St. Mary's County, Maryland
Comprehensive Economic Development Study
& Proposed Strategy
(CEDS)

Revised 05/2016

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Contents

List of Figures

List of Tables

Introduction

Introduction

Throughout 2014 and 2015, the St. Mary's County Economic Development Commission (EDC) engaged in a series of meetings and planning sessions to examine current and projected economic conditions in the County and develop this Comprehensive Economic Development Strategy (CEDS) to guide future growth. This effort was supported by several academics and consultants who produced background studies, facilitated meetings, and transformed all of the pieces into this report. Throughout the process, EDC staff provided invaluable background information, coordinated meetings, and engaged various firms and community groups in parts of the process. This CEDS was built around the vision, goals, and objectives developed by the EDC and the unique opportunities available to St. Mary's County in the next five years.

Vision and High-Level Goals

Through its meetings, the EDC developed a vision and a set of high-level goals to help structure and guide the development of CEDS strategies. The vision of the EDC is to focus broadly on enhancing the quality of life, supporting business development, and strengthening workforce development in St. Mary's County. Table 1 summarizes high-level goals, rationale, and expected outcomes developed by the EDC.

Quality of Life	Business Development	Workforce Development
Goals		
Enhance the quality of life in St. Mary's County	Create an environment that attracts and retains quality employers, supports business expansions, and helps new businesses form.	Strengthen human capital to ensure a qualified workforce for today's business and for businesses of the future.
Why		
A high quality of life is desired by our residents and helps retain and attract businesses and residents. It is a primary component for a vibrant and growing economy.	A robust local economy provides the means for St. Mary's County residents to be gainfully employed and have a high standard of living.	Businesses need an educated and trained workforce to succeed.
What this means (Outcomes)		
Stronger, growing middle class	Lower unemployment	Training/education efforts are matched to business needs
Stronger, more resilient communities	Higher-wage jobs	Adequate number of workers are available today to meet the needs of local firms
Improved public infrastructure, services, and amenities	More businesses	Businesses can retain workers
Higher wages / lower unemployment rate	More innovation	College graduates are retained and attracted to St. Mary's County
lower cost of living	More start-ups	Businesses that are looking to expand into St. Mary's County are assured of available workers

Table 1. *High-Level Economic Development Goals Established by the Economic Development Commission*

Challenges and Unique Opportunities for St. Mary's County

The geography, historical development, and other characteristics of St. Mary's County present economic development challenges. For example, while the defense industry has had an overwhelmingly positive affect on the County, the EDC identified economic diversification as a significant focus of the CEDS. However, the very conditions that have helped the defense sector grow and become strong will continue to favor growth in that sector over other industries, such as manufacturing, that could lead to diversification. At the same time, the County has a deep concentration of talent and capacity related to the development of Unmanned Aerial Systems (UAS), or drones. Commercial applications of UAS technologies are still in their infancy. Combined with the emergence of additive manufacturing technologies and the County's proximity to Washington, D.C. and multiple federal agencies, the emerging market for commercial UAS products presents the County with significant entrepreneurial opportunities.

Structure of the Report

Chapter 2 of this report presents the key factors that influenced the creation of a comprehensive economic development strategy including geography, economic and demographic conditions, and the County's industry clusters. Expanded versions of these factors and supplemental metrics are included in Appendices B, C, D and E.

Chapter 3 takes a deeper look at defense-related industries and manufacturing in the County primarily from the innovation perspective. This chapter introduces a new form of innovation network analysis, which helps identify specific opportunities for innovation-led economic development and entrepreneurial growth.

Chapter 4 presents an analysis of the factors presented in chapters 2 and 3 with particular attention to what these factors mean in terms of a comprehensive economic development strategy for St. Mary's County. The analysis examines significant limitations to agglomeration-based (or cluster-based) economic development strategies given geographic and industry constraints faced by the County. The chapter also presents an argument in favor of Innovation-Led Economic Development (ILED) strategies and explains why such strategies could help the County achieve its high-level goals.

Chapter 5 presents detailed goals, objectives and metrics based on the data and analysis presented in chapters 2 – 4. Chapter 6 outlines an implementation and evaluation plan for those goals, objectives and metrics. The report also contains several appendices with detailed supporting information.

Chapter 1

Factors Influencing Economic Development Strategy

Economic Overview

St. Mary's County ranked seventh in the nation for off-the-radar tech hubs. The tech sector has grown 88% since 2001 and 50% since 2010. Most of the jobs are in engineering services, federal government, guided missile and space vehicle manufacturing, other computer-related services and direct health and medical insurance carriers.

St. Mary's County is the home to the Naval Air Station (NAS) Patuxent River, located on the Chesapeake Bay near the mouth of the Patuxent River. Commissioned April 1, 1943, on land mostly acquired through eminent domain, the air station grew rapidly in response to World War II and continued to evolve through the Cold War. It is now home to Headquarters, Naval Air Systems Command (NAVAIR), the U.S. Naval Test Pilot School, the Atlantic Test Range, and serves as a center for test and evaluation and systems acquisition relating to naval aviation. NAS Patuxent River influences the economic structure of St. Mary's County.

St. Mary's County was the third-fastest growing county in Maryland from 2010 to 2013. According to the U.S. Census Bureau, by 2013 there were 109, 633 people living in the County. St. Mary's County, with a median age of 36.7, has the youngest median population of Maryland counties. Military veterans represent 18.2% of the population, which is a higher proportion than any other county in Maryland. The population growth and its special characteristics are caused by the exurban migration from the D.C.- and Baltimore-metro regions and the

employment opportunities in St. Mary's County, primarily at NAS Patuxent River. The influx of residents and job growth created the fastest growing workforce, the third-highest median household income growth rate, and the sixth-lowest unemployment rate in state by 2013.

St. Mary's County is the site of the first colonial settlement and the first capital of Maryland. The settlement of Lord Baltimore's Maryland began with the arrival of passengers from England at St. Clement's Island in the Potomac River — in what is now southwestern St. Mary's County — on March 25, 1634. The county is also home to the first Catholic Mass celebrated in one of the original 13 British colonies. St. Mary's City was the first capital of Maryland and remained so for more than 50 years until the capital moved to Annapolis in 1695.

Location

St. Mary's County is on a peninsula in Southern Maryland with more than 500 miles of shoreline on the Patuxent River, Potomac River and the Chesapeake Bay. Figure 1 shows its location on map. The County is 38 miles southeast of Washington, D.C.

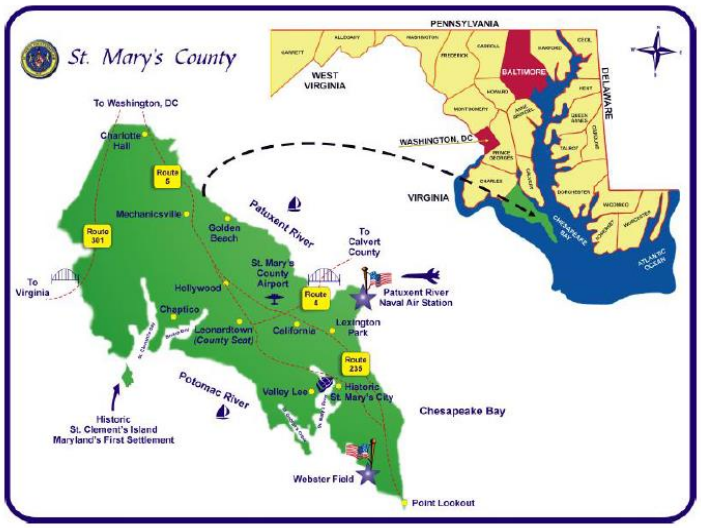


Figure 1 *Location of St. Mary's County, Maryland*

and 90 miles south of Baltimore. The convenient location shapes its economic and demographic characteristics.

Population

Population growth in St. Mary's County has been steady for several decades. As Figure 2 shows, the population has more than doubled from 47,388 in 1970 to 109,633 in 2013. According to projections by the Maryland Department of Planning, St. Mary's County will have a population of 125,150 by 2020 and 148,720 by 2030.

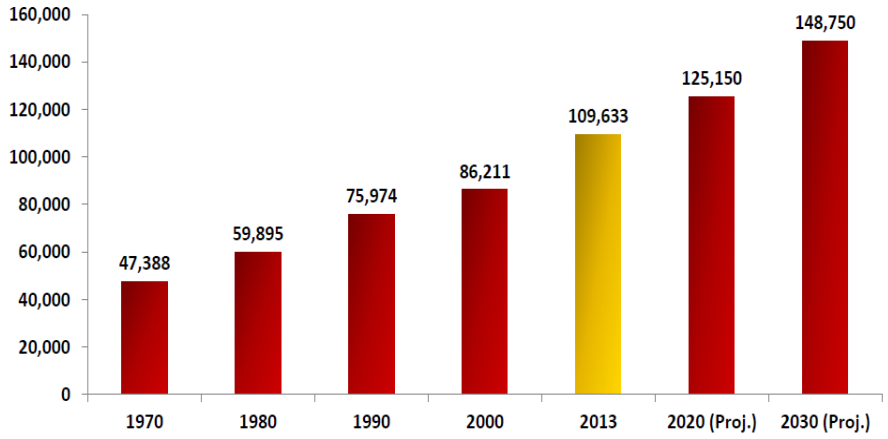


Figure 2 *Population in St. Mary's County. Sources: U.S. Census Bureau and Maryland Department of Planning, Planning Data Services.*

The population distribution across ZIP Codes is not even. As is shown in Table 2, Lexington Park had the largest population of the county in 2010, followed closely by Mechanicsville. Leonardtown had the third-largest population in St. Mary's County, but its population was only 56% of Lexington Park's population.

