

A Baseline Assessment of Economic Conditions in Provincetown, Massachusetts

Implications for the Growth Management Policy



Public Policy Center

UMass Dartmouth

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Town of Provincetown, Massachusetts**

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The Center is supported by a highly experienced team of professionals who leverage the skills and expertise of UMass faculty, staff, and students to meet the needs of our clients and partners. Services provided by the PPC include survey research, program evaluation (summative and formative), economic and workforce analysis, demographic and socioeconomic analysis, technical assistance, and needs assessment. These services are offered in the areas of economic development, community development, education, public health, transportation, housing, and environment.

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EXECUTIVE SUMMARY

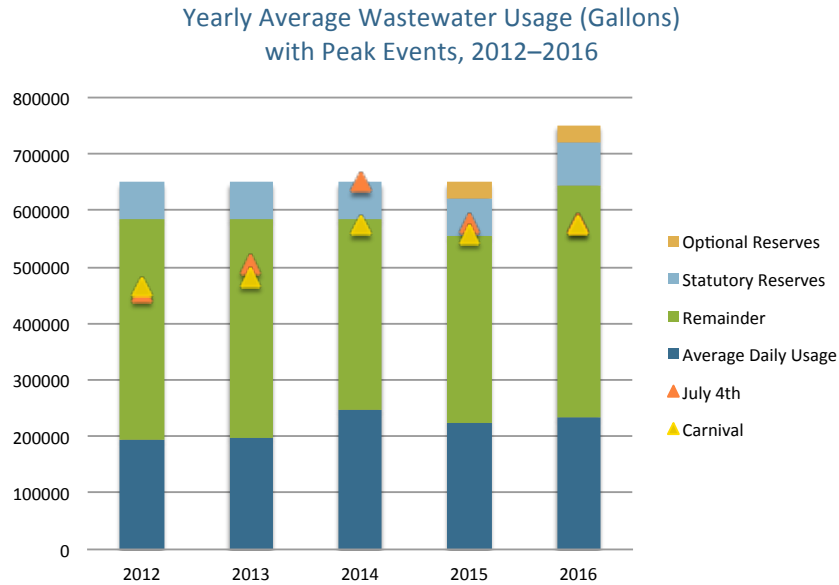
Provincetown faces serious challenges in a number of areas – including but not limited to housing and economic development – driven in large part by changes in the national economy, regional development patterns, and the continued decline of its traditional year-round industries. While the town continues to thrive as a tourist destination, the seasonal nature of Provincetown’s resort economy is placing considerable stress on the community. Some of the ways in which these pressures are having a negative impact include its imbalanced and increasingly unaffordable housing market and limitations on the Town’s wastewater processing facility. These resources are overtaxed in the summer and under-utilized in the winter.

In order to help Provincetown systematically grapple with these issues, this document provides a comprehensive baseline assessment of relevant conditions. In addition, it includes an analysis of historical wastewater usage data and an examination of whether Provincetown can increase the number of allowable sewer connections without expanding system capacity.

WASTEWATER PROCESSING CAPACITY

The Provincetown Municipal Wastewater System was originally planned to serve only the downtown area businesses and properties that could not meet the requirements of Title 5 when their onsite septic system failed. However, there has been a strong demand for additional flow allocations and more connections ever since.

The peak season demand for wastewater processing capacity has been particularly problematic in that it has created a physical constraint on individual business growth and overall economic growth. The wastewater processing plant is designed to handle the flow on the maximum usage day. Each year this occurs either during Carnival week in August or near the Fourth of July. The availability of new wastewater connections or expanded Title 5 Design Flow is limited by the difference between these peaks events and the total processing capacity, which is currently 750,000 gallons per day. After accounting for reserves required by the Massachusetts Department of Environmental Protection (Mass DEP) and additional reserves that were set aside by the Board of Selectmen to insure that the mandatory reserves would be adequate to meet peak demand, a limited amount of wastewater capacity is available to support new housing and expanded business development to support both off season and peak season demand. Presently, the remaining wastewater capacity is allocated into priority categories that are described in the Town’s Growth Management Plan.



Source: Town of Provincetown

Our analysis suggests that Provincetown may have more capacity to support growth than the assumptions built into its current growth management policies imply. Provincetown can decrease the amount of optional wastewater reserves without having a large impact on the amount of precipitation the system can handle on the busiest tourism days. (See table below.) These results highlight the tradeoffs between the protective effect of the optional reserves and the desire to promote economic development and increase tax revenues. However, it is clear that over the long run, Provincetown will need to expand its permitted wastewater capacity if highly seasonal growth patterns persist over time.

Forecasted Precipitation Amount (Inches) Needed to Exceed Plant Capacity

Reserve Amount	Lower Estimate	Midpoint	Upper Estimate
0	6.5	12.8	16.8
5,000	6.8	12.9	17.1
10,000	6.9	13.2	17.3
15,000	7.2	13.4	17.5
20,000	7.4	13.7	17.7
25,000	7.6	13.9	18
30,000	7.9	14.1	18.2

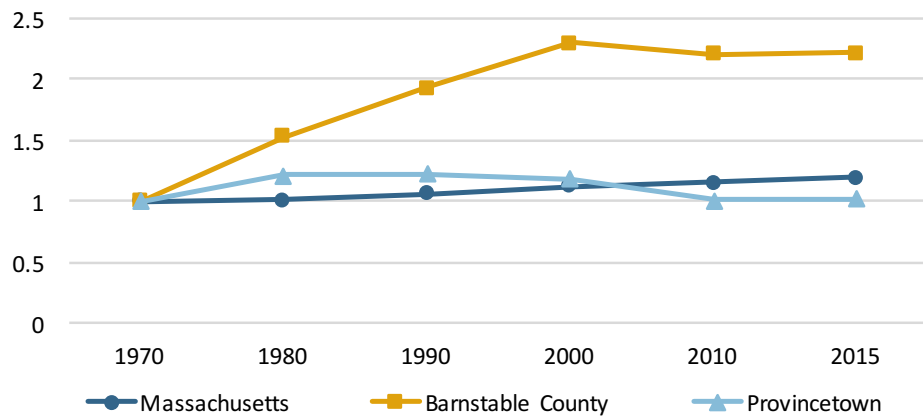
Source: PPC Calculations

ECONOMIC AND DEMOGRAPHIC PROFILE

In the service of informed decision making, long-term economic and demographic trends in Provincetown were analyzed. Additionally, comparisons are made to provide context and to measure how Provincetown performs relative to the state, Barnstable County, and the regions of Cape Cod: Lower Cape, Mid Cape, Outer Cape and Upper Cape.¹

Socio-Demographic Trends

Index of Population Trends, Massachusetts, Barnstable County, and Provincetown, 1970–2015



Source: 1970-2010 U.S. Census Bureau Summary File 1, 2011–2015 ACS 5-Year Estimates, UMass Donahue Institution Population Estimates Program (Indexed to 1970)

Provincetown and Cape Cod as a whole experienced substantial population growth from 1970 to 2000. However, population decreased in both places from 2000 to 2015, even as population growth continued across Massachusetts. Both regions are also becoming older than the rest of the state population. In Provincetown, 76 percent of the population is 45 years of age or older, compared to 43 percent for the state as a whole.

Provincetown residents have higher incomes than both the Barnstable County and state averages—a difference that has increased over time. Per capita income in Provincetown increased by 16 percent from 2000 to 2015, but only 8 percent in Barnstable County and 3 percent in Massachusetts.

¹ The Lower Cape consists of Brewster, Chatham, Harwich and Orleans. Barnstable, Dennis and Yarmouth make up the Mid Cape. The Outer Cape holds Eastham, Provincetown, Truro and Wellfleet, while the Upper Cape includes Bourne, Falmouth, Mashpee and Sandwich.

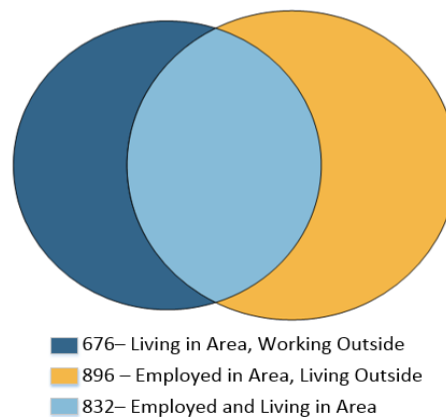
Employment Trends

Since 2000, Provincetown and the Outer Cape as a whole have had a higher unemployment rate than the state and the remainder of the Cape. Employment patterns are also highly seasonal. The number of employed Provincetown residents fluctuates by 25 percent every year, from about 1,600 in the winter to about 2,000 in the summer.

Even though Provincetown residents have high incomes, its workers do not. Only 34 percent of the employed population makes more than \$3,333 per month (about \$40,000 per year), compared to 44 percent for Barnstable County, and 50 percent for Massachusetts.

Commuting Patterns

Commuting Inflows and Outflows, Provincetown, 2014



Source: U.S. Census Bureau LEHD Origin-Destination Employment Statistics, All Jobs

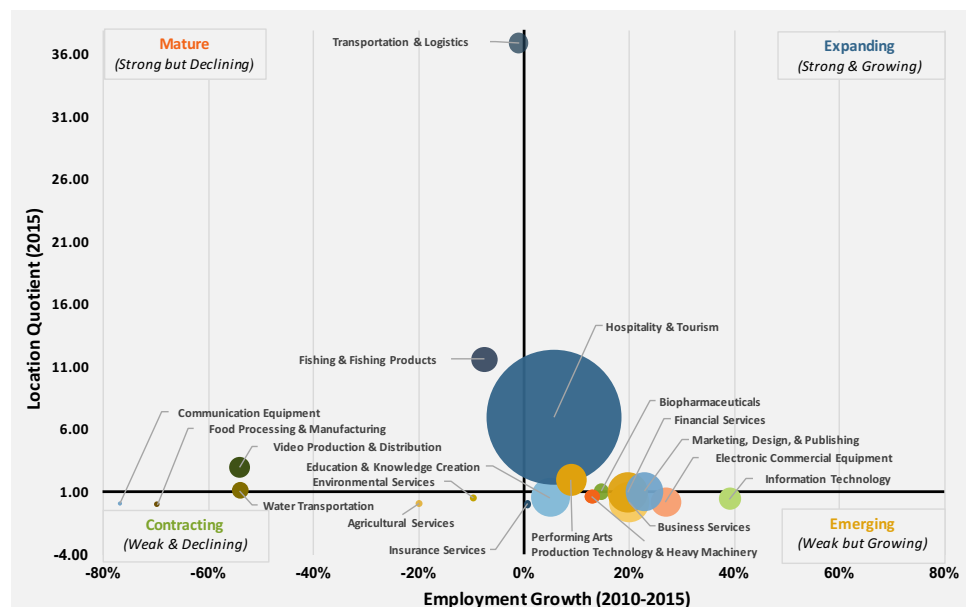
Among people who work in Provincetown, about half live in town and half commute from another community, mostly on the Cape. Conversely, among employed people who reside in Provincetown, 55 percent work in town and 45 percent commute to another community for work, again mostly on the Cape.

Barnstable County residents who are employed off-Cape earn higher wages than off-Cape residents employed within the region, while people working and living in Barnstable County earn lower wages than both of these groups. This result suggests that the area exports many of its most skilled workers while importing less skilled workers from off-Cape locations.

Industries and Occupations

Hospitality & Tourism was the largest traded industry cluster in Provincetown in 2015, as well as the fastest growing (448 total jobs, increase of 24 jobs).² All other traded industry clusters added fewer than ten jobs during the five-year period from 2010 to 2015. Correspondingly, the top occupations in Provincetown are mostly service occupations connected to the Hospitality & Tourism cluster. However, there is some growth in medical occupations. Likewise, an analysis of all individual industries (not just traded clusters), reveals that in Provincetown, “Other Ambulatory Health Care Services” is the fastest growing industry, with an increase of 84 jobs during this time.

Industry Clusters by Location Quotient and Employment Growth, Provincetown, 2010–2015



Source: EMSI, Industry Group Comparison, 2010–2015

² Traded industries are industries that are concentrated in a subset of geographic areas and sell to other regions and nations. Local industries are industries present in most (if not all) geographic areas, and primarily sell locally. Only traded clusters were included in the PPC’s analysis, since these clusters bring new money into the region by selling to markets outside the local economy.

Housing

Provincetown has a persistent housing crisis, with an inadequate supply of affordable housing for year-round residents and seasonal employees. According to the *Provincetown Housing Playbook*, the lack of affordable housing has resulted in the out-migration of many year-round residents and families, which in turn has led to the closing of the high school and a decrease in the year-round population by 14 percent from 2000 to 2010.

A large part of the problem is the peak demand that occurs during the summer tourism season. Provincetown had a low year-round housing occupancy rate in 2015 (39.5%) compared to Barnstable County (61.8%) and the state as a whole (90.2%). This problem has worsened, with the share of the residents who are seasonal increasing over time.

Another contributor to the affordability problem is the limited new housing development, creating a supply crunch. Even though new housing construction has been permitted, there was no appreciable change in the number of housing units in Provincetown between 2009 and 2015. It may be that most of the new buildings were built for seasonal use, which is not included in Census data, or replaced an existing structure. Over this time, there was a slight increase in the percentage of multi-unit buildings, which is likely the result of condominium conversions.

The end result is that for the past 20 years, Provincetown has had higher housing costs than Barnstable County, Massachusetts, and Boston. At the end of 2016, the median price per square foot was 121 percent higher than Barnstable County, 150 percent higher than Massachusetts, and 16 percent higher than Boston. Furthermore, 64 percent of renters spent more than 35 percent of their incomes on rent in 2015, compared to 40 percent for the state. This housing affordability problem has worsened since 2010.

Cost Burdened Rental Households, 2010–2015

	2010		2015	
	Year-Round Renter Households	Spending 35% of Income or More on Rent	Year-Round Renter Households	Spending 35% of Income or More on Rent
Provincetown	592	57.6%	617	64.2%
Outer Cape	1,451	43.8%	1,401	54.9%
Lower Cape	3,061	33.2%	2,831	39.5%
Mid Cape	8,983	43.9%	5,872	44.6%
Upper Cape	5,789	40.3%	7,055	34.2%
Barnstable County	19,284	41.1%	17,159	40.3%
Boston	159,964	42.9%	168,836	41.4%
Massachusetts	904,078	40.4%	966,054	40.5%

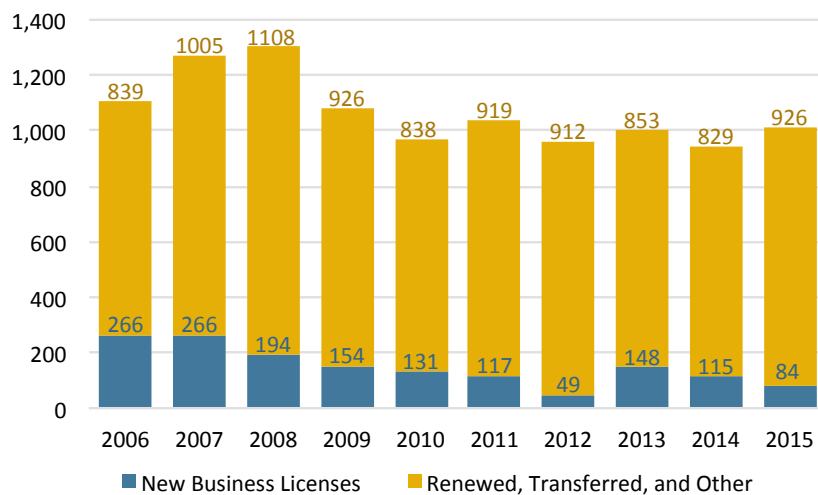
Source: 2006-2010 and 2011-2015 American Community Survey 5-Year Estimates

ECONOMIC ACTIVITY

Economic activity measures in Provincetown present a mixed picture. Inflation-adjusted sales, room, and meals tax payments display a modest but consistent increase over time, suggesting that tourism is increasing, prices are rising faster than inflation, or possibly both. June meal tax payments (which includes collections from February, March, and April) have increased at an average annual growth rate of 7 percent, which could indicate some success in expanding the tourism season. However, no change is observed during the winter months.

