Population Projection Methodology

For Heartland 2060 Futures Modeling

Prepared for/by the Central Florida Regional Planning Council

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For the Florida Heartland

Consisting of DeSoto, Glades, Hardee, Hendry, Highlands, Okeechobee and Polk Counties

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Purpose

Population projections were developed for the Florida Heartland, as part of the goal of creating a regional vision for the rural heart of Florida. The Florida Heartland consists of seven counties, all of which are landlocked. These counties are DeSoto, Glades, Hardee, Hendry, Highland, Okeechobee, and Polk.

Map 1: The Counties of the Florida Heartland

This population projection was created to facilitate the modeling of alternative future scenarios to examine potential future spatial development patterns. Ultimately these alternative future scenarios, or Futures, will be compared and contrasted and the information they provide will be available for local leaders and decision-makers. The population projection outlined in this report will be standardized and used across all Futures, to ensure comparability. The population projections cover the seven counties and extend from current time (2010) to the year 2060. This time period corresponds to the time period of the 50-year regional vision that is being developed as part of the Heartland 2060 project.

Aside from being used to determine how many people to allocate to different counties during the spatial Futures modeling, this population projection is also used as a component of the employment projection development. The employment projections are also used in the Futures modeling, to allocate jobs spatially to employment centers, by industry. The employment projections were derived from an economic forecasting software (REMI PI+), by replacing the stock population forecast with the population projection exhibited in this report.

Background

As many credible population projections as were available were analyzed and vetted for their particular applicability to this project, and ultimately a hybrid of two projections generated by the University of Florida (UF) Bureau of Economic and Business Research (BEBR), was selected. However, before reaching that selection there were several considerations.

One such consideration was that a standardized method needed to be developed that could be implemented across all counties in the state. This was an important, although peripheral, criteria, because the population projections are also used in the creation of credible employment projections through the REMI PI+ economic forecasting software. The PI+ software requires that population projections be updated for all counties in Florida, or else the economic geography component of the model will differentially favor some counties over others, skewed by the change in those counties' selected population projections. Therefore a methodology was necessary that satisfied the criteria put forth by the Futures modeling process, as well as satisfied the criteria for the PI+ software.

An Inventory of Population Projection Methodologies

Many different population projection methodologies were analyzed and vetted for their applicability to the Futures modeling of the Heartland 2060 project. The sources of different projections were

- Traffic Analysis Zone (TAZ) – this is a dataset generated by the Florida Department of Transportation, sometimes in collaboration with local governments.
- Regional Economic Models, Inc. (REMI) PI+ – this is the economic forecasting software that Florida's Regional Planning Councils use. It has built-in population projections that are built, at least initially, from U.S. Census projections.
- Comprehensive Plan-based – Counties and incorporated cities and towns state the population projections that they use for comprehensive planning purposes in their Comprehensive Plans, which are legally-binding documents.
- Bureau of Economic and Business Research (BEBR) – this suite of population projections (High, Medium, and Low) are generated annually for every county in Florida, and the Medium projection is legislatively recognized as a default population projections for purposes of comprehensive planning.

Problems with Stock Methodologies

Aside from methodology specific issues that prevented each standalone method from being used as the population projection for the Heartland 2060 Futures modeling, a more basic

problem existed. No source data – TAZ, Census, or BEBR – had projections that extended out to the timeframe addressed in the Futures modeling, which was approximately 50 years into the future. The REMI PI+ model does have projections that extend out to 2060, but the utilize their own methodology after the Census data (which is their base data) reaches its limit, which is still 20+ years shy of the 2060 goal. In addition, each of the projections had their own issues that limited their applicability across the long term time frame of the project.

It was decided to build from accepted methodologies generated by experts, and use numerically-based data extrapolation methods to extend the projections to the year 2060. The intent was not to replicate the methods of each projection methodology (most of which are proprietary anyway) and extrapolate it to 2060, but to reasonably approximate the results of each projection methodology. To that end, the methodology described herein is primarily based upon data filling and data extrapolation. In order to successfully use the population projections for generating employment projections, it was necessary to generate a data point for each county for each year of the time period of interest (2010-2060). However, the end results of the Futures modeling will only be displayed for years 2040 and 2060, so any minute variation or discrepancies that might occur from data filling and extrapolation would not have any significant effect on the final product, when used in the proper context of the goals of this project.

