# LOCATION-BASED ANALYSIS FOR THE RECRUITMENT OF UNITED STATES BORDER PATROL AGENTS

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# Introduction

On January 25th, 2017 Executive Order 13767 was signed by the President of the United States with the intent of enhancing security along the border between the United States and Mexico. This document includes many goals meant to strengthen the fight against illegal activity along said border. One such recommendation is the hiring of five thousand additional Border Patrol agents above and beyond their current hiring goals (The White House, Office of the Press Secretary, 2017). In any situation, hiring five thousand skilled employees is not an easy task. To add to this, testimonies from U.S. Customs and Border Protection (CBP) leadership to Congress state that the agency is already struggling to meet previously set hiring goals for these front-line personnel (U.S. Department of Homeland Security, 2016a; 2016b). As of 2016, there were over 19,800 active Border Patrol Agents throughout the United States, which is roughly one thousand positions below its staffing goal at the time (U.S. Border Patrol, 2016; Stenglein, 2017). These staffing issues reach back to before the creation of the Department of Homeland Security, under which Customs and Border Protection is currently organized.

As far back as 1991, the General Accounting Office (GAO), wrote about the United States Immigration and Naturalization Service (INS), the precursor to CBP, and their difficulty hiring enough agents, especially in the Southwest border region. This report attributed said difficulty to high attrition and a low number of recruits completing training (U.S. General Accounting Office, 1991). In the year 2000 this continued, and required an average of 45 eligible candidates entering into the Border Patrol Academy in order to get one successful agent at the end of a 6 month to year long process (U.S. Department of Justice, Office of the Inspector General, 2000).

In order to hire such a large number of qualified applicants, a big enough labor pool must be found. This must be large enough to fill, not only these new positions, but also to backfill opened positions from agents who have previously transferred or separated away from their Border Patrol positions. Even if a large enough pool of applicants is found, there may be various factors hindering their recruitment. In the aforementioned CBP testimonies to Congress, these recruitment difficulties are attributed to certain variables including undesirable duty locations, a difficult work environment, an extensive entrance process, and competition with other law enforcement employers (U.S. Department of Homeland Security, 2016a).

One noticeable factor that hinders the adequate recruitment of agents is that of location. There are a limited number of Border Patrol duty locations, and new Border Patrol agents often have little choice in where they are placed (U.S. Department of Justice, Office of the Inspector General, 2000). Many of these locations are remote and lacking in urban amenities. In a 2016 testimony, it was emphasized that many applicants are uninterested in "working in remote locations, where there may be limited medical care, schooling, and opportunities for spousal employment" (U.S. Department of Homeland Security, 2016b).

As can be seen in Figure 1, Border Patrol Agent duty locations are generally at stations found along the borders of the United States and Mexico, Canada, or the Gulf of Mexico. Much, though not all, of this area is rural with few communities nearby to provide amenities such as comfortable housing options, schools, healthcare, shopping, and similar features (U.S. Department of Justice, Office of the Inspector General, 2000). These "less-than-desirable duty locations" are strongly attributed to both loss of, and failure to hire enough, agents (U.S. Department of Homeland Security, 2016a).
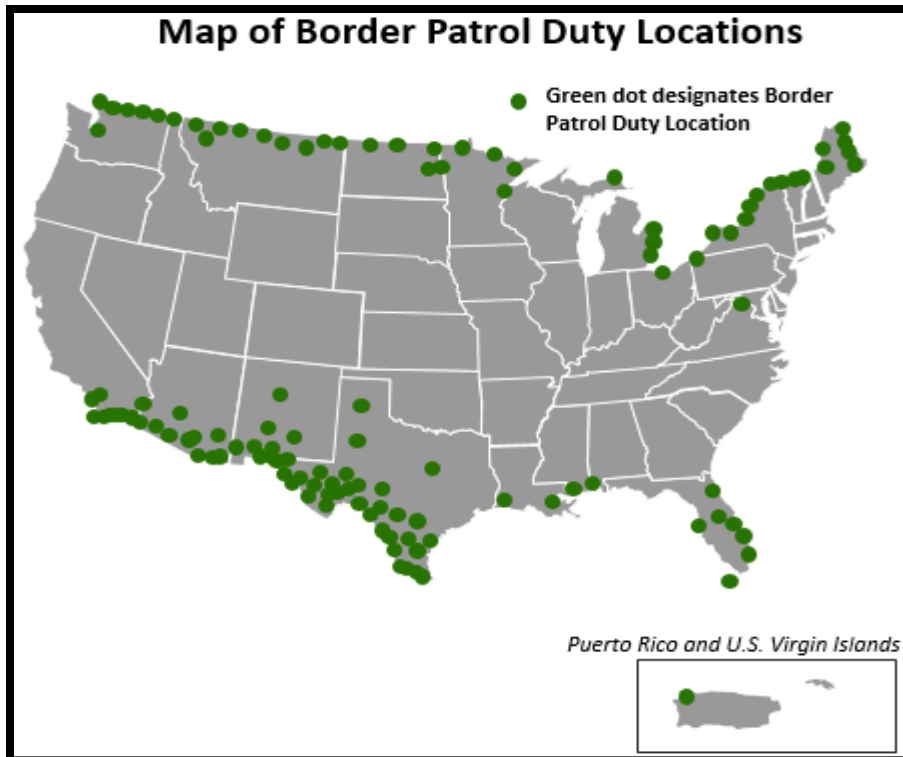
Figure 1: Map of Border Patrol duty locations in the United States (Border Patrol Agent Duty Locations, 2017)

As of fiscal year 2017, Border Patrol Agents in the Southwest Region made up about eighty-five percent of the roughly 19,400 Agents on duty (U.S. Border Patrol, 2016). According to the Customs and Border Protection website, "Currently, all new agents will be stationed along this southwest border" (Border Patrol Agent Duty Locations, 2017). With the addition of 5,000 agents, all placed along the southwestern border, roughly eighty-eight percent of the overall workforce would be employed in these locations.

## Problem Statement & Project Goal

This information provides a clear case that there is a recruitment problem for the United States Border Patrol. In order to rectify this problem, solutions must be found to appropriately recruit a sustainably large workforce.

One way to solve this issue is through strategic recruitment of Border Patrol agents, based on the factors that hinder their hiring and retention. By seeking those labor pools that have higher populations containing desired traits, there is a greater likelihood of successfully bringing more agents onboard, and retaining them, in an efficient and effective manner.

Based on the availability of data for this project, the goal is twofold. First, a method indicating which southwestern Border Patrol sectors are more likely struggling to meet their recruitment goals is developed. Data on Border Patrol agent workload are used to calculate which sectors have higher ratios of workload per agent and labor pools less likely to provide for their hiring needs.

Following this, demographic, occupational, and distance data are used to rate metropolitan and nonmetropolitan areas within the United States. These ratings may support decisions as to

which areas within the United States could potentially provide better labor pools from which to recruit Border Patrol agents.

## Literature Review

This project began with a literature review to better understand which factors can help or hinder one's likelihood to become a Border Patrol recruit. This included Border Patrol documentation as well as research on people's choices in employment-based migration.

Some factors are fairly straight forward. These can be found in the applicant requirements and preferences for those seeking to become Border Patrol agents. A sample of these include being under the age of 37, a United States citizen, having a degree or background in law enforcement, and the ability to speak or learn Spanish (Border Patrol Enforcement Series, 1896, n.d.). The importance of age, beyond being a requirement of the occupation, is also associated with a person's willingness to migrate. Coates and Gindling state that, in general, those willing to migrate for work are younger than those unwilling to do so (Coates, Gindling, 2013, pg. 652; Cameron, 2011, pg. 10). Using criteria such as these, ratings can be given to communities based on the proportion of their population that is under the age of 37, works in a law enforcement or military based profession, or speaks Spanish.

Still, other criteria that affect recruitment and retention of Border Patrol agents may be more complex. Roslyn Cameron reiterates points made by Shah and Burk (2003) about skill shortages. She states that these shortages happen, not only when there is not an adequate population of qualified workers available, but also when there are enough able workers that are not willing to do the work (Cameron, 2011, pg. 2). She writes that this can be caused by generally low levels of unemployment, bad duty location, poor work conditions, and lack of job flexibility. Focusing on location, she reiterates that non-availability of community services such as healthcare, education, and social elements within nearby communities can have a negative impact on bringing in and keeping employees (Cameron, 2011, pg. 5, 10).

Many articles mention income potential and unemployment as strong influencers of one's willingness to migrate for work. Aba Schwartz writes that the level of unemployment in one's current location has a large effect on their decision to move for employment (Schwartz, 1973, pg. 1155). Additionally, in a study of military recruitment strategies, higher unemployment rates among military-aged men were stated as an important variable in recruitment rates (Orvis, Asch, 2001, pg. 9). Whether caused by restructuring, job automation, or even economic uncertainty, unemployment plays a major role in one's willingness to migrate for work (Halseth, 1999, 369-371).

There are also factors, such as psychological values, which are very difficult if not impossible to track, but have an effect on labor-based migration. For example, one's personal logic of increased income versus the financial and personal cost of relocating is an important influence in willingness to migrate for employment (Schwartz, 1973, pg. 1155). In the case of rural healthcare workers, another skilled profession, Daniels et al. write that decisions on where one is willing to live and work is based on factors such as upbringing in a similar location, proximity to extended family, sufficient income potential to support one's entire family, and a desire to serve a particular type of community (Daniels, Valeit, Skipper, Sander, Rhyne, 2007, pg. 70; Halseth, 1999, pg. 373). By appropriately meeting these criteria, employers cannot only attract workers, but keep them longer. However, it is also this kind of factor that can often make it difficult to recruit and sustain a needed workforce in rural communities (Daniels, VaLeit, Skipper, Sander, Rhyne, 2007, pg. 66, 62).

Considering that many Border Patrol duty stations are in rural areas, a willingness to work in such a location is important. According to Playford et al., employees who have a background in a similar sized community as the one in which the work is located makes them roughly three times more likely to choose to work there (Playford, Larson, Wheatland, 2006, pg. 16-17; Halseth, 1999, pg. 363). In some cases, simply having been trained in a similar sized community has a similar effect (Playford, Larson, Wheatland, 2006, pg. 16-17). Thus, one major criterion to use in this analysis is how similar the size and demography of the duty station community is to that of the labor pools. Additionally, migration data can be used to see if people from certain other areas are more likely or less likely to move into or near to the desired area.

Ernst Ravenstein's first law of migration is that it happens mostly over short distances (Ravenstein, 1885, p. 198). Aba Schwartz also writes that distance has a strong negative effect on one's choice of migration locations. He states that the farther a potential new work/living area is from one's current community, the less likely she or he is to move there. This is because of the cost, both financial and psychological, of moving; the financial cost of this being actual movement logistics and housing, and the psychological cost being movement away from one's social and familial ties. He also writes that this distance effect can be caused by it being less likely for people to know about a specific job the farther they are away from the employment location (Schwartz, 1973, pg. 1154-1155). Soutar and Turner similarly emphasize the psychological impact of distance in a study of student decisions to migrate for university attendance (Soutar, Turner, 2002, pg. 40).

These factors, and many more, affect the ability of an employer to recruit and retain staff to a specific place of employment. In ranking and weighting the factors, potential communities of applicant pools can be scored on their likelihood to provide a worthwhile opportunity to hire an adequate number of employees.

Similar projects to this have performed site suitability-like analysis to measure and compare the usefulness of areas for a certain purpose. Many of these studies, such as one performed by Bunramkaew and Murayama, use a method called Multi-Criteria Decision Analysis (MCDA). This method of analysis combines various factor ratings into a single score used to rank study locations for decision making (Bunruamkaew & Murayama, 2011, p. 270-272). A similar method of analysis is used for this project.

# Data

## Data Constraints

In an ideal study, spatially-based employment data on Border Patrol agents would be used. This may include salary, length of service, retirement eligibility, age, ethnicity, veteran status, attrition, and prior residential history by specific Border Patrol duty location for previous and current agents. This could be used in an attempt to find common factors that are tied to successful recruits and higher retention levels. This information could then be used in conjunction with Census Bureau and Bureau of Labor Statistics data to judge where the best labor pools from which to recruit agents might be located.

However, due to the sensitive nature of data at this level, this information is not available for open usage in a project such as this. Limited data on the demographics of Border Patrol agents can be found at www.fedscope.opm.gov, however, no location data is available for this particular occupational series. Available information includes counts of Border Patrol agents according to age group, salary range, position tenure, education level, and gender. It also

includes separation rates by type, such as retirement, resignation, firing, transfer, and death. While this information is available at an aggregate scale, it cannot be separated into any sort of geographical area. Separate from this, www.data.gov contains links to some additional information which is somewhat spatially focused. This includes the number of agents and border apprehensions within each Border Patrol sector. These sectors, however, are only relatively location specific, as they can cover multiple states and many duty locations.

Likewise, while the locations of specific Border Patrol stations are known, no other data are openly available to tie to them individually, making station specific site suitability analysis not feasible. Thus, said information is still not available at desired areal units.

## Available Data

As stated above, there are some data available aggregated at the Border Patrol sector level, including current agent supply and demand in the form of employee and apprehension counts. Also, United States Bureau of Transportation Statistics border crossing information is available, and can be spatially joined to Border Patrol sectors for an additional measure of agent workload.

General demographic data are available by county. This provides an aggregate population from which to calculate desired factors. Metropolitan and nonmetropolitan areal units provide even further aggregation of this county-based information. Metropolitan Areas are made up of Metropolitan Statistical Areas and Metropolitan Divisions. Metropolitan Statistical Areas are defined as a group of counties within commuting distance of at least one core urban area with a population of at least 50,000 people. Metropolitan Divisions are a single core area with a population of at least 2.5 million. Nonmetropolitan areas are formed from micropolitan statistical areas and other nonmetropolitan areas. Micropolitan statistical areas are similar to metropolitan statistical areas, but with a core area population ranging from 10,000 to 50,000 people. Other nonmetropolitan areas are those that do not meet any of the above population requirements (U.S. Census Bureau, 2018).These areal units are beneficial for a number of reasons. First, they are based on economic, transit, and social factors rather than just administrative boundaries. Second, each is aggregated from one or more counties, and therefore county-based demographic data can be cleanly organized at this level (University of Alabama, n.d.). Lastly, by separating areas between metropolitan and nonmetropolitan, labor pools can be identified in rural versus urban groupings (Health Resources & Services Administration, 2017).

As all new Border Patrol agent recruits will be stationed along the United States' southwestern border with Mexico, much of this project and the data used within is focused on this area of the country (Border Patrol Agent Duty Locations, 2017). This includes Border Patrol employment, border crossing, and migration data. Border Patrol data can be found by organizational sector and these can be tied to duty station groups via the coordinates of each station within each sector. Demographic data are available for the entire United States, allowing for the study of areas both close to, and away from, the southwest.

All table-based data are combined with location data via either FIPS code or city name for spatial placement. Said data are then spatially joined and/or aggregated as necessary to perform the project.

Table 1 lists the data used in this project with a description and original source. More in-depth information on each data element can be found in Appendix I of this report.

| Data Grouping | Description | Source |
|---|---|---|
| Border Patrol Data | Location of Border Patrol stations by city, which can be aggregated to sectors and regions | U.S. Customs & Border Protection |
| | Count of Border Patrol agents employed within each sector from fiscal year 2011 through fiscal year 2017 | U.S. Customs & Border Protection |
| Border Patrol Workload Data | Count of Border Patrol apprehensions within each sector between 2011 and 2017 | U.S. Customs & Border Protection |
| | Count of border crossings into the United States broken down by individual, personal vehicle, truck, and train. Located according to specific border crossing location | U.S. Bureau of Transit Statistics |
| Employment Data | Population size and average wages for protective services workers by metropolitan and nonmetropolitan area | U.S. Bureau of Labor Statistics |
| | Labor force size and unemployment levels by county | U.S. Census Bureau |
| Population Demographics | Population demographic estimates by county: age group, Spanish speakers, and veterans | U.S. Census Bureau |
| | Migration between United States counties from 2010 to 2015 | U.S. Census Bureau |
| Location Data | Metropolitan and nonmetropolitan areas (including metropolitan divisions) by county reference table | U.S. Bureau of Labor Statistics |
| | U.S. Counties shapefile | Esri |
| | United States & Mexico border line shapefile | U.S. Geological Survey |
| | United States City locations shapefile | U.S Department of Agriculture |

Table 1: List of data sources by subject, with description and source.

# Methodology

This project is broken into two sections. The first is a descriptive analysis of which Border Patrol sectors are most in need of additional recruitment efforts. This is based on workload calculations and available labor pools of each area. The second section consists of rating metropolitan and nonmetropolitan areas throughout the United States on factors related to their potential as successful labor pools from which to recruit Border Patrol agents.

## Border Patrol Sector Descriptive Analysis

As the necessary Border Patrol data for this project are aggregated at the sector level, and there are only nine studied sectors, the sample size is too small for anything but descriptive analysis.

With the available data, this portion of the project begins by calculating rough measurements of workload for each Border Patrol Sector. Fiscal year 2017 agent staffing and apprehension counts are gathered. This information is joined to city-level data containing the location of stations within each sector. 2016 transit counts of people entering the United States via various methods are then collected by city-level border crossing locations, and these are spatially joined to the Border Patrol sector data based on the sector of the closest Border Patrol station. Lastly, Border Patrol station location data are spatially joined with a layer of metropolitan and nonmetropolitan areas containing general labor pool information. These data are used to create the measures found in Table 2 below.

| Measure | Calculation |
|---|---|
| Agent Count | Total number of Border Patrol agents as of September 2017 |
| 2011-2017 Agent Change | Percent change of agent count between 2011 and 2017 |
| Station Count | Number of Border Patrol stations per sector, including sector headquarters |
| Border Crossing Location Count | Number of border crossing locations within a sector |
| Apprehensions per Agent | Count of yearly apprehensions, divided by number of agents |
| People Entering U.S. per Agent | Number of border crossings into the United States per year divided by number of agents |
| Percent of Stations in Nonmetropolitan Areas | Proportion of all sector stations that are found in nonmetropolitan areas |
| Population of Areas Containing Stations | Combined population total of all metropolitan and nonmetropolitan areas containing Border Patrol sector stations |

Table 2: Factor list for Border Patrol agent descriptive analysis.

These factors are used to make descriptive profiles for each Border Patrol sector. Based on them, rough conclusions can be made on which Border Patrol sectors have the greatest need for additional recruitment efforts to bring in new agents.

## Analysis of Potential Labor Pools

To help decide which labor pool areas are more likely to provide a greater population to recruit from, data are gathered relating to both Border Patrol agent requirements/recommendations and literature-reviewed factors of work-based migration. Given these desired variables and the data available via open-source methods, Table 3 contains a list of factors chosen for this project.