Even though excise taxes should show an upward trend, there has been limited new business development. The total number of business licenses was flat from 2010 to 2015 in Provincetown, even as the state and the nation were going through an economic expansion. Furthermore, the number of new business licenses has been on a downward trend since 2007.

Business Licenses, Provincetown, 2006–2015



Source: Provincetown, Approved Business Licenses, 2006–2015

NEXT STEPS

In recent years Provincetown has experienced several troubling demographic and economic trends including a declining population, an increasingly unaffordable housing market, and sluggish new business activity—largely as a result of the seasonal nature of the town’s largest industry. These findings underscore the opportunity to support more growth in housing and business activity that serves year-round residents and uses. This is not a new challenge and opportunity for Provincetown but it is clear that the price associated with

status quo development patterns is rising and significantly limiting the growth management options available to Town leaders.

While efforts to promote the “shoulder seasons” of fall and spring tourism are ongoing both in Provincetown and Cape Cod, it is clear that there is a need for creative alternative approaches to encouraging and supporting more year-round activity. It is our sincere hope that, informed by the evidence contained in this report, Provincetown’s leaders can work together to find economically and environmentally sustainable strategies to managing its growth.

1. INTRODUCTION

Provincetown faces serious challenges in a number of areas – including but not limited to housing and economic development – driven in large part by changes in the national economy, regional development patterns, and the continued decline of its traditional year-round industries. While the town continues to thrive as a tourist destination, the seasonal nature of Provincetown’s resort economy is placing considerable stress on the community. Some of the ways in which these pressures are having a negative impact include its imbalanced and increasingly unaffordable housing market, and limitations on the Town’s wastewater processing facility, which is underutilized most of the year.

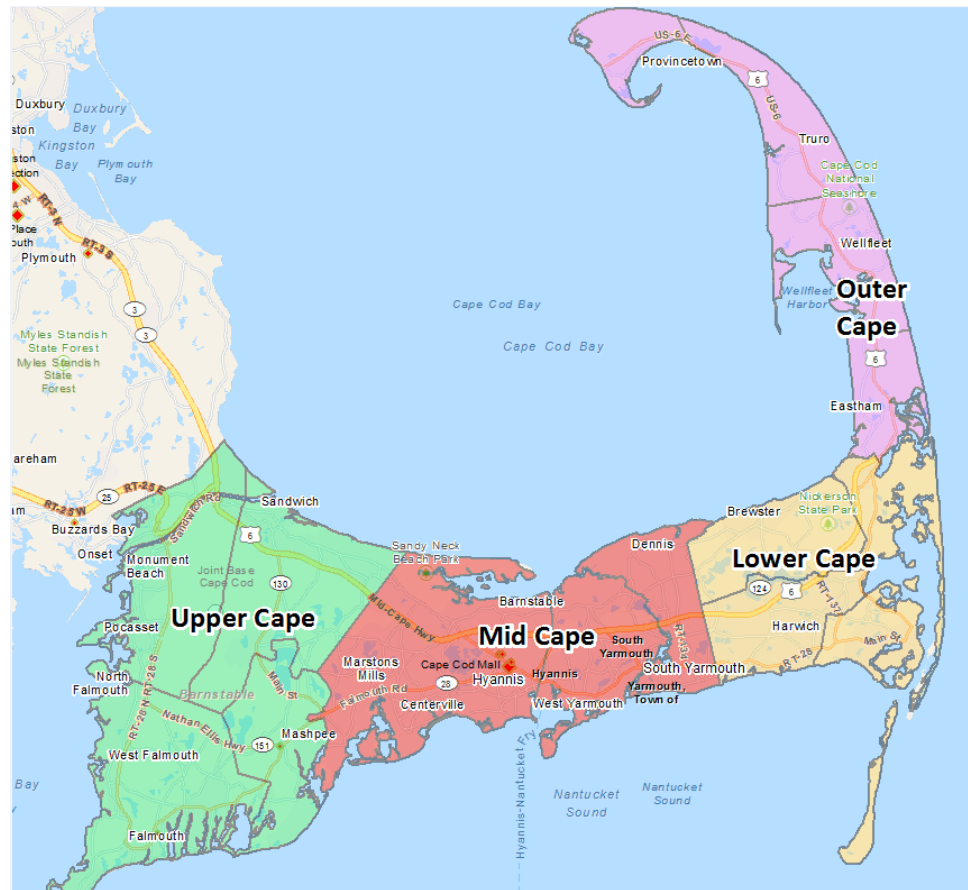
Provincetown has partnered with the Public Policy Center (PPC) at UMass Dartmouth to provide technical assistance and applied research support as the community begins to systematically grapple with these issues. Toward these ends, the following document provides a comprehensive baseline assessment of relevant conditions. In addition, it includes an analysis of historical wastewater usage data and an examination of whether Provincetown can increase the number of allowable sewer connections without expanding system capacity.



2. ECONOMIC AND DEMOGRAPHIC PROFILE OF PROVINCETOWN AND BARNSTABLE COUNTY

Provincetown is one of 15 towns that constitute Barnstable County, commonly known as Cape Cod. In the service of informed decision making, long-term economic and demographic trends in Provincetown were analyzed. Additionally, comparisons are made to provide context and to measure how Provincetown performs relative to the state, Barnstable County, and the regions of Cape Cod: Lower Cape, Mid Cape, Outer Cape and Upper Cape.³

Figure 1: Map of Cape Cod Regions



Source: Public Policy Center

³ The Lower Cape consists of Brewster, Chatham, Harwich and Orleans. Barnstable, Dennis and Yarmouth make up the Mid Cape. The Outer Cape holds Eastham, Provincetown, Truro and Wellfleet, while the Upper Cape includes Bourne, Falmouth, Mashpee and Sandwich.

2.1 SOCIO-DEMOGRAPHIC TRENDS

Highlights:

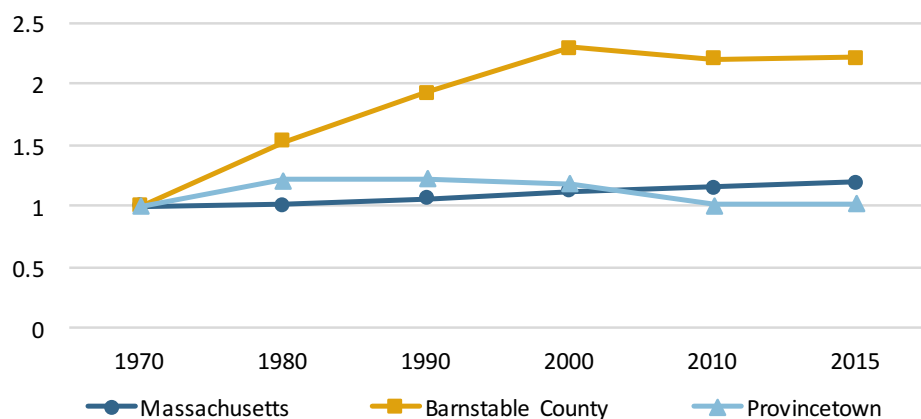
- Provincetown and Cape Cod as a whole experienced substantial population growth from 1970 to 2000. However, population decreased in both places from 2000 to 2015, even as population growth continued across Massachusetts.
- In Provincetown, 76 percent of the population is 45 years of age or older, compared to 43 percent for Massachusetts as a whole.
- Per capita income in Provincetown increased by 16 percent from 2000 to 2015 whereas per capita increased only 8 percent in Barnstable County as a whole.

2.1.1 Population

Cape Cod had an estimated population of 214,333 people in 2015. The Cape's population grew by 122 percent from 1970 to 2015, compared to only 20 percent for Massachusetts as a whole during the same period. However, population growth on the Cape has slowed considerably in recent years. From 2000 to 2015, Barnstable County experienced a four percent decrease in population while the state continued to grow by seven percent.

Provincetown's population was two percent higher in 2015 than in 1970, but decreased by 13 percent between 2000 and 2015. An estimated 2,968 people lived in Provincetown in 2015, a number that has been stable since 2010 (see Figure 2).

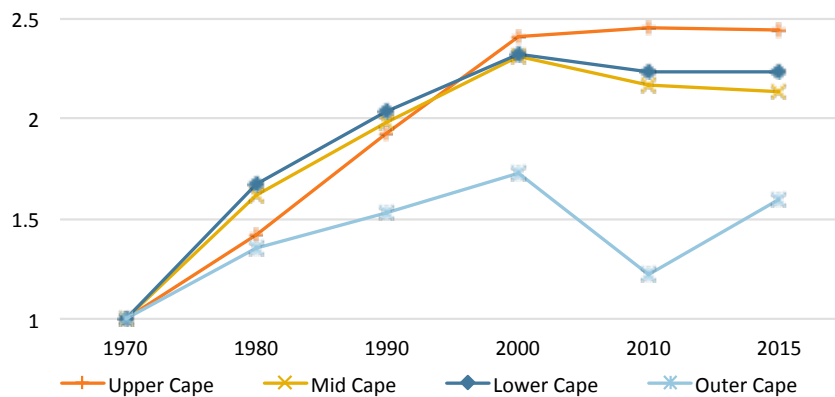
Figure 2: Index of Population Trends, Massachusetts, Barnstable County, and Provincetown, 1970–2015



Source: 1970-2010 U.S. Census Bureau Summary File 1, 2011–2015 ACS 5-Year Estimates, UMass Donahue Institution Population Estimates Program (Indexed to 1970)

The Lower, Mid, and Upper Cape regions experienced significant growth between 1970 and 2015, increasing by 123 percent, 113 percent and 144 percent, respectively. The Outer Cape experienced slower growth than other regions of the Cape, growing by 60 percent. During the period from 2000 to 2015, the population of all Cape regions decreased, except for the Upper Cape, which grew slightly by 1.6 percent (see Figure 3).

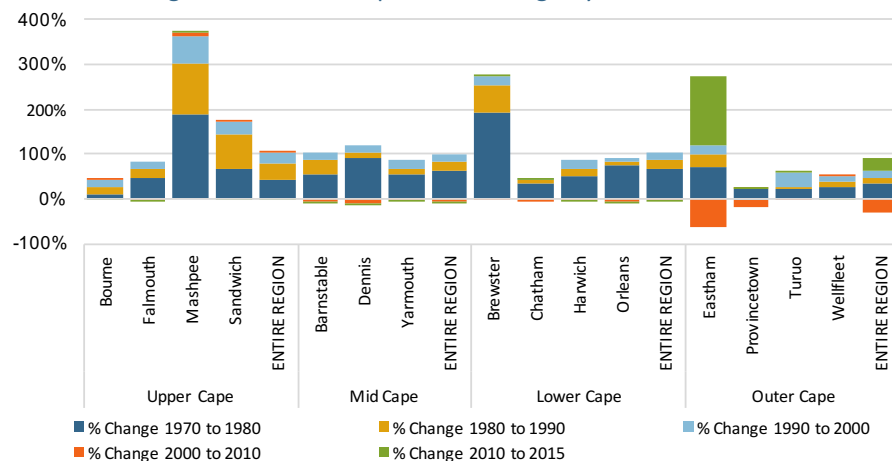
Figure 3: Index of Population Trends, Cape Cod Regions, 1970 to 2015



Source: 1970-2010 U.S. Census Bureau Summary File 1, 2011-2015 ACS 5-Year Estimates, UMass Donahue Institution Population Estimates Program (Indexed to 1970)

Between 2010 and 2015, the Outer Cape was the only region to experience growth (30.9%, +2,981 people). The Outer Cape town of Eastham had the fastest population increase of all Cape towns, growing by 151 percent, or 2,959 individuals. Barnstable, conversely, lost the largest percent of its population, with a 2 percent decrease, or approximately 820 individuals (see Figure 4).

Figure 4: Percent Population Change by Decade, 1970-2015

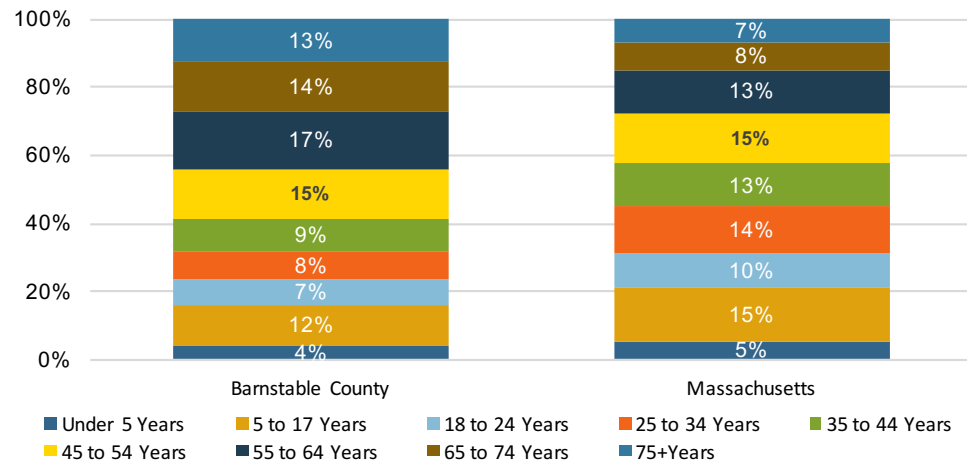


Source: 1970-2010 U.S. Census Bureau Summary File 1, 2011-2015 ACS 5-Year Estimates, UMass Donahue Institution Population Estimates Program

2.1.2 Age Cohorts

The Cape has an aging community. In 2015, the median age in Barnstable County was 51 years, which is up from 45 years in 2000. Massachusetts as a whole is comparatively younger, with a median age of 39 years (see Figure 5).

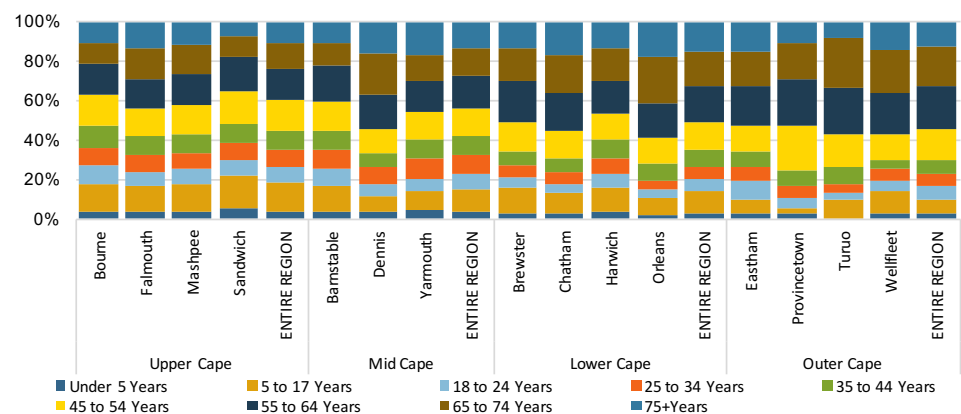
Figure 5: Age Cohorts, Massachusetts and Barnstable County, 2015



Source: 2015 ACS 5-Year Estimates

The Outer Cape has the largest share of residents 45 years or older (70%) among the Cape's regions. The Upper Cape features the greatest share of individuals 24 years or younger, who make up 26 percent of the population. In Provincetown, 76 percent of the population is 45 years or older (see Figure 6).