Mailing Area	Population
Abell	431
Avenue	1,120
Bushwood	607
California	10,503
Callaway	1,443
Chaptico	1,373
Charlotte Hall	4,900
Clements	1,282
Coltons Point	373
Dameron	594
Drayden	348
Great Mills	5,927
Hollywood	9,937

Mailing area	Population
Leonardtown	13,717
Lexington Park	24,481
Mechanicsville	23,498
Morganza	97
Park Hall	494
Patuxent River	1,014
Piney Point	830
Ridge	1,119
St. Inigoes	1,125
St. Mary's City	1,332
Scotland	313
Tall Timbers	740
Valley Lee	1,051

Table 2.*Population by ZIP Code. Source: U.S. Census Bureau, 2010.*

The gender ratio in St. Mary's County is quite balanced. Table 3 shows that in 2013, 50.8% of the total population was males, and 49.2% was females.

Gender	Estimate	Percent
Total Population	109,633	
Male	55,688	50.8
Females	53,945	49.2

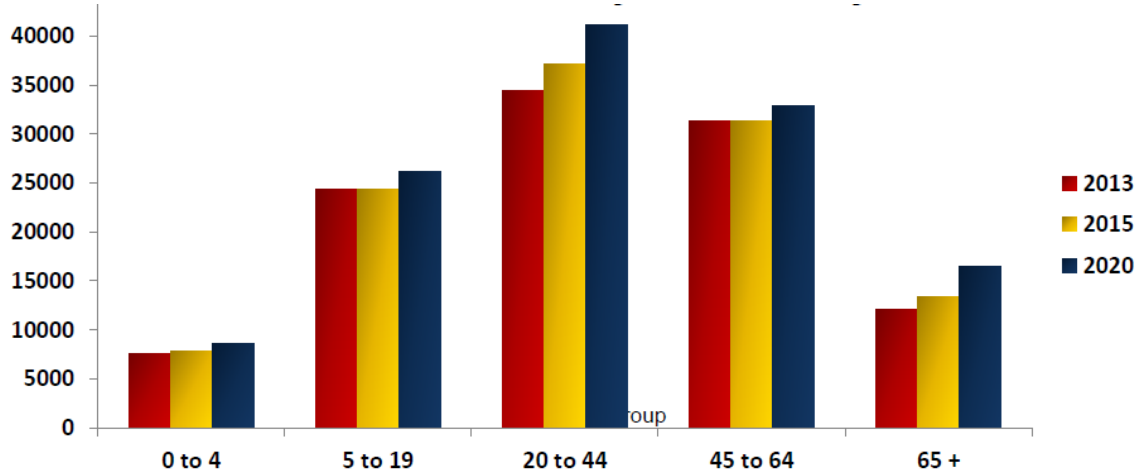
Table 3.*Population by Gender. Source: U.S. Census Bureau, 2013*

The working-age population accounts for 74.9% of St. Mary's total population. As presented in Table 4, the median age in St. Mary's County is quite young, only 36.7 years old, and 74.9% of the population is 18 to 64 years old. Children under the age of 5 account for 6.8% of the population, and children aged 6 to 17 account for 5.8% of total population. People aged 65 to 85 account for 11% of the population and people older than 85 account for 1.5%.

Age	Estimate	Percent
Total Population	**109,633**	
Median Age	**36.7**	
Under 5 Yrs	7,502	6.8
18 yrs +	82,107	74.9
65 yrs +	12,103	11.0
85 yrs +	1,634	1.5

Table 4.*Population by Age. Source: U.S. Census Bureau, 2013.*

People 20 to 44 years old are expected to be the largest age group in St. Mary's County in the next five years. Figure 3 shows that the age distribution in St. Mary's County is projected to be relatively stable over time, but the percentage of people over 65 will increase from 11.04% in 2013 to 13.15% in 2020.



Year	0 to 4	5 to 19	20 to 44	45 to 64	65 +	Total
2013	7,502	24,295	34,446	31,287	12,103	109,633
2015	7,800	24,400	37,060	31,340	13,310	113,900
2020	8,550	26,140	41,140	32,870	16,460	125,150

Figure 3 *Projected Age Distribution in St. Mary's County. Source: Maryland Department of Planning, U.S. Census Bureau. Totals may not add due to rounding.*

The majority St. Mary's County's population is White people, who account for 78.1%; Black people account for 15.2%; and Hispanic people account for 4.5%. The rest are Asian, American Indian/Alaska Native and Native Hawaiian/Pacific Islander. The vast majority — 97.7% — are of a single race.

Race	Estimate	Percent
Total Population	**109,633**	
White	85,665	78.1
Black	16,660	15.2
Hispanic	4,940	4.5
Asian	3,137	2.9
American Indian/Alaska Native	542	0.5
Native Hawaiian/ Pacific Islander	84	0.1
One race	107,154	97.7
Two or more races	2,479	2.3

Table 5.*Population by Race. Source: U.S. Census Bureau, 2013.*

Table 6 shows 89.6% of the County population are high school graduates or have higher-level education. Another 29.5% have a bachelor's or higher-level degree and 10.7% have a graduate or professional degree.

Social Characteristics	Estimate	Percent
Population 25 yrs and Over	**70,537**	
High School Graduate or Higher	(X)	89.6
Bachelors Degree or Higher	(X)	29.5
Graduate or Professional Degree	(X)	10.7

Table 6.*Population by Education Attainment. Source: U.S. Census Bureau, 2013 American Community Survey. (X) - The value is not available.*

Income

St. Mary's County has a higher median household income than the state and the nation. Figure 4 shows that the 2013 median household income was $78,233 in St. Mary's County, $72,483 in Maryland, and $52,250 in the United States.

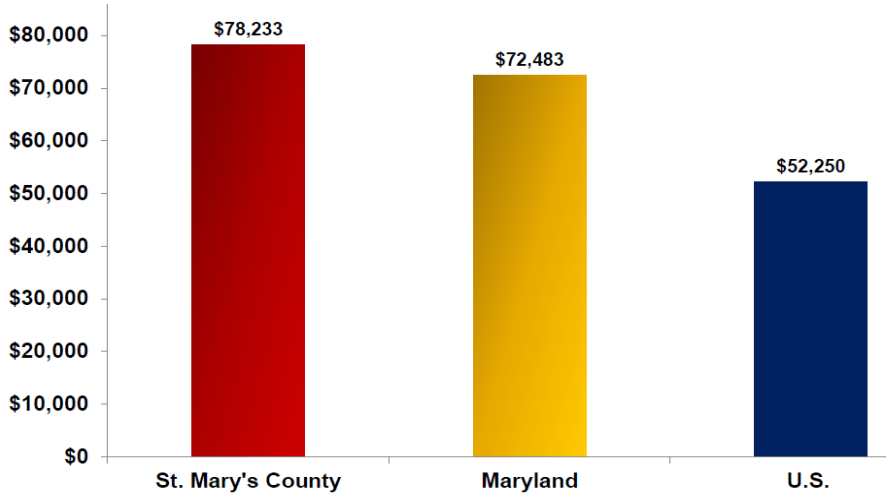


Figure 4 *Median Household Income. Source: U.S. Census Bureau, 2013*

Median household income grew at a rate of 43% in St. Mary's County from 2000 to 2013, which was the fifth-highest rate in Maryland. Figure 5 shows that in 2000, the median household income in St. Mary's County was $54,706, grew to $71,158 in 2006, and, in 2010, it further grew to $88,444. However, from 2010 to 2013, the median household income dropped to $78,233.

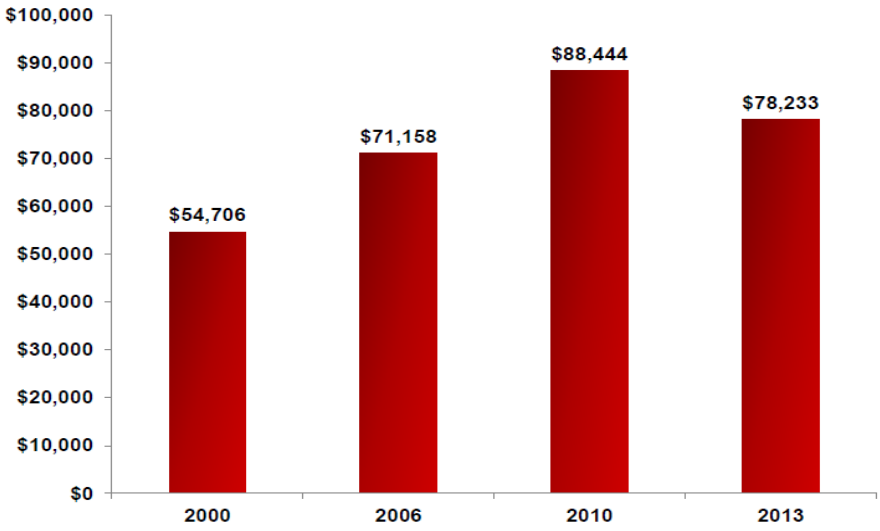


Figure 5 *Median Household Income Growth. Sources: U.S. Census Bureau, Maryland Department of Planning*

Employment and Wages

St. Mary's County unemployment rate ranks as the sixth lowest in the state. As Figure 6 shows, the 2013 annual average unemployment rate in St. Mary's County is 5.8%, lower than the statewide (6.3%) and national (7.3%) averages.

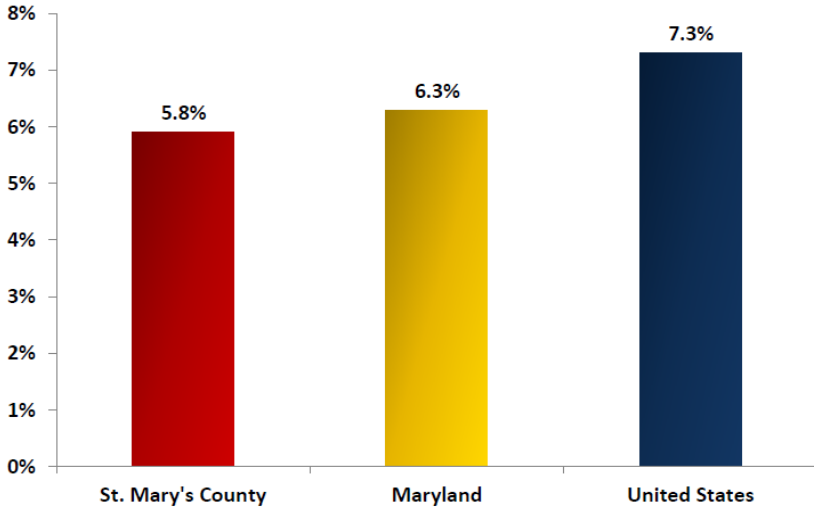


Figure 6 *2013 Annual Average Unemployment Rate. Sources: Maryland Department of Labor, License and Regulation, Bureau of Labor Statistics*

Figure 7 shows the unemployment rate in St. Mary's County has been lower than the state and national rate for the past several years. Also, the unemployment rates in St. Mary's County, Maryland and the U.S. follow the same pattern.