Each dataset, except for distance from nearest Border Patrol station, was downloaded in tabular format and joined to boundary shapefiles. The Protective Services Occupation data were downloaded at the metropolitan and nonmetropolitan area level of aggregation and thus did not require any further aggregation. The other demographic data were downloaded at the county level and had to be aggregated to the metropolitan and nonmetropolitan area level.

Distance data were calculated using the Near (Analysis) tool in ArcMap (Environmental Systems Research Institute, 2018). This measured the distance between features in a layer containing metropolitan and nonmetropolitan areas and those of another layer containing Border Patrol stations by city.

As was stated in the data section above, metropolitan and nonmetropolitan areas were chosen as the areal unit of analysis. This is partially due to the availability of desired occupation related data, but also because of the social and economic factors in developing these units that make them a preferable unit of analysis over administrative boundaries. This is also convenient because of the ease of aggregating relatively easily found county-level data into these areas.

County-level demographic data, originally gathered as population counts, are summed and dissolved into metropolitan and nonmetropolitan areas. Unemployment rates are not summed but averaged when aggregated, as it was originally collected as a percentage. At this level, all data are combined into a single shapefile. Certain demographic numbers for each area are

divided by the total population estimate for said area to calculate them as a percentage. This is done in order to keep the overall population of each area from having too strong of an effect on the total rating results.

| Factor | Use |
|---|---|
| Total Population | Areas with greater population may provide greater number of potential recruits. |
| Unemployment Rates | People are generally more willing to migrate for work from within areas of high unemployment. |
| Percent of Total Population: Ages 18-34 | Border Patrol agents must start work before the age of 37. Also, younger people are more likely to migrate for work. Higher proportions of people aged 18-34 may provide a larger potential migration-willing recruitment pool. |
| Percent of Total Population: Veterans, ages 18-34 | DHS desires to hire veterans. Greater proportions of veterans within the necessary age range may provide a larger experienced labor pool. |
| Percent of Total Population: Spanish Speakers, Ages 18-64 | The ability to speak or learn Spanish is required by the Border Patrol. Larger proportions of Spanish speakers in an area may provide a larger potential recruitment pool. |
| Percent of Total Population: Protective Services Occupation Employees | Law enforcement experience is a beneficial trait for recruits. Areas with a greater proportion of law enforcement and other protective services personnel may provide a larger experienced labor pool from which to recruit. |
| Protective Services Occupation Average Salary | People are generally more willing to migrate for work if their earning potential is greater at the new location. Experienced protective services employees may be more willing to relocate if their current employment provides a lower annual salary than that paid by the Border Patrol. |
| Distance to Nearest Border Patrol Station | People are more likely to migrate to areas closer to their current location. The closer potential recruits live to a duty location, the higher likelihood they will be willing to migrate for work. |
| Metropolitan vs Nonmetropolitan Area | People are generally more willing to move to a nonmetropolitan area if they have previously lived in a similar area. Potential recruits may be more willing to move to nonmetropolitan areas if they are migrating from one. |
| Percent of Total Population: Positive Net Previous Migration to Southwest U.S. | If a large number of migrants have previously moved from a given area to areas near the southwest border, there may be certain factors, such as social ties, that make others from said area more likely to move to the southwest border area for work. Net positive migration from a given area to areas within 100 miles of the southwest border can be beneficial. |

Table 3: Factors used in area ratings and a description of their use.

After performing these calculations, the results of each were ranked into five quantiles and given a rating between one and five, with a one given to the least desirable values and five given to the most desirable values. Individual ratings can be seen in Table 4 below.

All ratings given to each metropolitan and nonmetropolitan area were then summed to give said area an overall fitness rating ranging from a minimum of ten to a maximum of fifty points possible. Given an overall score for each area, five quantiles were calculated, showing categories of fitness as potential Border Patrol agent labor pools. This final rating map can be seen in Figure 2 below.

| Category | Worst Rating: 1 | | Rating: 2 | | Rating: 3 | | Rating: 4 | | Best Rating: 5 | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Bottom | Top | Bottom | Top | Bottom | Top | Bottom | Top | Bottom | Top |
| 2016 Estimated Total Population | 18,147 | 129,858 | 129,859 | 203,043 | 203,044 | 332,140 | 332,141 | 614,774 | 614,775 | 14,398,700 |
| Unemployment Rate | 2.278% | 4.130% | 4.130% | 4.869% | 4.869% | 5.468% | 5.468% | 6.297% | 6.298% | 23.986% |
| Percent of Total Population: Age 18-34 Years | 8.243% | 19.879% | 19.879% | 21.271% | 21.271% | 22.611% | 22.611% | 24.185% | 24.185% | 42.669% |
| Percent of Total Population: Veterans Age 18-34 Years | 0.152% | 0.390% | 0.390% | 0.472% | 0.472% | 0.553% | 0.553% | 0.690% | 0.690% | 4.331% |
| Percent of Total Population: Spanish Speakers, Age 18-64 Years | 0.330% | 1.342% | 1.342% | 2.271% | 2.271% | 3.620% | 3.620% | 7.746% | 7.746% | 51.094% |
| Percent of Total Population: Protective Services Occupation Employees | 0.000% | 0.658% | 0.659% | 0.800% | 0.800% | 0.969% | 0.970% | 1.191% | 1.191% | 3.894% |
| Protective Services Occupation Average Annual Wages | 49,511 | 74,230 | 44,531 | 49,510 | 40,181 | 44,530 | 36,261 | 40,180 | 0 | 36,260 |
| Distance (Decimal Degrees) of Area from Nearest Border Patrol Station | 17.781 | 41.857 | 13.593 | 17.781 | 10.211 | 13.593 | 5.070 | 10.211 | 0 | 5.070 |
| Metropolitan vs Nonmetropolitan Area | Metropolitan | | | | | | | | Nonmetropolitan | |
| Percent of Total Population: Positive Net Previous Migration to Southwest U.S. | 0.000% | 0.000% | 0.000% | 0.028% | 0.028% | 0.056% | 0.056% | 0.105% | 0.105% | 1.358% |

Table 4: Decision factors and quantile rank according to value

Testing was performed on these results to verify their statistical soundness. First r-squared calculations were used to measure any correlation between individual variables used. This strengthened the need for many variables to be in the form of a ratio of the total population, rather than flat population counts, as increases in total population often correlated with equal increases in population parts, such as that of protective services occupation employment. When the correlation between variables was calculated and found to be at acceptable levels, sensitivity testing was performed by removing a single factor at a time and continually recalculating the overall score. The results of this can be seen in Figure 3 below. They show that each individual value has a minimal effect on the overall score distribution in these calculations and thus this choice of factors can be used.

Visual analysis is performed on overall ratings throughout the country to find areas of particular strength in fitness as a recruitment labor pool. The ArcGIS 'Hot Spot Analysis (Getis-Ord Gi*)' tool is used to find particularly hot (desired values) and cold (undesired values) areas clustered together. The 'Cluster and Outlier Analysis (Anselin Local Morans I)' tool is also used to find clusters of particularly high or low overall ratings, along with outliers within them (Environmental Systems Research Institute, 2018). The results of this can be seen in Figure 15, in the Results section of this report. For both calculations, the distance calculation of these clusters was based on the relationship of each area polygon to its direct neighbors, with the spatial relationship settings on the 'contiguity edges and corners' setting. This, rather than distance, was chosen as

these are polygon features of various sizes, and thus distance from feature to feature could negatively impact overall scores.

To look into the statistical soundness of these results, two statistics were run. First, r-squared correlation coefficients were calculated between each individual factor value and the total rating, as well as each factor rating and the total rating for each area. These verify that no individual factor score contains too strong of an effect on the total rating score. Then Geoda software was used to calculate the Univariate Local Moran's I statistic for each factor value, factor rating, and the overall rating for each area (Geoda, n.d.). This was done using a queen contiguity weighting system which allows boundaries sharing borders, as well as corners, with each area to detect spatial correlation. These results can be seen in Tables 5 through 7 below.

With these data, decisions can be made on potential areas of beneficial Border Patrol agent recruitment effort focus throughout the United States.
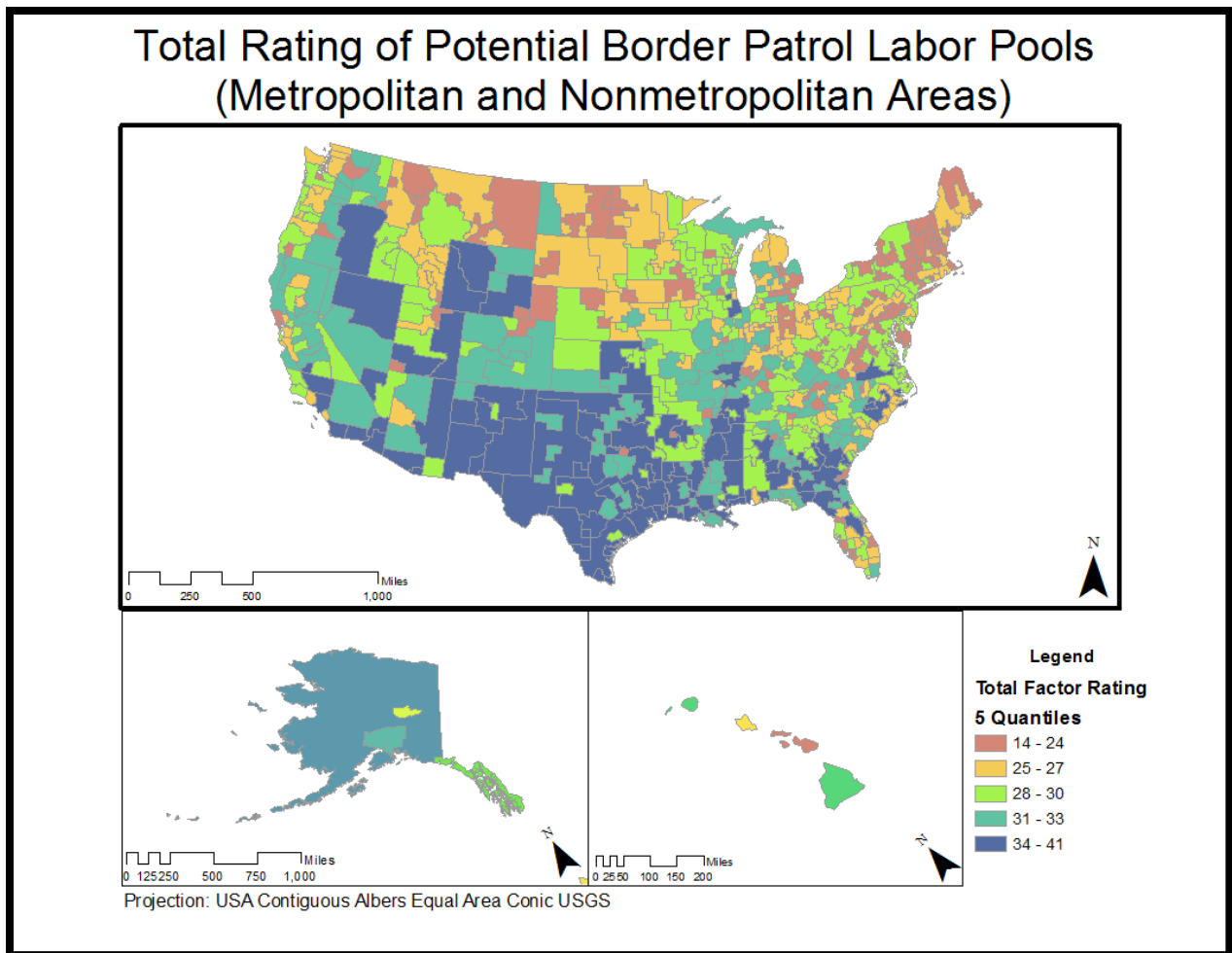


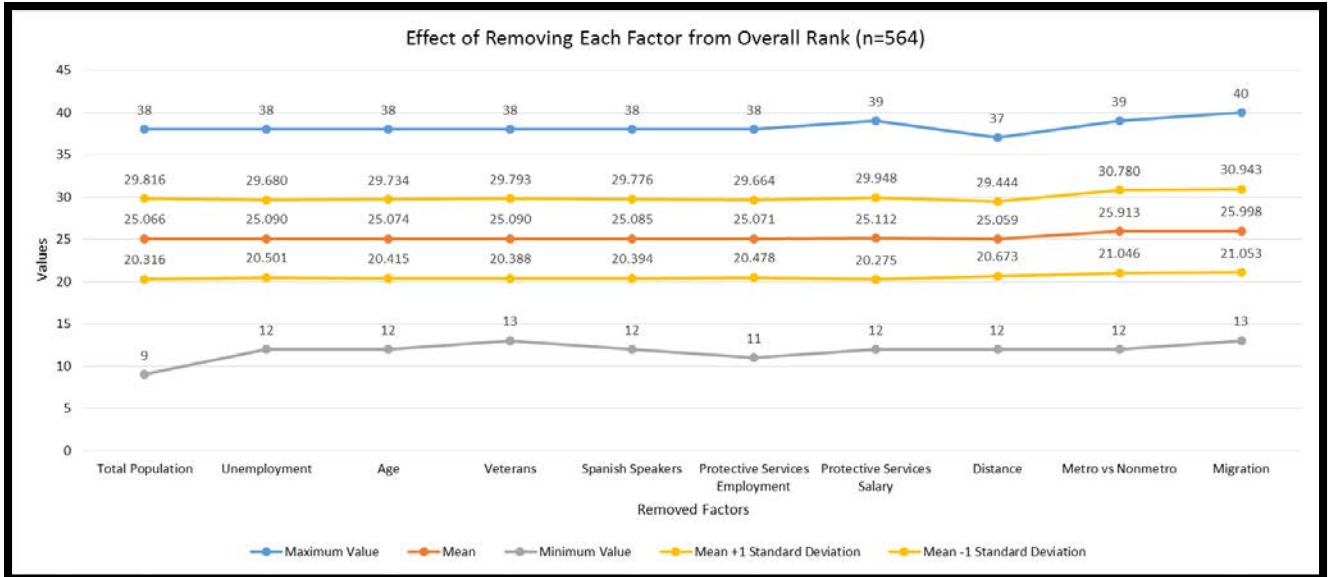Figure 2: United States metropolitan and nonmetropolitan rating factor overall scores.

Figure 3: Sensitivity testing maximum, minimum, mean, and single standard deviation values for each sensitivity run.

It is understood that the ecological fallacy may have an effect on these results. This is to say that, though an area may have a high proportion of appropriately aged people, as well as people with the ability to speak Spanish, the aggregation of data to a relatively large area masks the potential that these populations may be separated from each other. It is not necessarily true that there are a large number of people that individually have all or most of the desired traits. (Hsieh, 2018). This must be kept in mind when interpreting the results of this project as an explanation for potential error.

# Results

## Border Patrol Sector Descriptive Analysis

As shown in Figure 4 below, all but one Border Patrol sector has an over 10% drop in agent count between 2011 and 2017 (U.S. Border Patrol, n.d.). Only Rio Grande Valley has an increase in their agent population within the same timeframe.
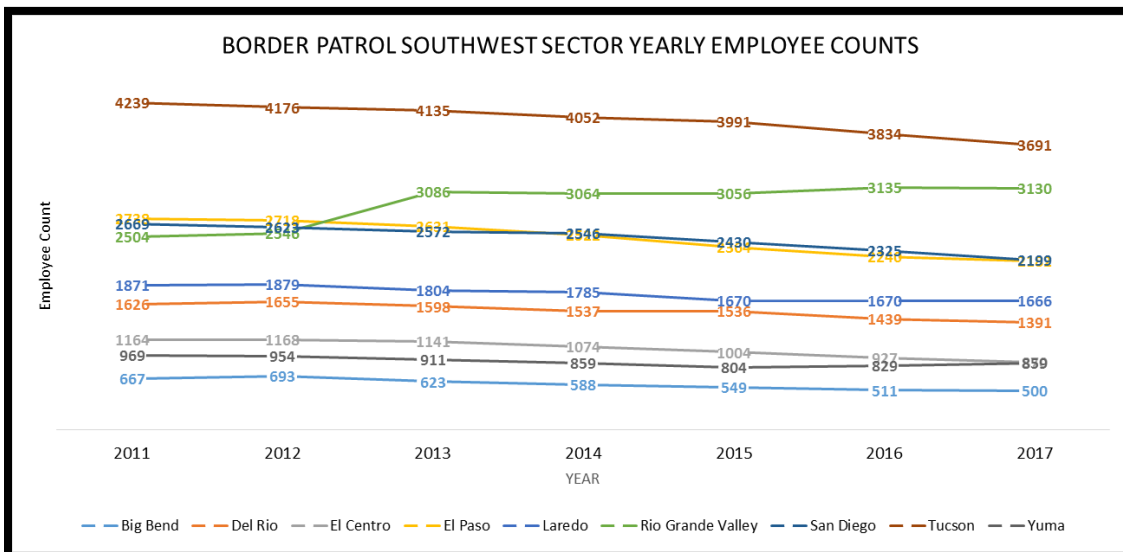


Figure 4: Southwest Border Patrol sector employee count from 2011 through 2017.

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Figures 5 through 13 show Border Patrol sector stations, and their associated agent workload information. By comparing these factors, decisions can be made on the sectors most in need of further recruitment efforts.
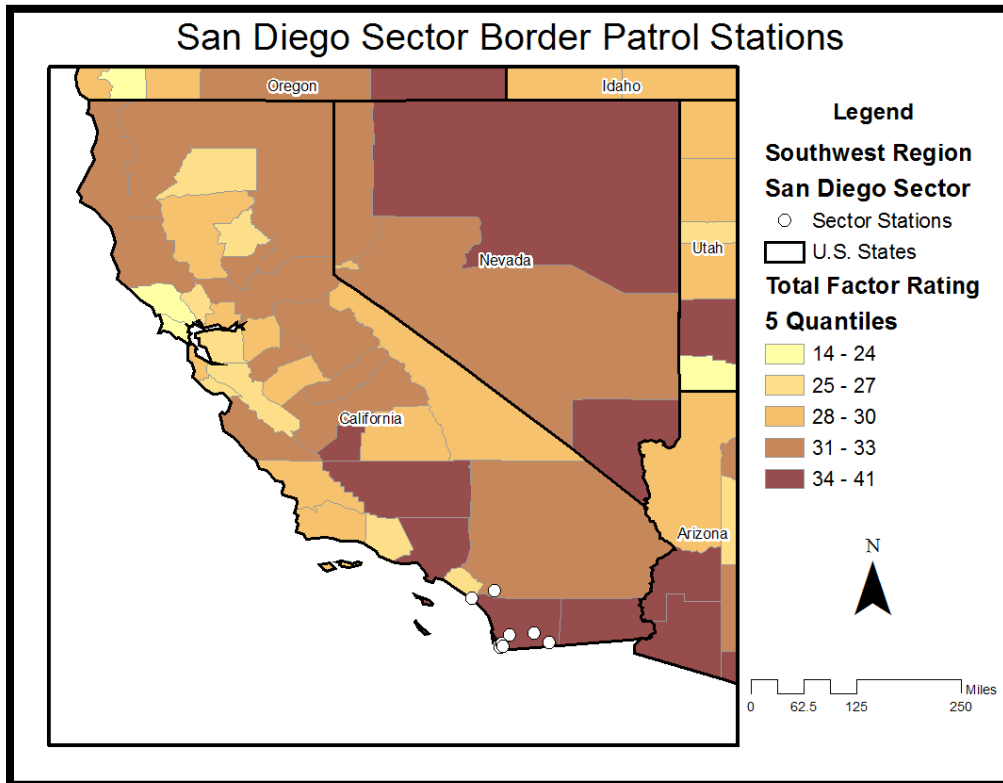


Figure 5: San Diego sector stations and metropolitan and nonmetropolitan area ratings.