Figure 6: Age Cohorts, Cape Cod Regions and County Subdivisions, 2015

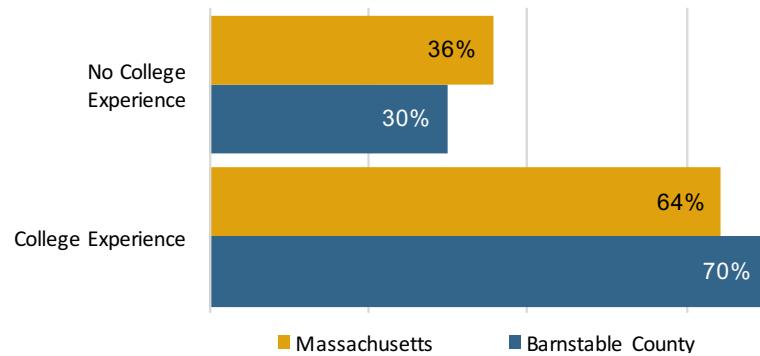


Source: 2015 ACS 5-Year Estimates

2.1.3 Educational Attainment⁴

A higher percentage of Barnstable County's residents have college experience in comparison to Massachusetts as a whole (70% compared to 64%) (see Figure 7). Having college experience is defined as attending some college or earning a degree, whether it is an Associate's, Bachelor's, or Graduate/Professional degree.

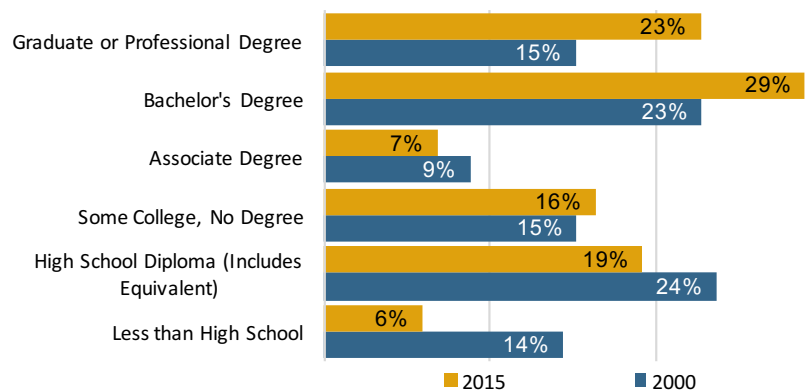
Figure 7: Educational Attainment, Massachusetts and Barnstable County, 2015



Source: 2011–2015 ACS 5-Year Estimates

In Provincetown, the share of citizens aged 25 and older with a Bachelor's degree increased by 6.2 percentage points from 2000 to 2015. At the same time, individuals with a Graduate or Professional Degree increased by 7.5 percentage points. Additionally, the share of residents who did not complete high school decreased by 8.5 percentage points.

Figure 8: Educational Attainment, Provincetown, 2000–2015



Source: 2000 Census, 2011–2015 ACS 5-Year Estimates

⁴ Only individuals age 25 and older are included.

2.1.4 Per Capita Income

Per capita income⁵ increased in Barnstable County by 8.1 percent from 2000 to 2015, compared to an increase of 3.3 percent statewide. Since 2009, the Cape's per capita income has been slightly higher than the state as a whole, and was 2.1 percent higher than the Massachusetts' per capita income in 2015 (see Table 1).

Table 1: Per Capita Income, Constant 2015 Dollars, 2000–2015

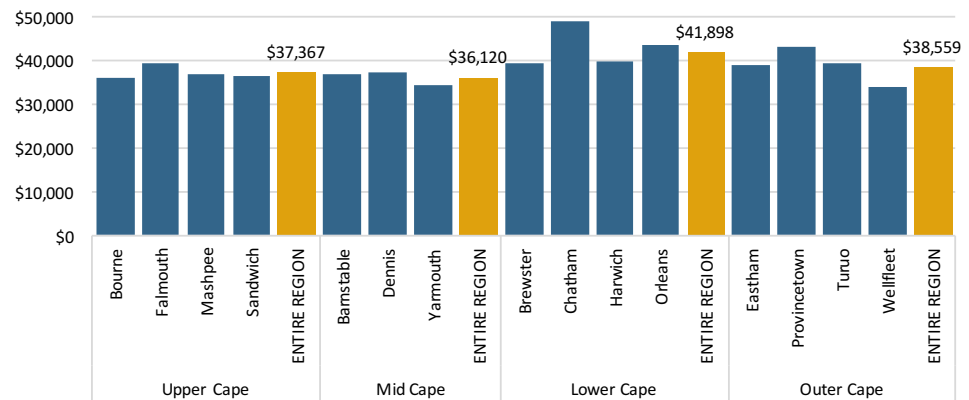
Area Name	2000	2009	2015	% Change 2000–2015
Provincetown	\$35,937	\$43,125	\$42,918	8.1%
Outer Cape	\$34,292	\$43,252	\$38,559	12.4%
Lower Cape	\$35,384	\$41,351	\$41,898	18.4%
Mid Cape	\$34,053	\$36,552	\$36,120	6.1%
Upper Cape	\$35,546	\$38,039	\$37,367	5.1%
Barnstable County	\$34,848	\$38,311	\$37,678	8.1%
Massachusetts	\$35,720	\$36,920	\$36,895	3.3%

Source: 2000 Census, 2005–2009 and 2011–2015 ACS 5-Year Estimates

While per capita income varies among the region's individual communities, for most towns it is greater than the state average. Chatham (\$49,057) and Orleans (\$43,602) have the highest per capita incomes, making the Lower Cape the region with the highest per capita income on the Cape (\$41,898). Conversely, the Mid Cape region has a slightly lower per capita income than Massachusetts and the lowest per capita income of all Cape regions (\$36,120) (see Figure 9).

⁵ Per capita income values for the Cape Cod regions were calculated using a weighted average of the individual community per capita incomes and populations, which takes into account the size of the population.

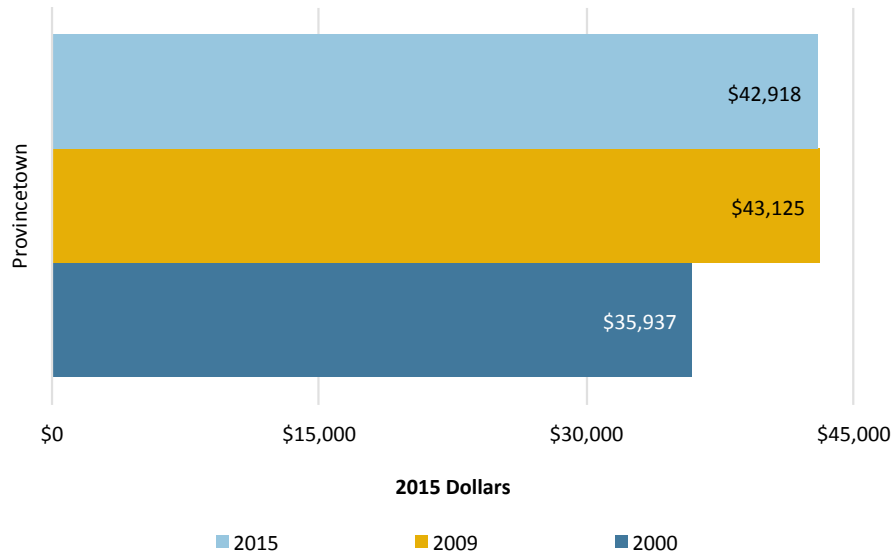
Figure 9: Per Capita Income, Cape Cod Regions and County Subdivisions, 2015



Source: 2011–2015 ACS 5-Year Estimates

In 2000, per capita income in Provincetown was 0.6 percent higher than statewide and 3.1 percent higher than Barnstable County. Since then, this gap continued to widen. In 2015, per capita income in Provincetown was 16.3 percent higher than statewide and 13.9 percent higher than Barnstable County. Overall, per capita income increased by 19 percent between 2000 and 2015 (see Figure 10).

Figure 10: Per Capita Income, Provincetown, 2000–2015



Source: 2000 Census, 2005–2009 and 2011–2015 ACS 5-Year Estimates

2.2 EMPLOYMENT TRENDS AND WORKFORCE PROFILE

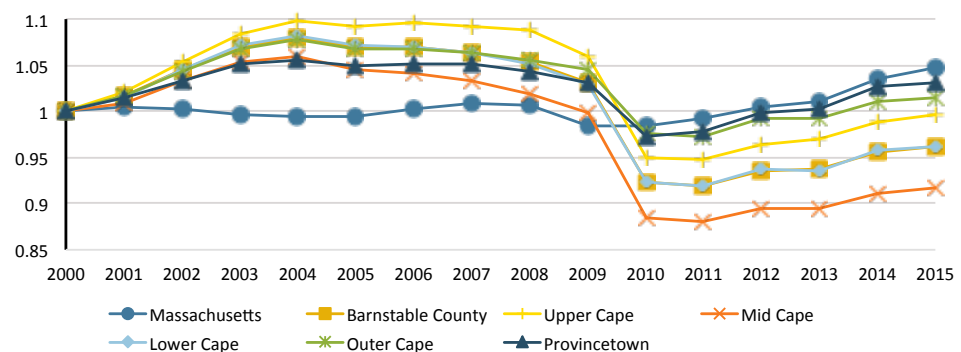
Highlights:

- Since 2000, Provincetown and the Outer Cape as a whole have had a higher unemployment rate than the state and the remainder of the Cape.
- The number of employed Provincetown residents fluctuates by 25 percent every year, from about 1,600 in the winter to about 2,000 in the summer.
- Even though Provincetown residents have high incomes, its workers do not. Only 34 percent of the employed population makes more than \$3,333 per month (about \$40,000 per year), compared to 44 percent for Barnstable County, and 50 percent for Massachusetts.

2.2.1 Total Employment

During the Great Recession, employment of Cape residents decreased at a faster rate than for the state as a whole. While employment levels have increased since 2010, none of the sub-regions have recovered their pre-recession peak levels. Given the aging nature of the population on the Cape, it is possible that many people simply left the labor force. Employment levels among Provincetown residents follow a similar pattern, but employment has increased at a faster rate since 2010 (see Figure 11).

Figure 11: Index of Total Employment, 2000–2015

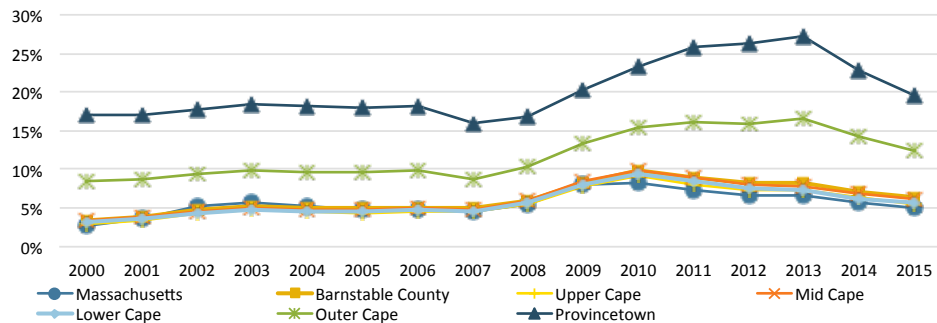


Source: MA EOLWD LAUS Data (Not Seasonally Adjusted), 2000–2015 (Indexed to 2000)

2.2.2 Unemployment

Barnstable County had an unemployment rate of 6.3 percent in 2015, compared to 4.9 percent for the state. Since 2000, Provincetown has had an unemployment rate significantly higher than the state and all the sub-regions of Cape Cod. The Outer Cape has also experienced higher unemployment rates than other regions (see Figure 12).

Figure 12: Unemployment Rates, Residents, 2000–2016

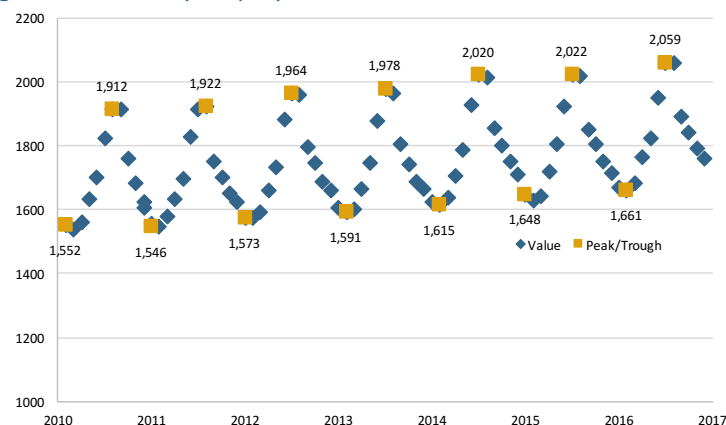


Source: MA EOLWD LAUS Data (Not Seasonally Adjusted), 2000–2015

2.2.3 Employment Seasonality

As a summer tourist destination, the economy in Provincetown is highly seasonal. Consequently, the number of Provincetown residents who are employed fluctuates 25 percent every year from about 1,600 in the winter, to about 2,000 in the summer. The difference between the high (peak) and low (trough) employment levels from year-to-year is consistently just under or around 400 jobs (see Figure 13).

Figure 13: Monthly Employment, Provincetown Residents, 2010–2017



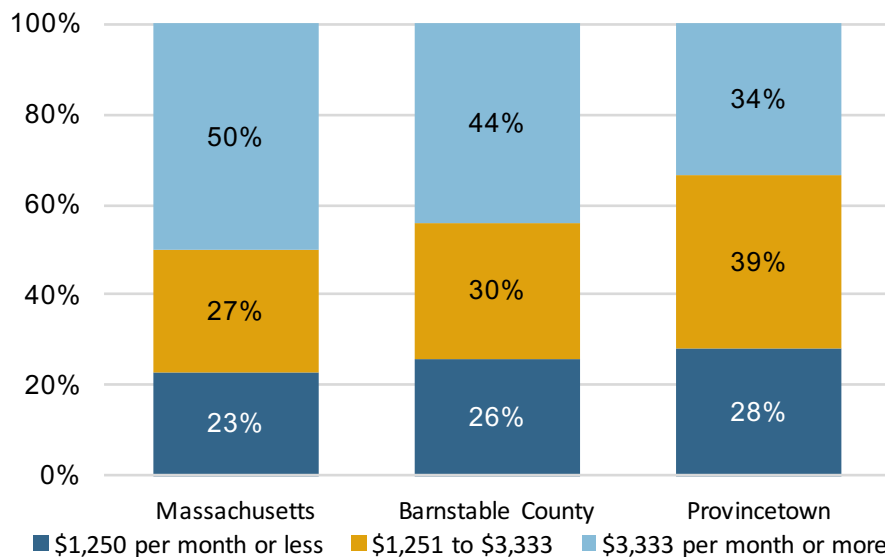
Source: MA EOLWD LAUS Data (Not Seasonally Adjusted), 2010–2017

2.2.4 Jobs and Wages⁶

Among the jobs held by Provincetown residents, 33 percent paid \$3,333 per month (\$39,996 per year) or more, 39 percent paid between \$1,251 and \$3,333 per month, and 28 percent paid less \$1,250 per month or less. Compared to Barnstable County and Massachusetts, a smaller proportion of Provincetown residents are in the highest wage category.

The largest numbers of Provincetown residents are employed in the Accommodation & Food Services and Retail Trade Sectors. However, there is also a substantial share of the population that is employed in higher-skilled service sectors, such as Health Care, Public Administration, and Educational Services. Only 24 residents are employed in any sort of manufacturing.