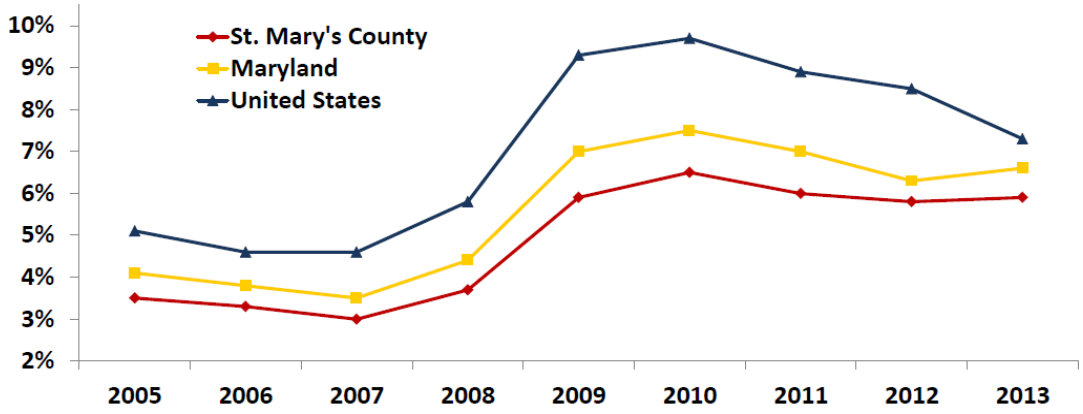


Figure 7 *Annual Average Unemployment Rate, 2005-2013. Sources: Maryland Department of Labor, License and Regulation, Bureau of Labor Statistics.*

Public sector jobs, primarily defense-related jobs, dominate county employment; defense contractors form the largest private sector category. In 2011, defense contractors employed 10,039 workers and the civil service employed 8,582 workers. The military employed 2,829 workers, and the public school system employed 2,200 workers.

Sector	Employment
Defense Contractors	10,039
Civil Service	8,582
Military	2,829
Public Schools	2,200
County Government	629
State Government	810

Table 7. *Employment by Sector. Source: St. Mary's County Department of Economic & Community Development, FY 2011 data*

The largest employer in St. Mary's County is NAS Patuxent River, which employed 11,232 workers in 2014. The second-largest employer — MedStar St. Mary's Hospital — only employed 1,201 workers. And the third-largest employer is DynCorp International, which employed 1,019 workers in 2014. Clearly, NAS Patuxent River is important to St. Mary's County's economy. For more about NAS Patuxent River, see the industry and technology section of this report.

Firm	Employment
Naval Air Station Patuxent River*	11,232
MedStar St. Mary's Hospital	1,201
DynCorp International	1,019
BAE Systems	850
Wyle	705
Lockheed Martin	540
Engility	500
Boeing	450
HMR of Maryland/Charlotte Hall	438
SAIC	431

Firm	Employment
Booz Allen Hamilton	412
St. Mary's College of MD	407
PAE Applied Technologies	400
Northrop Grumman	368
General Dynamics	352
Walmart	350
J.F. Taylor	340
CACI	325
Food Lion	284
McKay's Foodland	275

Table 8.*Major Employers. Excludes post offices, state and local governments; includes higher education. *Federal and military facilities excludes contractors. Source: Maryland Department of Business and Economic Development, February 2014.*

The labor force participation rate in St. Mary's County is lower than the rest of Southern Maryland. As Table 9 shows, in both 2005 and 2013, the labor participation rate in St. Mary's County is lower than Calvert and Charles counties. Moreover, the labor participation rate in St. Mary's County decreased from 69.4% in 2005 to 66.9% in 2013. The projected labor participation rate in 2020

increases to 67.8% in St. Mary's County, while Calvert and Charles counties are projected to experience a decline.

2005	Total Population 16+	In Labor Force	% in Labor Force
Calvert County	64,680	45,500	70.3
Charles County	101,970	72,590	71.2
St. Mary's County	**73,730**	**51,160**	**69.4**
2013	**Total Population 16+**	**In Labor Force**	**% in Labor Force**
Calvert County	71,731	50,935	71.0
Charles County	119,228	83,713	70.2
St. Mary's County	**85,616**	**57,308**	**66.9**
2020 (projected)	**Total Population 16+**	**In Labor Force**	**% in Labor Force**
Calvert County	77,270	52,240	67.6
Charles County	136,570	94,290	69.0
St. Mary's County	**98,360**	**66,710**	**67.8**

Table 9.*Labor Force Participation in Southern Maryland. Sources: Maryland Department of Planning, US Census.*

St. Mary's County has the second-highest average weekly wages in the state, and, as shown in Table 10, St. Mary's County continues to have the highest average weekly wage in Southern Maryland. Moreover, the growth of average weekly wages in St. Mary's County from 2005 to 2013 was faster than Calvert and Charles counties. By 2013, St. Mary's County's average weekly wage was $1,194.

Location	2005	2013	% Change
St. Mary's County	**$885**	**$1,194**	**34.9**
Charles County	665	792	19.1
Calvert County	699	820	17.3
Southern Maryland	750	935	23.8
Maryland	853	1,040	21.9

Table 10. *Average Weekly Wages in Southern Maryland. Source: Maryland Department of Labor, License and Regulation April 2014.*

Across industries in the past 10 years, federal government positions offer the highest average weekly wage in St. Mary's County, followed by professional and business services and then manufacturing, according to Figure 8.

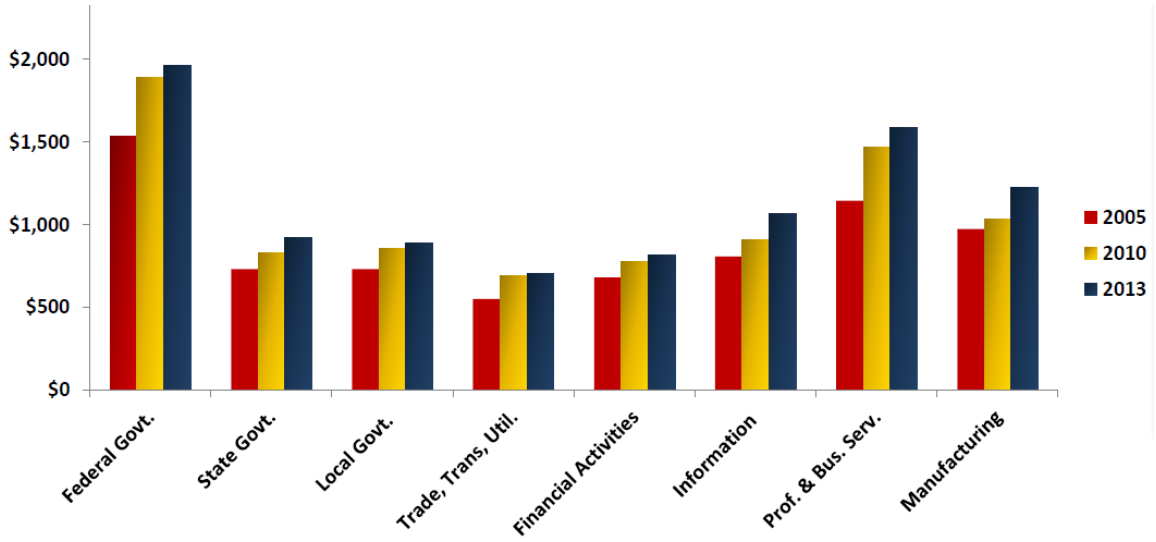


Figure 8 *Average Weekly Wages by Industry. Source: Maryland Department of Labor, License and Regulation.*

The average weekly wage grew steadily over the past decades in St. Mary's County, and the federal government outgrew average industry in the County.

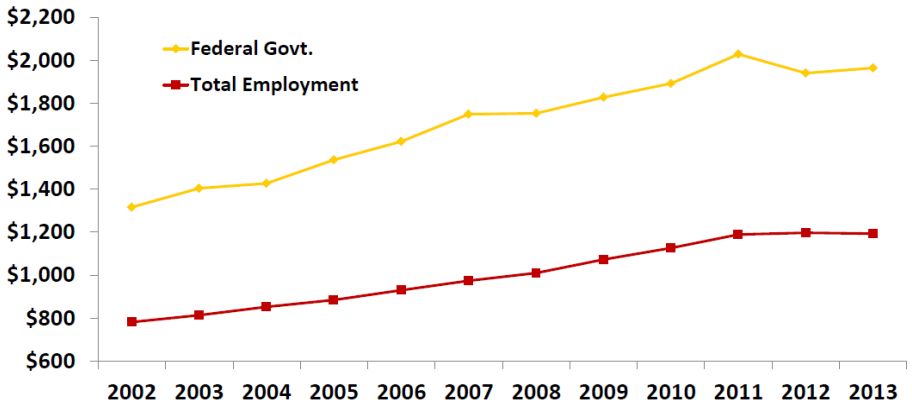


Figure 9 *Average Weekly Wage Growth. Source: Maryland Department of Labor, License and Regulation.*

Commuting

The majority of St. Mary's County residents are employed within the County, which is counter to Calvert and Charles counties, where an abundance of residents commute beyond Southern Maryland. Table 11 shows the commuting pattern across counties in Southern Maryland and that 67% of St. Mary's County residents commute within the County, 22% commute beyond Southern Maryland, and a small share commute to other Southern Maryland counties.