San Diego Sector:
- 2017 Agent Count: 2199
- 2011-2017 Agent Change: 17.6% loss
- Station Count: 13
- Border Crossing Location Count: 3
- Apprehensions per Agent: 12
- People Entering the United States per Agent: 23,360
- Percent of Stations that are in Nonmetropolitan Areas: 0%
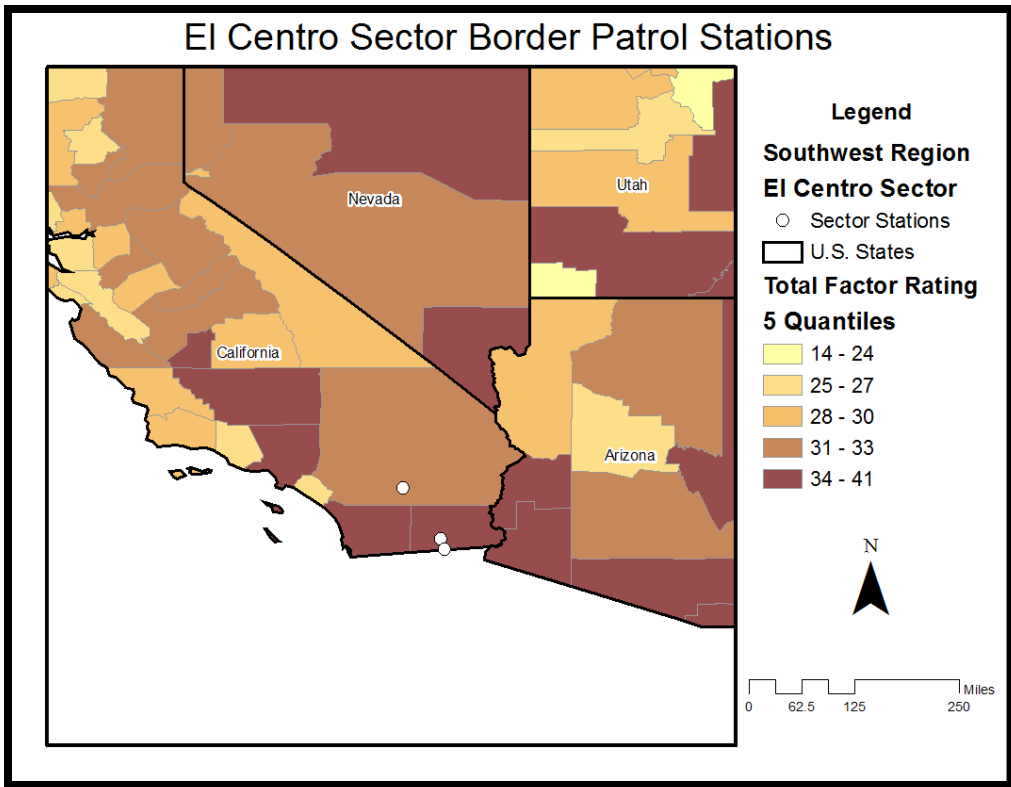- Population of Areas Containing Stations: 11,018,118

Figure 6: El Centro sector stations and metropolitan and nonmetropolitan area ratings.

El Centro Sector:
- 2017 Agent Count: 870
- 2011-2017 Agent Change: 25.2% loss
- Station Count: 4
- Border Crossing Location Count: 1
- Apprehensions per Agent: 21
- People Entering the United States Yearly per Agent: 22,454
- Percent of Stations that are in Nonmetropolitan Areas: 0%
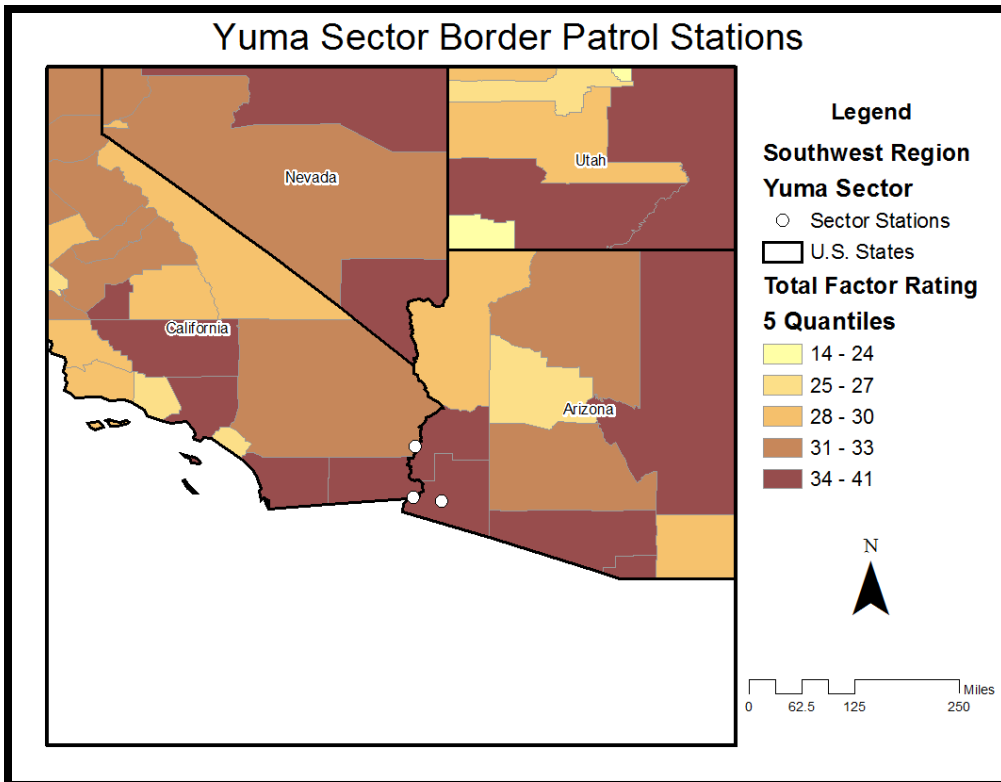- Population of Areas Containing Stations: 4,708,720

Figure 7: Yuma sector stations and metropolitan and nonmetropolitan area ratings.

Yuma Sector:
- 2017 Agent Count: 859
- 2011-2017 Agent Change: 11.4% loss
- Station Count: 4
- Border Crossing Location Count: 2
- Apprehensions per Agent: 15
- People Entering the United States Yearly per Agent: 11,596
- Percent of Stations that are in Nonmetropolitan Areas: 0%
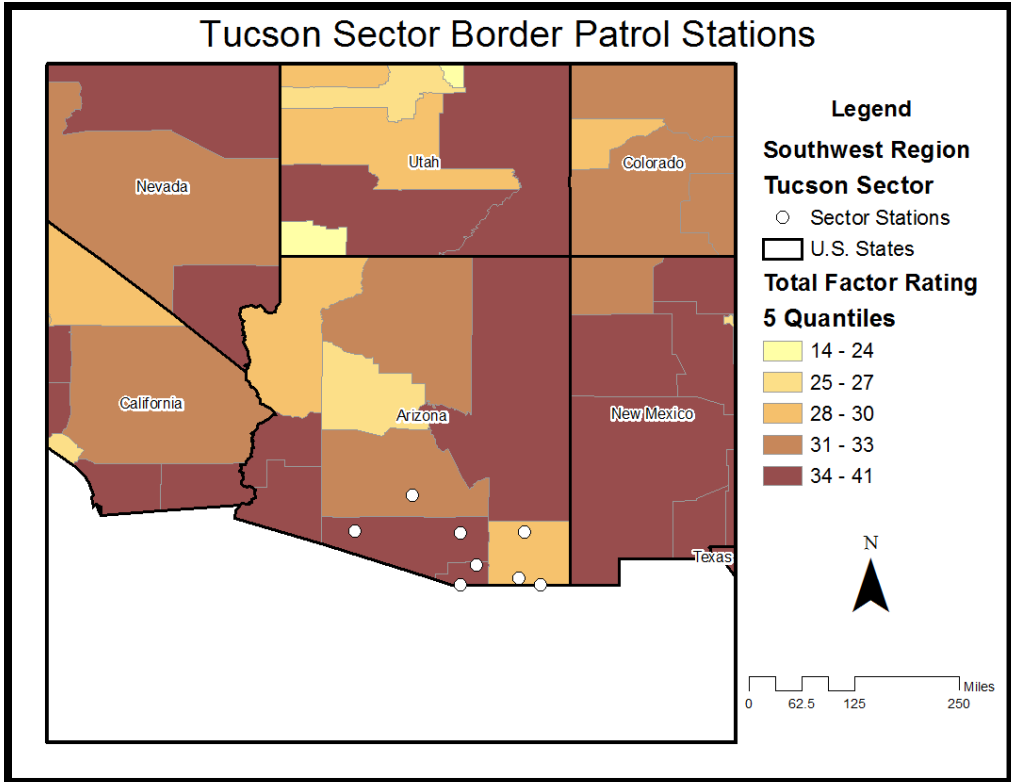- Population of Areas Containing Stations: 4,733,468

Figure 8: Tucson sector stations and metropolitan and nonmetropolitan area ratings.

Tucson Sector:
- 2017 Agent Count: 3691
- 2011-2017 Agent Change: 12.9% loss
- Station Count: 9
- Border Crossing Location Count: 5
- Apprehensions per Agent: 10
- People Entering the United States Yearly per Agent: 4,342
- Percent of Stations that are in Nonmetropolitan Areas: 22.2%
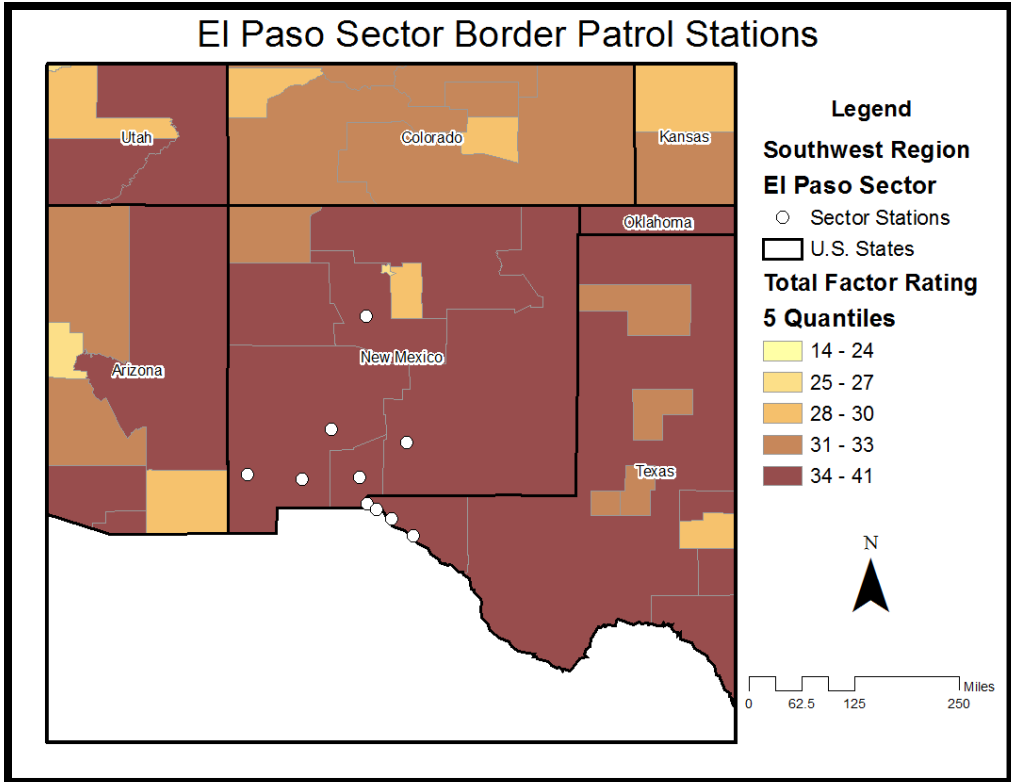- Population of Areas Containing Stations: 6,153,721

Figure 9: El Paso sector stations and metropolitan and nonmetropolitan area ratings.

El Paso Sector:
- 2017 Agent Count: 2182
- 2011-2017 Agent Change: 20.3% loss
- Station Count: 12
- Border Crossing Location Count: 4
- Apprehensions per Agent: 12
- People Entering the United States Yearly per Agent: 14,321
- Percent of Stations that are in Nonmetropolitan Areas: 33.3%
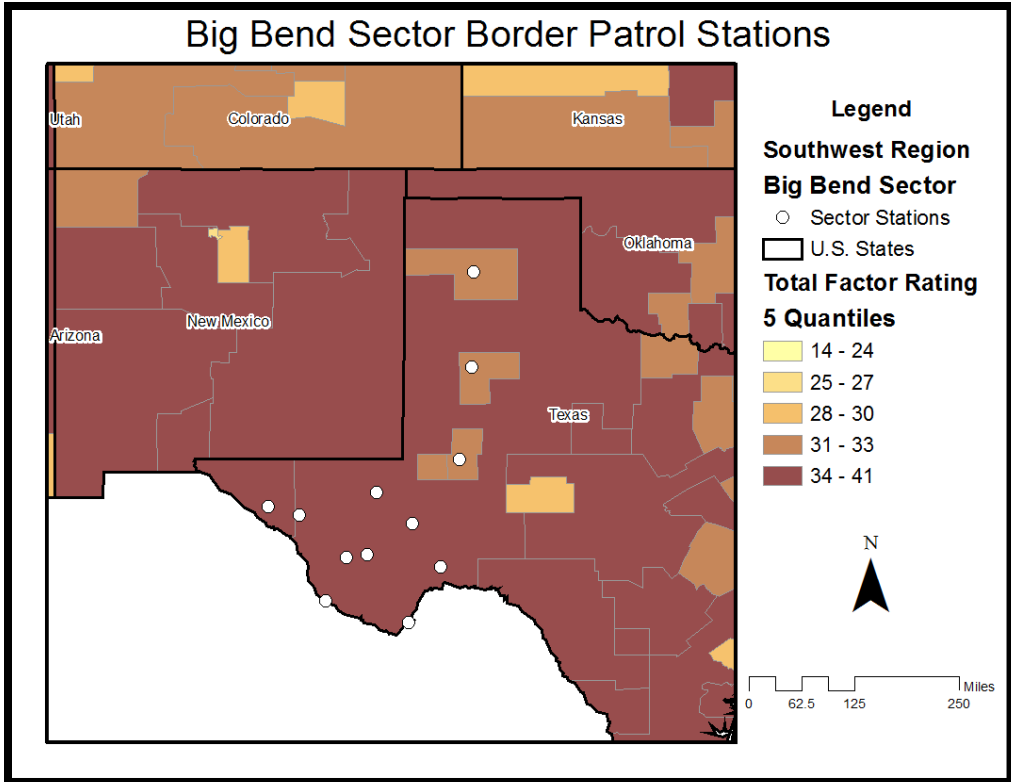- Population of Areas Containing Stations: 2,421,077

Figure 10: Big Bend sector stations and metropolitan and nonmetropolitan area ratings.

Big Bend Sector:
- 2017 Agent Count: 500
- 2011-2017 Agent Change: 25% loss
- Station Count: 13
- Border Crossing Location Count: 2
- Apprehensions per Agent: 12
- People Entering the United States Yearly per Agent: 2,990
- Percent of Stations that are in Nonmetropolitan Areas: 69.2%
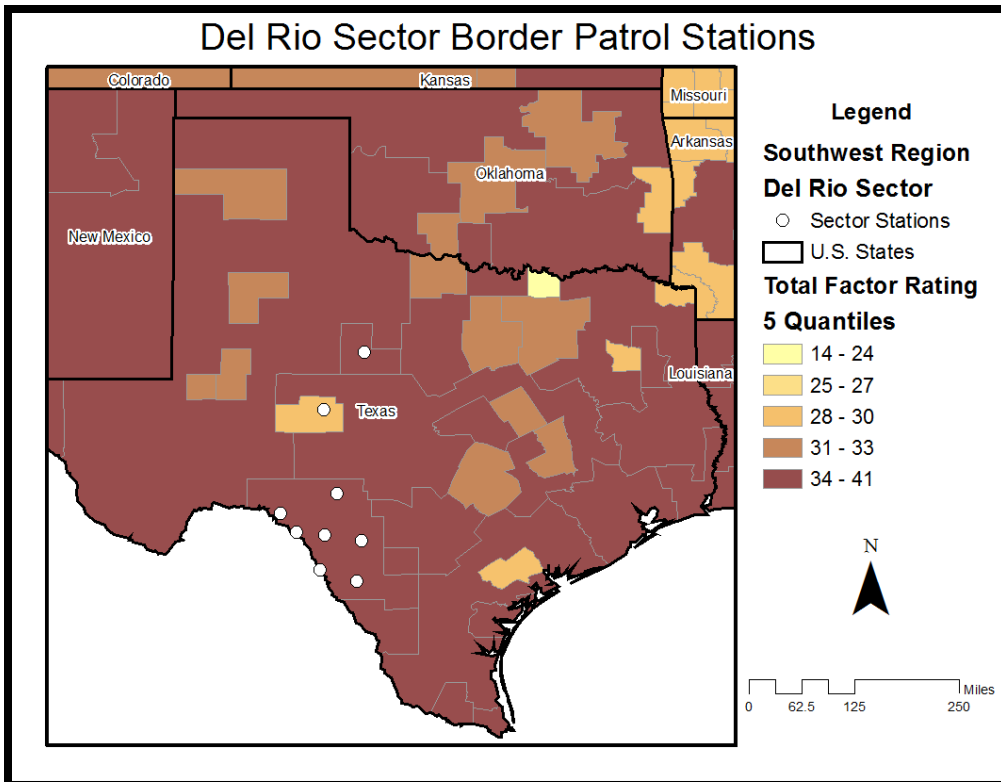- Population of Areas Containing Stations: 2,142,736

Figure 11: Del Rio sector stations and metropolitan and nonmetropolitan area ratings.

