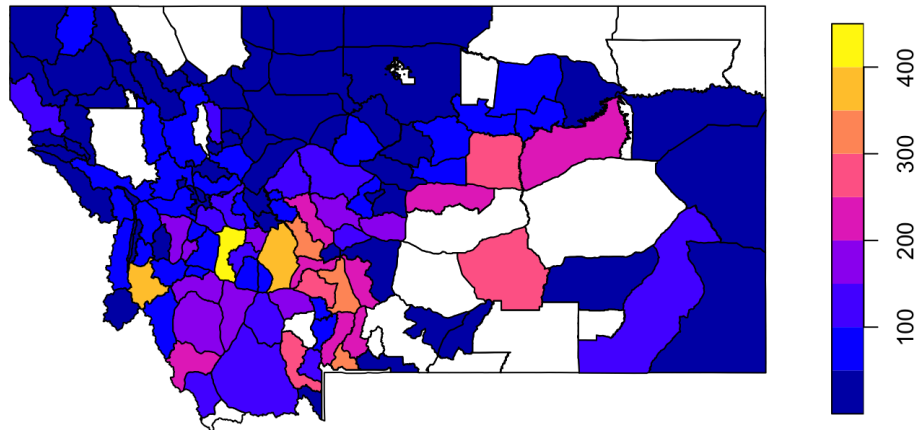
Total_Harvests_2021



The hunting district that stood out for hosting the largest number of harvests was district 380, which is the Elkhorn District, located south of Helena, Montana. This was the only district that showed up in the top five harvested units in the last five years. After completing the analysis on harvests, the next thing I looked at was the units with the highest harvest rates for bull elk. I conducted the same analysis as I did for total harvest, but just looked at the data from bulls.

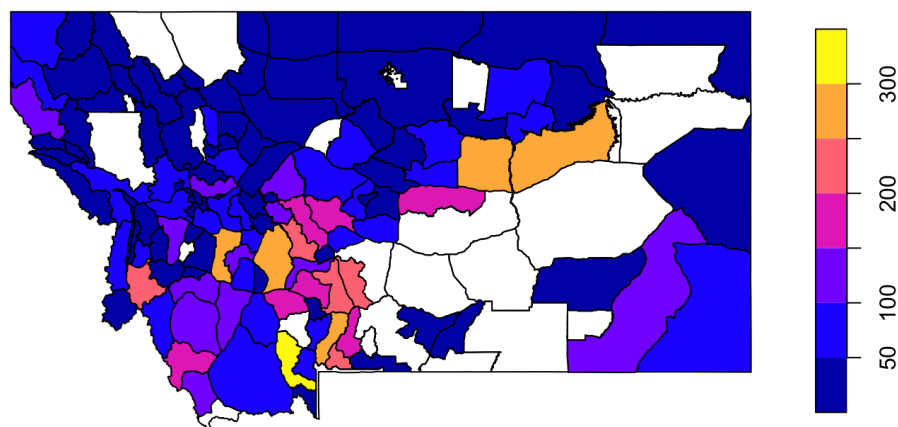
The findings from the bull harvest analysis show that the top five units that outputted the highest harvest rates for 2017 in descending order were District 215, District 270, District 380, District 391, and District 393.

Bulls_2017



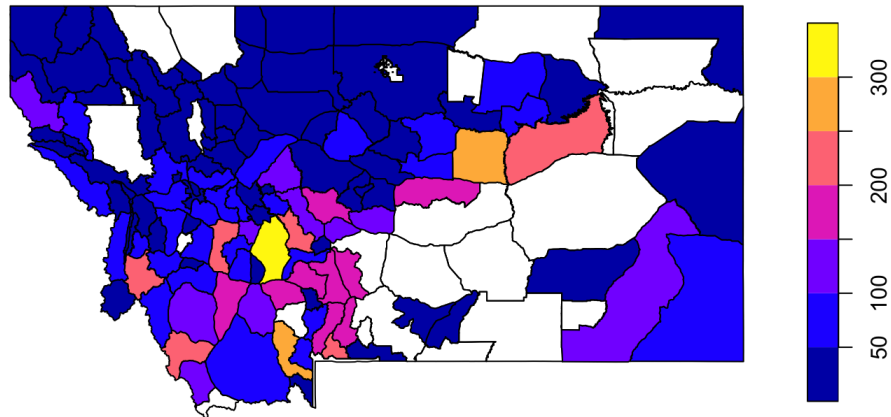
The findings from the bull harvest analysis show that the top five units that outputted the highest harvest rates for 2018 in descending order were District 360, District 314, District 215, District 380, and District 410.