		TO			
		Calvert County	Charles County	St. Mary's County	Other
FROM	Calvert County	9,067	1,545	3,474	23,475
	Charles County	1,135	29,560	2,643	47,455
	St. Mary's County	2,000	3,775	37,045	12,130
	Other	5,193	13,054	8,013	

Table 11. *Commuting Patterns in Southern Maryland. Source: Maryland Department of Planning, 2006-2008.*

Housing

The number of new housing units authorized for construction in St. Mary's County decreased after 2004, but began to rebound in 2011. As Figure 10 shows, dwelling units and single-family homes follow the same pattern, but the rebound of the number of dwelling units is stronger.

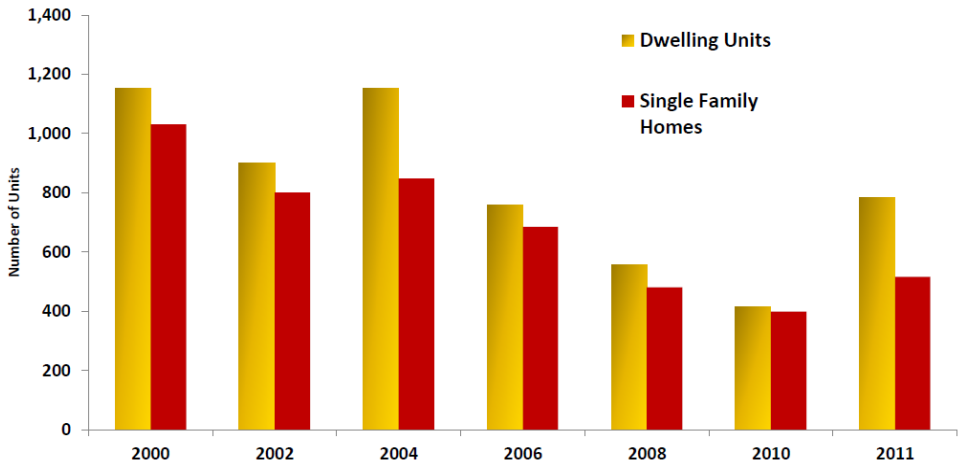


Figure 10 *New Housing Units Authorized For Construction. Source: Maryland Department of Planning.*

At the end of 2013, the price of the median housing unit sold in St. Mary's County was $270,000, and the total units sold were 1,127. From 2012 to 2013, the average sold price dropped 2.8% and the median sold price dropped 1.82%, but the total units sold increased 17.27%. A unit on was on the market an average of 116 days in 2012 and 104 days in 2013.

2013 Year End	Median Household Sold Price	Total Units Sold
St. Mary's County	$270,000	1,127

2013 Year End	2013	2012	% Change
Average Sold Price:	$281,719	$289,829	-2.8%
Median Sold Price:	$270,000	$275,000	-1.82%
Total Units Sold:	1,127	961	17.27%
Average Days on Market:	104	116	-10.34%
Average List Price for Solds:	$287,307	$296,5381	-3.11%
Avg Sales Price to Original List Price Ratio	94.6%	94.3%	0.35%

Table 12. *Housing Price Trends. Source: Southern Maryland Association of Realtors*

In 2012, St. Mary's County had 37,352 total occupied housing units; 27,174 of them were owner-occupied, and the other 10,178 were renter-occupied, as shown in Figure 11.

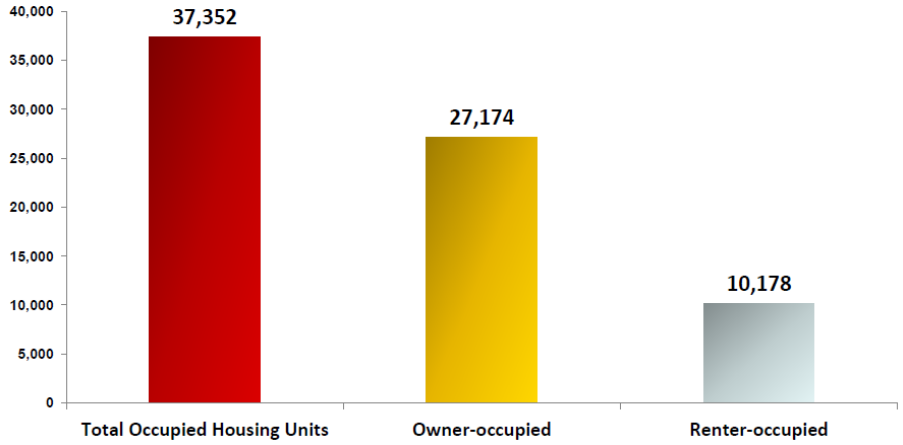


Figure 11 *St. Mary's County Home Ownership in 2012. Source: Census Bureau, 2012.*

Industry and Technology

Aerospace & Defense Industry

Home to NAS Patuxent River and more than 200 high-tech defense contractors, St. Mary's County has emerged as a world-class center for maritime aviation, research, development, testing, and evaluation.

NAS Patuxent River is located in St. Mary's County on the Chesapeake Bay near the mouth of the Patuxent River and includes the headquarters of Naval Air Systems Command (NAVAIR) as well as Naval Air Warfare Center Aircraft Division (NAWCAD), Naval Research Laboratory, Flight Support Detachment Air Test and Evaluation, and the Webster Field Annex at St. Inigoes. It is also home to U.S. Naval Test Pilot School and VC-6 Unmanned Aerial Vehicle Detachment. The

world-class facilities, labs, and workforce provide a full spectrum of Research, Development, Acquisition, Test & Evaluation (RDAT&E), engineering, and fleet support center for air platforms.

Businesses interested in working with NAVAIR should visit www.navair.navy.mil and click on Business Opportunities.

Figure 12 lists NAS Patuxent River's more than 60 current and three future programs.

NAS Patuxent River

Current and Future Programs

Photo illustration courtesy Northrop Grumman/Released

Current Programs

- F-35 Lightning II Joint Strike Fighter (JSF)
- E-2D Advanced Hawkeye
- F/A-18 & EA-18G
- MV-22B Osprey
- P-8A Poseidon
- AV-8B Harrier II
- EA-6B Prowler
- E-6B Mercury
- T-6 A/B Texan II
- T-34C Turbomentor
- T-44 Pegasus
- T-39 Saberliner
- TH-57 Sea Ranger
- T-45A/C Goshawk
- AIM-9 Sidewinder
- AIM-120 AMRAAM
- AIM-7 Sparrow
- E-2D Advanced Hawkeye
- E-2C Hawkeye
- C-2A Greyhound

Unmanned Air Systems

- MQ-4C Triton (formerly known as BAMS UAS)
- MQ-8B Fire Scout
- X-47B Unmanned Combat Air System (Unmanned Combat Aerial Vehicle - Demonstration)
- Joint Precision Approach and Landing System (JPALS)

Tactical Airlift, Adversary & Support Aircraft Program Systems

- C-9B Skytrain II
- UC-12B/F/M Huron
- C-20A/D Gulfstream
- RC/EC/C-26D
- C-37A Gulfstream V, C-37B Gulfstream 550
- C-40A Clipper
- C/KC-130T Hercules, KC-130J Super Hercules
- F-5N Adversary
- F-16A Fighting Falcon
- UC-35C Huron

Presidential Helicopters

- VH-60N
- VH-3D

H-53 Helicopters

- CH-53D Sea Stallion
- CH-53E
- CH-53K
- MH-53E

H-60 Helicopters

- HH-60H
- MH-60R
- MH-60S
- SH-60B
- SH-60F

Air Anti-Submarine Warfare Systems

- Sonobuoys
- Multi-Static Active Coherent (MAC)
- High Altitude Anti-Submarine Warfare (HAASW)
- Airborne ASW Intelligence (AAI)

Aircraft Launch and Recovery Equipment (ALRE)

- Launching Systems
- Recovery Systems
- Information Systems
- Visual Landing Aids (VLA)
- Expeditionary Airfields (EAF)

Common Support Systems (Program Management, or AIR 1.0)

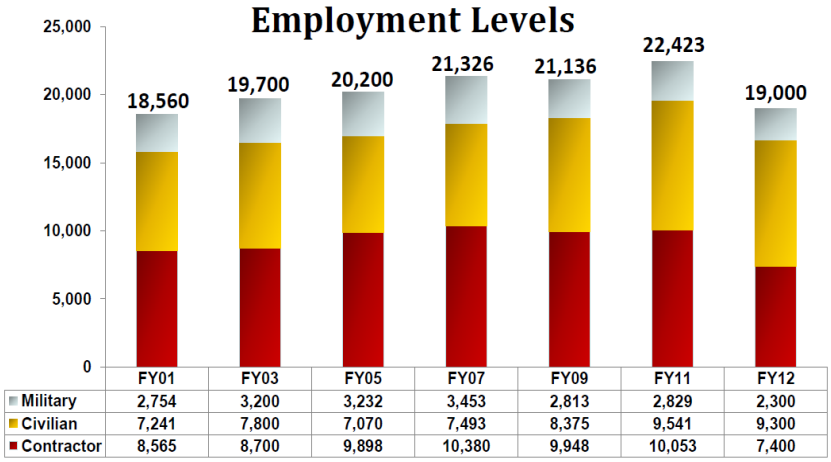
- Joint helmet mounted cueing system/Night Vision Cueing and Display
- Navy Common Ejection Seat
- Naval Aviation Training Systems
- Tactical Combat Training System
- Undersea Warfare Training Range
- Ground Proximity Warning System
- Terrain Awareness Warning System
- Military Flight Operations Quality Assurance
- Electronic Consolidated Automated Support System (eCASS)

Future Programs

- Next Generation Jammer
- Electromagnetic Aircraft Launch System (EMALS)
- Advanced Arresting Gear (AAG)

Figure 12 *NAS Patuxent River's Current and Future Programs. Source: Naval Air Station Patuxent River, Fall 2013.*

NAS Patuxent River is the largest employer in St. Mary's County. The employment in NAS Patuxent River increased from 18,560 in 2001 to 22,423 in 2011, but dropped to 19,000 in 2012. Workers are employed by defense contractors, civil services, and military sectors. Before 2005, contractors employed most workers in NAS Patuxent River, but after 2007, civilian services began to employ more than other sectors.