Del Rio Sector:
- 2017 Agent Count: 1391
- 2011-2017 Agent Change: 14.5% loss
- Station Count: 11
- Border Crossing Location Count: 2
- Apprehensions per Agent: 10
- People Entering the United States Yearly per Agent: 6,880
- Percent of Stations that are in Nonmetropolitan Areas: 81.8%
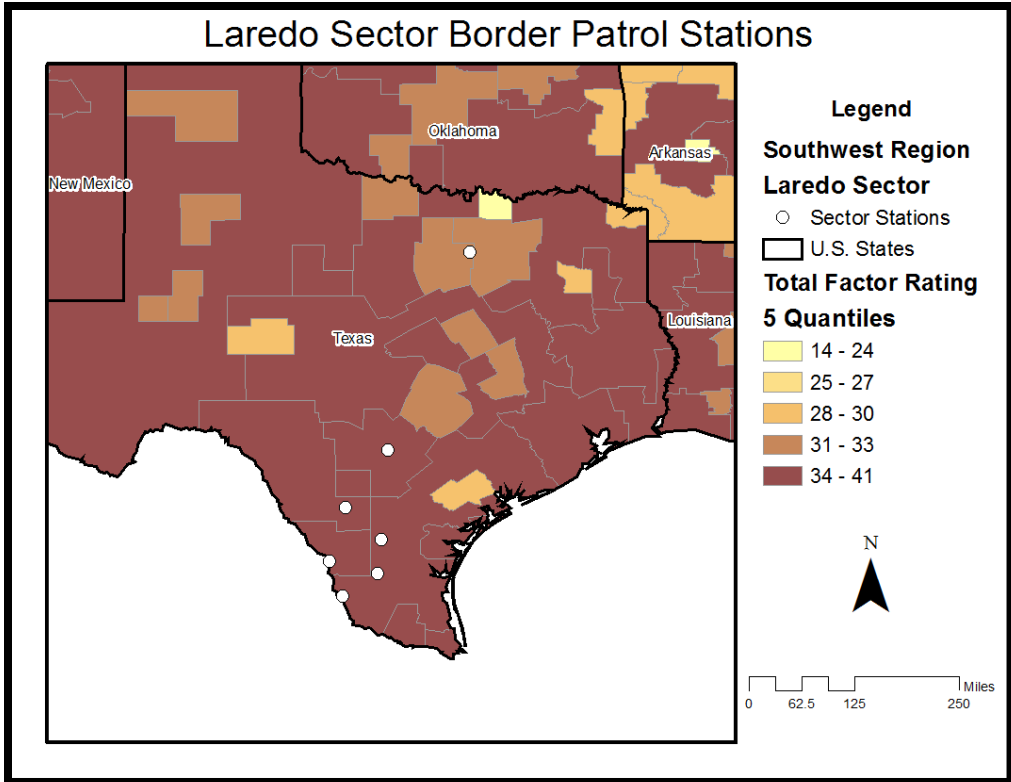- Population of Areas Containing Stations: 463,478

Figure 12: Laredo sector stations and metropolitan and nonmetropolitan area ratings.

Laredo Sector:
- 2017 Agent Count: 1666
- 2011-2017 Agent Change: 11% loss
- Station Count: 10
- Border Crossing Location Count: 1
- Apprehensions per Agent: 15
- People Entering the United States Yearly per Agent: 9,219
- Percent of Stations that are in Nonmetropolitan Areas: 40%
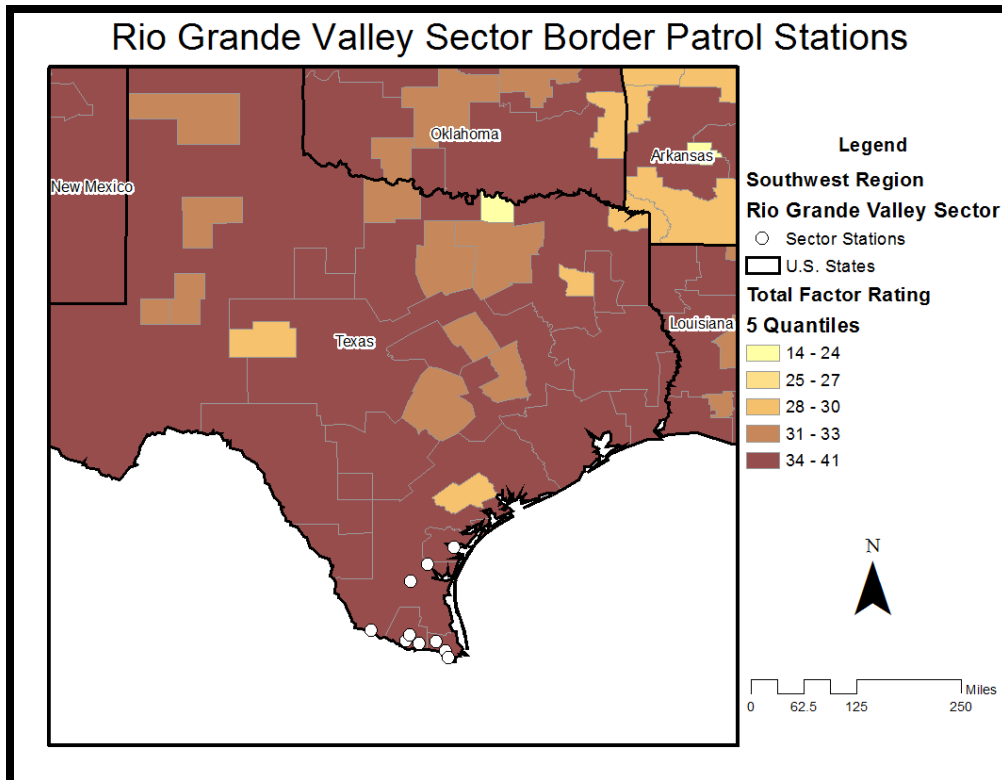- Population of Areas Containing Stations: 5,777,469

Figure 13: Rio Grande Valley sector stations and metropolitan and nonmetropolitan area ratings.

Rio Grande Valley Sector:
- 2017 Agent Count: 3130
- 2011-2017 Agent Change: 25% loss
- Station Count: 10
- Border Crossing Location Count: 5
- Apprehensions per Agent: 44
- People Entering the United States Yearly per Agent: 9,774
- Percent of Stations that are in Nonmetropolitan Areas: 22.2%
- Population of Areas Containing Stations: 2,190,526

Based on these factors, the sectors that are most in need are not immediately evident. Looking for areas that have the fewest agents, highest workload, and more stations located in nonmetropolitan areas narrowly identifies the Big Bend, El Paso, and Del Rio sectors as those most in need of new recruitment support.

Big Bend sector has the fewest overall agents, with the highest percent loss in agents since 2011. They also have the greatest number of Border Patrol stations. Big Bend sector has nine of its thirteen stations in a single nonmetropolitan area, which could provide an issue in finding an adequate immediate labor pool from which to hire new recruits. Looking at Figure 10 above, of the four stations found in individual metropolitan areas, only one is located in a highly rated area. The other three are found in more mid-to low-rated areas. Though higher rated areas can be seen surrounding this sector in New Mexico and eastern Texas, many of these areas contain other sector stations, which may pull potential recruits away from Big Bend sector. The overall population of the labor pools within Big Bend sector is roughly two million people, which is slightly lower than the median population value of the nine sectors. These factors work together

to give the Border Patrol's Big Bend sector a slight lead in its need for more recruitment support and inability of the immediate labor pools to provide for it.

The next two sectors that are, arguably, most in need are El Paso and Del Rio. Both sectors have agent counts in roughly the middle range of all southwest sectors. Both have a loss in agent population of over fourteen percent from 2011 to 2017, with El Paso's at over twenty percent. These sectors also have above average station counts. They differ in their ratio of border crossings into the United States to Border Patrol agents, with Del Rio sector at roughly 6,880 crossings per agent at under half of El Paso's 14,321 crossings per agent. They also differ in their percent of stations in nonmetropolitan areas with Del Rio sector having the overall highest percentage of 81.8% and El Paso at 33.3%. These two sectors also happen to be directly east and west of the most in need Big Bend sector. The combined population of metropolitan and nonmetropolitan areas within these three sectors is roughly five million people, which is lower than the top three individually most populated sector station areas. This strengthens the argument that these three sectors are the most in need, in the fact that their individual difficulties may multiply across the Border Patrol sectors in New Mexico and western Texas.

El Centro Sector can also be argued to be in the grouping of sectors in greater need of recruitment support. This sector has the fewest number of stations, as well as only a single border crossing location. However all of these stations, as well as the border crossing, are in a single metropolitan area. It also has the second highest ratio of apprehensions per agent, and border crossings per agent. El Centro sector also has the third fewest agents, and over twenty five percent loss in agent workforce between 2011 and 2017.

San Diego, Tucson, and Yuma sectors are arguably those least in need, based on their relatively high amounts of metropolitan-based stations, low apprehension to agent ratio, and, with the exception of San Diego, low border crossing to agent ratio. These three sectors also have three of the four most populated metropolitan and nonmetropolitan areas containing stations.

Laredo sector is roughly in the middle of all sector need factors. Though Rio Grande Valley has the highest apprehension to agent ratio, they have only a mid-level border crossing to agent ratio. Thirty percent of its stations are in nonmetropolitan areas, but all stations fall into areas with relatively strong overall labor pool ratings, as can be seen in Figure 13 above. Though this sector may be in need of agent recruitment efforts, it is not likely among the most in-need southwest Border Patrol stations.

While it can be argued that there are not significant differences between Border Patrol sectors in ability to recruit an adequate number of agents, there is a clear overall problem in doing so. Thus labor pools outside of these sectors are sought in an attempt to find enough of a population with which to provide an adequate number of recruits to the Border Patrol sectors of the southwest United States.

## Analysis of Potential Labor Pools

Based on initial visual inspection of Figures 2 (above) and 14 (below), better potential Border Patrol recruitment labor pools do tend to focus on the southern and western portions of the United States. These areas largely correspond to the location of the Border Patrol's southwestern sector stations, as can be seen in Figure 14 below. As this project is focused on finding potential labor pools that are not necessarily close to these Border Patrol's southwestern stations, areas outside of this require greater focus. Excluding the areas near these stations,

there appear to be potential labor pool hot spots in eastern Mississippi, Southern Georgia, and southeastern North Carolina within the southeastern United States. Likewise, in this visual inspection, areas in Nevada, eastern Oregon, Wyoming, and Alaska could provide possible labor pools.
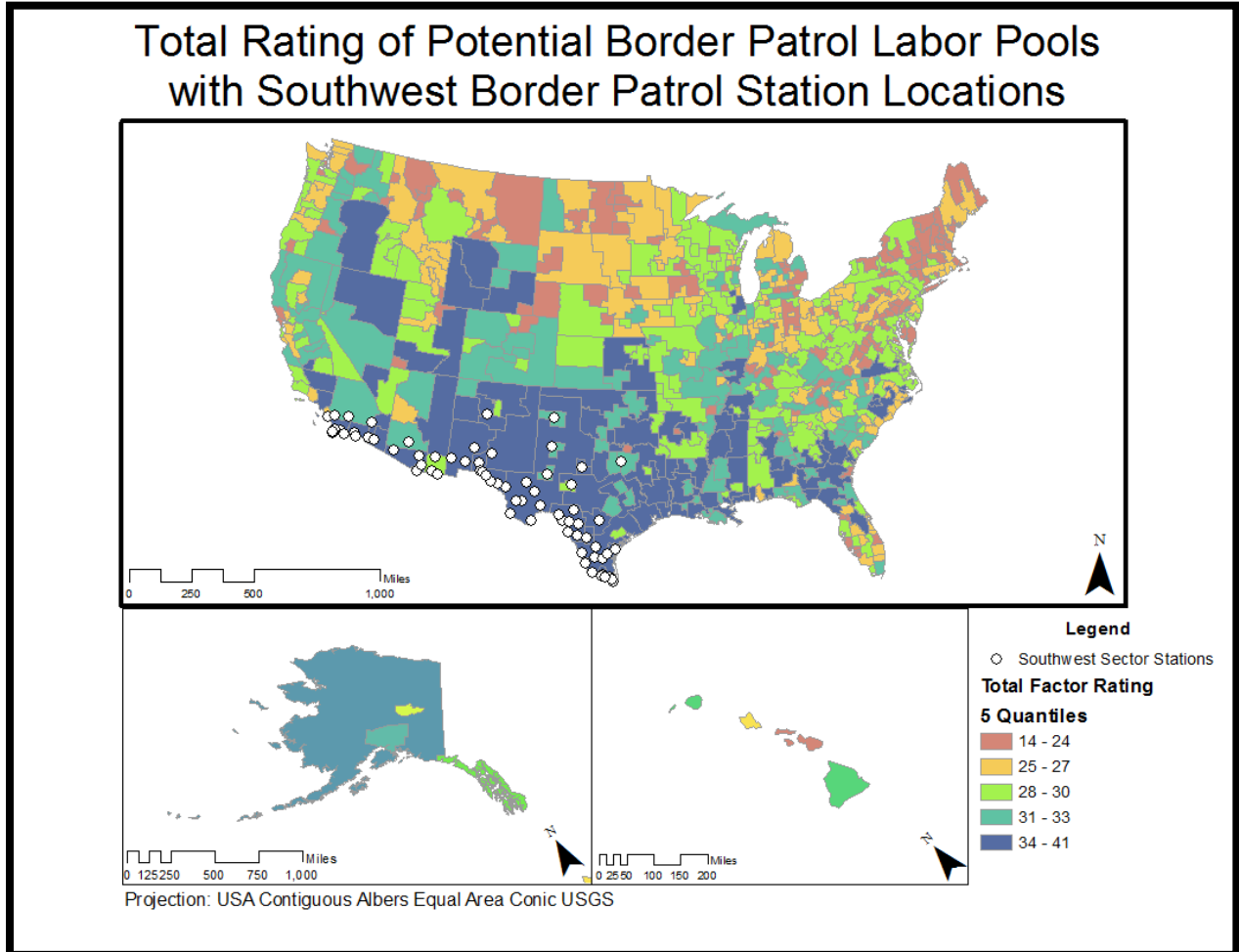


Figure 14: Total rating by metropolitan and nonmetropolitan areas with Border Patrol station locations displayed.

To ensure that no single factor holds too powerful an effect on the overall rating, the r-squared coefficient is calculated for each individual factor value and the total rating, as well as each factor rating and the total rating of each metropolitan and nonmetropolitan area. No r-squared value, shown in table 5 below, indicates major correlation between each value or rating with the total area rating. Though some slight correlation can be seen between the distance from nearest Border Patrol station factor and the overall rating, it is not at a high enough value to indicate that this factor has an overpowering effect on the total rating score for each labor pool area.

| | Total Population | Unemployment | Age | Veterans | Spanish Speakers | Protective Services Employment | Protective Services Salary | Distance | Metro vs Nonmetro Area | Migration |
|---|---|---|---|---|---|---|---|---|---|---|
| Value r-squared | 0.025 | 0.163 | 0.041 | 0.037 | 0.131 | 0.091 | 0.016 | 0.276 | 0.064 | 0.003 |
| Rating r-squared | 0.100 | 0.181 | 0.140 | 0.114 | 0.119 | 0.179 | 0.058 | 0.299 | 0.064 | 0.035 |

Table 5: r-squared correlation for each factor value and rating to total rating for each area.

The Univariate Local Moran's I statistic was then run on each factor value (Table 6), factor rating (Table 7), and the overall rating (also Table 7). These results do indicate a certain amount of spatial clustering among these features. In particular, it can be expected that the factor of 'distance from nearest Border Patrol Station' will contain very spatially correlated features, as the factor is inherently spatially specific. That is to state that nearer areas to stations are naturally going to be close to other near features, and far features close to other far features. Outside of this single factor, there are some other features, such as 'average protective services employee wage' and 'percent of population that are Spanish speakers' that indicate spatial clustering. Similarly, the overall rating for these labor pools indicates both high and low value clustering. Maps of these clusters, as well as outliers, can be seen in Figures 15 and 16 below.

| Factor Values | N | Mean | Median | Standard Deviation | Minimum | Maximum | Univariate Local Moran's I | p-value |
|---|---|---|---|---|---|---|---|---|
| 2016 Estimated Total Population | 564 | 572926.729 | 260524 | 1086960.5 | 18147 | 14398700 | 0.161 | p < 0.001 |
| Unemployment Rate | 564 | 5.37% | 5.16% | 1.74% | 2.78% | 23.99% | 0.502 | p < 0.001 |
| Percent of Total Population: Age 18-34 Years | 564 | 22.45% | 21.87% | 3.92% | 8.24% | 42.67% | 0.068 | p < 0.001 |
| Percent of Total Population: Veterans Age 18-34 Years | 564 | 0.62% | 0.51% | 0.43% | 0.15% | 0.43% | 0.156 | p < 0.001 |
| Percent of Total Population: Spanish Speakers, Age 18-64 Years | 564 | 5.43% | 2.85% | 7.06% | 0.33% | 51.09% | 0.651 | p < 0.001 |
| Percent of Total Population: Protective Services Occupation Employees | 562 | 0.95% | 0.88% | 0.38% | 0.02% | 3.89% | 0.160 | p < 0.001 |
| Protective Services Occupation Average Annual Wages | 558 | $ 43,502.04 | $ 42,275 | $8,009.32 | $ 27,330 | $ 74,230 | 0.525 | p < 0.001 |
| Distance (Decimal Degrees) of Area from Nearest Border Patrol Station | 564 | 12.115 | 12 | 7.713 | 0 | 42 | 0.830 | p < 0.001 |
| Metropolitan vs Nonmetropolitan Area | 564 | | | | Metropolitan Area | Nonmetropolitan Area | 0.045 | p < 0.001 |
| Percent of Total Population: Positive Net Previous Migration to Southwest U.S. | 564 | 0.05% | 0.00% | 0.13% | 0.00% | 1.36% | 0.129 | p < 0.001 |

Table 6: Factor value univariate local Moran's I scores.

| Factor Index | N | Mean | Median | Standard Deviation | Minimum | Maximum | Univariate Local Moran's I | p-value |
|---|---|---|---|---|---|---|---|---|
| 2016 Estimated Total Population | 564 | 2.996 | 3 | 1.414 | 1 | 5 | 0.210 | p < 0.001 |
| Unemployment Rate | 564 | 2.996 | 3 | 1.414 | 1 | 5 | 0.046 | p < 0.001 |
| Percent of Total Population: Age 18-34 Years | 564 | 2.998 | 3 | 1.412 | 1 | 5 | 0.081 | p < 0.001 |
| Percent of Total Population: Veterans Age 18-34 Years | 564 | 2.995 | 3 | 1.416 | 1 | 5 | 0.243 | p < 0.001 |
| Percent of Total Population: Spanish Speakers, Age 18-64 Years | 564 | 2.996 | 3 | 1.414 | 1 | 5 | 0.665 | p < 0.001 |
| Percent of Total Population: Protective Services Occupation Employees | 562 | 2.998 | 3 | 1.412 | 1 | 5 | 0.174 | p < 0.001 |
| Protective Services Occupation Average Annual Wages | 558 | 2.982 | 3 | 1.406 | 1 | 5 | 0.626 | p < 0.001 |
| Distance (Decimal Degrees) of Area from Nearest Border Patrol Station | 564 | 3.004 | 3 | 1.414 | 1 | 5 | 0.875 | p < 0.001 |
| Metropolitan vs Nonmetropolitan Area | 564 | 2.149 | 1 | 1.811 | 1 | 5 | 0.045 | p < 0.001 |
| Percent of Total Population: Positive Net Previous Migration to Southwest U.S. | 564 | 2.064 | 1 | 1.436 | 1 | 5 | 0.046 | p < 0.001 |
| Overall Index Score | 564 | 28.14007 | 28 | 4.985937 | 14 | 41 | 0.489755 | p < 0.001 |

Table 7: Factor and overall rating univariate local Moran's I.