The TAZ data does not exist in a format that is standardized by year that the projections are provided. For instance, some counties had projections for 2007 and 2012, while other counties had projections for 2010 and 2030. These projections are not always developed with input from local jurisdictions. This factor, along with the limited data points, made the TAZ data a poor starting point for creating annual population projections. It is difficult to reliably extrapolate population projections to 2060 from only two data points. In the end, the lack of a substantial base of data points for filling and extrapolation was a major contributor to why the TAZ-based method was not pursued further.

The REMI PI+ (version 1.4) projections are built, initially, from the projections published by the U.S. Census. This is a cohort-based population projection methodology that uses age-groups and birth, death, and migration rates in its calculations. The Census does not project forward 50 years, and so at the point where the Census projections stop, the REMI software takes over and continues to project the cohort-method forward. The REMI projections were quite low when compared to previous decades of growth, as recorded by the Census (1990, 2000, and 2010). This predisposed a leaning away from using the REMI stock population projections. Additionally, since most Florida municipalities use the BEBR projections, as legislatively allowed, it seemed inappropriate to use a Census-derived projection, particularly since Florida as a whole has decidedly different historic growth patterns than the nation on average.

A Comprehensive Plan-based methodology was also considered. Within each Comprehensive Plan, each municipality has recorded certain population projections that they use for planning purposes. Often these projections are informed by local knowledge, and sometimes influenced by local aspirations as well. These population projections were taken from the text of each jurisdiction, extrapolated to 2060 based on linear rates of change within the projections themselves, and summed to the county, and finally Heartland, geographic regions. These projections were not used in the final modeling process because they were often, but not always, drastically different from other accepted methodologies, including being vastly different from previously recorded Census data (1990, 2000, and 2010). While being different does not necessarily constitute being incorrect or inaccurate, there was no distinguishable pattern for the discrepancies, and the differences were sometimes so vast as to be infeasible in practice.

The BEBR methodology, as mentioned previously, is legally accepted for purposes of planning in the state of Florida. Particularly, the BEBR Medium is the highest acceptable projection unless a jurisdiction has reasoning and presents data to support using a higher projection, such as BEBR High. Many jurisdictions often do argue successfully for using higher projections. Projections from BEBR's 2010 and 2011 reports were used to compare with other methods and develop the projections that were finally accepted. Specifically, the 2010 Medium and 2011 Medium and High were used. At first the BEBR High was selected for use, but was later determined to be too high, especially when compared with past growth rates from Census measurements (1990, 2000, and 2010). BEBR 2010 Medium was rejected because the growth rates were similarly determined to be too low. The BEBR 2010 report was produced towards the end of the Great Recession, and any projections for recovery at the time the report was produced were grim. BEBR 2011 Medium was considered as an alternative to BEBR 2011 High, but it was determined to be just barely too low when compared to past Census growth measurements, and when vetted by local knowledge.

Another significant factor affecting the development of population projections for this region is the composition of the seven-county area. Polk County is considered an urban county, and the concentration and distribution of population support this designation. Polk County registered a population of 602,095 in the 2010 Census. The other six counties are considered rural, with population counts ranging from 12,884 to 98,786 in the 2010

Census.

Table 1: U.S. Census Population (2010)	
County/Area	**2010**
DeSoto	34,862
Glades	12,884
Hardee	27,731
Hendry	39,140
Highlands	98,786
Okeechobee	39,996
Polk	602,095
Rural counties only	253,399
Seven-county Region (Heartland)	855,494

Several types of comparisons between the different projection methodologies were made in order to assess relevance, accuracy of extrapolation method, and to provide a basis for vetting with locals knowledgeable of the area. The most useful comparisons involved comparing the final 2060 population projections as extrapolated, and comparing the average annual growth rates (seen in the next section) for different methods. The year 2060 was a useful point of comparison because it reflects the utmost difference that can be found between the different projection methodologies when extrapolated to their logical extension.

As can be seen in Figure 1 and Figure 2, of the different population projection methodologies discussed, four of the five tend to cluster fairly closely. Even though they display the same information, the figures are separated for viewing because the scale of population in the urban county (Polk) dwarfs that in the other counties.