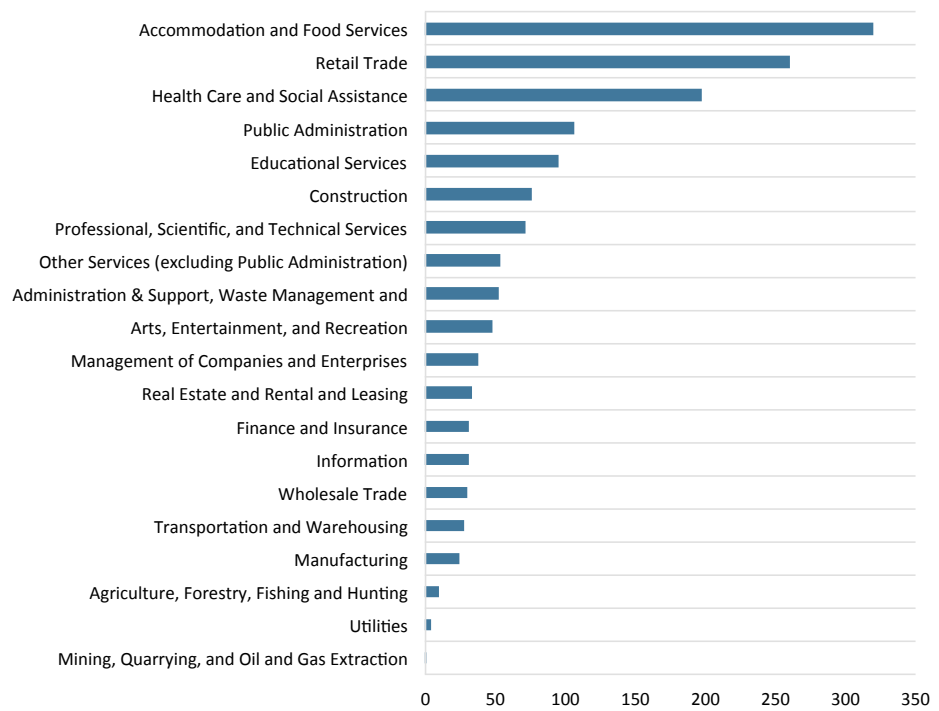
Figure 14: Monthly Wages, Residents of Massachusetts, Barnstable County, and Provincetown, 2014



Source: U.S. Census Bureau LEHD Origin-Destination Employment Statistics, All Jobs

⁶ All wages are adjusted for inflation to year 2015.

Figure 15: Employment by Major Industry Sector, Provincetown Residents, 2014



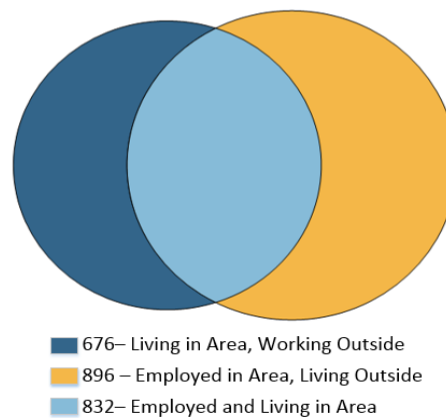
Source: U.S. Census Bureau LEHD Origin-Destination Employment Statistics, All Jobs

2.3 COMMUTING PATTERNS

Highlights:

- Among people who work in Provincetown, about half live in town and half commute from another community, mostly on the Cape.
- Among employed people who reside in Provincetown, 55 percent work in town and 45 percent commute to another community for work, again mostly on the Cape.
- Barnstable County residents who are employed off-Cape earn higher wages than off-Cape residents employed within the region, while people working and living in Barnstable County earn lower wages than both of these groups.

Figure 16: Commuting Inflows and Outflows, Provincetown, 2014

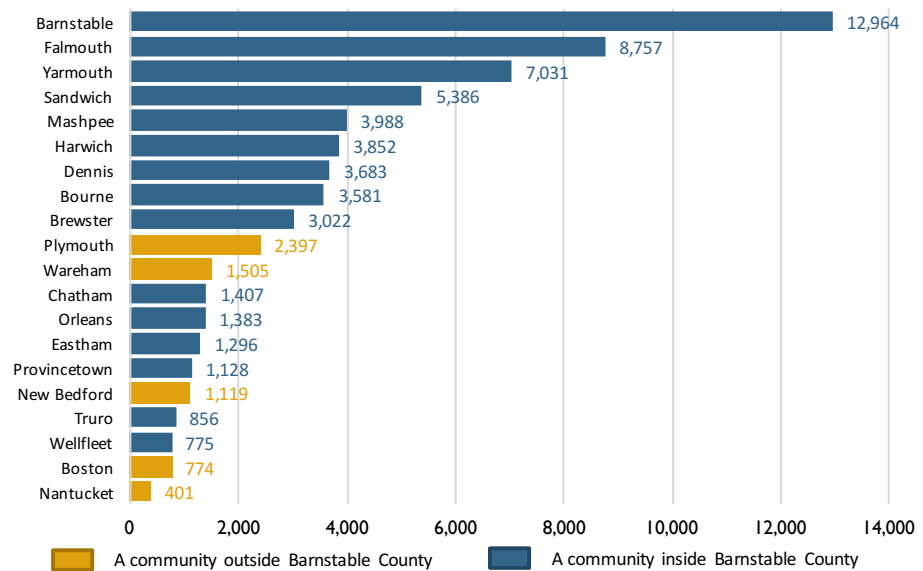


Source: U.S. Census Bureau LEHD Origin-Destination Employment Statistics, All Jobs

Twenty-eight percent (28%) of Barnstable County workers live in communities outside of the region. People commuting into Barnstable County come from 1,358 different communities, with the majority coming from Massachusetts cities and towns. However, the majority of workers in Barnstable County live within Barnstable (73%), Plymouth (9%) and Bristol (5%) counties respectively.

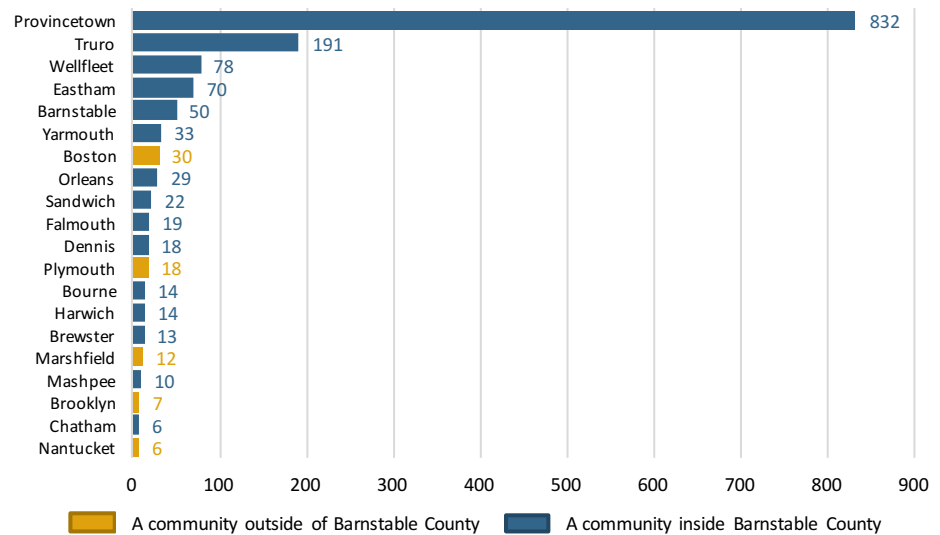
Conversely, 52 percent of people working in Provincetown live outside of the town. Most of Provincetown's workers live in either Barnstable (81%), Plymouth (4%), or Suffolk (2%) County.

Figure 17: Top 20 Cities and Towns Where People Working in Barnstable County Reside, 2014



Source: U.S. Census Bureau LEHD Origin-Destination Employment Statistics, All Jobs

Figure 18: Top 20 Cities and Towns Where People Working in Provincetown Reside, 2014



Source: U.S. Census Bureau LEHD Origin-Destination Employment Statistics, All Jobs

In order to determine which cities and towns Provincetown is the most economically integrated with in terms of commuting relationships, the Employment Interchange Measure (EIM) was used. The Office of Management and Budget (OMB) used the EIM to define Metropolitan Statistical Areas (MSAs) and other Labor Market Areas. It measures the amount of bi-directional commuting flow between two areas, controlling for size.⁷

Provincetown is most strongly connected to its neighbors Truro and Wellfleet, in terms of a shared commuting relationship. All other nearby cities and towns do not come close to these two, with the third ranked town, Barnstable, having an EIM that is nearly a third that of Wellfleet (see Table 2). Surprisingly, given the size of Boston and the three-hour commute from Provincetown, Boston ranks highly on this list. It is possible that many of the people who appear to make this commute list Provincetown as their primary residence, but have a “pied-à-terre” to be near their work in Boston.

Table 2 Employment Interchange Levels Between Provincetown and Other Massachusetts Communities, 2014

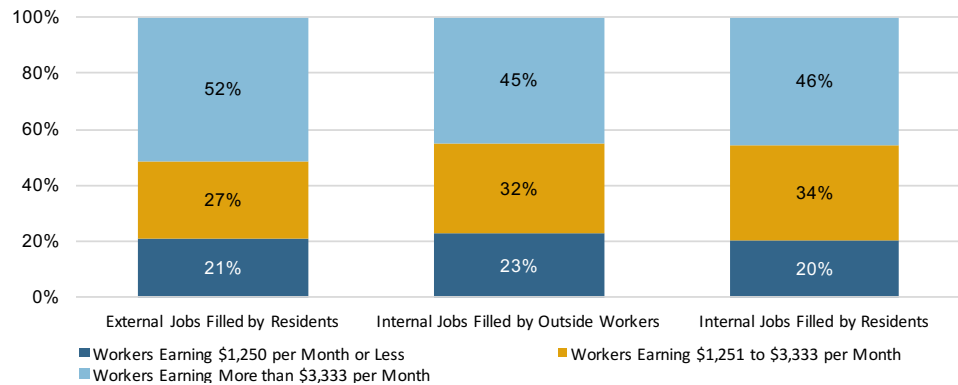
City or Town	EIM
Truro	28.58
Wellfleet	14.25
Barnstable	5.39
Boston	5.38
Eastham	5.20
Brewster	2.98
Orleans	2.89
Yarmouth	2.86
Dennis	1.99
Falmouth	1.77

Source: LEHD Origin-Destination Employment Statistics, All Jobs, 2014, and PPC Calculations

Barnstable County residents who are employed elsewhere earn higher wages than outside workers employed within the region, while people working and living in Barnstable County earn wages lower than both of these groups. This result suggests that the area exports many of its most skilled workers while importing less skilled workers from off-Cape locations (see Figure 19).

⁷ For more information, see the 2010 OMB Standards for Delineating Metropolitan and Micropolitan Statistical Areas.

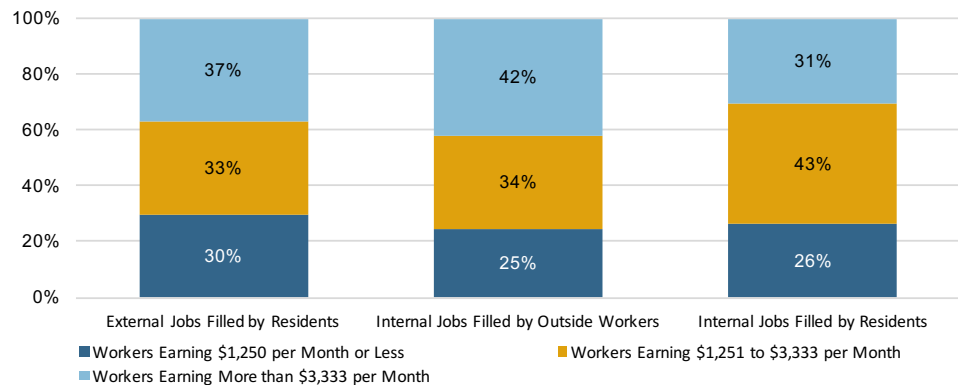
Figure 19: Inflow/Outflow Job Monthly Job Earnings, Barnstable County, 2014



Source: U.S. Census Bureau, OnTheMap Application and LEHD Origin-Destination Employment Statistics, All Jobs, 2014

Workers who are employed in Provincetown but reside elsewhere earn more than residents working within the town and residents who work elsewhere. Additionally, Provincetown has a large number of employees who reside and are employed within the town making monthly wages between \$1,251 and \$3,333 (see Figure 20).

Figure 20: Inflow/Outflow Job Monthly Earnings, Provincetown, 2014



Source: U.S. Census Bureau, OnTheMap Application and LEHD Origin-Destination Employment Statistics, All Jobs, 2014

2.4 INDUSTRIES AND OCCUPATIONS

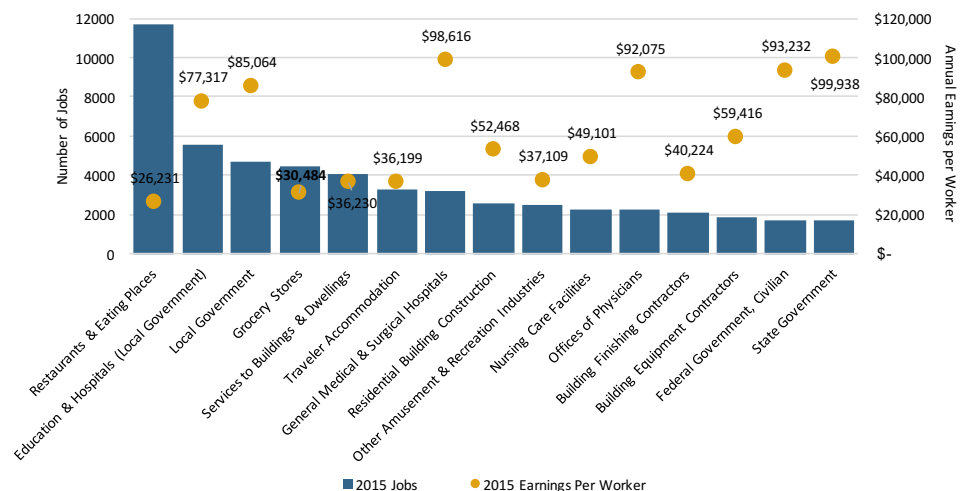
Highlights:

- The size of the Hospitality & Tourism cluster dwarfs all other industry clusters in Provincetown.
- In addition to being among the largest industries, restaurants, traveler accommodation, and healthcare added the most jobs between 2010 and 2015.
- The top occupations in Provincetown are mostly service occupations connected to the Hospitality & Tourism cluster. However, there is some growth in medical occupations.

2.4.1 Largest Industries

Barnstable County's 15 largest industries in terms of employment are shown in Figure 21.⁸ Restaurants & Eating Places accounted for the largest number of Cape Cod's jobs in 2015 (11,664), followed by Local Education & Hospitals (5,573) and Local Government (4,677). Among these industries, average annual wages range considerably, from \$99,938 in State Government to \$26,231 in Restaurants & Eating Places (not accounting for tips). In general, educational, medical, and governmental establishments pay the highest wages, while the service industry pays the lowest wages.

Figure 21: Largest Industries, Barnstable County, 2015

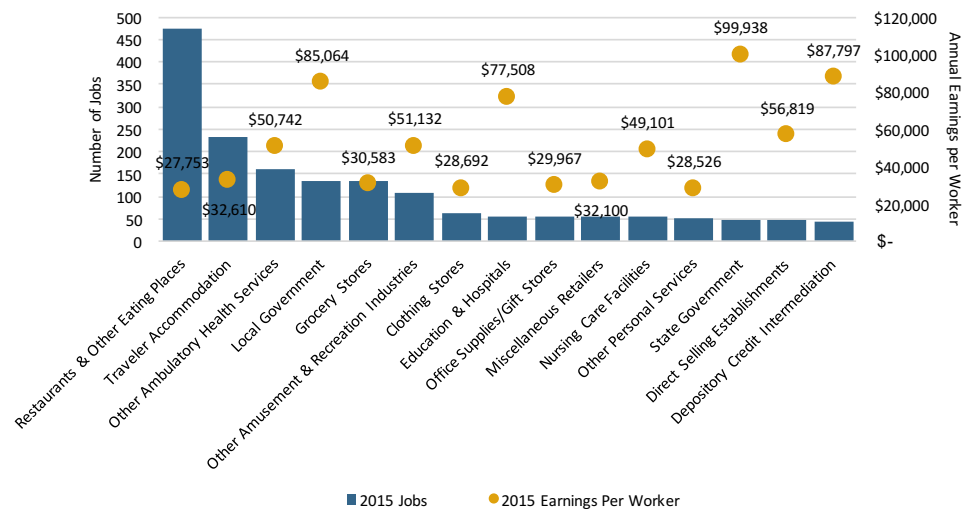


Source: EMSI Highest Ranked Industries- Largest Industries, 2015

⁸ Industries based on 4-digit NAICS codes.