Maps created using the ArcGIS 'Hot Spot Analysis (Getis-Ord Gi*)' and 'Cluster and Outlier Analysis (Anselin Local Morans I)' tools are shown in Figures 15 and 16 below. Based on these results, one conclude that labor pools in the southern United States, Nevada, Utah, Colorado, and Kansas may be good places to provide additional recruitment efforts for the southwestern Border Patrol sector agent population. These maps also show areas of particularly low value clustering in Minnesota, Michigan, and the northeastern United States. Based on these values, and the assumption that southwestern labor pools have not been able to provide enough viable candidates thus far, the southeastern portion of the country and the area directly north of the southwest border area may have many potential migration-willing recruits for the Border Patrol's southwest sectors.
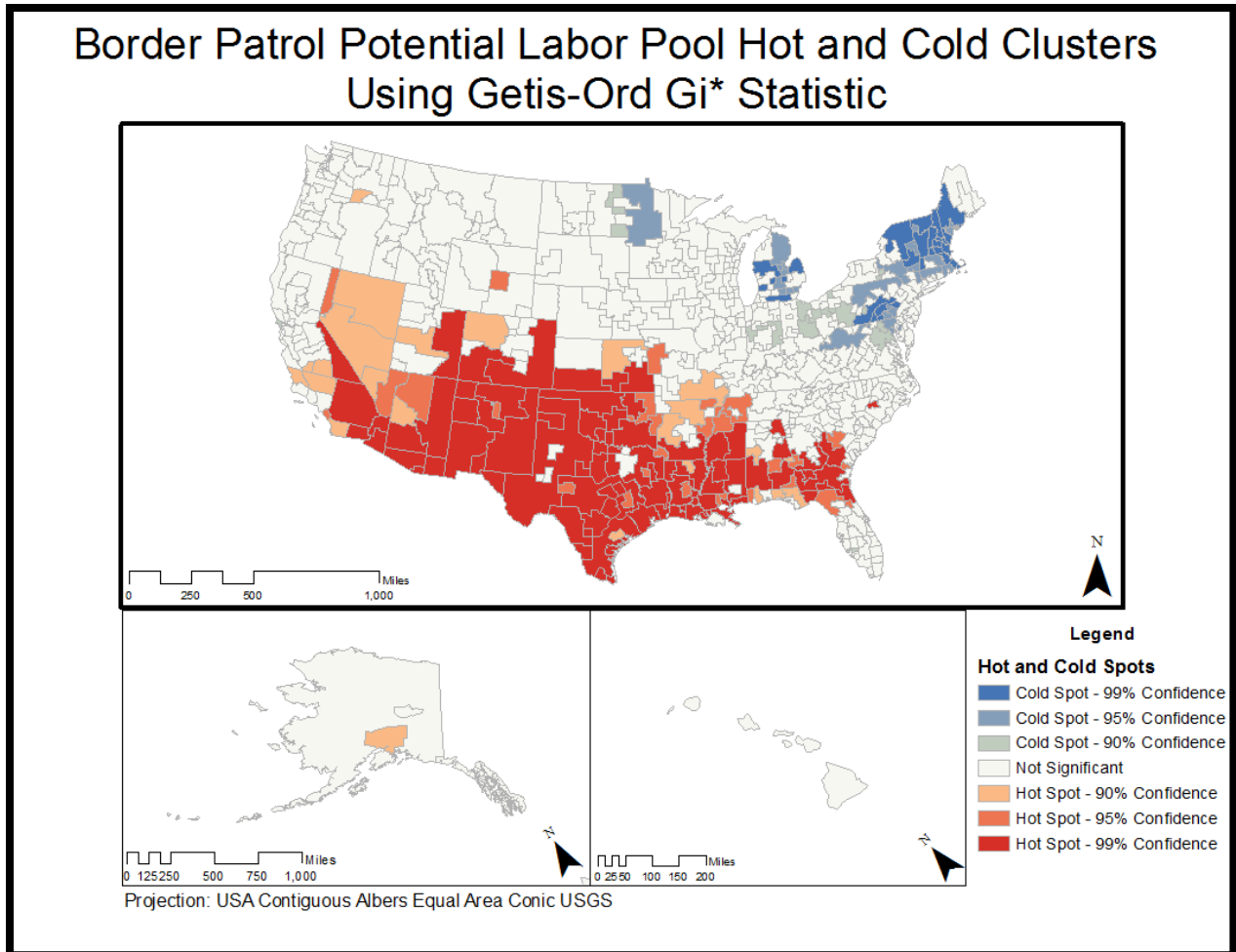


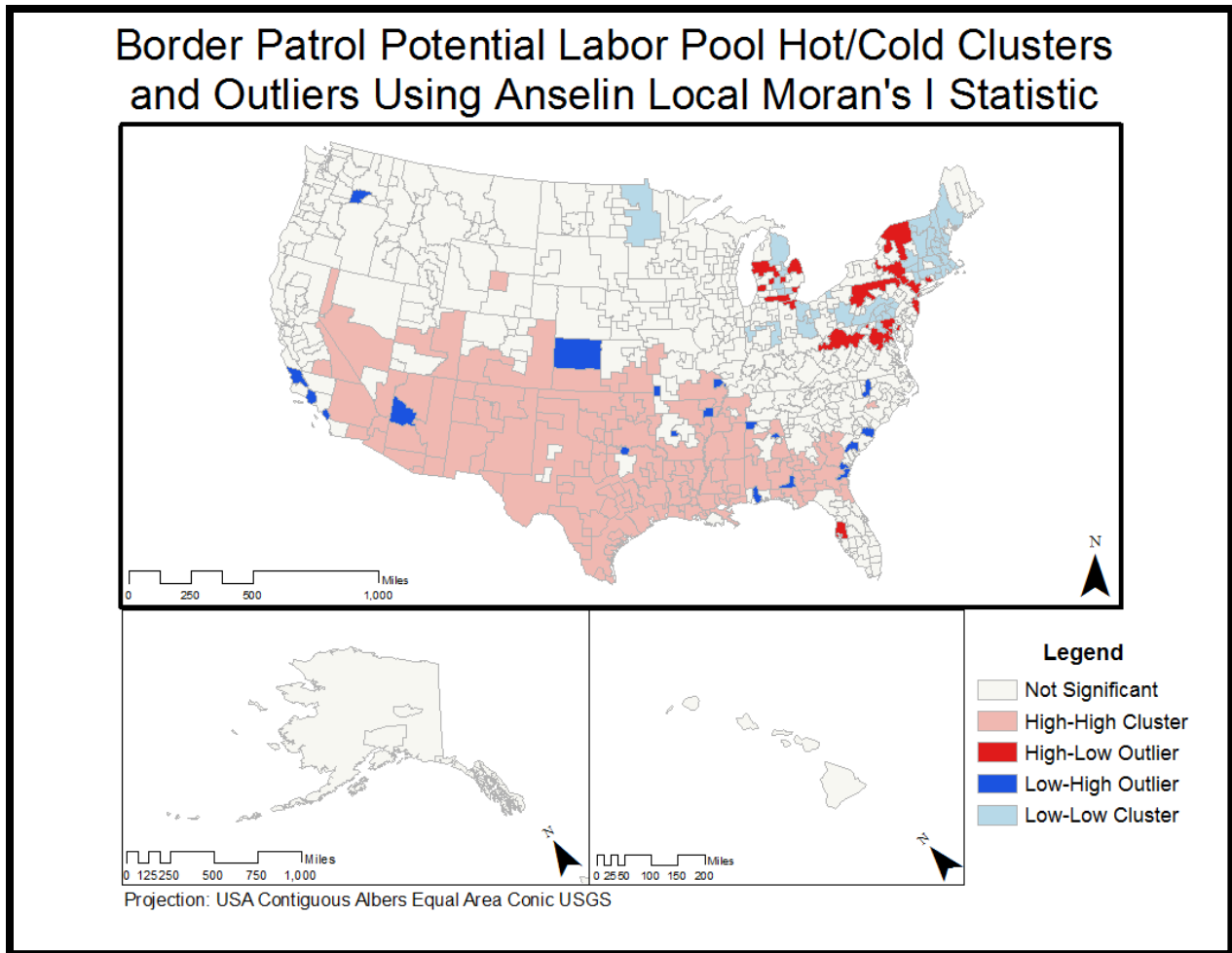Figure 15: Hot and cold area rating clusters based on Getis-Ord Gi* statistic

Figure 16:  Hot and cold area rating clusters, as well as outliers, based on Anselin Local Moran's I Statistic

## Conclusions

The United States Border Patrol has historically struggled with recruiting enough agents to meet its employment goals. This has largely been attributed to stringent hiring requirements and undesirable duty locations. Particularly, the nine southwest sectors along the border between Mexico and the United States have greater employment difficulty due to a 2017 Presidential Executive Order which makes it necessary to raise their overall hiring goal by 5,000 agents. To support this effort, this project does two things. First, features of these nine sectors and the areas around them are compared, which helps decide which sectors are most in need of additional recruitment support. This found that there is no clear sector that is most in need, but that that three (Big Bend, El Paso, and Del Rio) have arguably more difficulty recruiting enough agents than the others. The second portion of this project looks at labor pools throughout the United States in the form of metropolitan and nonmetropolitan area demographics. In rating the fitness of these areas, it is suggested that the southeastern United States, from Louisiana to Georgia, may provide particularly valuable additional labor pools from which to recruit needed agents.

Should it be desired, data internal to the Department of Homeland Security might be used to perform further analysis on this subject. Current and previous Border Patrol workforce demographic information can be used to find which factors have a statistically significant effect

on recruitment and retention of agents. This, in conjunction with the methodology and results of this project, can be used for continuing improvement of the United States Border Patrol recruitment process.

This project also seeks to add value to the Human Resources professional field in general, by providing a specific example of the use of analysis for the recruitment of a large and difficult to fill workforce. Geographic Information System (GIS)-based practices have not been found to be used in any large manner for Human Resources-based analysis, and it is hoped that this project will introduce valuable practices for future use.

# References

Border Patrol Agent Duty Locations (2017). U.S. Customs and Border Protection Website. Retrieved from https://www.cbp.gov/careers/frontline-careers/bpa/duty-locations on August 21, 2017.

Border Patrol Enforcement Series, 1896 (n.d.) Classification & Qualifications: General Schedule Qualifications Standards. Retrieved from https://www.opm.gov/policy-data-oversight/classification-qualifications/general-schedule-qualification-standards/1800/border-patrol-enforcement-series-1896/ on August 21, 2017.

Bunruamkaew, K., Murayama, Y. (2011). Site Suitability Evaluation for Ecotourism Using GIS & AHP: A Case Study of Surat Thani Province, Thailand. *Procedia Social and Behavioral Sciences, 21*, 269-278. http://www.sciencedirect.com/science/article/pii/S1877042811013474

Cameron, R. (2011). Responding to Australia's regional skill shortages through regional skilled migration. *Journal of Economic and Social Policy, 14(3)*, Article 4. http://epubs.scu.edu.au/jesp/vol14/iss3/4/

Coates, D., Gindling, T. H. (2013) Is Hispanic population dispersion into rural counties contributing to local economic growth? *Contemporary Economic Policy, 31(4)*, 649-668. http://sk8es4mc2l.search.serialssolutions.com.ezaccess.libraries.psu.edu/?url_ver=Z39.88-2004&rft_val_fmt=info%3Aofi%2Ffmt%3Akev%3Amtx%3Ajournal&rft.genre=article&rft.jtitle=Contemporary%20Economic%20Policy&rft.atitle=IS%20HISPANIC%20POPULATION%20DISPERSION%20INTO%20RURAL%20COUNTIES%20CONTRIBUTING%20TO%20LOCAL%20ECONOMIC%20GROWTH%3F&rft.volume=31&rft.issue=4&rft.spage=649&rft.epage=668&rft.date=2013-10-01&rft.aulast=COATES&rft.aufirst=DENNIS&rft.issn=1074-3529&rft.eissn=1465-7287&rfr_id=info:sid/wiley.com:OnlineLibrary

Daniels, Z. M., VanLeit, B. J., Skipper, B. J., Sanders, M. L., Rhyne, R. L. (2007). Factors in recruiting and retaining health professionals for rural practice. *The Journal of Rural Health, 23(1)*, 62-71. http://onlinelibrary.wiley.com/doi/10.1111/j.1748-0361.2006.00069.x/full

Environmental Systems Research Institute (2016). Spatial Autocorrelation (Global Moran's I). Retrieved from http://desktop.arcgis.com/en/arcmap/10.3/tools/spatial-statistics-toolbox/spatial-autocorrelation.htm on February 5, 2018.

Environmental Systems Research Institute (2018). ArcGIS (Version 10.5.1) [Software]. Available from http://www.arcgis.com/features/index.html.

Geoda (n.d.). Geoda (Version 1.12) [Software]. Available from http://geodacenter.github.io/.

Health Resources & Services Administration (2017). Defining Rural Population: Office of Management and Budget Definition. Retrieved from https://www.hrsa.gov/rural-health/about-us/definition/index.html on February 6, 2018.

Hsieh, J. J. (2018). Ecological Fallacy. In Encyclopedia Britannica online. Retrieved from https://www.britannica.com/topic/ecological-fallacy on February 4, 2018.

Halseth, G. (1999). "We came for the work": Situating employment migration in B.C.'s small, resource-based, communities. *The Canadian Geographer, 43(4)*, 363-381. http://sk8es4mc2l.search.serialssolutions.com/?ctx_ver=Z39.88-2004&ctx_enc=info%3Aofi%2Fenc%3AUTF-8&rfr_id=info%3Asid%2Fsummon.serialssolutions.com&rft_val_fmt=info%3Aofi%2Ffmt%3Akev%3Amtx%3Ajournal&rft.genre=article&rft.atitle=%22WE+CAME+FOR+THE+WORK%22%3A+SITUATING+EMPLOYMENT+MIGRATION+IN+B.C.%27S+SMALL%2C+RESOURCE-BASED%2C+COMMUNITIES&rft.jtitle=The+Canadian+Geographer&rft.au=Halseth%2C+Greg&rft.date=1999-12-22&rft.pub=Canadian+Association+of+Geographers&rft.issn=0008-3658&rft.eissn=1541-

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Orvis, B. R., Asch, B. J. (2001). Military Recruiting: Trends, Outlook, and Implications. Rand Publications. Santa Monica, CA. Retrieved from https://www.rand.org/pubs/monograph_reports/MR902.html

Playford, D., Larson, A., Wheatland, B. (2006). Going country: Rural student placement factors associated with future rural employment in nursing and allied health. *Australian Journal of Rural Health, 14*, 14-19. http://onlinelibrary.wiley.com/doi/10.1111/j.1440-1584.2006.00745.x/full

Schwartz, A. (1973). Interpreting the Effect of Distance on Migration. Journal of Political Economy, 81(5), 1153-1169. http://www.jstor.org.ezaccess.libraries.psu.edu/stable/1830643?pq-origsite=summon&seq=1#page_scan_tab_contents

Shah, C., Burke, G. (2003). Skilled Shortages: concepts measurement and implications, Working Paper no. 52, November 2003, Centre for the Economics of Education and Training, Monash University. https://eric.ed.gov/?id=ED505811

Soutar, G. N., Turner, J. P. (2002). Students' preferences for university: a conjoint analysis. The International Journal of Education Management, 16(1), 40-45. https://search-proquest-com.ezaccess.libraries.psu.edu/docview/229147546?pq-origsite=summon

Ravenstein, E. G. (1885). The Laws of Migration. Journal of the Statistical Society of London, 48(2), 167-235. http://www.jstor.org.ezaccess.libraries.psu.edu/stable/2979181?pq-origsite=summon&seq=1#page_scan_tab_contents

Stenglein, C. (2017). Struggling to hang on to 20K officers, Border Patrol looks to hire 5K more. Brookings. Retrieved from https://www.brookings.edu/blog/fixgov/2017/07/07/struggling-to-hang-on-to-20k-officers-border-patrol-looks-to-hire-5k-more/ on August 31, 2017.

The White House, Office of the Press Secretary (2017). Executive Order: Border Security and Immigration Enforcement Improvements. Retrieved from https://www.whitehouse.gov/the-press-office/2017/01/25/executive-order-border-security-and-immigration-enforcement-improvements on August 21, 2017.

U.S. Border Patrol (2016). U.S. Border Patrol Fiscal Year 2016 Sector Profile. Retrieved from https://www.cbp.gov/newsroom/media-resources/stats on February 3, 2018.

U.S. Border Patrol (2017). U.S. Border Patrol Fiscal Year 2017 Sector Profile. Retrieved from https://www.cbp.gov/newsroom/media-resources/stats on February 3, 2018.

U.S. Border Patrol (n.d.). Stats and Summaries. Retrieved from https://www.cbp.gov/newsroom/media-resources/stats?page=1 on February 3, 2018.

U.S. Department of Homeland Security (2016a). Written testimony of CBP U.S. Border Patrol Chief Mark Morgan and Deputy Chief Carla Provost for a Senate Committee on Homeland Security and Governmental Affairs hearing titled "Initial Observations of the New Leadership at the U.S. Border Patrol". Retrieved from https://www.dhs.gov/news/2016/11/30/written-testimony-cbp-senate-committee-homeland-security-and-governmental-affairs on August 21, 2017.

U.S. Census Bureau (2018). Metropolitan and Micropolitan. Retrieved from https://www.census.gov/programs-surveys/metro-micro/about.html on February 3, 2018.

U.S. Department of Homeland Security (2016b). Written testimony of CBP Office of Administration Assistant Commissioner Eugene Shied, CBP Human Resources Management Assistant Commissioner Linda Jacksta, and CBP Office of Field Operations Deputy Assistant Commissioner John Wagner for a House Committee on Homeland Security, Subcommittee on Border and Maritime Security hearing titled "Keeping Pace with Trade, Travel, and Security: How does CBP Prioritize and Improve Staffing Infrastructure?". Retrieved from https://www.dhs.gov/news/2016/04/19/written-testimony-cbp-house-homeland-security-subcommittee-border-and-maritime on August 21, 2017.