Figure 1: Comparison of Population Projection Methodologies – Rural Counties

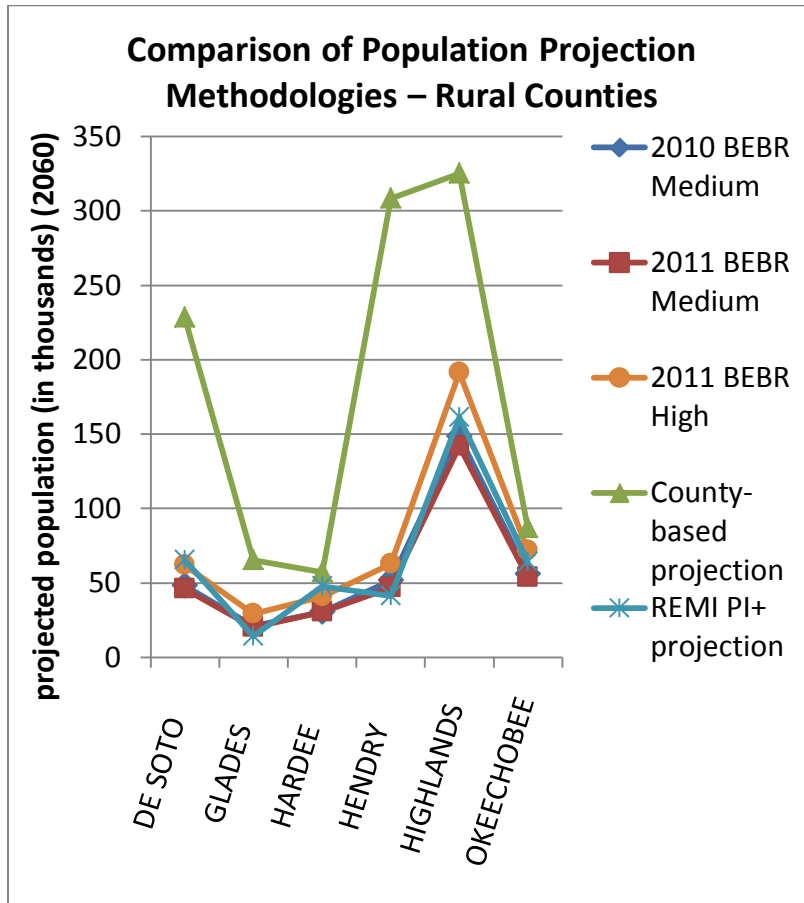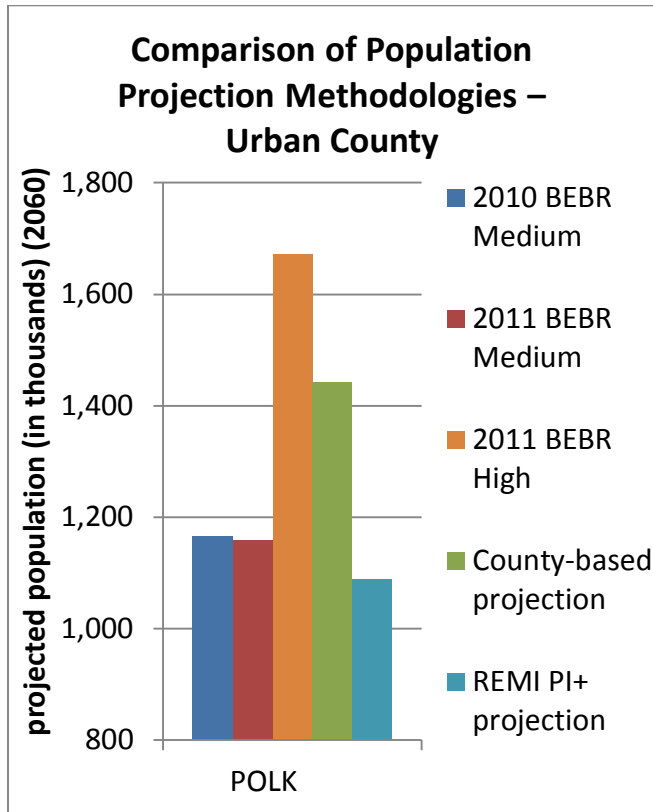Comparison of Population Projection Methodologies – Rural Counties