	FY01	FY03	FY05	FY07	FY09	FY11	FY12
Military	2,754	3,200	3,232	3,453	2,813	2,829	2,300
Civilian	7,241	7,800	7,070	7,493	8,375	9,541	9,300
Contractor	8,565	8,700	9,898	10,380	9,948	10,053	7,400

Figure 13 *NAS Patuxent River Employment Levels. Source: Naval Air Station Patuxent River, February 2014.*

New fighter aircraft often provide new opportunities for the defense industry in St. Mary's County. Three of the Department of Defense's (DoD) F-35 Lightning II (Joint Strike Fighter) recently arrived at NAS Patuxent River for flight test and evaluation. Eight of the 14 F-35 Lightning II test aircraft will be tested at NAS Patuxent River. Two P-8A Poseidon Multimission Maritime Aircraft (MMA) were ferried to NAS Patuxent River for flight testing. Two X-47B Unmanned Combat Air Systems (UCAS-D) carrier-based aircraft arrived in 2011 and 2012 for

testing. The tests include compatibility with planned electronic warfare systems, arrested landings, and catapult launches, to validate the ability of the aircraft to conduct precision approaches to an aircraft carrier. On July 10 2013, the X-47B launched from Patuxent River and landed on the deck of the George H.W. Bush, conducting the first arrested landing of a UAV on an aircraft carrier at sea. Preparations are underway for the arrival of the CH-53K Super Stallion Heavy-Lift Helicopter.

Tourism

The hotel development in St. Mary's County has prospered in the past decade. Figure 14 shows that the number of hotel rooms in St. Mary's County has steadily increased and is expected to climb. In 2011, there were 1,142 hotel rooms in St. Mary's County.

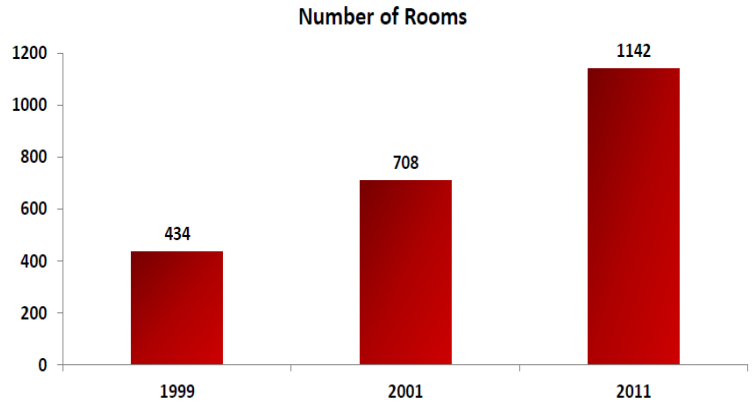


Figure 14 *Number of Hotel Rooms. Source: St. Mary's County Department of Economic & Community Development.*

The number of visitors to St. Mary's County has steadily grown since 2008. The day visitors accounted for 52% of all visitors and overnight visitors accounted

for 48%. The total number of day and overnight visitors in 2012 was 646,700. The growth rate of overnight visitors is similar to the overall growth rate of visitors.

St. Mary's County - Visitors (thousands)				
	Overnight	Day	Total	Growth Rate
2012	314.1	332.6	646.7	3.3%
2011	302.5	323.7	626.2	6.9%
2010	276.1	307.6	583.7	11.1%
2009	241	284.4	525.4	5.6%
2008	241.7	255.9	497.6	1.6%
2007	239.6	250	489.6	-8.1%
2006	265.1	267.9	533	

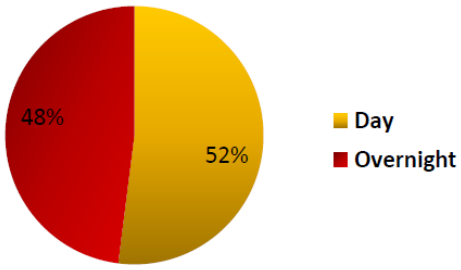


Figure 15 *Number of Day and Overnight Visitors. Source: St. Mary's County Department of Economic & Community Development.*

St. Mary's County tourism industry sales grew since 2008. Total sales in 2012 were $143.0 million, the majority of which came from food and beverage.

St. Mary's County Tourism Industry Sales (millions)								
	Lodging	Food & Beverage	Retail	Recreation	Transport	Second Homes	Total	Growth Rate
2012	$21.9	$32.1	$23.1	$15.4	$30.6	$19.9	$143.0	3.8%
2011	$21.3	$30.2	$22.2	$14.9	$29.4	$19.8	$137.8	0.6%
2010	$14.7	$24.8	$18.0	$11.3	$22.0	$23.1	$114.0	11.3%
2009	$11.2	$22.0	$16.4	$10.8	$19.7	$22.3	$102.4	0.9%
2008	$9.6	$20.3	$17.1	$10.3	$20.8	$23.4	$101.5	

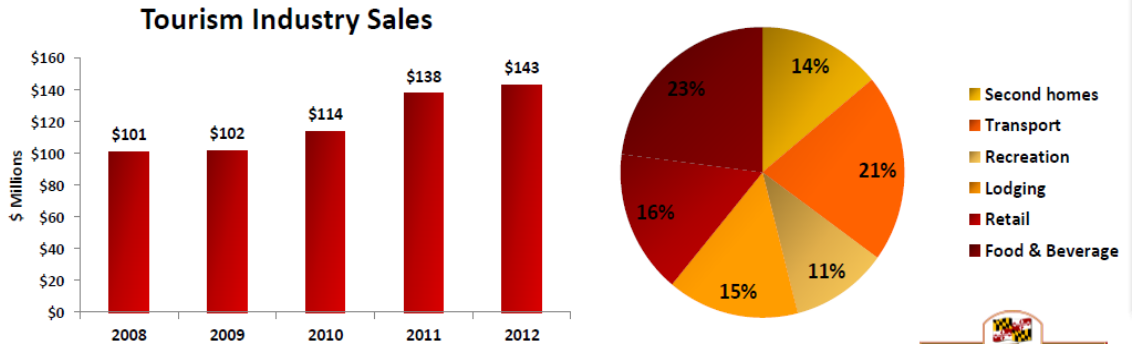
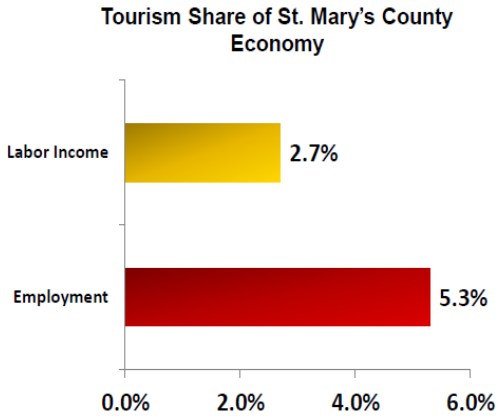


Figure 16 *St. Mary's County, Tourism Industry Sales. Source: St. Mary's County Department of Economic & Community Development.*

In 2012, 5.3% of employment and 2.7% of labor income in St. Mary's County came from tourism. Figure 17 shows that direct tourism employment was 1,308 and the indirect and induced employment is 937. Tourism labor income in 2012 was $31.7 million, and indirect and induced labor income was $38.3 million. Tax revenue from tourism to state and local governments was $19.9 million.

St. Mary's County			
Tourism Employment			
Year	Direct	Total (Dir, Ind, Induced)	Share of State (Total)
2012	1,308	2,245	1.09%
2011	1,226	2,126	1.06%
2010	1,135	1,964	1.00%
2009	1,158	2,036	1.04%
2008	1,192	2,113	1.04%
Tourism Labor Income (millions)			
Year	Direct	Total (Dir, Ind, Induced)	Share of State (Total)
2012	$31.7	$70.0	0.88%
2011	$29.6	$66.1	0.86%
2010	$25.6	$60.0	0.81%
2009	$26.2	$60.8	0.83%
2008	$25.3	$59.9	0.80%



Total Tourism Tax Receipts (millions)				
Year	Federal	State & Local	Hotel	Total
2012	$15.2	$19.9	$0.86	$35.1
2011	$14.4	$19.3	$0.81	$33.7
2010	$12.9	$16.9	$0.79	$29.8
2009	$12.7	$15.4	$0.73	$28.1
2008	$12.7	$14.8	$0.63	$27.5

Tourism Sales (millions)		
Year	Tourism Industry	Tourism Economy
2012	$143.0	$153.9
2011	$137.8	$147.8
2010	$114.0	$125.0
2009	$102.4	$110.2
2008	$101.5	$111.1

Figure 17 *Tourism Impact. Source: St. Mary's County Department of Economic & Community Development.*

Manufacturing

Manufacturing is a small but growing component of St. Mary's County's economy. The County has a number of manufacturing firms: BAE Systems, Wyle, CACI, Smartronix, Inc., Triton Metals, Sailing Specialties, Inc., Ship Point Machine Company, Inc., and others that produce innovative products the military, transportation, law enforcement, communications, and custom plastics.

Technology Growth

Although the major influx of new activity at NAS Patuxent River occurred in the late 1990s, growth in the number and diversity of technology firms continues. The number of technology firms in St. Mary's County rose from 60 in 1990 to 203 in 2013, but slightly declined to 193 in 2014.