U.S. Department of Justice, Office of the Inspector General (2000). Inspection of the Influx of New Personnel. Report Number 1-2000-018. Retrieved from https://oig.justice.gov/reports/INS/e0018/results.htm on August 21, 2017.

U.S. General Accounting Office (1991). Border Patrol: Southwest Border Enforcement Affected by Mission Expansion and Budget. GAO/GGD-91-72BR. Retrieved from http://www.gao.gov/assets/80/78084.pdf on August 28, 2017.

University of Alabama (n.d.). Metropolitan and Micropolitan Areas. Retrieved from https://cber.cba.ua.edu/asdc/metro_micro.html on February 3, 2018.
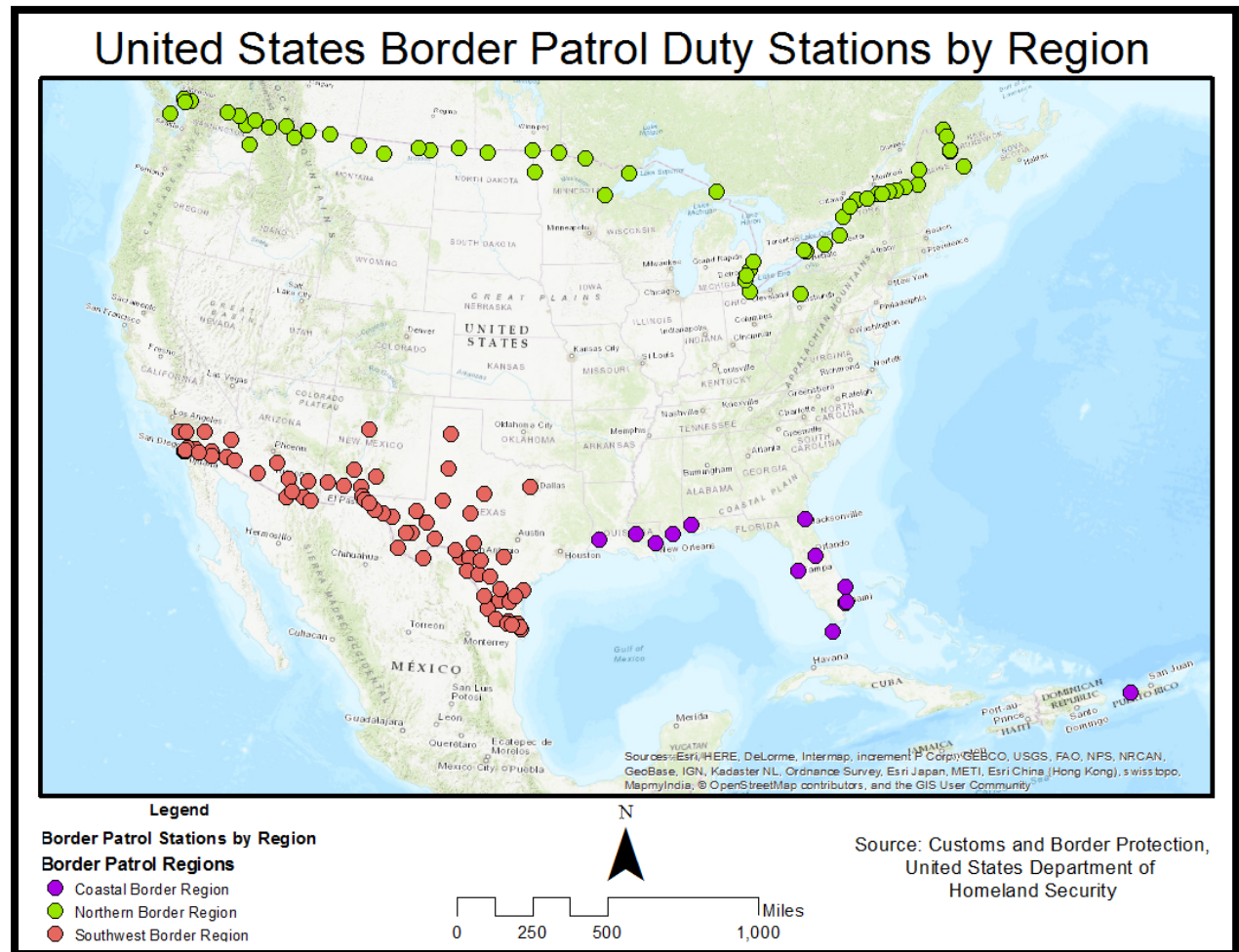
# Appendix I: Full Data List

This appendix provides information on data sources used in this project. It includes a description, use, timeframe, original data format, source web location, and at least one derived sample map for each dataset.
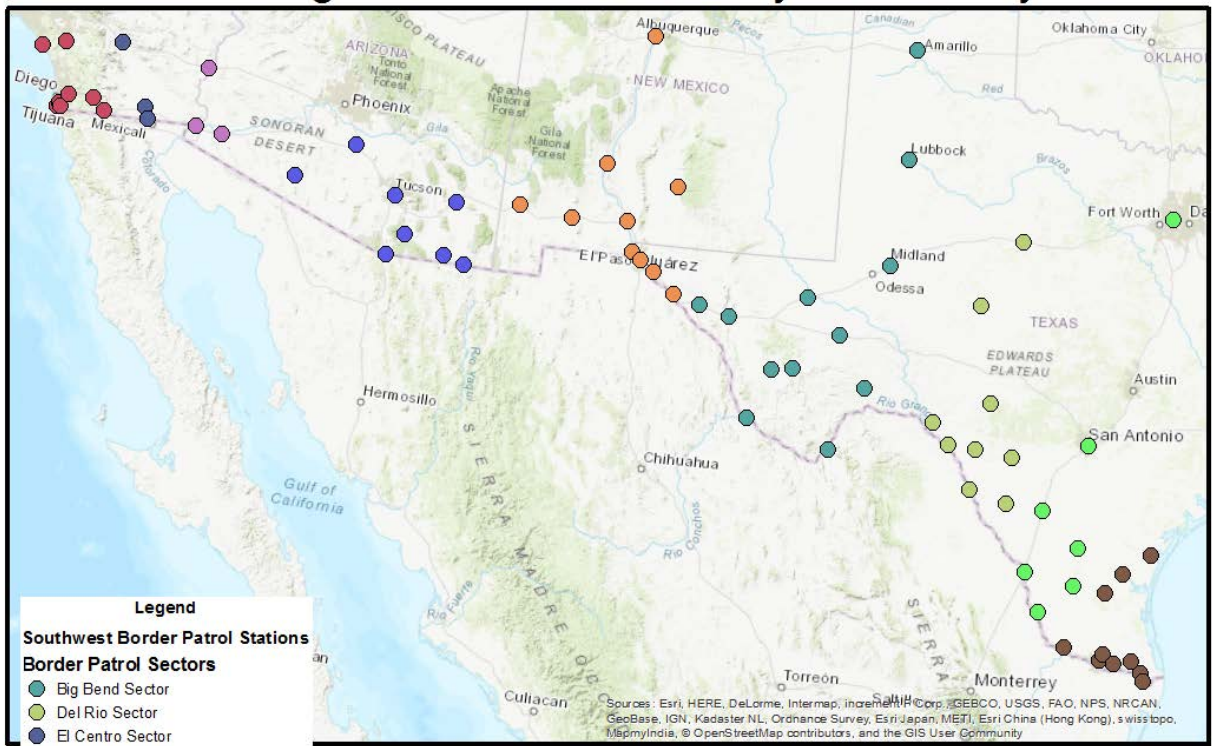
## Border Patrol Data

**Border Patrol Stations, Sectors, & Regions**
- Description: The locations of individual Border Patrol agent duty stations, and their larger groupings within Border Patrol sectors and regions.
- Use: These duty stations are the locations where recruits work. They can be spatially joined to the communities they are found within to compare needs to actual available labor pool.
- Timeframe: 2017
- Original Format: Individual profiles converted to a table
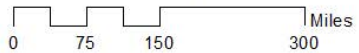- Source: Customs and Border Protection
  - https://www.cbp.gov/border-security/along-us-borders/border-patrol-sectors#
  - https://www.cbp.gov/careers/frontline-careers/bpa/duty-locations



United States Border Patrol Duty Stations by Region

Legend
Border Patrol Stations by Region
Border Patrol Regions
- Coastal Border Region
- Northern Border Region
- Southwest Border Region

Source: Customs and Border Protection, United States Department of Homeland Security

Southwest Region Border Patrol Duty Stations by Sector

Legend
Southwest Border Patrol Stations
Border Patrol Sectors
- Big Bend Sector
- Del Rio Sector
- El Centro Sector
- El Paso Sector
- Laredo Sector
- Rio Grande Valley Sector
- San Diego Sector
- Tucson Sector
- Yuma Sector

Source: Customs and Border Protection, United States Department of Homeland Security

**Border Patrol Agent Staffing by Sector**
- Description: Count of Border Patrol agents stationed within each Border Patrol sector.
- Use: Gives trends of agent counts over time, including whether or not sectors are losing or gaining agents.
- Timeframe: 2011-2017
- Original Format: Table
- Source: Customs and Border Protection
  - https://www.cbp.gov/newsroom/media-resources/stats?title=Border%20Patrol

## Border Patrol Workload Data
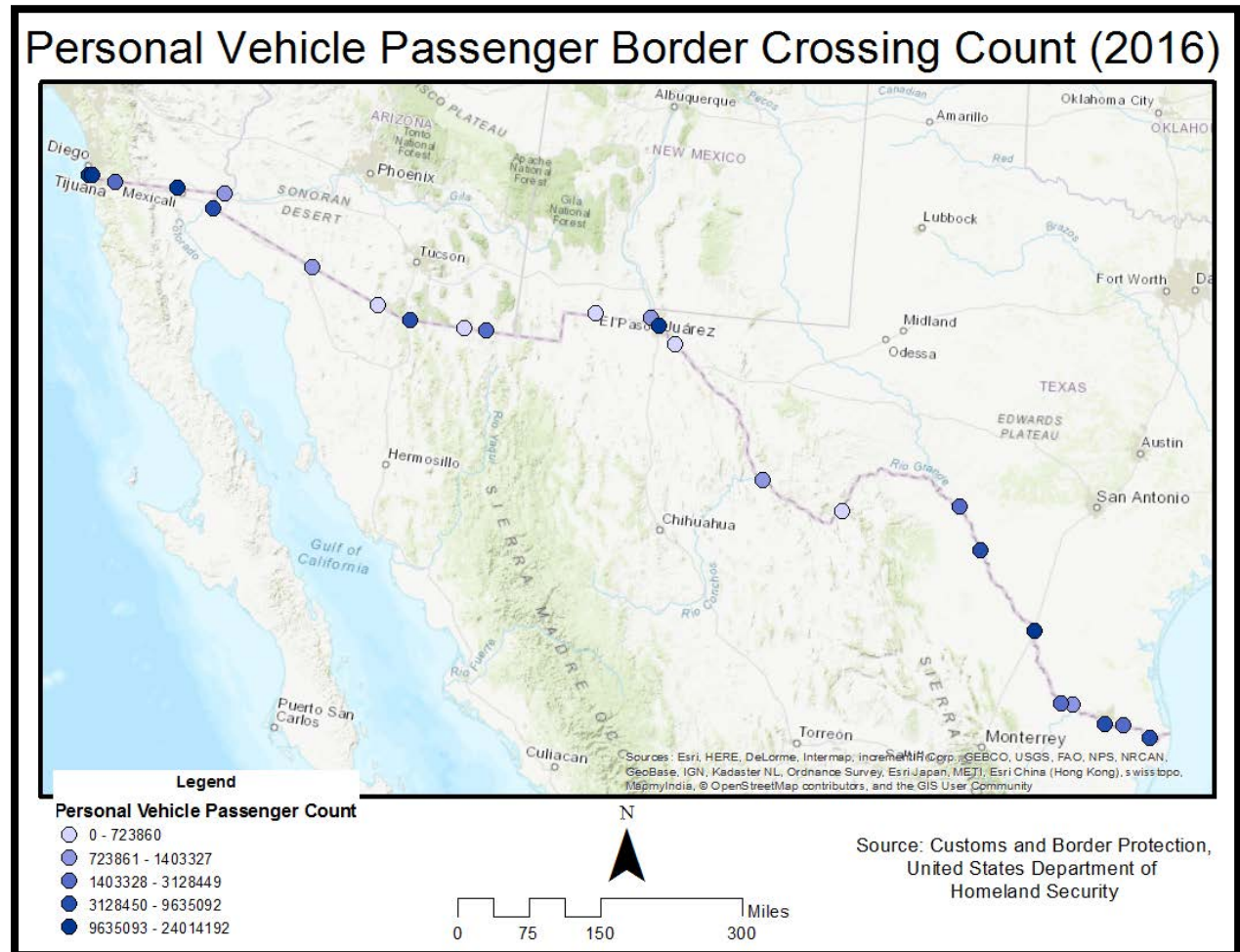
**Border Patrol Apprehensions by Sector**

- Description: Count of apprehensions by Border Patrol sector.
- Use: Provides rough workload of agents within each Border Patrol sector.
- Timeframe: 2011-2017
- Original Format: Table
- Source: Customs and Border Protection
  - https://www.cbp.gov/newsroom/media-resources/stats?title=Border%20Patrol



Southwest Border Patrol Sector Apprehensions (2016)

**Legend**
**Border Patrol Sectors**
BPA_Loc_31
- 6366 - 14170
- 14171 - 23078
- 23079 - 31891
- 31892 - 64891
- 64892 - 186830

Source: Customs and Border Protection, United States Department of Homeland Security

**Border Crossing Data (Crossings from Mexico into the United States)**
- Description: Count of people and vehicle crossings by specific border crossing location.
- Use: Provides a measure of workload for within each Border Patrol sector. This border crossing data can be spatially joined to each Border Patrol sector via the nearest Border Patrol station.
- Original Format: Table
- Source: Bureau of Transit Statistics
  - https://www.bts.gov/content/border-crossingentry-data



Personal Vehicle Passenger Border Crossing Count (2016)

Legend
Personal Vehicle Passenger Count
- 0 - 723860
- 723861 - 1403327
- 1403328 - 3128449
- 3128450 - 9635092
- 9635093 - 24014192

Source: Customs and Border Protection, United States Department of Homeland Security
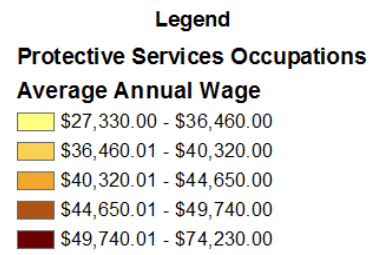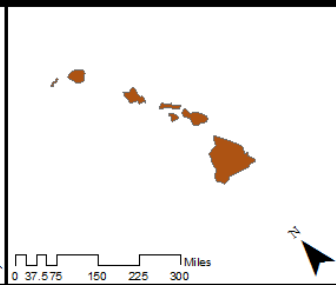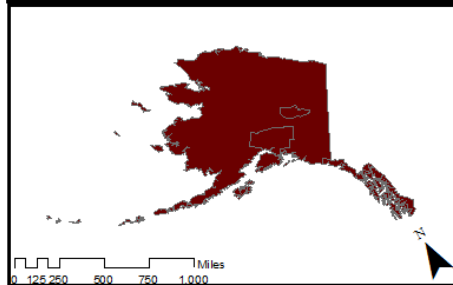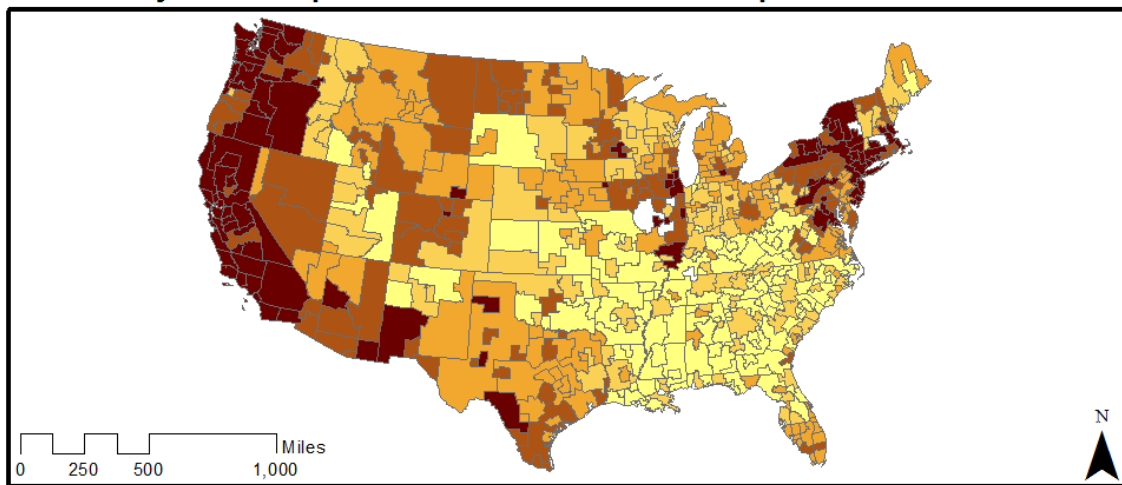
## Employment Data

**Protective Services Occupational Information**

- Description: Provides population size and average wages for protective services workers in metropolitan and nonmetropolitan areas throughout the United States. Protective services workers include law enforcement, game wardens, emergency services, and other related occupations.
- Use: Employee count is used to calculate percent of total population that works in protective services occupations. Higher proportions of protective services employees provide a larger experienced population within each labor pool. Also, labor pools with lower annual protective services wages may provide more experienced employees willing to migrate for work.
- Timeframe: 2016 (latest)
- Original Format: Table
- Source: Bureau of Labor Statistics
    - https://data.bls.gov/oes/#/occGeo/One%20occupation%20for%20multiple%20geographical%20areas



2016 Protective Services Occupation Employee Count by Metropolitan and Nonmetropolitan Area

**Legend**
**Protective Services Occupations**
**Employee Count**
- 5841 - 222790
- 3131 - 5840
- 1761 - 3130
- 1061 - 1760
- 160 - 1060