Figure 2: Comparison of Population Projection Methodologies – Urban County

Methodology

Ultimately, through much comparative analysis and vetting with local knowledge, a workable compromise was created by averaging the 2011 BEBR Medium and High projections. This is referred to as the BEBR Medium-High Average, and it is the chosen and accepted methodology for the purposes of population projection for the Heartland 2060 Futures modeling.
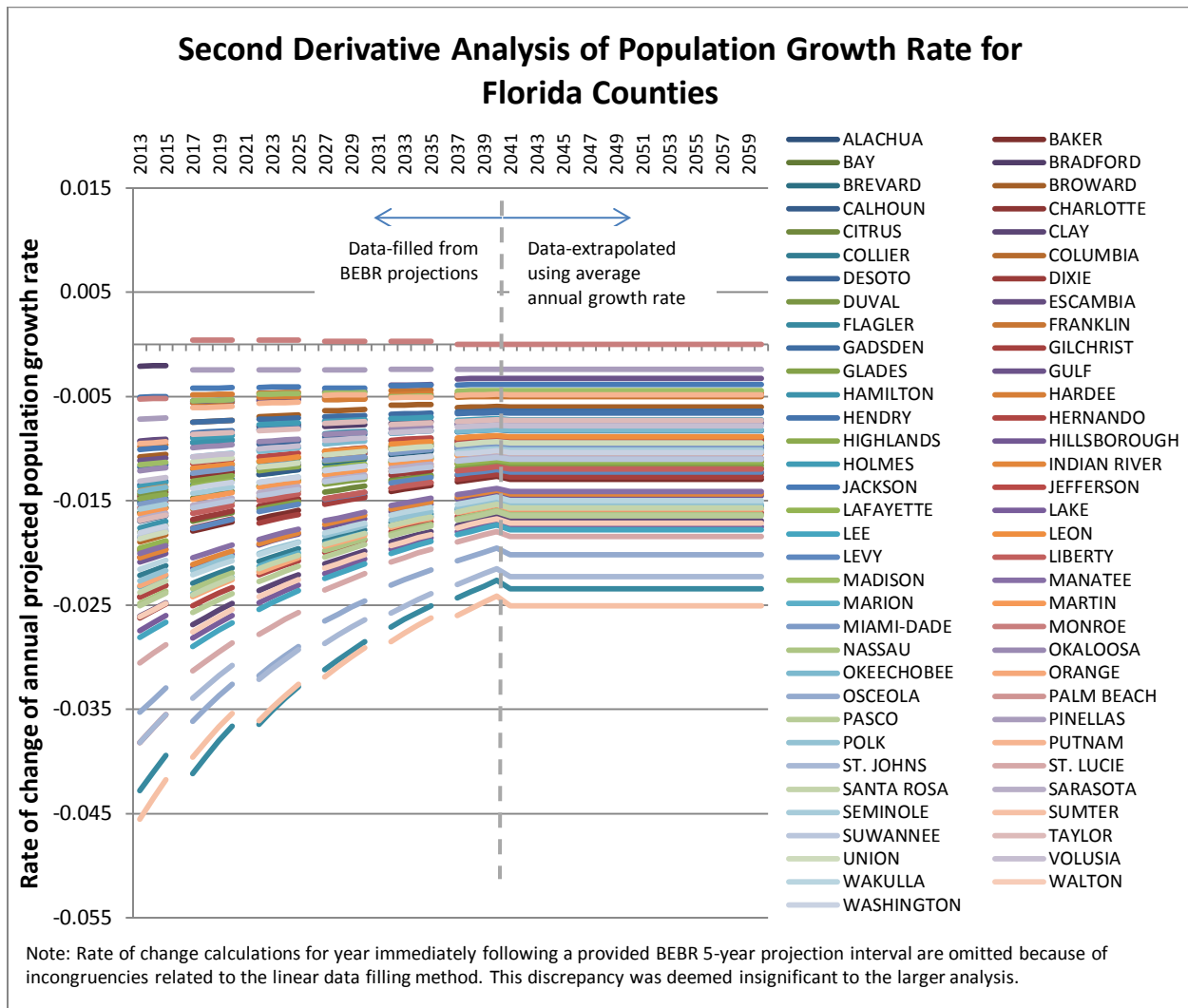
The BEBR 2011 Medium-High Average

U.S. Census estimates were used for years 2010 and 2011. A modified BEBR projection was used for the remainder, up to the year 2060. The BEBR 2011 Medium-High Average was generated quite simply by averaging the projections for each county for each year, using the 2011 BEBR Medium and High projections. However, the BEBR report does not project population past 2040, and the Futures modeling requires projections to the year 2060. To continue to extrapolate the population projections without replicating the explicit methodology, an analysis of the second derivative of the existing 2011-2040 BEBR projections was conducted.