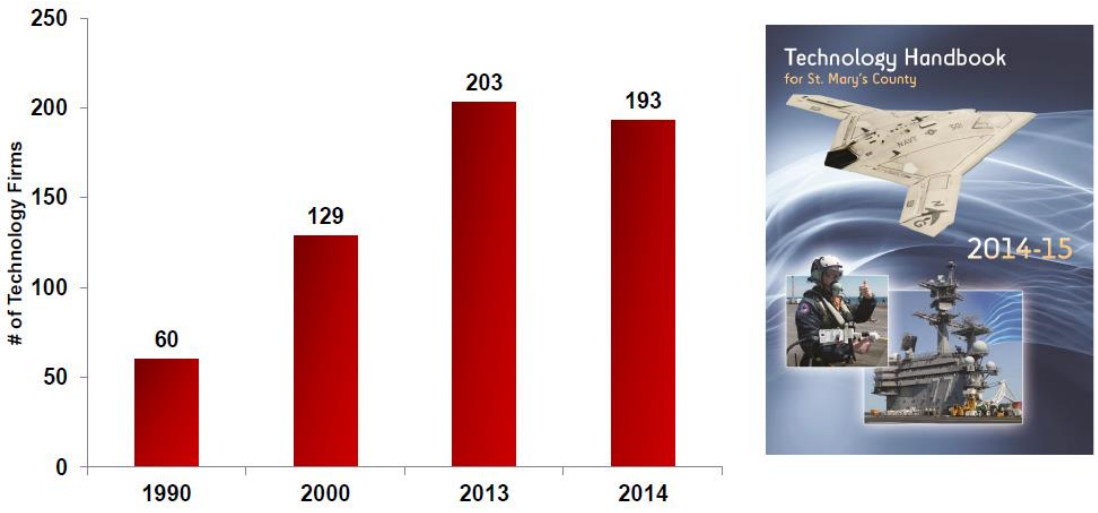


Figure 18 *Number of Technology Establishments. Source: St. Mary's County Department of Economic & Community Development.*

Broadband (High Speed Internet) Accessibility

MetroCast offers cable internet through most of the County. A newer cable franchise agreement was made to increase coverage and capabilities through the rest of the County. Comcast services the Charlotte Hall and Golden Beach areas. Verizon offers DSL internet service, and service capabilities expand constantly. Wifi hotspots are available in select locations. Tri-County Council for Southern Maryland developed the Broadband Improvement Initiative to provide residential, business, and public anchor institutions with the opportunity to be served by the evolving and most current information technologies available.

Other

Land Preservation

To date, more than 19,320 acres of farmland have been permanently preserved in St. Mary's County through Maryland Agricultural Land Preservation

Foundation, Rural Legacy, Maryland Historical Trust, Maryland Environmental Trust and the County's Transferable Development Rights Programs.

Commercial Market

Commercial office space in St. Mary's County on average costs $22.15 per square foot. Southern Maryland Electric Cooperative provides electric service. Washington Gas provides natural gas. St. Mary's Metropolitan Commission (MetCom) serves the greater Lexington Park–Hollywood area and Piney Point with water and sewer.

Tax Rates

	St. Mary's County	Maryland
Corporate Income Tax (2012) Base – Federal taxable income.	None	8.25%
Personal Income Tax (2012) Base – Federal adjusted gross income. *Graduated rate peaking at 5.5% on taxable income over $500,000.	3.00%	2.0%-5.5%*
Sales and Use Tax (2012) Exempt – sales for resale; manufacturer's purchase of raw materials; manufacturing machinery and equipment; purchases of materials and equipment used in R&D and testing of finished products; purchases of computer programs for reproduction or incorporation into another computer program for resale.	none	6.0%
Real Property Tax (FY 12) Effective rate per $100 of assessed value. In addition to this rate, there are some miscellaneous taxes and/or special taxing areas in the county. In an incorporated area, a municipal rate will also apply.	$0.857	$0.112
Business Personal Property Tax (FY 12) Rate per $100 of depreciated value. Exempt – manufacturing and R&D machinery, equipment, materials and supplies; manufacturing, R&D, and warehousing inventory. In an incorporated area, a municipal rate will also apply.	$2.143	none

Table 13. *Tax Rates. Source: Maryland State Department of Assessments and Taxation; Comptroller of the Treasury*

Summary

With steady population and job growth in past few decades, labor income has continued to rise in St. Mary's County and it has become one of the economically strongest counties in Maryland — and the nation. The County has an especially strong defense economy centered around NAS Patuxent River. The County provides supportive public investment, and several diversification initiatives are underway.

Chapter 2

Agriculture in St. Mary's County

Location and Population Growth

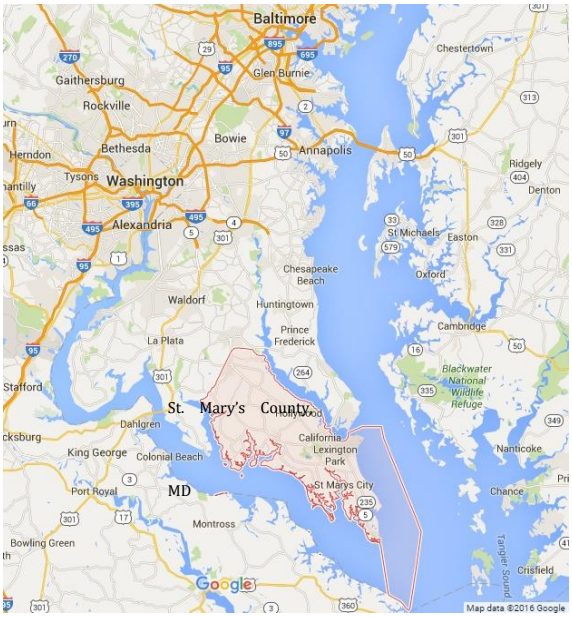


Figure 20 *Location of St. Mary's County*

St. Mary's County is bordered on the southwest by the Potomac River, on the southeast by the Chesapeake Bay, on the northeast by the Patuxent River and on the north by Charles County. According to its recent comprehensive plan (2010), St. Mary's County has more than 400 miles of shoreline, placing 18.3% (43,700 acres) of the County's land area within the "critical area" defined by the state Department of Natural Resources. The County ranks fourth among Maryland counties in critical area acreage. The County has a rich historic culture of Chesapeake Bay tidewater farming, fishing, and crabbing communities. Many farms in the northwest portion of the County are operated by Amish and Mennonite communities. Although only 38 miles south of D.C. and 90 miles south of Baltimore, the County was historically isolated from the pressures of growth in the Baltimore and Washington metropolitan areas. Figure 20 defines urban areas of Maryland by four major data sources; in all of the sources, St. Mary's County is listed as a rural non-metropolitan county. Since the 1990s, several factors have combined to make St. Mary's County one of the fastest-growing counties in the state including the expansion of NAS Patuxent River as part of the Base Realignment and the growth of St. Mary's College. The County population has more than doubled since 1970.

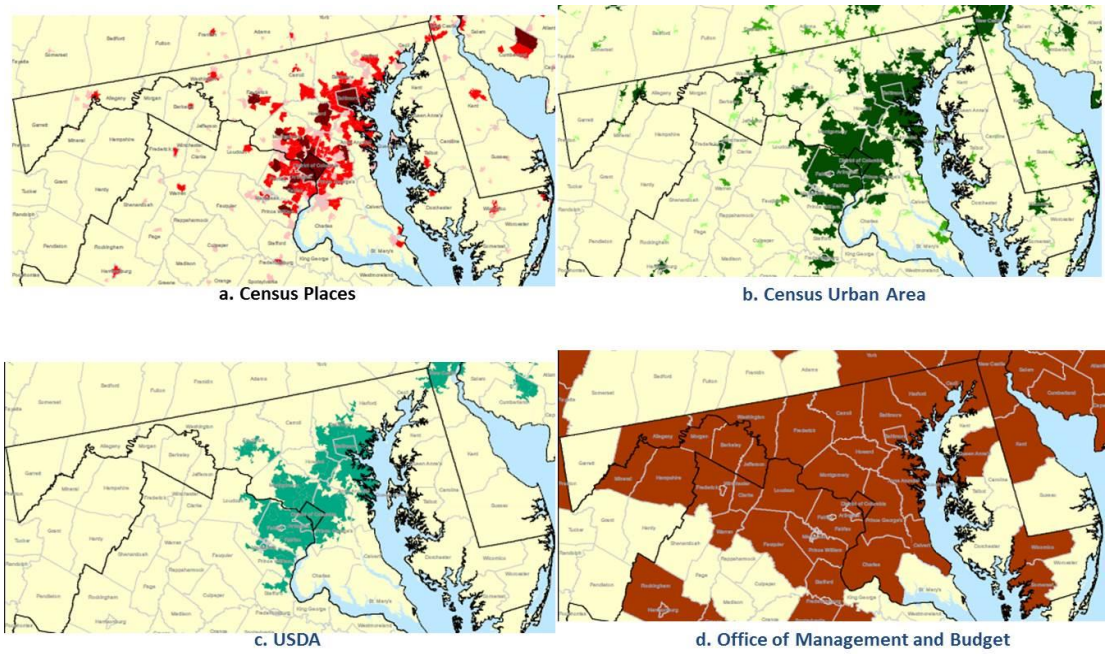
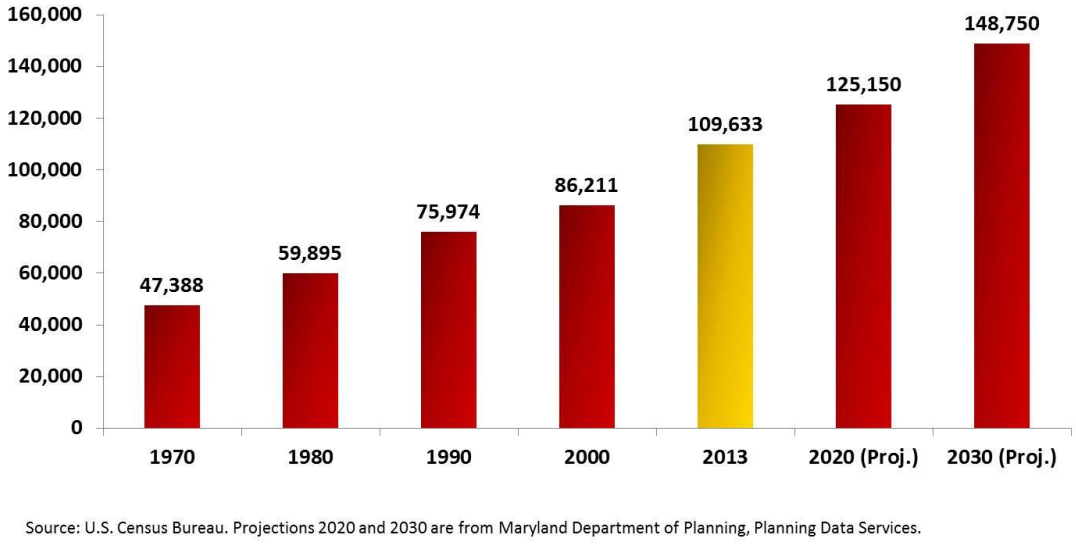


Figure 21 *Urban Area Definitions by Four Sources, Sources: U.S. Census, U.S. Agriculture Census, Office of Management and Budget*



Source: U.S. Census Bureau. Projections 2020 and 2030 are from Maryland Department of Planning, Planning Data Services.