Projection: USA Contiguous Albers Equal Area Conic USGS

Source: United States Bureau of Labor Statistics
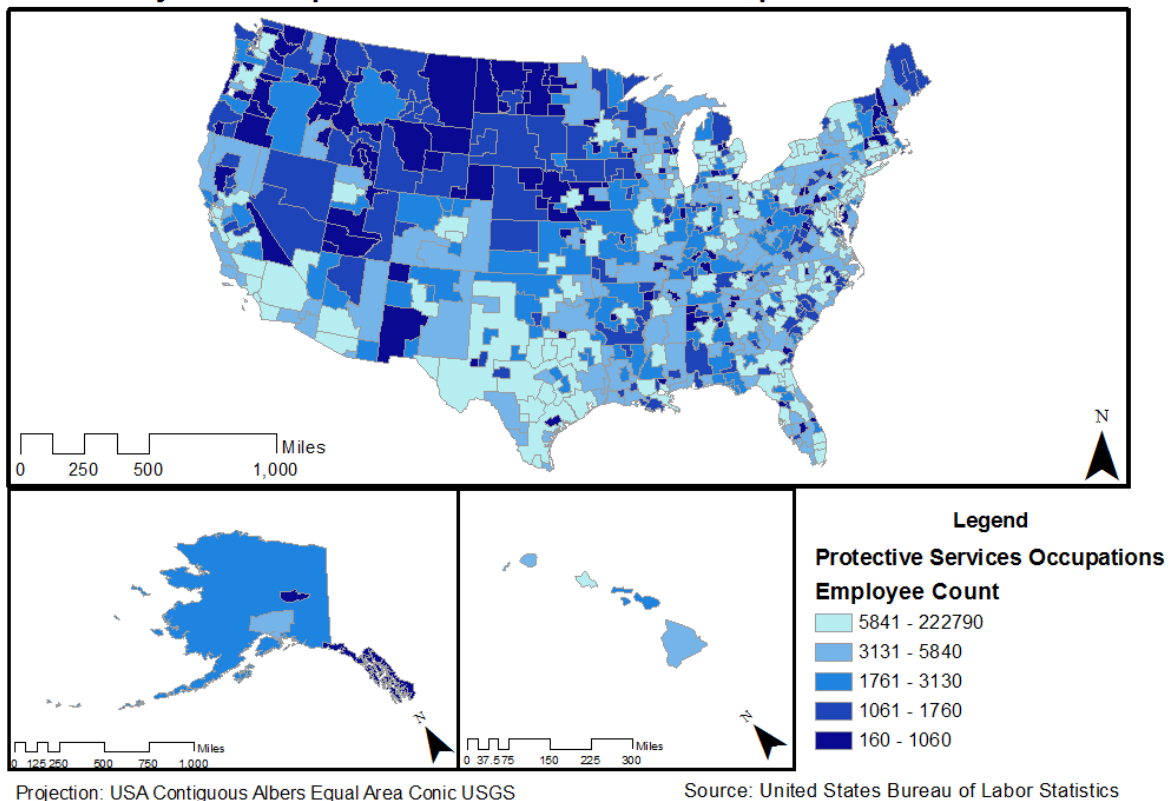
# 2016 Protective Services Occupation Average Annual Wage by Metropolitan and Nonmetropolitan Area



**Legend**
**Protective Services Occupations**
**Average Annual Wage**

- $27,330.00 - $36,460.00
- $36,460.01 - $40,320.00
- $40,320.01 - $44,650.00
- $44,650.01 - $49,740.00
- $49,740.01 - $74,230.00

Projection: USA Contiguous Albers Equal Area Conic USGS

Source: United States Bureau of Labor Statistics
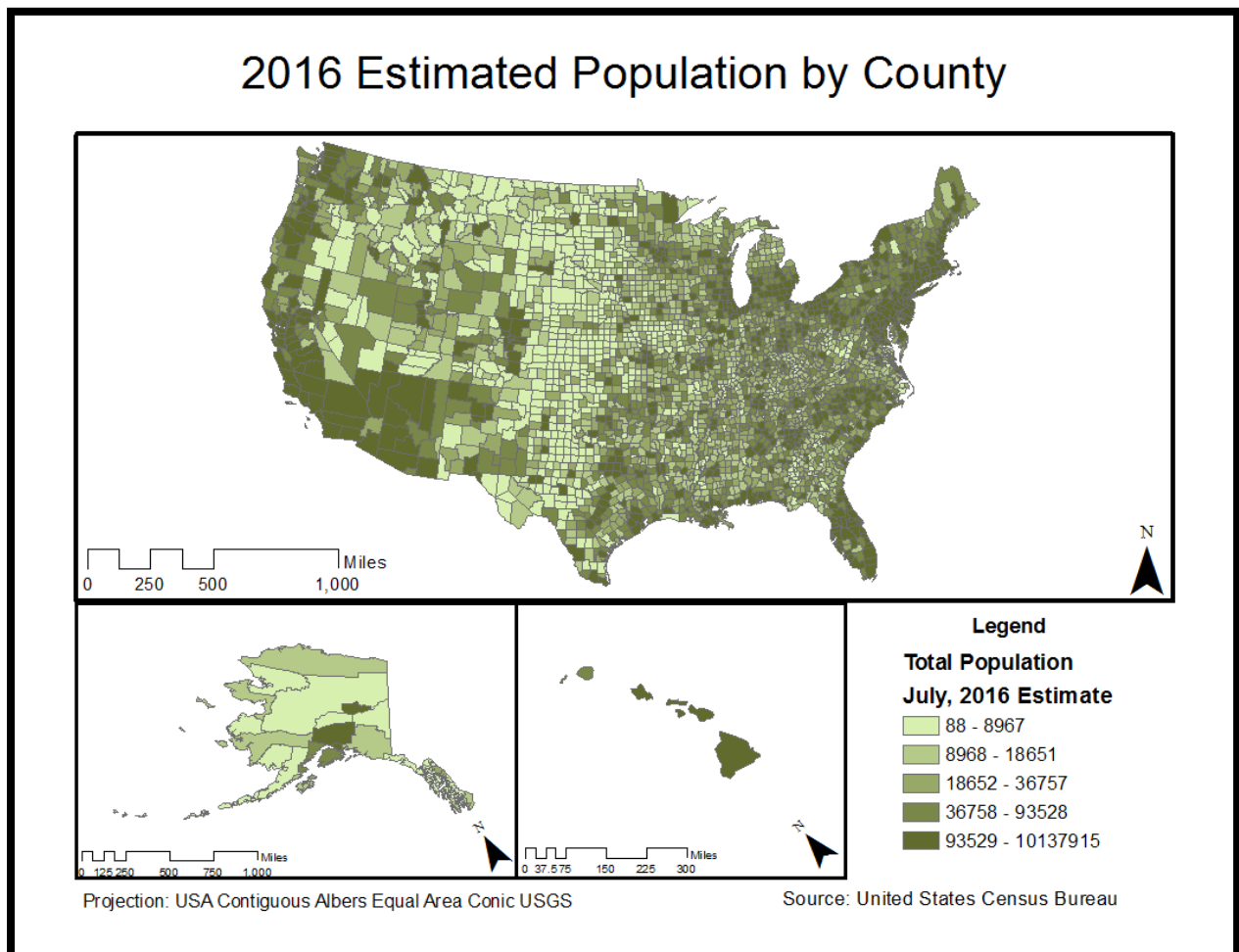
**United States Employment Data**

- Description: Size of labor force, count of employed, count of unemployed, and unemployment rate by county.
- Use: This dataset gives labor force size, as well as unemployment rates as factor for analysis. Higher rates of unemployment potentially make people more willing to migrate for work.
- Timeframe: 2016
- Original Format: Table
- Source: Bureau of Labor Statistics
    - https://www.bls.gov/lau/tables.htm
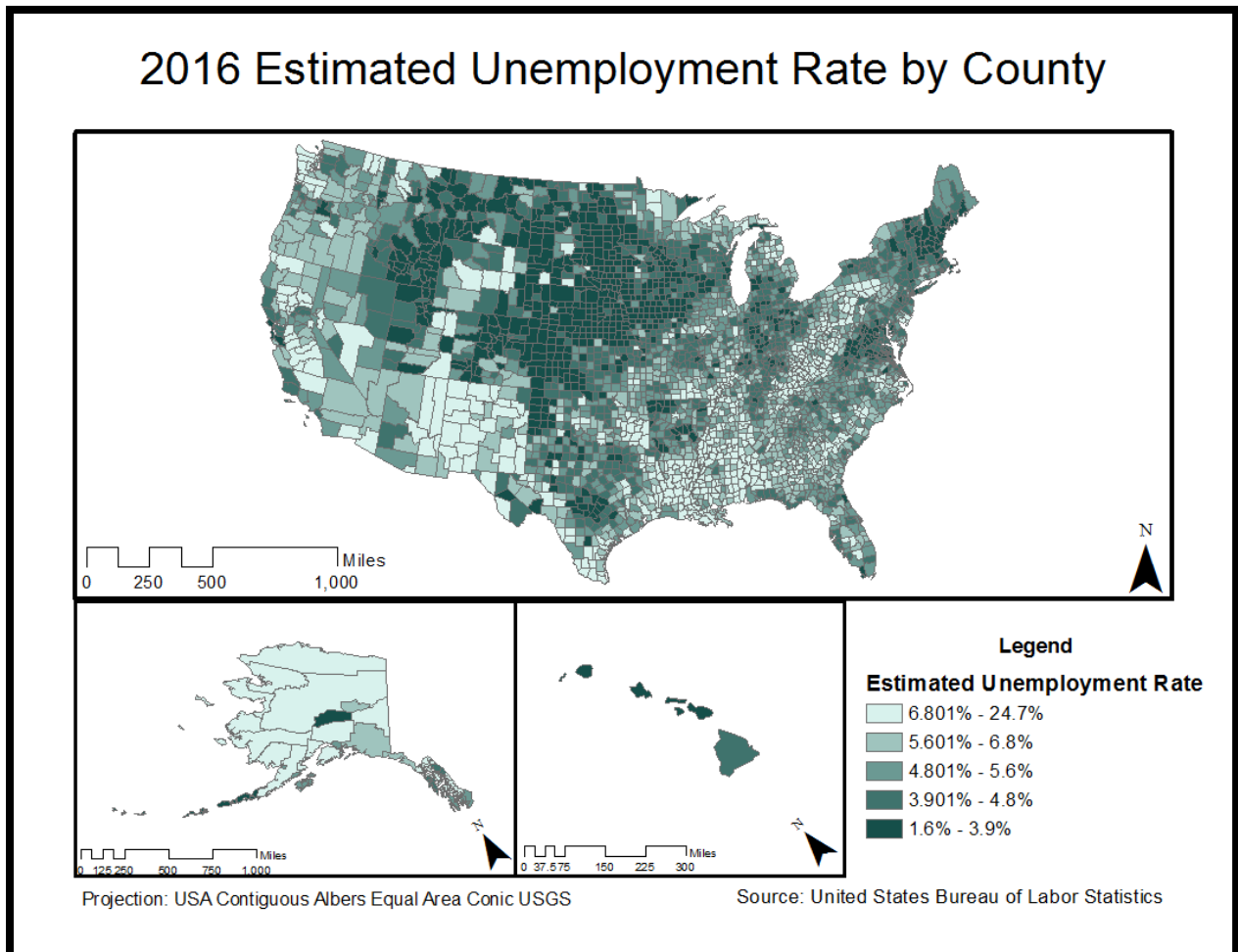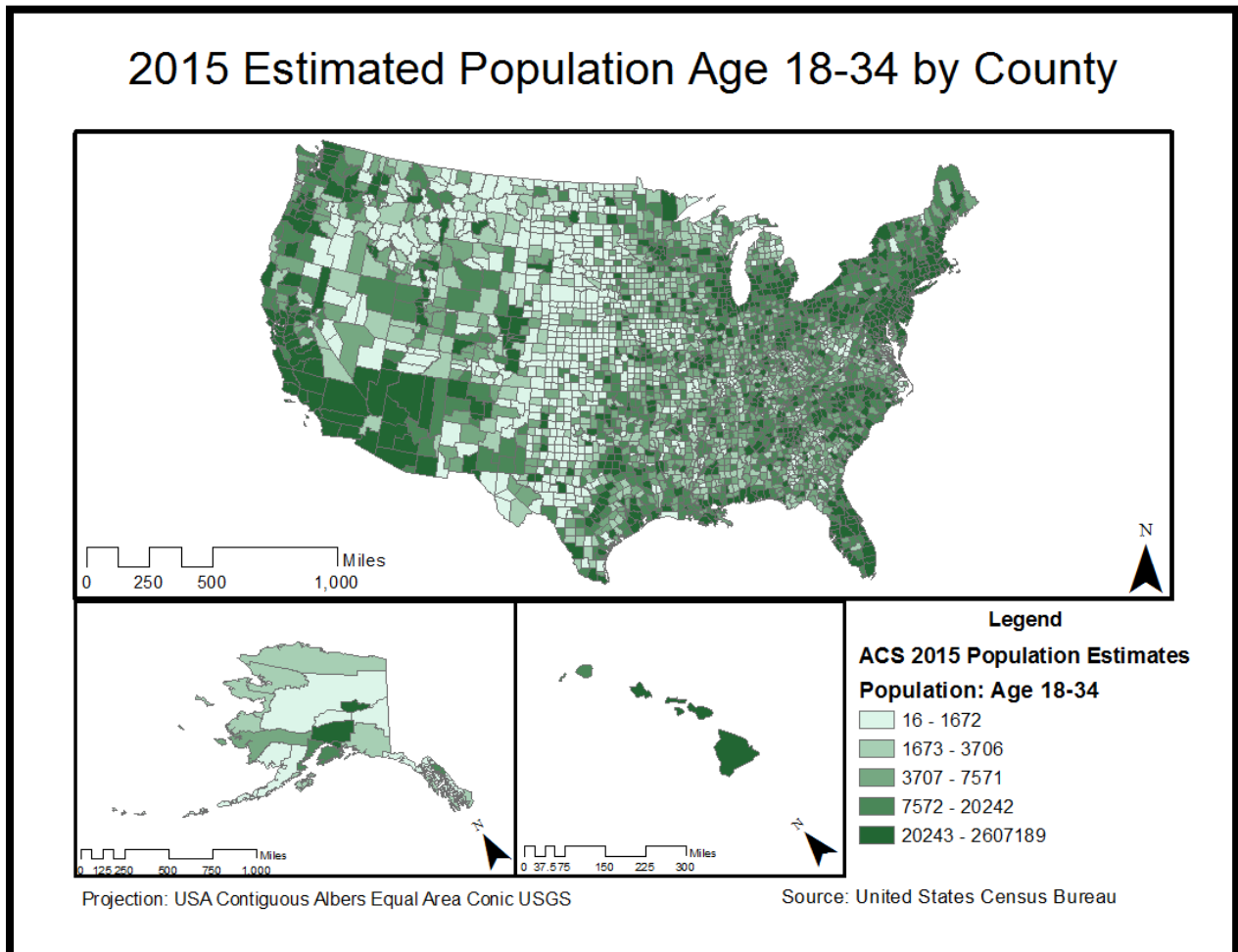
## Population Demographics
**United States Population Estimates**
- Description: Estimated population for each county within the United States.
- Use: Areas of greater population provide larger labor pools from which to recruit. Likewise, total population provides a divisor in calculating proportions of population for other demographic factors. For example, the percent of a county's total population that is between the ages of 18 and 34 can be calculated.
- Timeframe: 2016
- Original Format: Table
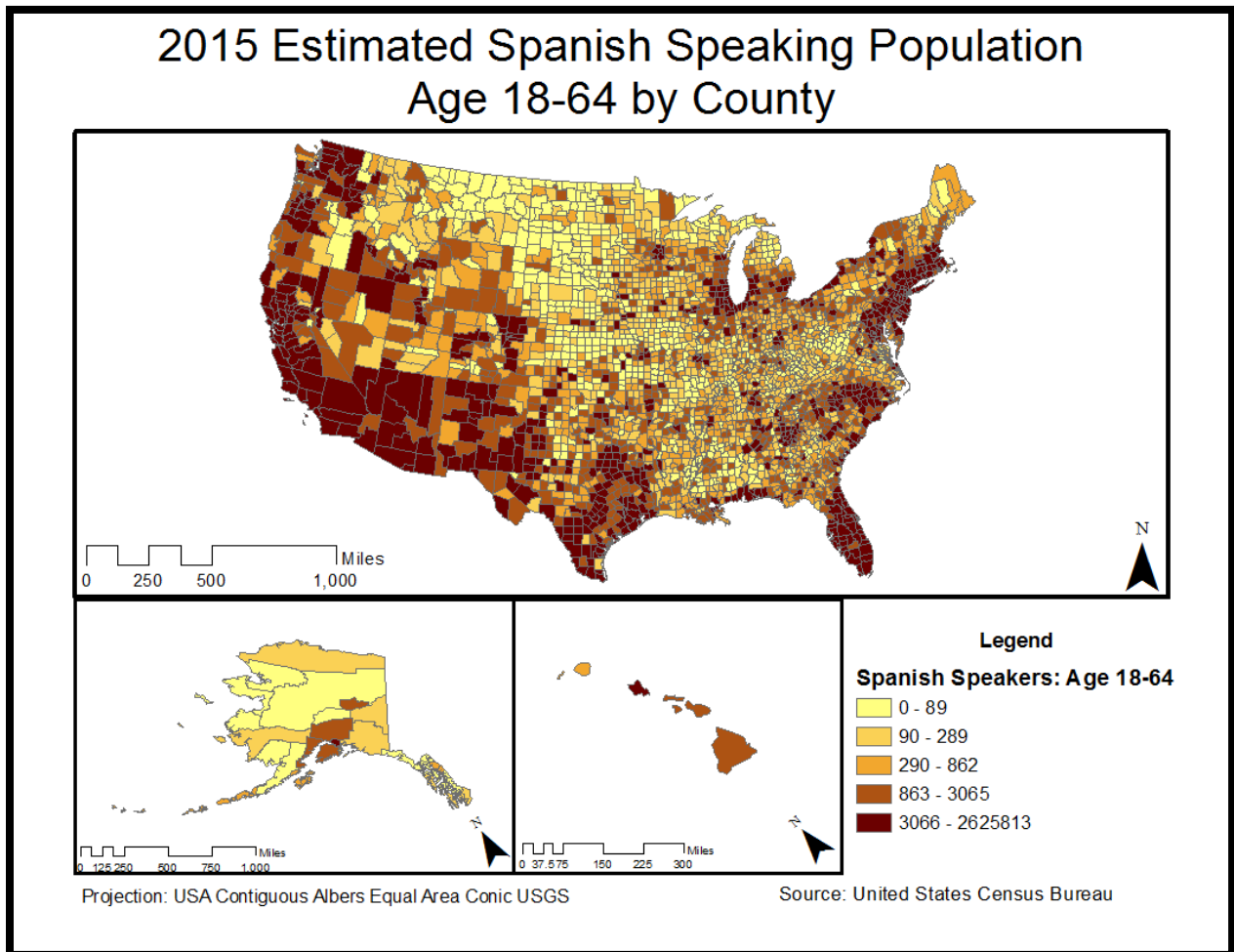- Source: United States Census Bureau
    - https://factfinder.census.gov/faces/nav/jsf/pages/index.xhtml

**United States Population Age Estimates**
- Description: Estimated population, broken down by age groups, for counties within the United States.
- Use: The United States Border Patrol requires agents to start employment by the age of 37. Having a large proportion of the population within the ages of 18 and 34 years provides a potentially larger labor pool from which to recruit.
- Timeframe: 2015
- Original Format: Table
- Source: United States Census Bureau
  - https://factfinder.census.gov/faces/tableservices/jsf/pages/productview.xhtml?pid=ACS_16_1YR_S2101&prodType=table