Remember that the final points of comparison for the different Futures will be maps from the years 2040 and 2060. This is useful in that the BEBR projections are provided up until the year 2040, and the Florida Department of Transportation also conducts projects planning to the year 2040. Also, since the maps of interest would be created for these discrete years, the data filling for the intervening years is not as important that it be overly precise. To that end, the data filling for years between the five-year intervals provided by BEBR in their stock projections were linearly interpolated.

For years 2041-2060, population projections were extrapolated from the BEBR data using an analysis of the second derivative of the projected population growth. Basically, the change in annual population growth as projected by BEBR for years 2037-2040 was approximated, averaged, and replicated for years 2041-2060. Since the measurement "annual population growth" is itself a first derivative measure of the rate of change of population, this makes the analysis conducted a second derivative analysis, because it was replicating the change in the annual population growth rate. This analysis was conducted in Microsoft Excel for every county in Florida (See Figure 3). Given the time frame of the projection period, this method was determined to be sufficiently accurate within the constraints of the Futures modeling and employment projection methodology.

Figure 3: Second Derivative Analysis of Population Growth Rate for Florida Counties

Note: Rate of change calculations for year immediately following a provided BEBR 5-year projection interval are omitted because of incongruencies related to the linear data filling method. This discrepancy was deemed insignificant to the larger analysis.

The final population projections using the BEBR Medium-High Average are presented in tabular form in Tables 2 and 3, and in graphical form in Figures 4 and 5. The tables display 5-year intervals in population projections, and are separated for ease of display. Although Figures 4 and 5 are displayed separately, it is to reduce distortion in viewing resulting from absolute differences between the counties. The unabridged population projections for the BEBR 2011 Medium-High Average method are recorded in Appendix A. These projections are the same that are used in the Futures modeling.

Table 2: BEBR Medium-High Average Population Projections (2011-2040)							
County	U.S. Census Estimate April 1, 2011	2011 BEBR (Medium-High Average) Population Projections					
		2015	2020	2025	2030	2035	2040
DE SOTO	34,708	36,600	38,350	40,200	42,000	43,800	45,650
GLADES	12,812	13,850	14,950	16,150	17,250	18,400	19,500
HARDEE	27,653	28,750	29,450	30,200	31,000	31,750	32,500
HENDRY	38,908	39,700	41,400	43,100	44,700	46,300	47,850
HIGHLANDS	98,712	104,650	111,600	118,450	125,150	131,500	137,850
OKEECHOBEE	39,870	42,150	44,450	46,750	49,000	51,100	53,250
POLK	604,792	660,950	734,200	809,400	885,050	960,950	1,037,650
Six rural counties	252,663	265,700	280,200	294,850	309,100	322,850	336,600
Total Heartland region	857,455	926,650	1,014,400	1,104,250	1,194,150	1,283,800	1,374,250

Table 3: BEBR Medium-High Average Extrapolated Population Projections (2045-2060)				
County	Extended projection (based on 2011 BEBR Medium-High Average rates)			
	2045	2050	2055	2060
DE SOTO	47,499	49,343	51,179	53,005
GLADES	20,598	21,691	22,776	23,849
HARDEE	33,250	33,999	34,747	35,494
HENDRY	49,399	50,946	52,489	54,026
HIGHLANDS	144,194	150,517	156,807	163,052
OKEECHOBEE	55,398	57,541	59,676	61,798
POLK	1,114,148	1,190,008	1,264,852	1,338,347
Six rural counties	350,338	364,037	377,673	391,224
Total Heartland region	1,464,486	1,554,045	1,642,526	1,729,571

Comparing Methodologies

As previously stated, one important method of contrasting and vetting the different methodologies was by using a comparison average annual growth. This was a simple standardized method for ball-parking the different methodologies. Detailed average annual growth rates for the BEBR Medium-High Average method are displayed in detail in Table 4. The difference between the urban and rural counties is apparent in the differences between their respective projected growth rates. In part, this dichotomy in the region has further suggested a different approach for the Futures modeling, which is discussed further in the methodology for that process. These growth rates are also compared with the other methodologies in Figure 4.