Provincetown's largest industries in terms of number of jobs are similar to the Cape as a whole, consisting primarily of education, hospitals, and tourism-focused service establishments. In Provincetown, the industries with the largest number of jobs are Restaurants & Other Eating Places (474), followed by Traveler Accommodation (233) and Other Ambulatory Health Care Services (161). Wages are also distributed similarly to the Cape as a whole.

Figure 22: Largest Industries, Provincetown, 2015



Source: EMSI Highest Ranked Industries- Largest Industries, 2015

In each Cape sub-region, the Restaurants & Other Eating Places industry is the largest in terms of number of jobs. However, this industry also provides the lowest annual average earnings per worker in each sub-region. The Securities & Commodity Contracts Intermediation & Brokerage industry is the highest paying industry in the Lower Cape, the Mid Cape, and the Upper Cape regions (\$203,175, \$235,290, and \$194,166, respectively). In the Outer Cape, workers within the Computer & Peripheral Equipment Manufacturing Industry earned an average of \$126,850 in 2015.

2.4.2 High Growth Industries

Table 3 and Table 4 present the fastest growing industries for Barnstable County and Provincetown⁹ based on the percent change in jobs from 2010 to 2015. The tables are sorted by absolute change in jobs over the five-year span rather than the percent change in jobs. In Barnstable County, the fastest growing industry was Restaurants & Other Eating Places, which grew by 1,118 jobs. In Provincetown, the Other Ambulatory Health Care Services industry grew the fastest, with an increase of 84 jobs during the five-year period.

Table 3: The Fastest Growing Industries, Barnstable County, 2010–2015

Industry	2010 Jobs	2015 Jobs	Change	% Change
Restaurants & Other Eating Places	10,545	11,664	1,118	11%
Services to Buildings & Dwellings	3,228	4,078	849	26%
Individual & Family Services	940	1,662	722	77%
Grocery Stores	3,791	4,414	623	16%
Education & Hospitals (State Government)	961	1,392	431	45%
Other Amusement & Recreation	2,107	2,505	398	19%
Department Stores	668	1,041	373	56%
Education & Hospitals (Local Government)	5,260	5,573	313	6%
Residential Building Construction	2,278	2,565	287	13%
Traveler Accommodation	3,039	3,292	253	8%

Source: EMSI Highest Ranked Industries- Fastest Growing Industries, 2010–2015

Table 4: The Fastest Growing Industries, Provincetown, 2010–2015

Industry	2010 Jobs	2015 Jobs	Change	% Change
Other Ambulatory Health Care Services	76	161	84	110%
Restaurants & Other Eating Places	432	474	42	10%
Traveler Accommodation	197	233	36	18%
Grocery Stores	116	135	19	17%
Specialty Food Stores	16	28	13	81%
Other Amusement & Recreation	97	107	11	11%
Outpatient Care Centers	23	32	9	38%
Services to Buildings & Dwellings	26	33	7	25%
Other Personal Services	46	53	7	16%
Other Miscellaneous Store Retailers	49	56	7	15%

Source: EMSI Highest Ranked Industries- Fastest Growing Industries, 2010–2015

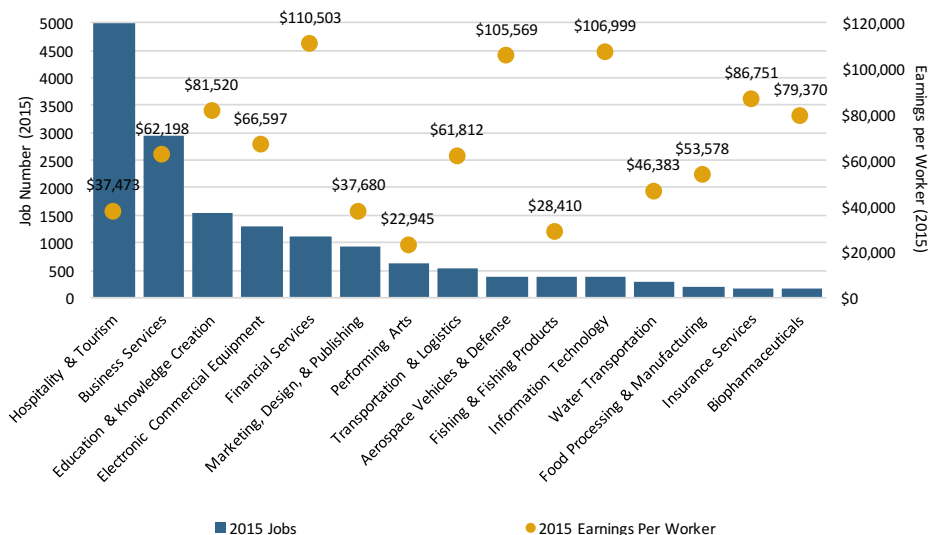
⁹ Industries based on 4-digit NAICS codes.

2.4.3 Industry Cluster Analysis

Industry clusters are groups of related industries in a defined geographic area that share common markets or are interrelated in some way. Traded clusters, which are examined here, are of particular interest since they bring new money into an economy.¹⁰ The following industry cluster analysis examines the largest industry clusters within Barnstable County and Provincetown in terms of the number of workers they employ.¹¹ Additionally, the ten fastest growing industry clusters within Barnstable County and Provincetown between 2010 and 2015 are identified and described.

Not surprisingly, the Hospitality & Tourism cluster was the largest in terms of employment in Barnstable County, while employees in Financial Services earned the highest wages (\$110,503 annually) (see Figure 23). Among the fastest growing industry clusters in Barnstable County, Business Services (361 jobs) and Hospitality & Tourism (349 jobs) added the most jobs (see Table 5).

Figure 23: The Largest Industry Clusters, Barnstable County, 2015



Source: EMSI, Industry Group Comparison- Jobs and Earnings Comparison, 2015

¹⁰ Traded industries are industries that are concentrated in a subset of geographic areas and sell to other regions and nations. Local industries are industries present in most (if not all) geographic areas, and primarily sell locally.

¹¹ Note: the clusters analyzed in this section were based off on the cluster definitions used by the U.S. Cluster Mapping Project.

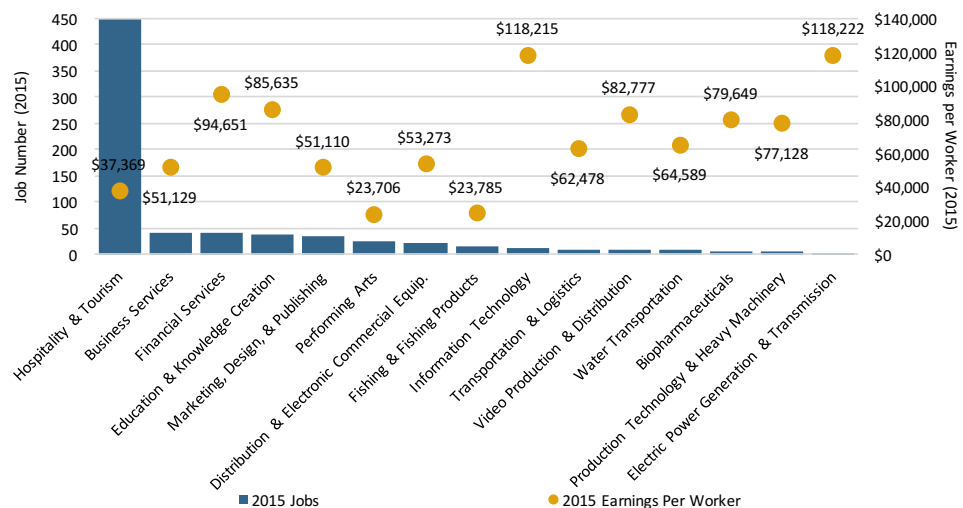
Table 5: Top Five Fastest Growing Industry Clusters, Barnstable County, 2010–2015

Industry	2010 Jobs	2015 Jobs	Change	% Change
Business Services	2,579	2,940	361	14%
Hospitality & Tourism	4,640	4,989	349	8%
Aerospace Vehicles & Defense	227	383	156	69%
Information Technology & Analytics	269	366	156	69%
Performing Arts	535	617	81	15%

Source: EMSI, Industry Group Comparison- Fastest Growing Industries, 2010–2015

In Provincetown, Hospitality & Tourism was the largest traded industry cluster in 2015, as well as the fastest growing (448 total jobs, increase of 24 jobs). All other traded industry clusters added fewer than ten jobs during this time. Hospitality & Tourism’s employees earned close to the lowest income (\$37,369), behind Performing Arts (\$23,706), and Fishing & Fishing Products (\$23,785) (see Figure 24).

Figure 24: The Largest Industry Clusters in Provincetown, 2015



Source: EMSI, Industry Group Comparison- Job and Earnings Comparison, 2015

Table 6: Top Five Fastest Growing Industry Clusters, Provincetown, 2010–2015

Industry	2010 Jobs	2015 Jobs	Change	% Change
Hospitality & Tourism	424	448	24	6%
Marketing, Design, & Publishing	28	35	7	23%
Business Services	33	40	7	20%
Financial Services	33	39	7	20%
Distribution & Electronic Equipment	17	21	5	27%

Source: EMSI, Industry Group Comparison- Fastest Growing Industries, 2010–2015

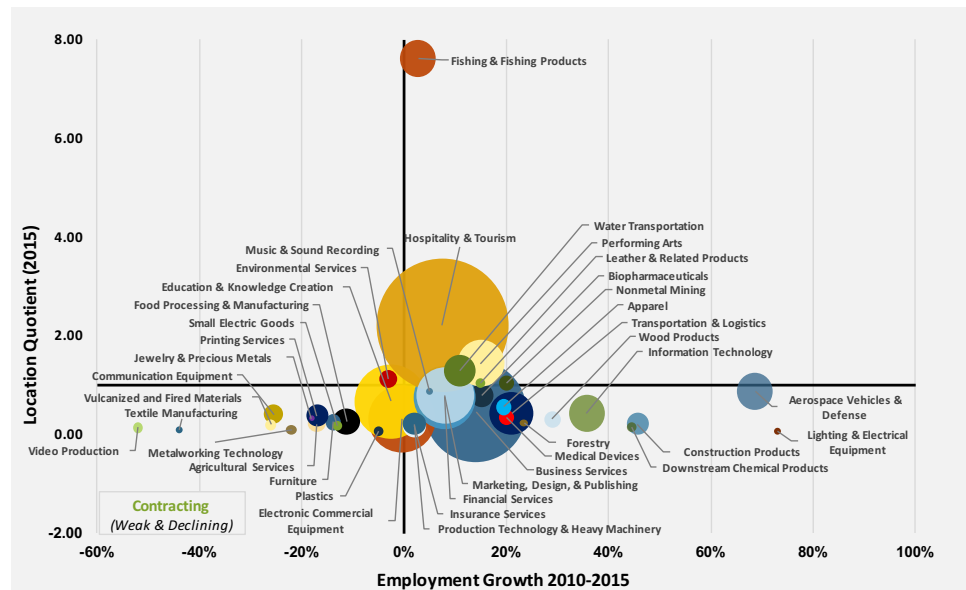
In order to compare regions of different sizes based on how concentrated a particular industry is as a percentage of the workforce, a measure called the location quotient (LQ) is used. Industries which have both a high LQ and relatively high total job count typically form a region's economic base. Economic developers and government officials should pay particular attention to these industries not only for the jobs they provide, but also for their multiplier effect—the jobs they create in other connected industries like retail trade and food services.¹²

The same industry clusters examined previously were examined from 2010 to 2015 in terms of LQ and growth. Barnstable County is highly specialized in the Fishing & Fishing Products cluster, with an LQ of 7.6. Additionally, the county also has a considerably high LQ in Hospitality & Tourism (2.2), a cluster that has grown eight percent since 2010. Other clusters that grew from 2010 to 2015 and have above average employment levels include Performing Arts, Water Transportation, Leather & Related Products, and Nonmetal Mining (see Figure 25).

Provincetown is highly specialized in Transportation & Logistics compared to the nation, with an LQ of 37.0, which is mostly due to the municipal airport. Similar to Barnstable County, Provincetown is specialized in both the Fishing & Fishing Products and the Hospitality & Tourism clusters (LQs 11.6 and 7.0, respectively). While the Hospitality & Tourism cluster grew by 5.7 percent during the five-year period, the Fishing & Fishing Products cluster shrank by 7.5 percent (see Figure 26).

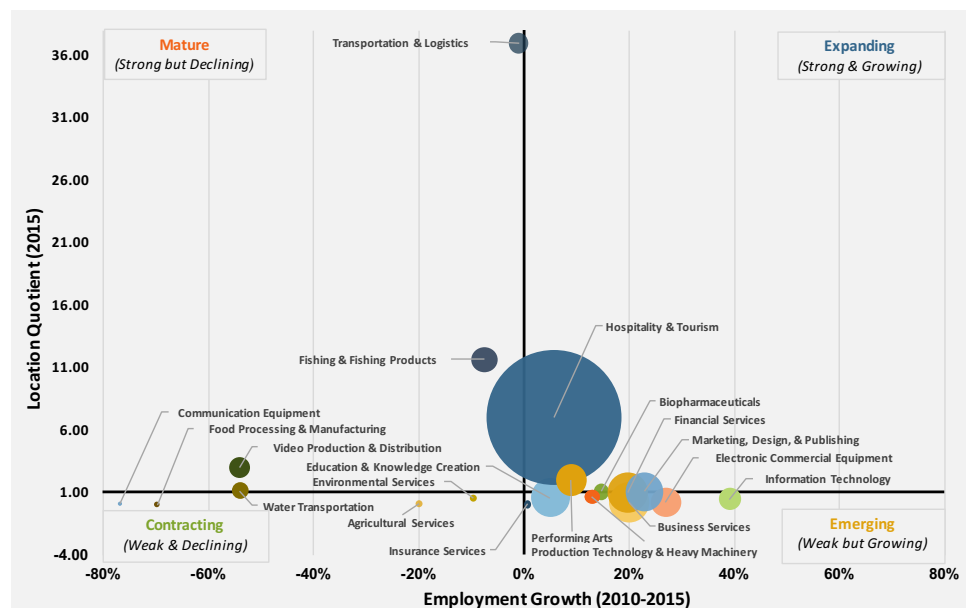
¹² Sentz, Robert. Understanding Location Quotient. EMSI. (14 October 2011).