2015 Estimated Population Age 18-34 by County

**Legend**
**ACS 2015 Population Estimates**
**Population: Age 18-34**
- 16 - 1672
- 1673 - 3706
- 3707 - 7571
- 7572 - 20242
- 20243 - 2607189

Projection: USA Contiguous Albers Equal Area Conic USGS

Source: United States Census Bureau
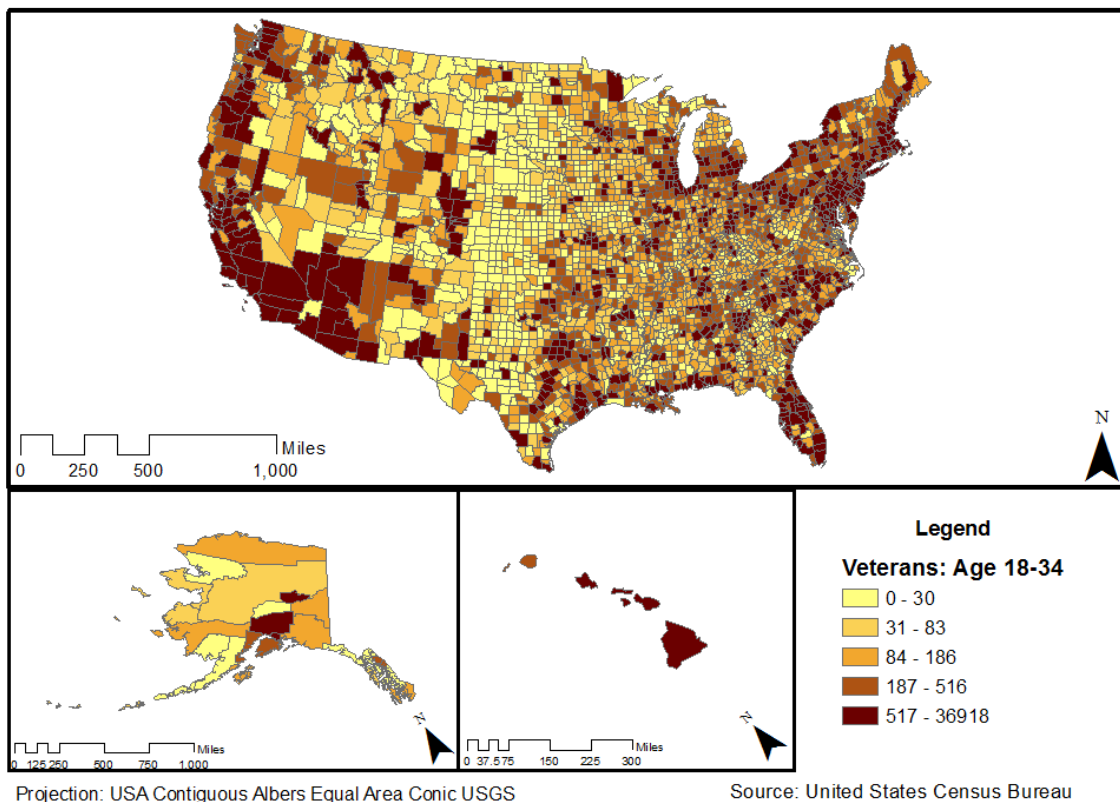
**United States Spanish Speaking Population Estimates**
- Description: Estimated population of those who speak Spanish at home by United Statescounty.
- Use: The United States Border Patrol prefers recruits to know or have the ability to learn Spanish. A higher proportion of Spanish Speakers may provide a preferable labor pool from which to recruit agents.
- Timeframe: 2015
- Original Format: Table
- Source: United States Census Bureau
  - https://factfinder.census.gov/faces/nav/jsf/pages/searchresults.xhtml?refresh=t



2015 Estimated Spanish Speaking Population Age 18-64 by County

Legend
Spanish Speakers: Age 18-64
- 0 - 89
- 90 - 289
- 290 - 862
- 863 - 3065
- 3066 - 2625813

Projection: USA Contiguous Albers Equal Area Conic USGS

Source: United States Census Bureau
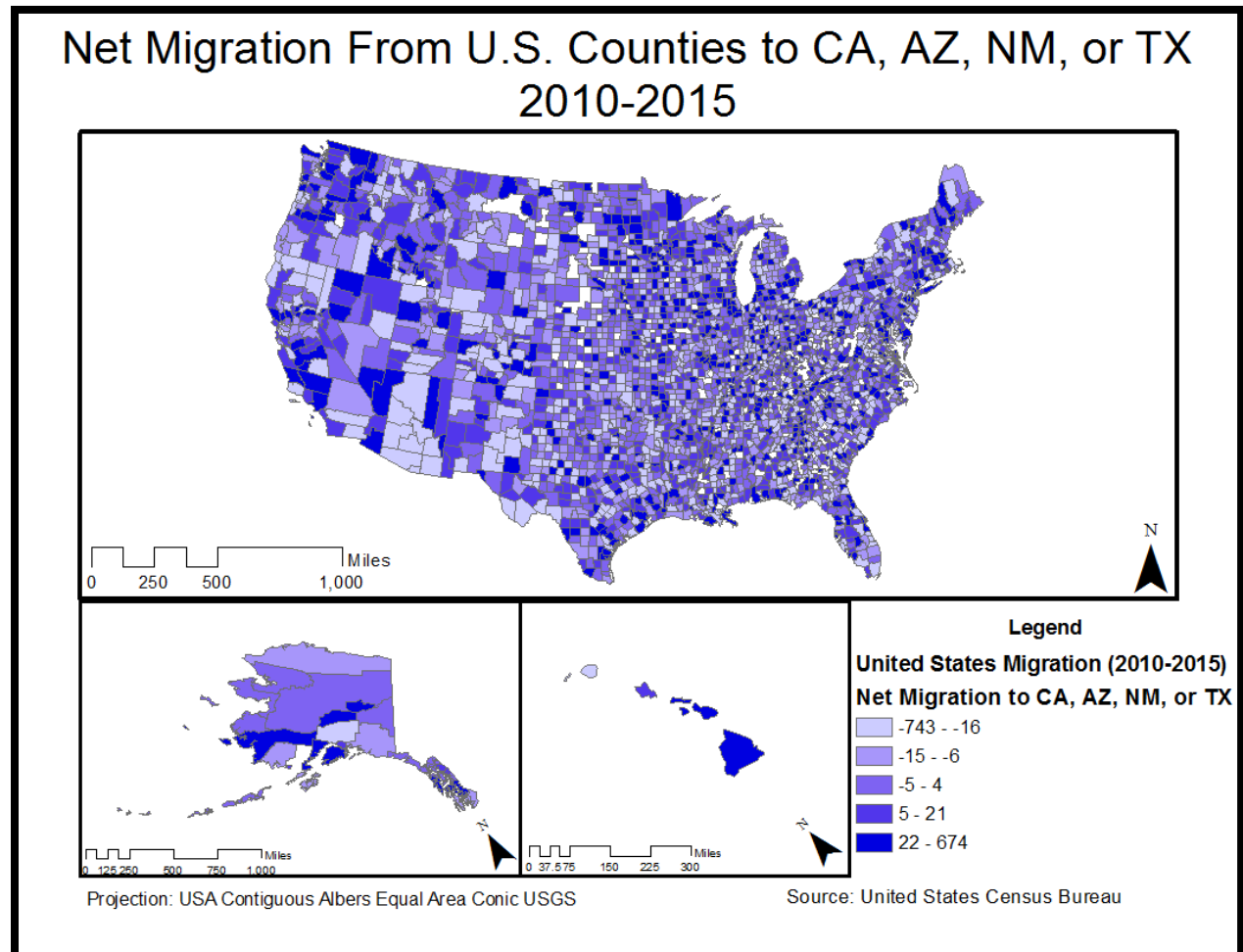
**United States Veteran Population Estimates**
- Description: Estimated population of military veterans by county within the United States.
- Use: The United States Border Patrol attempts to hire military veterans for their experience. Higher proportions of veterans may provide a preferable labor pool from which to recruit agents.
- Timeframe: 2015
- Original Format: Table
- Source: United States Census Bureau
  - https://factfinder.census.gov/faces/tableservices/jsf/pages/productview.xhtml?pid=ACS_16_1YR_S2101&prodType=table



2015 Estimated Veteran Population Age 18-34 by County

Legend
Veterans: Age 18-34
- 0 - 30
- 31 - 83
- 84 - 186
- 187 - 516
- 517 - 36918

Projection: USA Contiguous Albers Equal Area Conic USGS

Source: United States Census Bureau

**County-Based Migration Internal to United States**

- Description: County to county migration rates within the United States.
- Use: Counties with higher amounts of net migration to areas in the southwest United States may provide more willing recruits to migrate to said area. Positive net migration to within 100 miles of the Southwest border may provide a higher likelihood of recruit migration due to potential social ties or other unseen influences.
- Timeframe: 2010-2015
- Original Format: Table
- Source: United States Census Bureau
  - https://www.census.gov/topics/population/migration/data/tables.All.html



Net Migration From U.S. Counties to CA, AZ, NM, or TX 2010-2015

Legend
United States Migration (2010-2015)
Net Migration to CA, AZ, NM, or TX
- -743 - -16
- -15 - -6
- -5 - 4
- 5 - 21
- 22 - 674

Projection: USA Contiguous Albers Equal Area Conic USGS

Source: United States Census Bureau

## Location Data

**United States County Boundaries**

- Description: Polygon Shapefile covering the conterminous United States.
- Use: This shapefile is joined to county-based data tables using FIPS codes, allowing them to be displayed on a map, dissolved into metropolitan and nonmetropolitan areas, and spatially joined to applicable Border Patrol sector station point data.
- Timeframe: 2016
- Original Format: Polygon shapefile
- Source: Environmental Systems Research Institute (ESRI)
  - https://www.arcgis.com/home/item.html?id=a00d6b6149b34ed3b833e10fb72ef47b
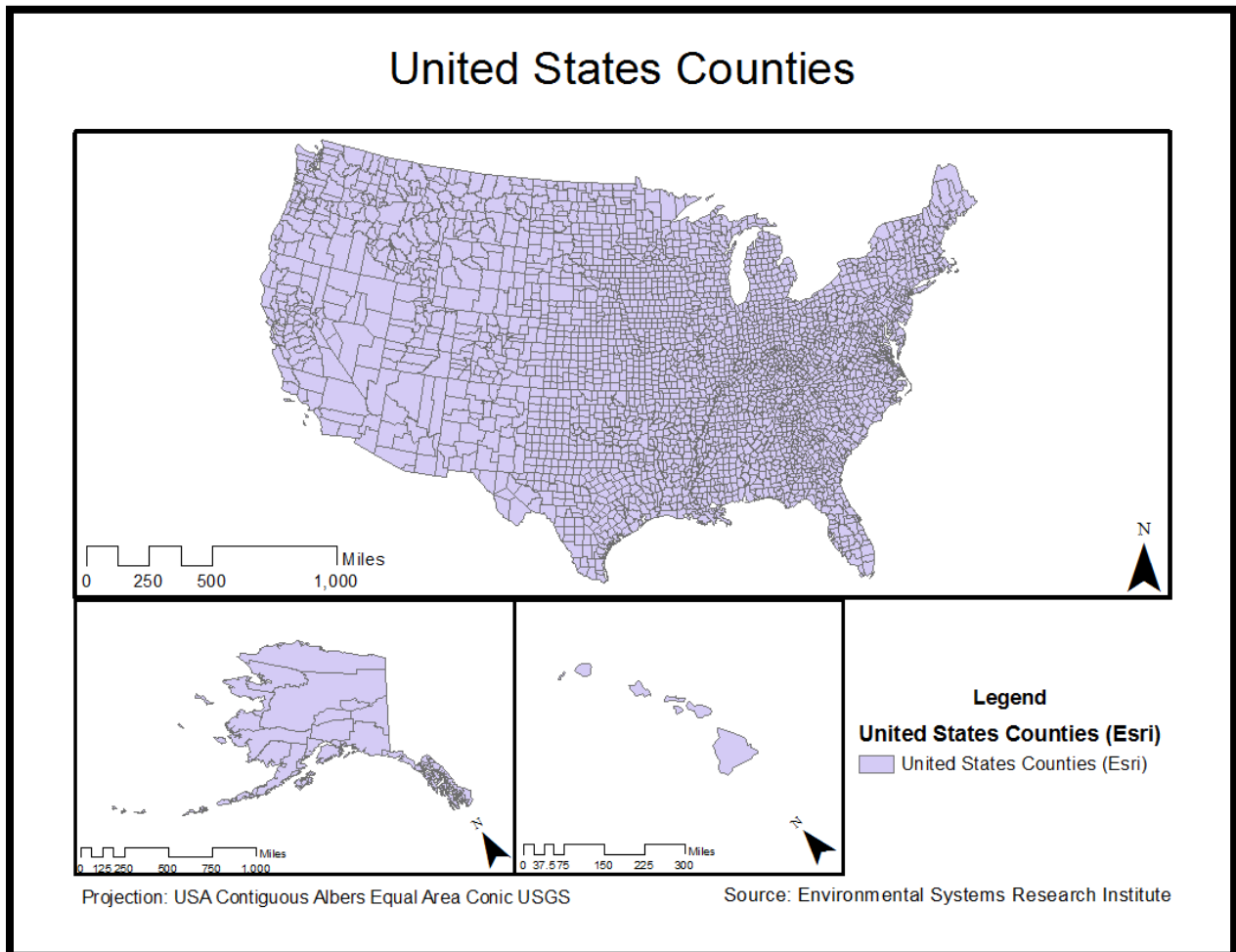
**United States Metropolitan and Nonmetropolitan Area Boundaries**

- Description: These areas are aggregates of one or more counties. They are economically and socially, rather than purely administratively, focused areas.
- Use: These areas identify population hubs and labor markets, rather than purely political or administrative boundaries. This can provide a more holistic view of an urban or rural economic area than political or administrative boundaries might. This table can be used as a key to compile county data into metropolitan and nonmetropolitan areas.
- Timeframe: 2016
- Original Format: Table
- Source: U.S. Bureau of Labor Statistics and U.S. Census Bureau
    - https://www.bls.gov/oes/2016/may/msa_def.htm



United States Metropolitan and Nonmetropolitan Areas Compared to Counties
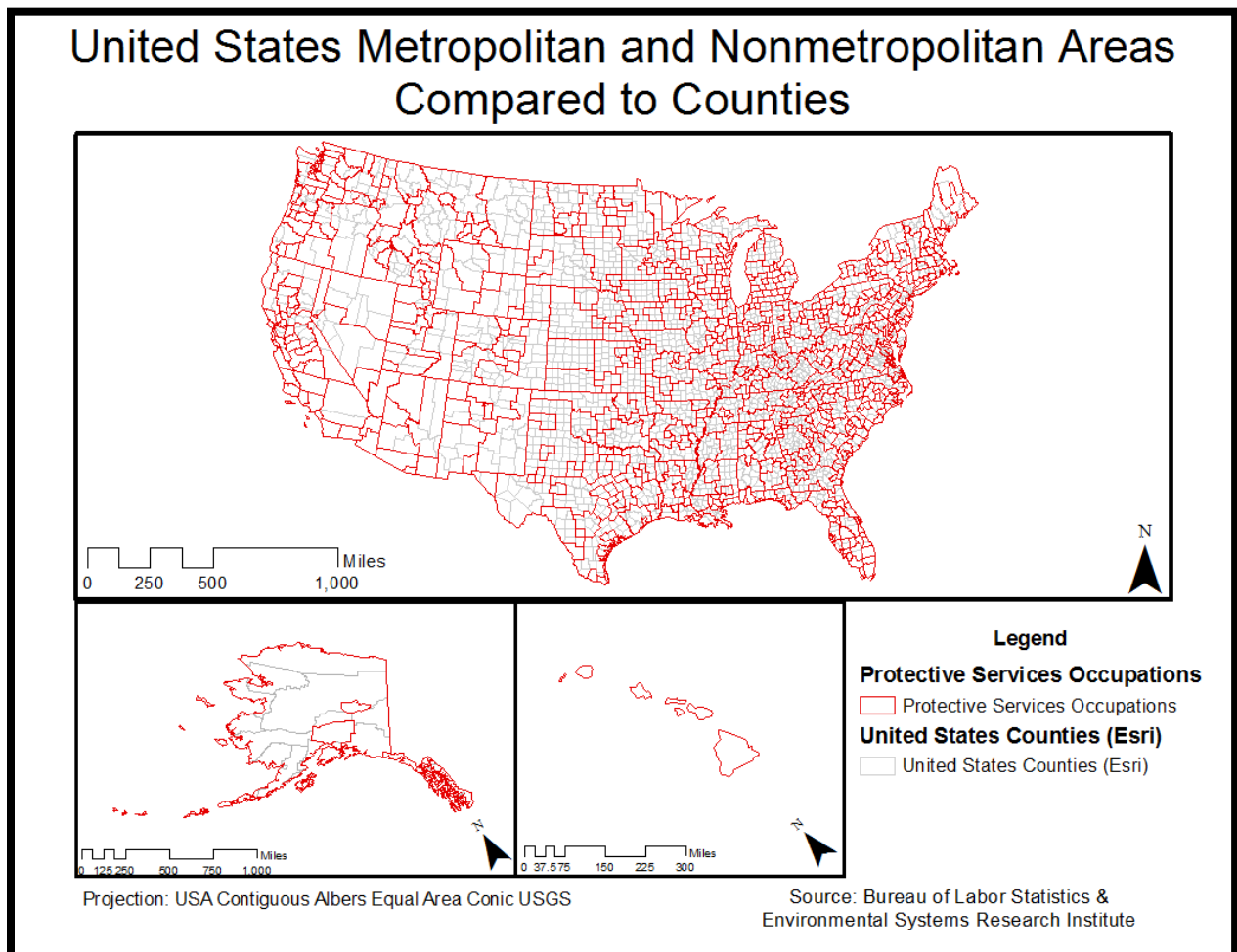
**Border Line between the United States and Mexico**

- Description: Line shapefile for the border between the United States and Mexico.
- Use: Used to calculate the distance of Border Patrol stations and labor pools from the border between the United States and Mexico.
- Timeframe: 2011 (latest available)
- Original Format: Line shapefile
- Source: United States Geological Survey
  - https://txpub.usgs.gov/BEHI/Data_download/Boundaries_Layers/

**United States City Locations**

- Description: Locations of cities throughout the United States.
- Use: Allows table-based data of city locations to be plotted on maps. This can be used to specify locations of city-based Border Patrol station or border crossing location, and thus derive distance measures to them.
- Timeframe: 2016
- Original Format: Point shapefile
- Source: United States Department of Agriculture
  - https://catalog.data.gov/dataset/usgs-small-scale-dataset-cities-and-towns-of-the-united-states-201403-shapefile