Bulls_2018



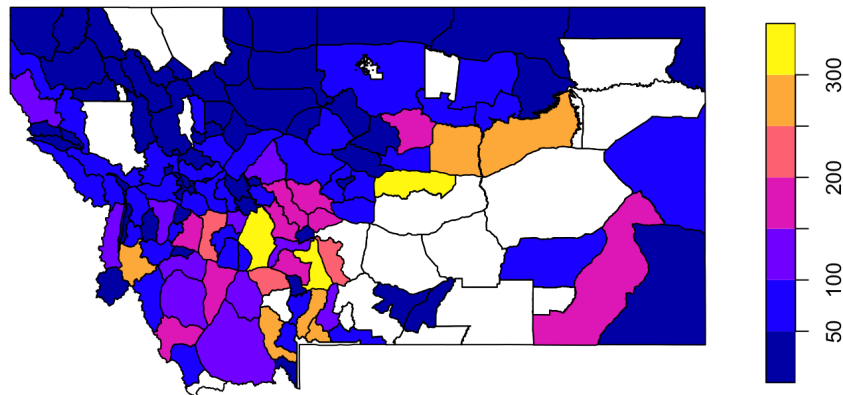
The findings from the bull harvest analysis show that the top five units that outputted the highest harvest rates for 2019 in descending order were District 380, District 410, District 360, District 313, and District 215.

Bulls_2019



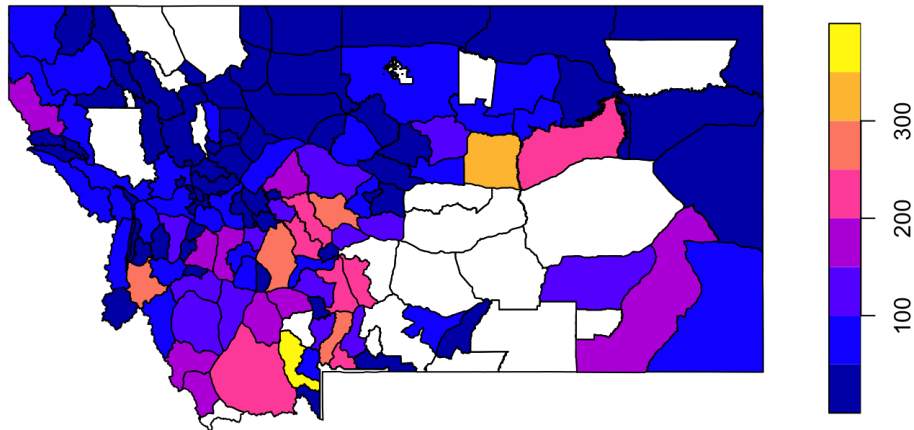
The findings from the bull harvest analysis show that the top five units that outputted the highest harvest rates for 2020 in descending order were District 411, District 393, District 380, District 410, and District 700.

Bulls_2020



The findings from the bull harvest analysis show that the top five units that outputted the highest harvest rates for 2021 in descending order were District 360, District 410, District 416, District 270, and District 314.