Figure 4 contains past and projected population measurements and presents them for comparison. There are several broad comparisons to be made when the data is viewed in this fashion.

When placed side-by-side, it is apparent that, in general, average annual population growth was higher in the past than is projected for the future, in this region. Averaged over the time period 1990-2010, there was significant growth in the Heartland; more than the Florida average and national average for the same time period. The Census average growth for 1990-2010 is higher than the Census for 2000-2010 also. There was significant population growth, measured as a percentage, in the Heartland during the 1990s. In part this is because many of these counties had small absolute populations and then experienced a relatively large influx of population. Across the region, percentage annual growth has slowed in the past decade, as shown by the Census 2000-2010 data.

Table 4: Projected Growth Rate for BEBR 2011 Medium-High Average	
County	Average Annual Projected Population Growth Rate (2011-2060)
DE SOTO	1.08%
GLADES	1.76%
HARDEE	0.58%
HENDRY	0.79%
HIGHLANDS	1.33%
OKEECHOBEE	1.12%
POLK	2.48%
Six rural counties	1.12%
Total Heartland region	2.08%

Another trend is that in most cases, the population projections are lower than the recorded past growth. In the six rural counties, the BEBR 2011 High projections are even lower than the recorded average annual growth over the past two decades. So, while it is likely that the region will still exhibit population growth, it is projected to be at a slower rate than experienced over the past two decades. The Census growth recorded for the past decade of measurement (2000-2010) consistently falls between the BEBR 2011 Medium and BEBR 2011 High projections.

The urban county – Polk – exhibits substantially different population growth projections than the rural counties. While Polk has had sustained population growth over the past two decades near 2.5%, the rural counties have had growth nearer to that figure in the 1990s, but in all cases lower than that in the most recent decade (2000-2010). In general, the projections for the urban county are higher than for the rural county, and the BEBR projections are much higher.

As can also be seen in the figure, the REMI projections are much lower than the BEBR projections, in the majority of cases. In the case of Hardee, REMI actually projects negative population growth when projected out to 2060. As previously stated, the PI+ software uses a cohort-based projection methodology that starts from and mimics the Census datasets and projection methodology. The consistently low average projections across all counties is part of the reason that the REMI projections were not used for the Futures modeling. In all

cases but one, the REMI projections were lower – sometimes dramatically lower – than the BEBR projections.

The BEBR Medium-High Average method was partially developed because the BEBR 2011 High was determined to be too optimistic a growth projection, given past trends. Similarly, the region has often surpassed the BEBR 2011 Medium projections, and so these were determined to be too low. Being halfway in the middle of these two projections, the BEBR 2011 Medium-High Average provides a conservatively optimistic projection while also being respectful of past growth trends. As a happy coincidence, the BEBR Medium-High Average projection fairly closely approximates the average annual growth observed by the Census 2000-2010.