Figure 25: Industry Clusters by Location Quotient and Employment Growth, Barnstable County, 2010–2015



Source: EMSI, Industry Group Comparison, 2010–2015

Figure 26: Industry Clusters by Location Quotient and Employment Growth, Provincetown, 2010–2015¹³



Source: EMSI, Industry Group Comparison, 2010–2015

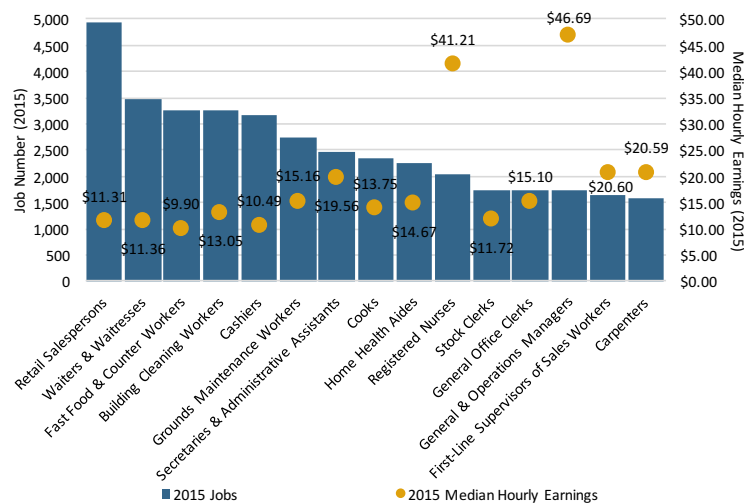
¹³ Clusters with zero jobs are not shown in the bubble chart.

2.4.4 Occupations

The largest occupations in Barnstable County and Provincetown are unsurprising given the region's industrial mix. For both Barnstable County and Provincetown, Retail Salespersons (4,946 and 197, respectively) and Waiters & Waitresses (3,462 and 180 respectively) are the largest occupational groups (see Figure 27 and Figure 28).

In Barnstable County, the highest paid occupation in 2015 was General & Operations Managers, who were paid \$46.69 per hour; 1,720 people were employed in this occupation in 2015. The lowest paid workers are the region's 3,271 Fast Food & Counter Workers, who earned a median wage of \$9.90 per hour in 2015. From 2010 to 2015, the fastest growing occupations in Barnstable County were Ground Maintenance Workers and Fast Food & Counter Workers, which added 466 and 417 jobs, respectively (see Table 7).

Figure 27: Largest Occupations, Barnstable County, 2015



Source: EMSI, Highest Ranked Occupations, 2015

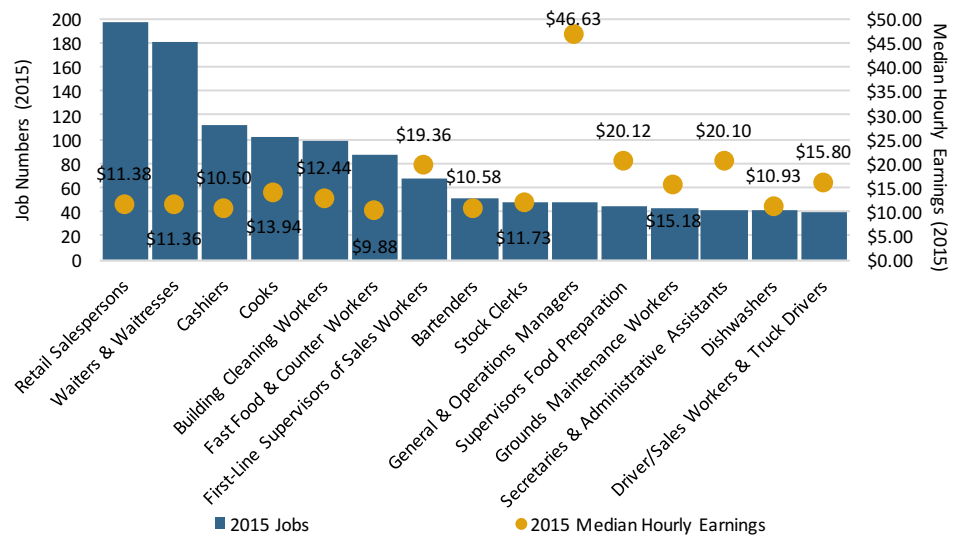
Table 7: Top Ten Fastest Growing Occupations, Barnstable County, 2010–2015

Industry	2010 Jobs	2015 Jobs	Change	% Change
Grounds Maintenance Workers	2,277	2,744	466	20%
Fast Food & Counter Workers	2,854	3,271	417	15%
Building Cleaning Workers	2,964	3,261	298	10%
Cashiers	2,903	3,174	272	9%
Construction Laborers	1,238	1,483	246	20%
Waiters & Waitresses	3,221	3,462	241	7%
Stock Clerks & Order Fillers	1,562	1,747	186	12%
Cooks	2,158	2,338	181	8%
General & Operations Managers	1,583	1,720	137	9%
Elementary & Middle School Teachers	1,384	1,517	132	10%

Source: EMSI, Highest Ranked Occupations, 2010–2015

The top occupations in Provincetown are primarily service occupations connected to the Hospitality & Tourism cluster (see Figure 28). However, there is some growth in medical occupations. The fastest growing occupations in 2015 were Emergency Medical Technicians & Paramedics (+17 jobs), Miscellaneous Healthcare Support Occupations (+14 jobs), Waiters & Waitresses (+10 jobs), and Fast Food & Counter Workers (+10 jobs) (see Table 8). Wages in Provincetown are similar to Barnstable County.

Figure 28: Largest Occupations, Provincetown, 2015



Source: EMSI, Highest Ranked Occupations, 2015

Table 8: Top Ten Fastest Growing Occupations, Provincetown, 2010–2015

Industry	2010 Jobs	2015 Jobs	Change	% Change
Emergency Medical Technicians & Paramedics	18	35	17	91%
Miscellaneous Healthcare Support	13	27	14	107%
Waiters & Waitresses	170	180	10	6%
Fast Food & Counter Workers	77	87	10	13%
Cashiers	103	111	8	8%
Building Cleaning Workers	92	99	7	8%
Cooks	96	102	6	6%
Stock Clerks & Order Fillers	42	48	6	15%
General & Operations Mangers	43	48	5	11%
Grounds Maintenance Workers	36	42	5	15%

Source: EMSI, Highest Ranked Occupations, 2015

2.5 HOUSING

Provincetown has a persistent housing crisis, with an inadequate supply of affordable housing for year-round residents and seasonal employees. According to the *Provincetown Housing Playbook*, the lack of affordable housing has resulted in the out-migration of many year-round residents and families, which in turn has led to the closing of the high school and a decrease in the year-round population by 14 percent from 2000 to 2010.¹⁴

The following section provides updated information and context to better understand the local housing stock, housing occupancy patterns, and cost burden.

Highlights:

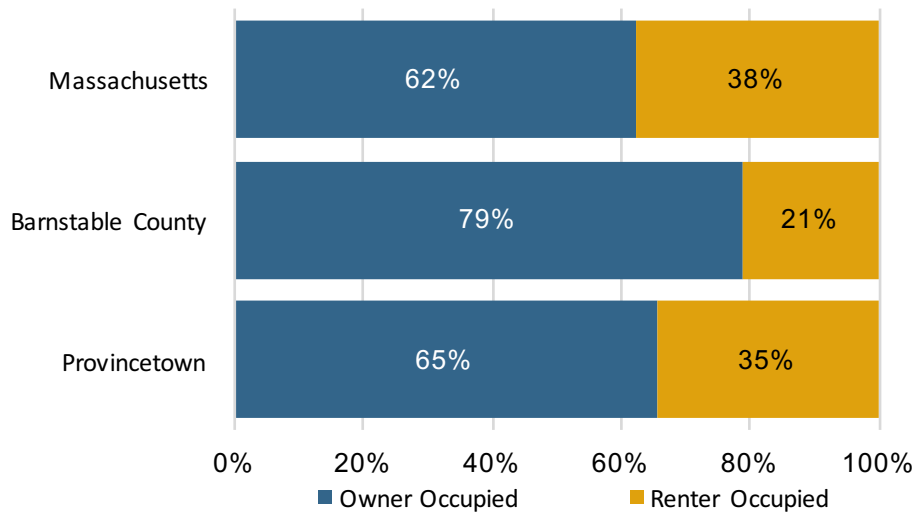
- Provincetown had a low year-round housing occupancy rate in 2015 (39.5%) compared to Barnstable County (61.8%) and the state as a whole (90.2%)—with seasonal residency increasing over time.
- There was no appreciable change in the number of housing units in Provincetown between 2009 and 2015. Over this time, there was a slight increase in the percentage of multi-unit buildings, which is likely the result of condominium conversions.
- For the past 20 years, Provincetown has had higher housing costs than Barnstable County, Boston, and Massachusetts. At the end of 2016, the median price per square foot was 121 percent higher than Barnstable County, 150 percent higher than Massachusetts, and 16 percent higher than Boston.
- 64 percent of renters spent more than 35 percent of their incomes on rent in 2015 (64.2%), compared to 40 percent for the state. 39 percent of renters spent more than 50 percent of their income on rent. This housing affordability problem has worsened since 2010.

¹⁴ Panagore, David, et al. (2016). *Provincetown Housing Playbook*. Technical Report. Retrieved from <http://www.provincetown-ma.gov/DocumentCenter/View/6072>

2.5.1 Housing Occupancy

The vast majority of Barnstable County's housing units are owner occupied. With a 78.8 percent owner occupancy rate, the region has a higher portion of owner-occupied housing units than the state (62.1%). Although a smaller proportion than Barnstable County, Provincetown's housing units are mostly owner occupied (65.4%), which is slightly higher than the state average.

Figure 29: Housing Tenure, 2015



Source: 2011-2015 ACS 5-Year Estimates

Provincetown had a low year round housing occupancy rate in 2015 (39.5%) compared to Barnstable County (61.8%) and the state as a whole (90.2%). Between 2010 and 2015, seasonal housing units have increased roughly three percentage points in Provincetown.

Figure 30: Seasonal and Year Round Housing Units, 2010–2015

	2010			2015		
	All Units	Seasonal	Year-Round	All Units	Seasonal	Year-Round
Provincetown	4,478	51.7%	42.6%	4,517	55.6%	39.5%
Outer Cape	17,730	57.5%	39.1%	18,176	62.0%	35.4%
Lower Cape	29,833	42.0%	54.1%	30,232	45.4%	50.9%
Mid Cape	59,728	30.1%	65.7%	60,236	33.7%	61.7%
Upper Cape	51,547	27.1%	69.6%	52,667	28.9%	67.2%
Barnstable County	158,838	34.4%	61.8%	161,311	37.5%	58.5%
Boston	270,470	0.6%	90.9%	278,521	1.1%	92.0%
Massachusetts	2,786,077	4.0%	90.2%	2,827,820	4.4%	90.2%

Source: 2006–2010 and 2011–2015 ACS 5-Year Estimates

2.5.2 Housing Stock

The majority of Barnstable County's occupied housing units are single-unit buildings; 84.6 percent in 2015. However, the opposite is true for Provincetown, where only 39.3 percent of housing units are single-unit buildings. Barnstable County's housing stock has not changed considerably over time, that is, total units have increased by only 4.0 percent since 2009. In Provincetown, the total number of housing units remained flat from 2009 and 2015. Over this time, there was a slight increase in the percentage of multi-unit buildings, which likely reflects condominium conversions.

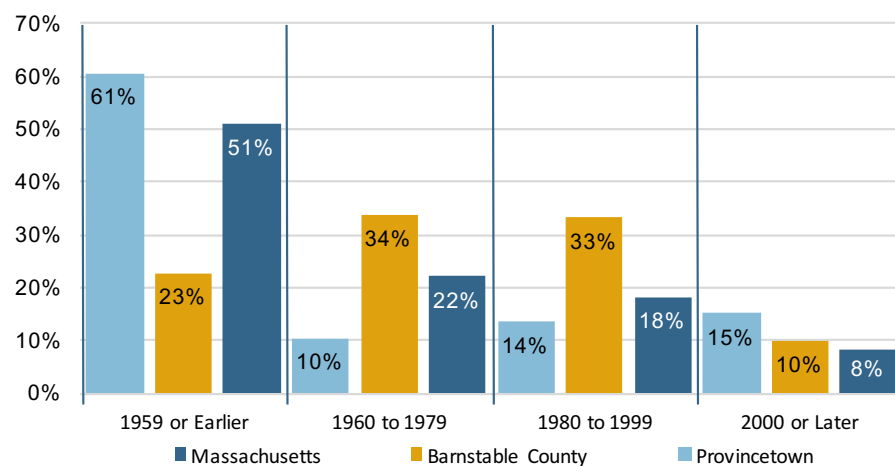
Table 9: Occupied Housing Units by Units in Structure, 2009–2015

	Massachusetts		Barnstable County		Provincetown	
	2009	2015	2009	2015	2009	2015
Total Units:	2,727,374	2,827,820	154,792	161,311	4,520	4,517
In Single-Unit Building	57.7%	57.4%	86.1%	84.6%	46.2%	39.3%
In Multi-Unit Building	42.3%	42.6%	13.9%	15.4%	53.8%	60.7%

Source: 2005–2009 ACS 5-Year Estimates, 2011–2015 ACS 5-Year Estimates

Barnstable County's housing stock is younger than that of the state, with 43.4 percent of housing units developed between 1980 and 2015, compared to 26.8 percent statewide. Provincetown also has a slightly more contemporary housing stock when compared to the state, with 29 percent of housing units built during this same period. While the majority of housing units were built 1959 or earlier for both Massachusetts and Provincetown, Barnstable County built most of its housing units between 1960 and 1999.

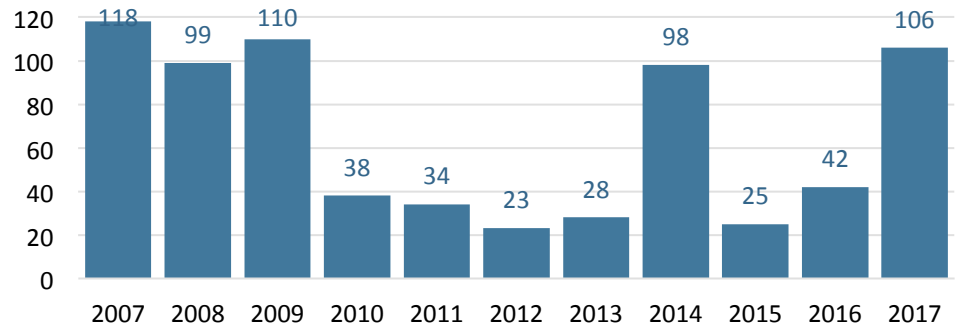
Figure 31: Total Housing Units by Year Structure Built, 2015



Source: 2011–2015 ACS 5-Year Estimates

Since 2007, there have been 721 condo conversions in Provincetown. Condo conversions are defined here as the change of ownership of the entire property to individually owned units allowing more individuals to own condominiums.

Figure 32: Provincetown Condo Conversions

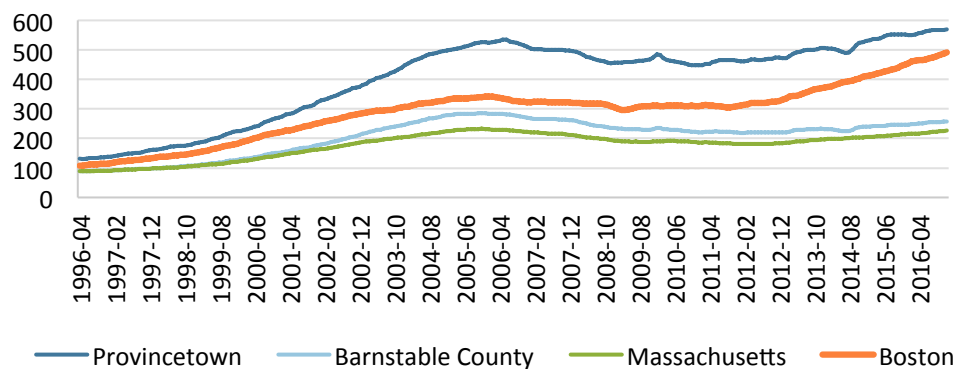


Source: Town of Provincetown

2.5.3 Housing Affordability

Provincetown had the highest median home price per square foot for the past 20 years in comparison to Barnstable County, Boston, and Massachusetts (see Figure 33). At the end of 2016, the median price per square foot was 121 percent higher than Barnstable County, 150 percent higher than Massachusetts, and 16 percent higher than Boston.