Figure 22 *Population Growth in St. Mary's County*

Dynamic Change in Agriculture Sector

In 1995, as part of its agricultural land preservation initiatives, St. Mary's County set a

goal to permanently protect 60,000 acres of farmland. The U.S. Agriculture Census data captures the changes in the number of farms, land within those farms, the average size of farms, total sales, and averages sales per farm for St. Mary's County and Maryland. The results are shown in tables 14 and 15.

	1997	2002	2007	2012	Percent Changes		
					1997-2002	2002-2007	2007-2012
Total Number of Farms							
	658	577	621	632	-12.3%	7.6%	1.8%
Farms by Size (acres)							
1 to 9	67	63	78	62	-6.0%	23.8%	-20.5%
10 to 49	204	204	227	243	0.0%	11.3%	7.0%
50 to 179	253	227	235	259	-10.3%	3.5%	10.2%
180 to 499	74	62	58	47	-16.2%	-6.5%	-19.0%
500 to 999	16	16	17	13	0.0%	6.3%	-23.5%
1,000+	7	5	6	8	-28.6%	20.0%	33.3%
Land In Farms (Acres)							
Total Acres	71,920	68,153	68,648	67,086	-5.2%	0.7%	-2.3%
Average Size	109	118	111	106	8.1%	-6.4%	-4.0%
Farm Sales							
Total Sales*	$32,917	$17,412	$15,947	$21,800	-47.1%	-8.4%	36.7%
Average Sales Per Farm**	$50.03	$30.18	$25.68	$34.49	-39.7%	-14.9%	34.3%

Note: *Market Value of Total Agricultural Product Sold, in 2012 constant dollar (Thousands of Dollars);

**Average Market Value of Total Agricultural Products Sold per Farm, in 2012 constant dollar (Thousands of Dollars);

Table 14. *Basic Statistics for Agriculture Sectors in St. Mary's County. Source: U.S. Census of Agriculture, County Data*

	1997	2002	2007	2012	Percent Changes		
					1997-2002	2002-2007	2007-2012
Number of Farms							
	13,254	12,198	12,834	12,256	-8.0%	5.2%	-4.5%
Farms by Size (acres)							
1 to 9	1,407	1,418	1,554	1,481	0.8%	9.6%	-4.7%
10 to 49	3,828	4,412	4,589	4,554	15.3%	4.0%	-0.8%
50 to 179	3,825	3,583	4,067	3,695	-6.3%	13.5%	-9.1%
180 to 499	2,038	1,836	1,719	1,594	-9.9%	-6.4%	-7.3%
500 to 999	617	562	539	553	-8.9%	-4.1%	2.6%
1,000+	369	387	366	379	4.9%	-5.4%	3.6%
Land In Farms (Acres)							
	2,193,063	2,077,630	2,051,756	2,030,745	-5.3%	-1.2%	-1.0%
Average Size	168	173	162	169	2.7%	-6.1%	4.0%
Farm Sales							
Total Sales*	$2,188,165	$1,846,457	$2,273,222	$2,271,397	-15.6%	23.1%	-0.1%
Avg. Sales Per Farm**	$165	$151	$177	$185	-8.3%	17.0%	4.6%

Note: * Market Value of Total Agricultural Product Sold, in 2012 constant dollar (Thousands of Dollars);

** Average Market Value of Total Agricultural Products Sold per Farm, in 2012 constant dollar (Thousands of Dollars);

Table 15. *Basic Statistics for Agriculture Sectors in Maryland. Source: U.S. Census of Agriculture, County Data*

The number of farms declined from 1997 (658 farms) to 2002 (577 farms), but that trend reversed in 2007 with a jump to 621 farms, and continued to grow slightly to 632 farms in 2012. From 2002 to 2007, the County saw a 7.6% increase in the number of farms, which was more than the statewide increase (5.2%). The number of farms is relevant because each farm offers employment and ownership opportunities to residents.

In 2012, the Census of Agriculture counted 67,086 acres of farmland in St. Mary's County, which is a decrease from 1997, 2002, and 2007 levels. Meanwhile, the statewide trend mirrored the County's trend. St. Mary's County's gross loss of 6.7% of farmland from 1997 to 2012 was slightly less than the statewide loss of 7.4%.

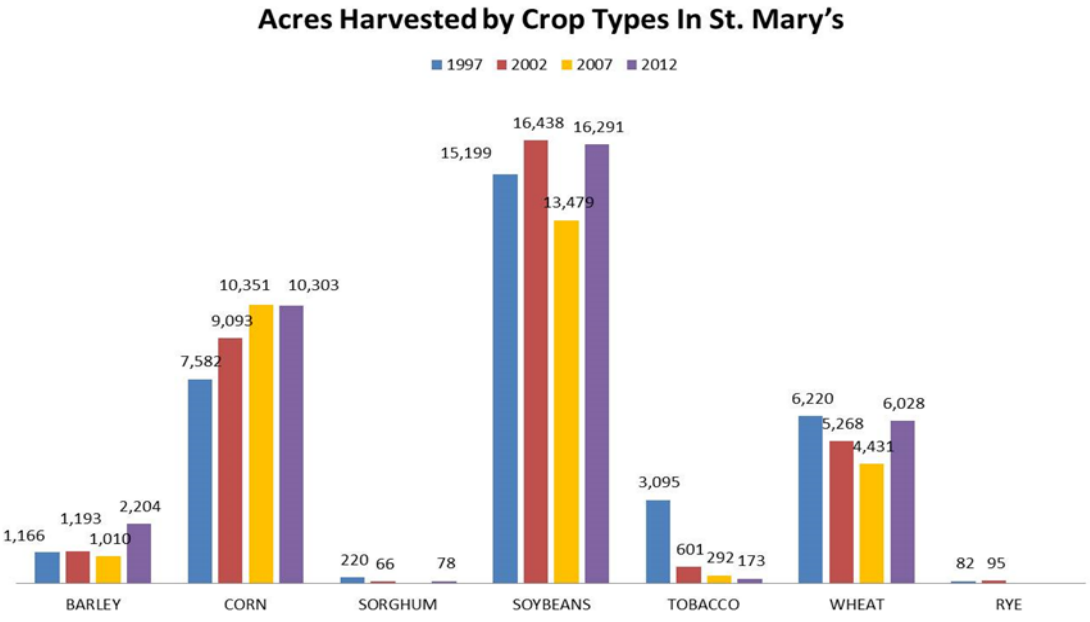
On average, the County has smaller farms than the state, and substantially smaller than the national average. The average for the County was 106 acres in 2012 compared to 169 for Maryland and 434 for the United States.

The decline in the total value of agricultural product sales from 1997 to 2002 in St. Mary's County was primarily because of the tobacco buyout program for tobacco—the most profitable County and statewide crop. The overall sales decline eased to a 8.4% loss from 2002 to 2007 and then rebounded with a 36.7% increase in value of sales from 2007 to 2012.

However, County farms realized less than one-third of the Maryland average total sales value per farm. In 2012, the average Maryland farm brought in five times the revenue ($1.09 per acre sales) of an average St. Mary's County farm ($0.33 in sales per acre).

For the County to meet its goal of preserving farmland and retaining the agricultural way of life, economic development strategies must improve the profitability of farms. Farm size is a factor. While 21% of Maryland farms are 180 acres or larger, only 11% of St. Mary's County farms fall in this range. The percentage of farms below 50 acres is comparable, 41% of St. Mary's County farms fall within the 50-179 acre range compared to just 30% statewide. Economic development strategies should pay particular attention to increasing the sales and profitability of farms in the 50-179 acre range, followed by those in the 15-49 acre range. Together, these two groups account for 79% of St. Mary's County farms.

The major land use in farms is still cropland, with 61% of total farmland devoted to crops. As Figure 23 indicates, soybeans, corn, wheat, and barley are the main crops in St. Mary's County. Because of the Tobacco Buyout program, tobacco production dropped dramatically after 1997. Historically, tobacco was a significant cash crop in St. Mary's County and Southern Maryland because of favorable soils, climate, and shipping access. The dramatic decline in total sales and average sales per farm in the County is mainly due to the program. See Figures 24, 25, and 26.



Source: U.S. Department of Agriculture. Census of Agriculture, NASS, November 2014.

Figure 23 *Major Crops in St. Mary's County*

Tobacco Buyout Program

In November 1998, The Master Settlement Agreement (MSA) was reached between the state Attorneys General of 46 states, five U.S. territories, the District of Columbia and the five largest tobacco companies. MSA set standards for, and imposed restrictions on, the sale and marketing of cigarettes by participating cigarette manufacturers.