Figure 4: Average Annual Population Growth: past vs. projected
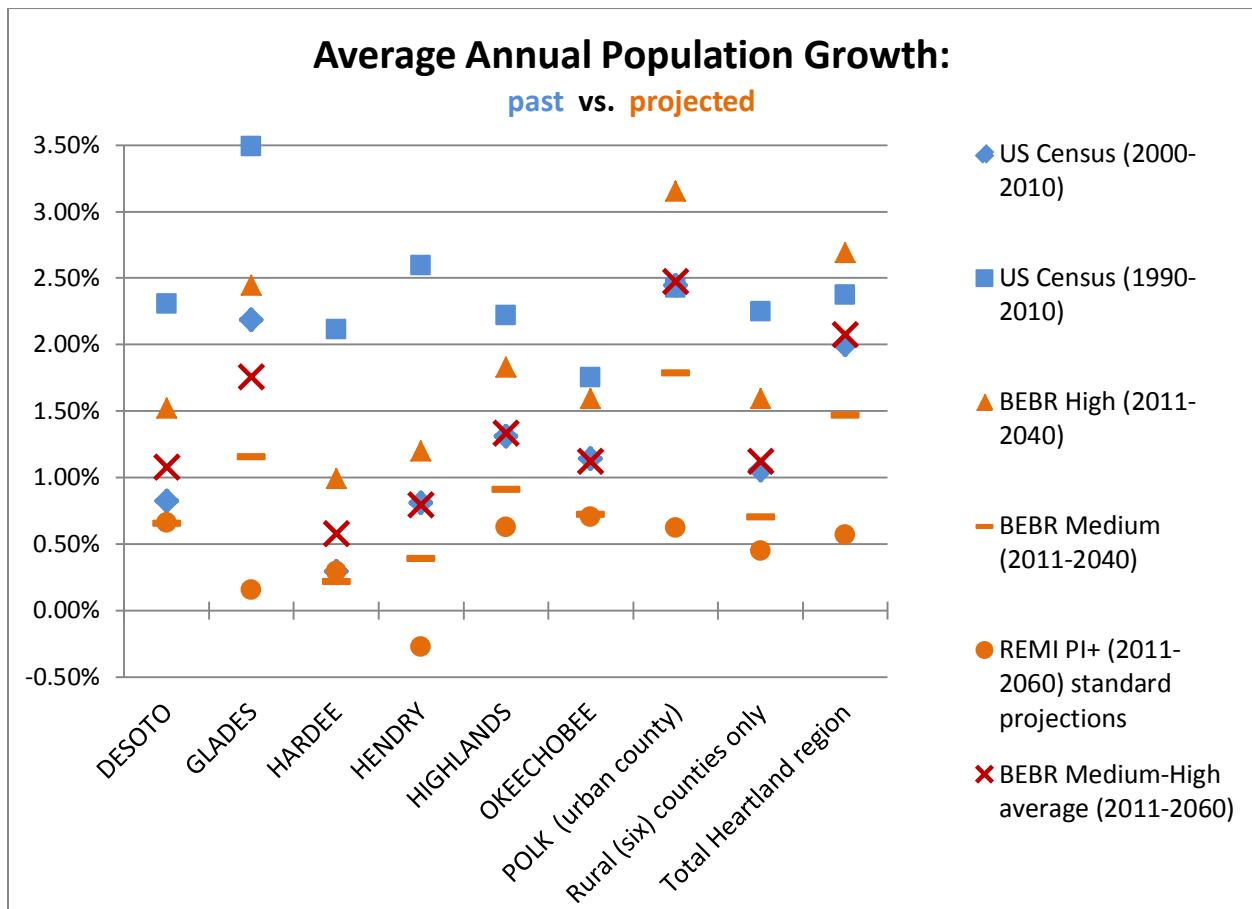
Conclusion

The BEBR 2011 Medium-High Average method of population projection was developed to more closely approximate the conditions that may be found in the Florida Heartland over the next 50 years. The methods described herein for data filling and extrapolation were necessary to mimic the methodology used by BEBR, and to extend the projections out to the year 2060. The BEBR Medium-High Average also works well across all counties in the state, as was required to utilize these projections in the generation of employment projections using the REMI PI+ software. The BEBR Medium-High Average method fits within recently observed historic growth estimates and better approximates perceived growth pressures for the region than any of the other methods that were available.

APPENDIX A: Compete BEBR 2011 Medium-High Average Population Projections

The full projections from the BEBR 2011 Medium-High Average method that will be used in the Futures modeling are presented below in Table 5.