Figure 33: Median Home Price per Square Foot, 1996 to 2016



Source: Zillow Home Value Index

Housing costs are defined to be burdensome when they are at or above 35 percent of income. In Provincetown, the majority (64%) of renters are cost burdened—a figure that has risen since 2010—and 39 percent of renters spent more than 50 percent of their income on rent.¹⁵ In comparison, over the past five years, the share of cost burdened rental households has remained stable statewide (40.4% in 2010, 40.5% in 2015).

Table 10: Cost Burdened Rental Households, 2010–2015

	2010		2015	
	Year-Round Renter Households	Spending 35% of Income or More on Rent	Year-Round Renter Households	Spending 35% of Income or More on Rent
Provincetown	592	57.6%	617	64.2%
Outer Cape	1,451	43.8%	1,401	54.9%
Lower Cape	3,061	33.2%	2,831	39.5%
Mid Cape	8,983	43.9%	5,872	44.6%
Upper Cape	5,789	40.3%	7,055	34.2%
Barnstable County	19,284	41.1%	17,159	40.3%
Boston	159,964	42.9%	168,836	41.4%
Massachusetts	904,078	40.4%	966,054	40.5%

Source: 2006–2010 and 2011–2015 ACS 5-Year Estimates

¹⁵ Percent of renters who spent more than 35 percent of income on rent from the 2011–2015 5-Year ACS and percent of renters who spent more than 50 percent of income on rent from the 2010–2014 5-Year ACS via a special tabulation for the U.S. Housing and Urban Development CHAS dataset.

3 FRESH AND WASTE WATER USAGE AND CAPACITY

Highlights:

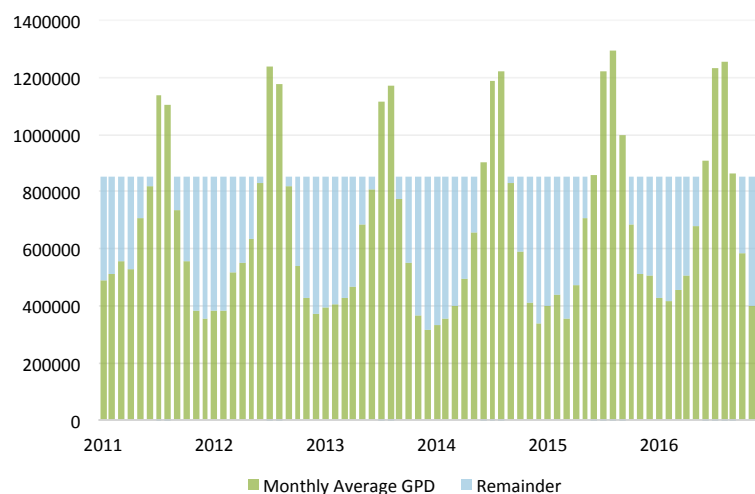
- Fresh and wastewater usage patterns reflect the seasonal nature of the Provincetown economy.
- Total fresh water usage changed very little from 2011 to 2016. Total gallons increased during this time at an average annual growth rate of just 0.76 percent.
- The 30,000 gallons of optional Title 5 wastewater reserves are estimated to protect against an additional 1.4 inches of rain.

3.1 FRESH WATER USAGE

The Massachusetts Department of Environmental Protection (Mass DEP) permits Provincetown to withdraw an average of 850,000 Gallons Per Day (GPD), (GPD), with non-compliance at 950,000 GPD. The monthly and annual average GPD are shown in Figure 34 and

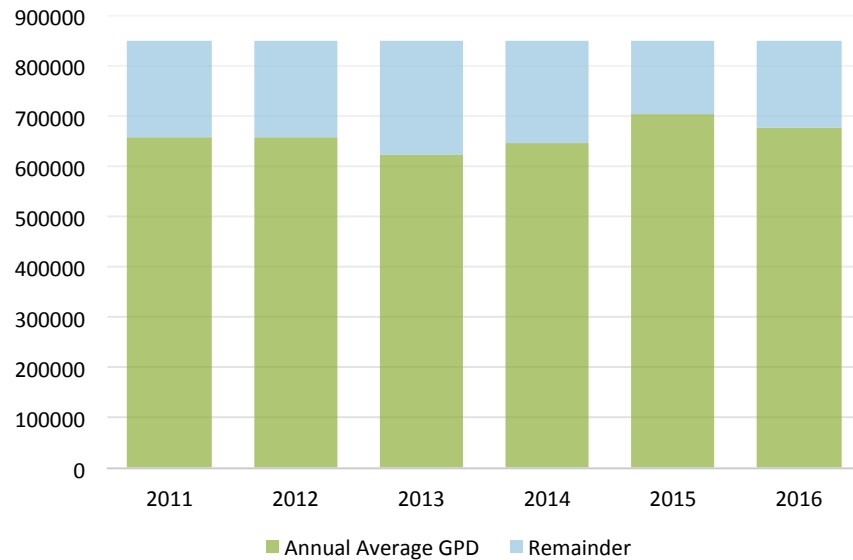
Figure 35 in green, with the difference between the average GPD and the maximum permitted amount shown in blue. Not surprisingly, the average water withdrawals display a seasonal pattern, with withdrawals exceeding the permitted average in the summer and falling far below this amount in the winter. Total fresh water usage changed very little from 2011 to 2016. During this time total gallons increased at an average annual growth rate of 0.76 percent.

Figure 34: Monthly Average Water Withdrawals, 2011–2016



Source: Town of Provincetown

Figure 35: Yearly Average Water Withdrawals, 2011–2016



Source: Town of Provincetown

3.2 WASTEWATER USAGE

The Provincetown Municipal Wastewater System was originally planned to serve only the downtown area businesses and properties that could not meet the requirements of Title 5 when their onsite septic system failed. However, there has been a strong demand for additional flow allocations and more connections ever since. To meet this additional interest, the Department of Public Works increased the overall capacity of the wastewater system through studies for Mass DEP determining the relationship between design flow and gallons of actual flow, system operating improvements, and the use of nearly \$11 million in grants plus low-interest loans to fund major capital projects.¹⁶

The wastewater collection system now serves a majority of the low-lying and waterfront areas from the Cape Cod National Seashore Park to the Truro town line. The Treatment Plant and disposal beds are permitted for 750,000 gallons per day of actual flow on the maximum flow day (MDF). After taking into account a mandatory 10 percent reserve that is needed for plant operations during large flow events, the Town is able to permit connections to the sewer for 1,121,000 gallons per day (GPD) of Title 5 design flow. At the present time,

an optional 30,000 MDF of this amount is also being held in reserve to ensure that the 10% amount will be adequate.¹⁶

Historically, the ratio of the maximum daily flow (MDF) to the Title 5 design flow connections has been at or below 60 percent, with some exceptions. In other words, each gallon of design flow accounts for just 0.6 gallons of actual flow on the maximum usage day. For this reason, this ratio has been used to determine how much Title 5 design flow can be built without exceeding the 750,000 gallons that can be processed on any given day at the Wastewater Treatment Facility.

All instances of this ratio exceeding 60 percent occurred on peak tourism days: the days on or around the 4th of July and Carnival (see Table 11). Notably, this can and does occur regardless of whether there is any rain, which infiltrates the system and increases total flow.

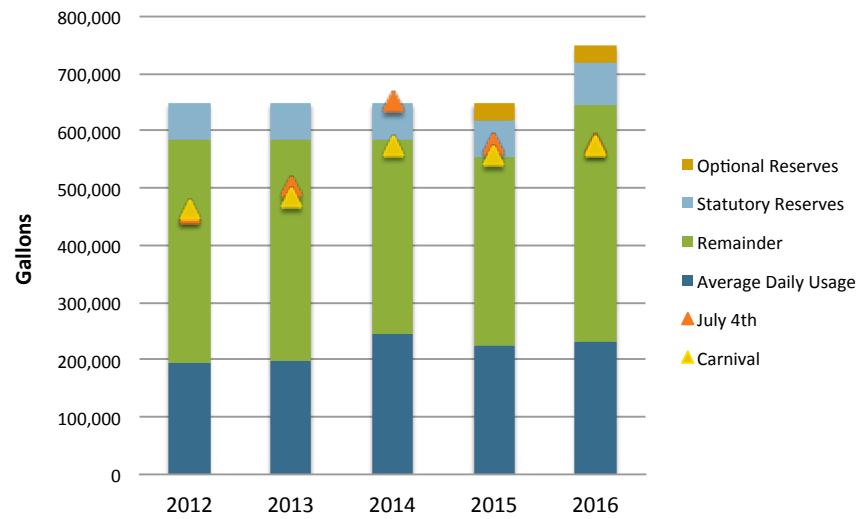
Table 11: Days When Flow Was Greater Than 60% of Title 5 Capacity, January 2006–February 2015

Date	Rain (Inches)	Ratio	Date	Rain (Inches)	Ratio
7/2/06	0	67.0%	8/18/06	0	62.0%
7/3/06	0	67.6%	8/19/06	0	63.8%
7/4/06	0	71.8%	8/20/06	0.5	61.8%
8/5/06	0.01	69.3%	7/4/07	0	64.7%
8/6/06	0	69.4%	7/3/11	0	60.8%
8/11/06	0.88	64.0%	7/4/11	0	60.4%
8/12/06	0	64.9%	8/18/11	0	60.2%
8/13/06	0	62.2%	8/16/12	0.44	60.8%
8/15/06	0.11	63.6%	7/4/14	1.13	67.6%
8/16/06	0.01	63.6%	7/5/14	0.99	70.7%
8/17/06	0	70.7%	8/21/14	0	61.1%

Source: Town and Provincetown and PPC Calculations

Figure 36: Yearly Average Wastewater Usage with Peak Events, 2012–2016

¹⁶ 2016 Provincetown Growth Management Report. Retrieved from <http://www.provincetown-ma.gov/DocumentCenter/View/8392>



Source: Town of Provincetown

Historically, the statutory reserves have been more than enough to cover the need for additional capacity on peak event days (see Figure 36). The only exception to this pattern occurred on July 4 and 5 of 2014, when the holiday tourism surge and unusually heavy rains caused the wastewater flow to exceed the permitted amount. However, it is unclear whether the 2014 event was an anomaly, corrected by subsequent improvements to the system and improved plant operations. For these reasons, it was necessary to use the historical data to determine the relationship between the number of connections and total flow, while being able to control for seasonality, holidays, and rain.

Between January of 2006 and February of 2017, total wastewater flow has never exceeded the amount experienced on July 5th, 2014, when 657,199 gallons entered the Town's system. The second highest amount was 627,932, which occurred on July 4th, 2014. Since then, total flow has never exceeded 600,000, despite an increasing number of sewer connections. Due to the highly seasonal nature of the Provincetown economy, the average daily flow is far lower than that, at 179,281 (see Table 12).

Table 12: Distribution of Daily Usage (Gallons), January 2006–February 2017

Minimum	25th Percentile	Median	Mean	75th Percentile	Maximum	NAs
24,013	92,000	134,122	179,281	242,095	657,199	45

Source: Town and Provincetown and PPC Calculations

Table 13: Holidays When Total Rain Exceeded 0.25 Inches, 2006–2016

Date	Influent (MDF)	Connections	Ratio	Rain (inches)
7/5/06	291,132	502,228	57.97%	0.32
7/5/07	309,832	529,080	58.56%	0.82
8/16/12	483,502	794,870	60.83%	0.44
7/4/14	627,632	928,946	67.56%	1.13
7/5/14	657,199	928,946	70.75%	0.99
7/5/16	519,456	1,000,206	51.93%	0.88

Source: Town of Provincetown, NOAA rain data for Barnstable, and PPC Calculations

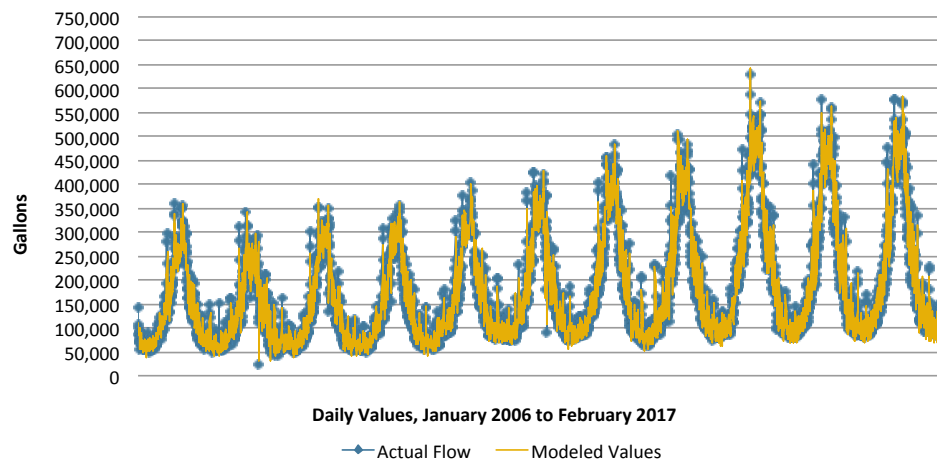
In order to predict the worst case scenario under current conditions, the historical wastewater flow was modeled as a function of precipitation, yearly and weekly demand fluctuations, the number of sewer connections in terms of Title 5 capacity, and whether it is one of the days on or surrounding the July 4th or Carnival Parade (labeled "Holiday").¹⁷

¹⁷ Weekly and yearly seasonality were isolated using an exponential smoothing state space model with a Box-Cox transformation. Errors modeled as an ARMA (4,5) process to adjust for serial autocorrelation (in other words, the tendency of yesterday's wastewater flow to affect the amount that needs to be processed today).

The model does not account for repairs to the system, which reduces the amount of precipitation and ground water that enters the system. It also does not account for the learning curve associated with the addition of an equalization basin, which came on-line in 2013.

The observed and modeled values match closely, with a correlation of 0.986. Indeed, the model appears to be able to predict extreme events (see Figure 37). The regression results indicate that an inch of rain is associated with 12,069 gallons of increased wastewater flow and that “holidays” are associated with 22,300 gallons of additional flow on top of the non-holiday summer average. Both of these effects are highly statistically significant.

Figure 37: Daily Waste Water Flow, Observed and Modeled Values



Source: Town of Provincetown, NOAA, and PPC Calculations

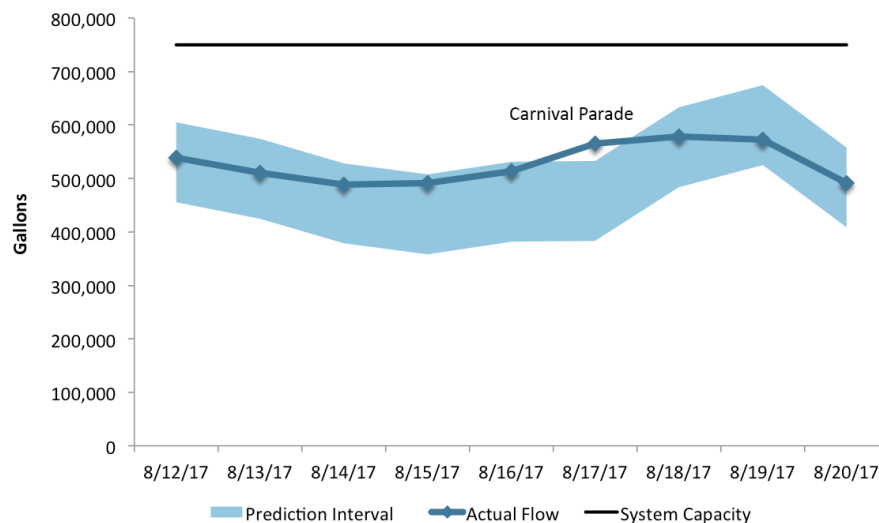
Table 14: Regression Results

	Precipitation	Connections	Holiday
Coefficient	12,069.3	0.24	22,300.2
Standard Error	840.5	0.0032	3389.4
P-Value	< 0.000001	< 0.000001	< 0.000001

Source: PPC Calculations

To test the predictive value of the time series model, it was used to forecast the wastewater flow for the week of the 2017 Carnival Parade. For nearly all of the values, the 95 percent prediction interval captures the true value of the amount of flow. The one exception is the day of the Carnival Parade. This is likely to be the result of treating the Carnival Parade, the 4th of July, and the days before and after these events as being equal. On this day, the actual flow was 5.6 percent higher than the upper limit of the prediction interval.