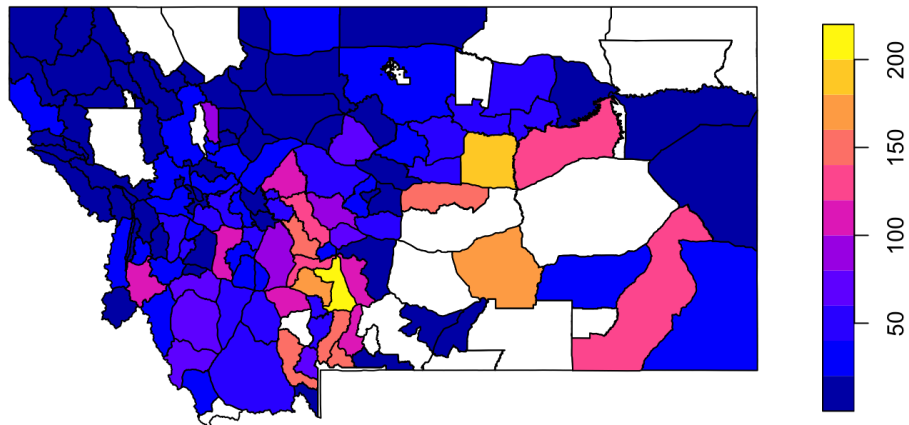
Bulls_2021



After analyzing the districts with the highest harvest rates, district 380 once again stands out as a prosperous unit for elk hunting, when targeting bulls. To further analyze each of the units, I looked at the units with the best harvest rates for mature bulls with 6 or more points.

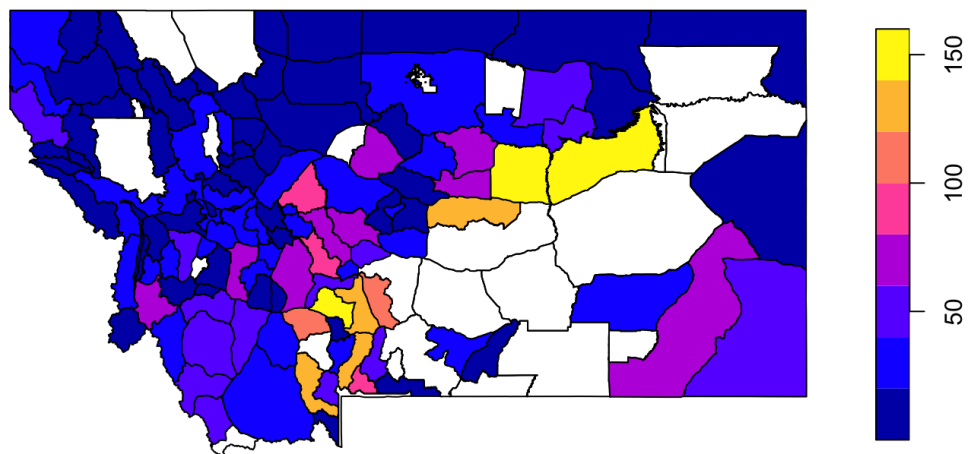
The findings from the bull harvest with 6 or more points analysis show that the top five units that outputted the highest harvest rates for 2017 in descending order were District 393, District 410, District 312, District 590, and District 314.

X6orMorePoints_2017



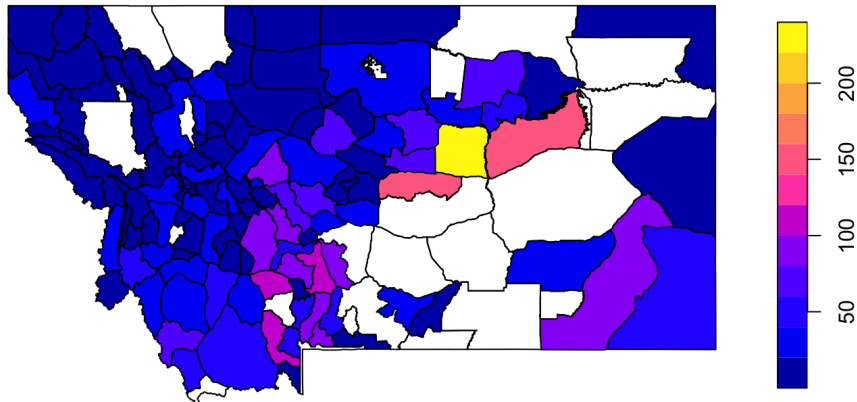
The findings from the bull harvest with 6 or more points analysis show that the top five units that outputted the highest harvest rates for 2018 in descending order were District 410, District 700, District 312, District 314, and District 411.