Table 5: Complete BEBR Medium-High Average Population Projection (2011-2020)									
County	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**
DESOTO	34,708	35,181	35,654	36,127	36,600	36,950	37,300	37,650	38,000	38,350
GLADES	12,812	13,072	13,331	13,591	13,850	14,070	14,290	14,510	14,730	14,950
HARDEE	27,653	27,927	28,202	28,476	28,750	28,890	29,030	29,170	29,310	29,450
HENDRY	38,908	39,106	39,304	39,502	39,700	40,040	40,380	40,720	41,060	41,400
HIGHLANDS	98,712	100,197	101,681	103,166	104,650	106,040	107,430	108,820	110,210	111,600
OKEECHOBEE	39,870	40,440	41,010	41,580	42,150	42,610	43,070	43,530	43,990	44,450
POLK	604,792	618,832	632,871	646,911	660,950	675,600	690,250	704,900	719,550	734,200

Table 6: Complete BEBR Medium-High Average Population Projections (2021-2030)									
County	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**
DESOTO	38,720	39,090	39,460	39,830	40,200	40,560	40,920	41,280	41,640	42,000
GLADES	15,190	15,430	15,670	15,910	16,150	16,370	16,590	16,810	17,030	17,250
HARDEE	29,600	29,750	29,900	30,050	30,200	30,360	30,520	30,680	30,840	31,000
HENDRY	41,740	42,080	42,420	42,760	43,100	43,420	43,740	44,060	44,380	44,700
HIGHLANDS	112,970	114,340	115,710	117,080	118,450	119,790	121,130	122,470	123,810	125,150
OKEECHOBEE	44,910	45,370	45,830	46,290	46,750	47,200	47,650	48,100	48,550	49,000
POLK	749,240	764,280	779,320	794,360	809,400	824,530	839,660	854,790	869,920	885,050

Table 7: Complete BEBR Medium-High Average Population Projections (2031-2040)									
County	**2031**	**2032**	**2033**	**2034**	**2035**	**2036**	**2037**	**2038**	**2039**	**2040**
DESOTO	42,360	42,720	43,080	43,440	43,800	44,170	44,540	44,910	45,280	45,650
GLADES	17,480	17,710	17,940	18,170	18,400	18,620	18,840	19,060	19,280	19,500
HARDEE	31,150	31,300	31,450	31,600	31,750	31,900	32,050	32,200	32,350	32,500
HENDRY	45,020	45,340	45,660	45,980	46,300	46,610	46,920	47,230	47,540	47,850
HIGHLANDS	126,420	127,690	128,960	130,230	131,500	132,770	134,040	135,310	136,580	137,850
OKEECHOBEE	49,420	49,840	50,260	50,680	51,100	51,530	51,960	52,390	52,820	53,250
POLK	900,230	915,410	930,590	945,770	960,950	976,290	991,630	1,006,970	1,022,310	1,037,650

Table 8: Complete BEBR Medium-High Average Population Projections (2041-2050)										
County	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050
DESOTO	46,020	46,390	46,760	47,129	47,499	47,868	48,237	48,606	48,974	49,343
GLADES	19,720	19,940	20,159	20,379	20,598	20,817	21,036	21,255	21,473	21,691
HARDEE	32,650	32,800	32,950	33,100	33,250	33,400	33,550	33,699	33,849	33,999
HENDRY	48,160	48,470	48,780	49,090	49,399	49,709	50,018	50,328	50,637	50,946
HIGHLANDS	139,120	140,389	141,658	142,926	144,194	145,460	146,726	147,991	149,254	150,517
OKEECHOBEE	53,680	54,110	54,539	54,969	55,398	55,827	56,256	56,685	57,113	57,541
POLK	1,052,981	1,068,300	1,083,603	1,098,887	1,114,148	1,129,384	1,144,591	1,159,766	1,174,906	1,190,008

Table 9: Complete BEBR Medium-High Average Population Projections (2051-2060)										
County	2051	2052	2053	2054	2055	2056	2057	2058	2059	2060
DESOTO	49,711	50,078	50,445	50,812	51,179	51,545	51,911	52,276	52,641	53,005
GLADES	21,909	22,126	22,343	22,560	22,776	22,991	23,206	23,421	23,635	23,849
HARDEE	34,149	34,298	34,448	34,598	34,747	34,897	35,046	35,196	35,345	35,494
HENDRY	51,255	51,564	51,872	52,181	52,489	52,797	53,104	53,412	53,719	54,026
HIGHLANDS	151,778	153,037	154,296	155,552	156,807	158,060	159,311	160,560	161,807	163,052
OKEECHOBEE	57,969	58,396	58,823	59,250	59,676	60,101	60,526	60,951	61,375	61,798
POLK	1,205,069	1,220,087	1,235,059	1,249,981	1,264,852	1,279,669	1,294,430	1,309,131	1,323,771	1,338,347