Figure 38: Comparison of Statistical Forecast to Actual Wastewater Flow, Provincetown, August 12th to August 20th, 2017



Source: Town of Provincetown and PPC Calculations

The same forecasting technique was also used to test the scenarios in which all of the Title 5 connections are made, and varying levels of optional reserves are held. Using the more conservative lower-end estimate, Provincetown could experience between 6.5 and 7.9 inches of rain on a peak summer tourism day before exceeding the capacity of the wastewater facility, depending on the amount of optional reserves that are held. In other words, the 30,000 gallons of optional Title 5 reserves are estimated to protect against an additional 1.4 inches of rain.

Table 15: Forecasted Precipitation Amount (Inches) Needed to Exceed Plant Capacity

Reserve Amount	Lower Estimate	Midpoint	Upper Estimate
0	6.5	12.8	16.8
5,000	6.8	12.9	17.1
10,000	6.9	13.2	17.3
15,000	7.2	13.4	17.5
20,000	7.4	13.7	17.7
25,000	7.6	13.9	18
30,000	7.9	14.1	18.2

Source: PPC Calculations

Unfortunately, there is only a very limited amount of historical precipitation data for Provincetown, so it is almost impossible to determine how likely it is for the town to experience the levels of rain presented in Table 15. These results highlight the tradeoffs between the protective effect of the optional reserves and the desire to promote economic development and increase tax revenues.

4 ECONOMIC ACTIVITY

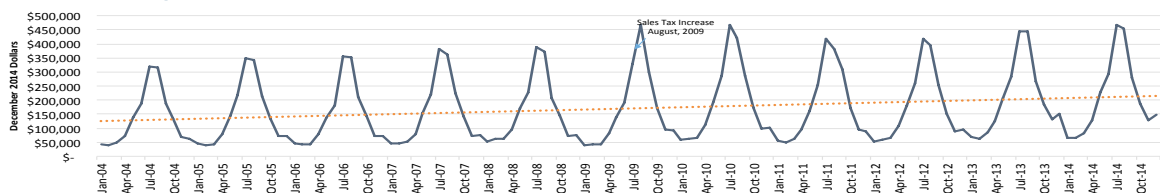
Highlights:

- Inflation-adjusted sales, room, and meals tax payments display a modest but consistent increase over time, suggesting that tourism is increasing, prices are rising faster than inflation, or possibly both.
- June meal tax payments (which includes collections from February, March, and April) have increased at an average annual growth rate of 7 percent, which could indicate some success in expanding the tourism season. However, no change is observed during the winter months.
- Most new housing construction being permitted on the Cape is for single-family homes.
- The total number of business licenses was flat from 2010 to 2015 in Provincetown, even as the state and the nation were going through an economic expansion. Furthermore, the number of new business licenses has been on a downward trend since 2007.

4.1 EXCISE TAXES

State sales tax collections show a modest but consistent increase since from 2004 to 2014. Figure 39 displays the monthly sales tax revenue filed by businesses in Provincetown, correcting for the 2009 sales tax increase and inflation.¹⁸ Consistent with other data displaying the seasonality of the Provincetown economy, more sales are made in the summer months than other months. Off-season (January), sales have increased at an average annual growth rate of 6.6 percent while sales have increased at an average annual growth rate of 4.9 percent during peak season (July).

Figure 39: Sales Tax Collections, Provincetown, Constant Dollars, 2004–2014

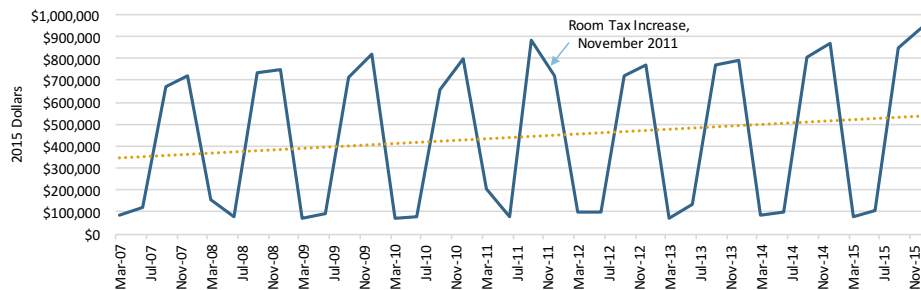


Source: Massachusetts Department of Revenue

¹⁸ There are a couple of issues affecting the ability of sales tax data to accurately reflect the location the sales are made: business that operate in more than one location generally file a single tax return and the address on the return might be for a corporate headquarters or accountant's office. Accordingly, these data should be interpreted cautiously.

Like the state sales tax, room tax collections show a modest but steady increase (see Figure 40). This data was adjusted for inflation and the 2011 room tax rate increase. From 2007 to 2015, annual room tax collections increased from \$1,601,753 to \$1,980,268—an increase of 24 percent.¹⁹

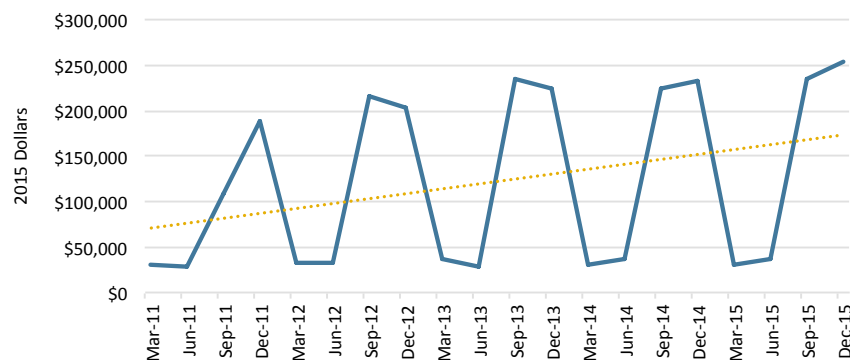
Figure 40: Room Tax Payments, Constant 2015 Dollars, Provincetown, 2007–2015



Source: Provincetown Document Center, 2007–2015

The meals tax data show a substantial increase in collections from 2011 to 2015, but all of the increase is in the summer months, with no increase in the winter season (see Figure 41). Quarterly, the largest payments are made in the September and December. Since those payments contain summer month tax collections, it can be assumed that tourists contribute greatly to the increase every year. One promising trend is that June meal tax payments (which includes collections from February, March, and April) have increased at an average annual growth rate of 7 percent, which could indicate some success in expanding the tourism season.

Figure 41: Meal Tax Payments, Constant 2015 Dollars, Provincetown, 2011–2015



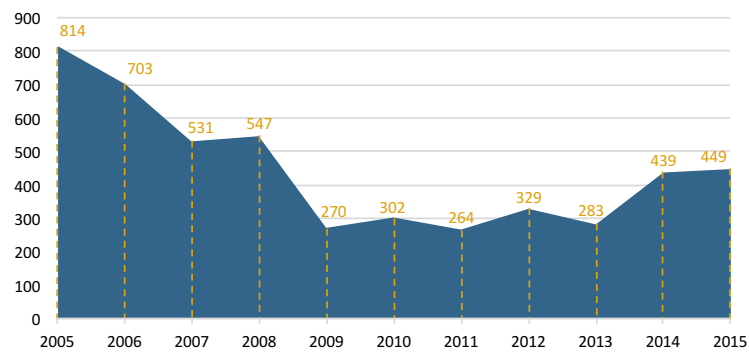
Source: Provincetown Document Center, 2011–2015

¹⁹ For room and meal taxes, the quarterly payment data does not accurately represent which months are included. A March payment includes November, December, and January tax collections. A June payment includes February, March, and April tax collections. A September payment includes May, June, and July tax collections. Lastly, a December payment includes August, September, and October tax collections.

4.2 HOUSING PERMITS

Most of the housing construction in Barnstable County in recent years has been single-family homes. Building permit estimates show that 5,385 new units were approved between 2005 and 2015. During this period, an estimated 4,931 single-family homes were permitted.

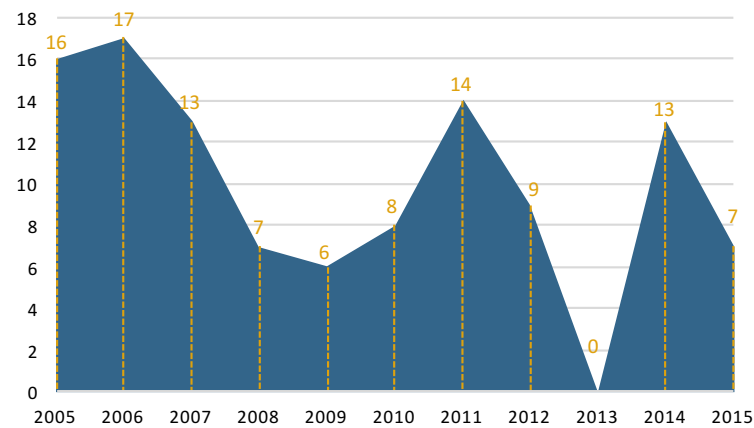
Figure 42: Single-Family Building Permits, Barnstable County, 2005–2015



Source: ACS 2010–2014 5-Year Estimates, Census of Building Permits

Between 2005 and 2015, 110 building permits were issued for the construction of a new residential structure in Provincetown (see Figure 43).²⁰ Despite this, the Census housing unit data shows no appreciable increase in the number of housing units. It may be that most of the new buildings were built for seasonal use, which is not included in Census data, or replaced an existing structure.

Figure 43: New Construction Residential Building Permits, Provincetown, 2005–2015



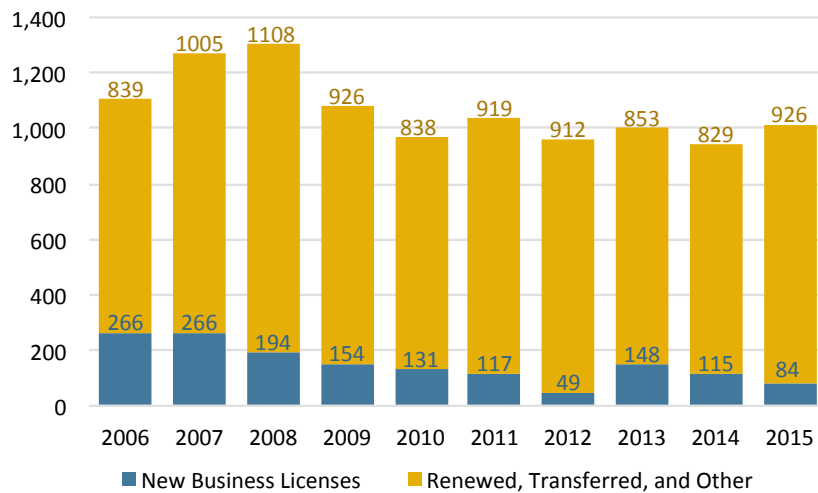
Source: Provincetown, Building Permits Issued, 2005–2015

²⁰ Data are unavailable for the second half of 2012 and all of 2013.

4.3 NEW BUSINESS LICENSES

Provincetown approved 1,524 new business licenses between 2006 and 2015. Thirty-five percent (35%) of all new business licenses were approved within the first two years of this ten-year period. New approved business licenses follow a downward trend, decreasing from 24 percent of all approved licenses in 2006 to 8 percent in 2015 (see Figure 44). More than half of new licenses approved in 2006 were renter certifications (57%) whereas taxicab operator licenses made up the most approved new business licenses in 2015 (30%). Altogether, 10,679 business licenses were approved between 2006 and 2015.

Figure 44: Business Licenses, Provincetown, 2006–2015



Source: Provincetown, Approved Business Licenses, 2006–2015

Table 16: New Business Licenses, 2014 and 2015

License Type	Count
Transportation	69
Retail	45
Food Service	33
Other	21
Alcohol	15
Fortune Tellers	5
Food Manufacturing	4
Accommodations	3
Entertainment	4
Total	199

Source: Town of Provincetown

5. SUMMARY OF CONCLUSIONS AND NEXT STEPS

As the analysis contained in the preceding pages makes crystal clear, Provincetown has a highly seasonal economy. This can be seen in various economic indicators including employment (see Figure 13), fresh and waste water usage (see Figure 34 and Figure 37), and consumer spending as measured by tax receipts (see Section 4.1). The summer surge of both tourists and seasonal residents places a strain on the town's infrastructure, especially housing and wastewater processing. These resources are overtaxed in the summer and under-utilized in the winter.

The peak season demand for wastewater processing capacity has been particularly problematic in that it has created a physical constraint on individual business growth and overall economic growth. The wastewater processing plant must be designed to handle the flow on the maximum usage day. Each year this occurs either during Carnival week in August or near the Fourth of July. The availability of new wastewater connections or expanded Title 5 Design Flow is limited by the difference between these peaks events and the total processing capacity, which is currently 750,000 gallons per day. After accounting for reserves required by the Mass DEP and additional reserves that were set aside by the Board of Selectmen to insure that the mandatory reserves would be adequate to meet peak demand, a limited amount of wastewater capacity is available to support new housing and expanded business development to support both off season and peak season demand. Presently, the remaining wastewater capacity is allocated into priority categories that are described in the Town's Growth Management Plan.

Partly as a result of this peak demand problem, in recent years Provincetown has experienced several troubling demographic and economic trends including:

A declining population: from 2000 to 2015, population decreased slightly in Provincetown and on the Cape in general, even as population growth continued across Massachusetts.

An increasingly unaffordable housing market: For the past 20 years, Provincetown has had a higher median home price per square foot than Barnstable County, Boston, and Massachusetts.

Sluggish new business activity: The total number of business licenses was flat from 2010 to 2015, even as the state and the nation were going through an economic expansion. Furthermore, the number of new business licenses has been on a downward trend since 2007.

Our analysis suggests that Provincetown may have more capacity to support growth than the assumptions built into its current growth management policies imply. Provincetown can decrease the amount of optional wastewater reserves without having a large impact on the amount of precipitation the system can handle on the busiest tourism days. (See table below.) These results highlight the tradeoffs between the protective effect of the optional reserves and the desire to promote economic development and increase tax revenues. However, it is clear that over the long run, Provincetown will need to expand its permitted wastewater capacity if highly seasonal growth patterns persist over time.

Forecasted Precipitation Amount (Inches) Needed to Exceed Plant Capacity

Reserve Amount	Lower Estimate	Midpoint	Upper Estimate
0	6.5	12.8	16.8
5,000	6.8	12.9	17.1
10,000	6.9	13.2	17.3
15,000	7.2	13.4	17.5
20,000	7.4	13.7	17.7
25,000	7.6	13.9	18
30,000	7.9	14.1	18.2

Source: PPC Calculations

These findings underscore the opportunity to support more growth in housing and business activity that serves year-round residents and uses. This is not a new challenge and opportunity for Provincetown but it is clear that the price associated with status quo development patterns is rising and significantly limiting the growth management options available to Town leaders.

While efforts to promote the “shoulder seasons” of fall and spring tourism are ongoing both in Provincetown and Cape Cod, it is clear that there is a need for creative alternative approaches to encouraging and supporting more year-round activity. It is our sincere hope that, informed by the evidence contained in this report, Provincetown’s leaders can work together to find economically and environmentally sustainable strategies to managing its growth.