X6orMorePoints_2018



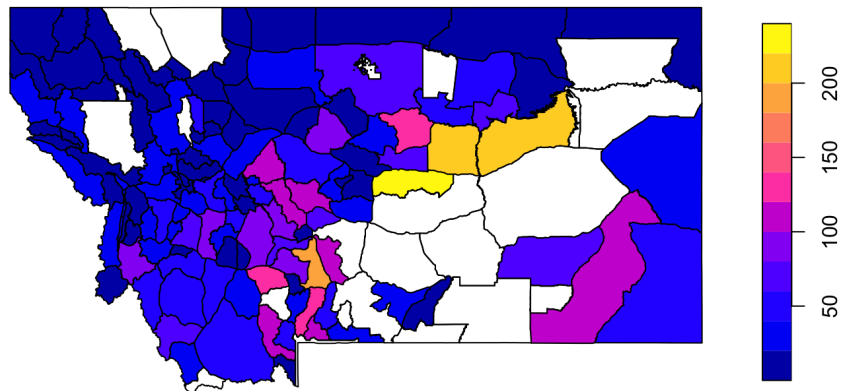
The findings from the bull harvest with 6 or more points analysis show that the top five units that outputted the highest harvest rates for 2019 in descending order were District 410, District 700, District 411, District 393, and District 311.

X6orMorePoints_2019



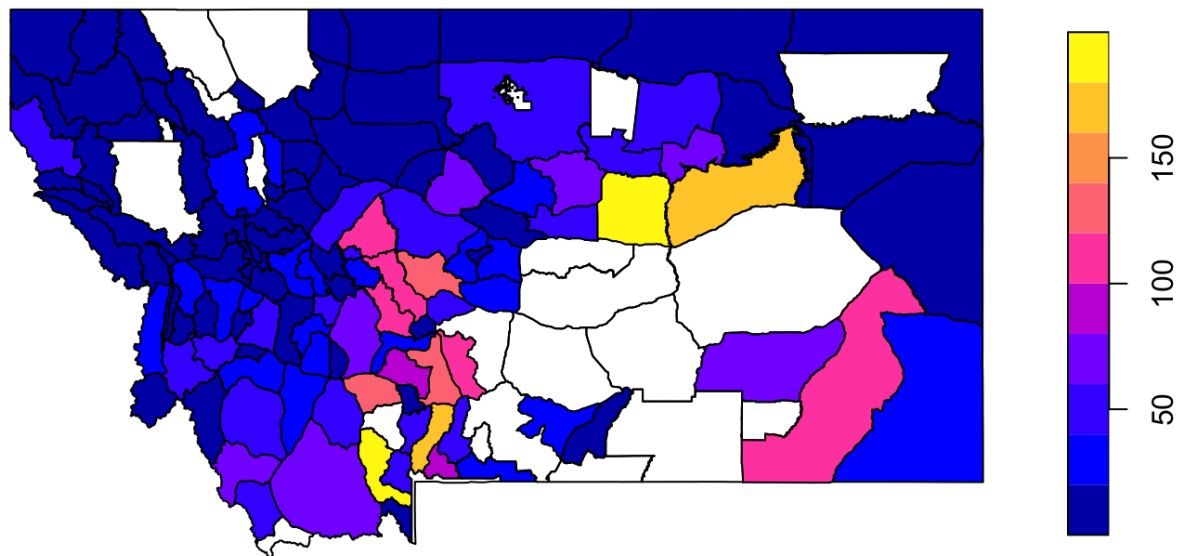
The findings from the bull harvest with 6 or more points analysis show that the top five units that outputted the highest harvest rates for 2020 in descending order were District 411, District 410, District 700, District 393, and District 314.

X6orMorePoints_2020



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X6orMorePoints_2021



After looking at each of the three units of analysis, it is clear that districts 410 and 411, which are the Missouri River Breaks and Snowy districts, stand out units when it comes to harvesting mature bull elk in Montana. Other units to mention are units 380, the Elk Horn District, as well as districts 393 and 312, which are the Bridger districts that surround the Bozeman community. Additional analysis that I would like to conduct would include breaking the analysis up between residents and nonresidents to see if there are any discrepancies in the data. I would also like to include drawing statistics for each unit to see how they play into the harvest rates. An additional analysis that I want to complete is to add in weather, elevation and land ownership type (public vs private) to see how these variables affect and/or are correlated with the harvest statistics.