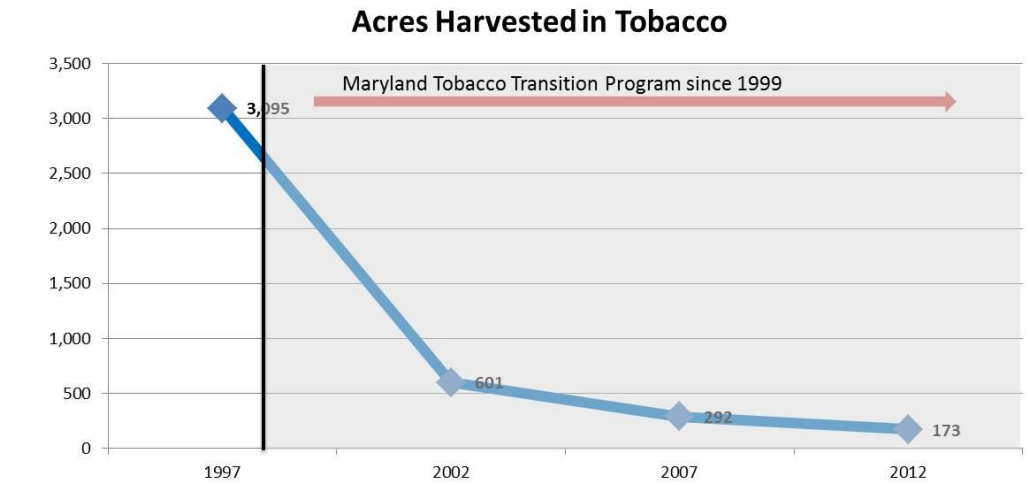
In 1999, Maryland began its Tobacco Buyout program with $78 million of a $4 billion share of the national tobacco settlement with cigarette manufacturers. The program allocates the $78 million over 10 years to tobacco farmers at an annual rate of $1 per pound, based on their average production between 1996 and 1998. To qualify for the program, a farmer must:

1. have grown tobacco in 1998;

2. permanently quit tobacco cultivation; and

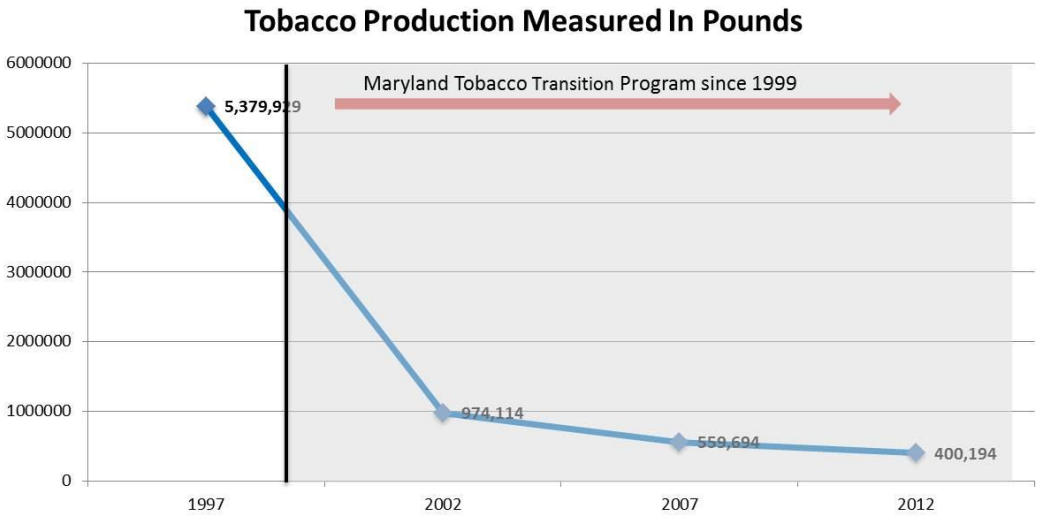
3. convert his land to other agricultural uses for at least 10 years.

This Tobacco Buyout program was designed to transition Maryland farmers, especially those in the traditional Southern Maryland cultivation region, out of tobacco production into more profitable, life-sustaining crops. Figures 24, 25, and 26 demonstrate the significant impact of the buyout program on St. Mary's County's tobacco industry. In 2002, the harvested acreage, production, and sales value for tobacco drastically dropped to only one-sixth of the pre-buyout level in 1997. There were less dramatic but stable declines thereafter. The losses required a major agricultural industry readjustment, requiring a campaign to increase demand for local produce and more value added products.



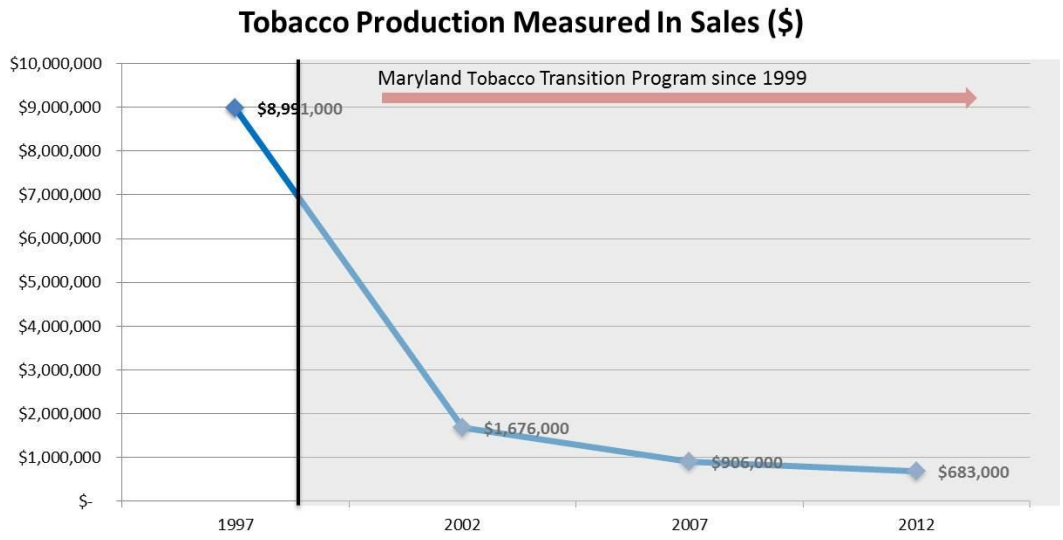
Source: U.S. Department of Agriculture. Census of Agriculture, NASS

Figure 24 *Harvest Tobacco Acreage in St. Mary's County*



Source: U.S. Department of Agriculture. Census of Agriculture, NASS

Figure 25 *Tobacco Production in Pounds in St. Mary's County*



Source: U.S. Department of Agriculture. Census of Agriculture, NASS
U.S. Census of Agriculture, County Data, 2012

Figure 26 *Tobacco Production Measured in Sales ($) in St. Mary's County.*
Note: The sales dollar is in 2012 constant dollars.

Employment and Income for Agriculture

Surrounded by high-tech jobs, federal employment, recreation jobs, and D.C. commuters, the County maintained an unemployment rate of less than 6% in 2012 and ranks sixth-

lowest in unemployment in the state. Since 2002, the unemployment rate has been consistently below the state and national averages. Not surprisingly, the income level in St. Mary's is high. According to Figure 27, the County's $86,358 median household income in 2013 was much higher than both the state and national averages. From 2006 to 2012, the County, with a 21% growth rate, achieved the highest median household income growth rate in the state.

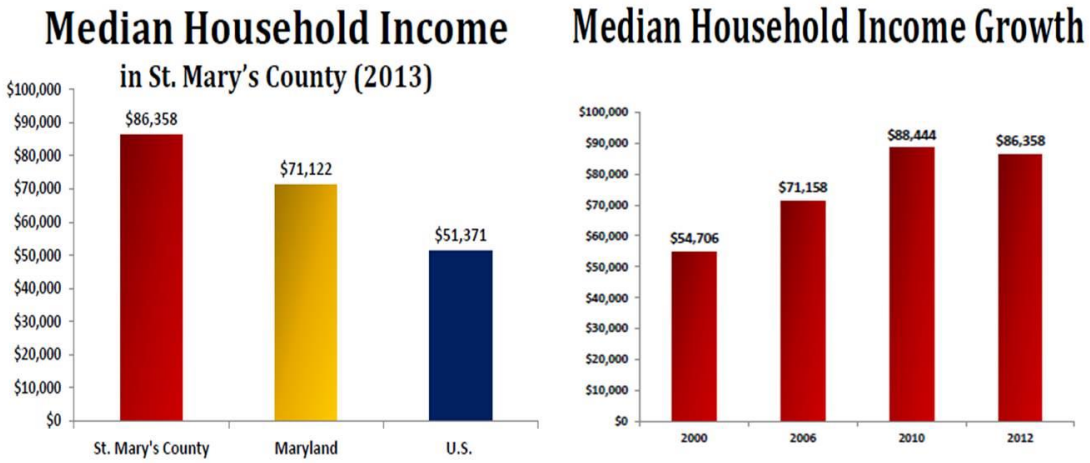


Figure 27 *Median Household Income and Growth Trend in St. Mary's County*
Source: U.S. Census Bureau

However, as shown Table 16, farm employment and income tell another story. In 1997, each farm supported 1.5 full-time jobs. By 2002, the average employment per farm dropped to 1 worker. The small labor-to-farm ratio also provides evidence of the small-scale farm operation trend in the County. However, the method of counting employment creates a downward bias. The Bureau of Economic Analysis only accounts for paid, non-family workers employed 200 days or more on the farm. Therfore, the data for St. Mary's County might undercount total farm employment. Total farm employment is vastly underestimated in some regions — such as the South and California — that have a lot of seasonal immigrant labor.

	1997	2002	2007	2012
Number of Farms	658	577	621	632
Farm Employment(number of jobs)*	885	597	630	633
Total Farm Income**	$42,455,580	$31,392,740	$30,569,790	$40,317,000
Total Farm Income per farm	$64,522.16	$54,407	$49,227	$63,793
Realized Net Farm Income***	$7,339,860	$3,027,220	$2,504,760	$10,070,000
Net Farm Income per farm	$11,155	$5,246	$4,033	$15,934

Note: All dollar estimates are in 2012 constant dollars (adjusted for inflation).

*Includes all operators, by any or 200 Days or more employed in the farms

**Total Farm Income=Cash receipts from marketing + Government payments + value of home consumption and other farm related income components

***Realized Farm Net Income=Total Farm Income – Production Expense

Source: U.S. Census of Agriculture, County Data;

U.S. Bureau of Economic Analysis, by County, Table CA25N, Table CA45, updated May 05, 2014;

Table 16. *Basic Statistics for Farm Employment and Income in St. Mary's County*

After converting values into 2012 constant dollars, the change of total farm income and net farm income in the past 15 years demonstrates the significant impact of the Tobacco Buyout program. Farm income dropped dramatically after 1997, and continued to worsen over the following 10 years. Farm incomes rebounded between 2007 to 2012, when the total income exceeded the 1997 level. The low net farm income adds to the challenge of retaining the County's farming and agricultural lifestyle.

Land Use Changes 2002-2010

Land use patterns, especially shoreline and agricultural preservation are critical for retaining the County's rural image and appeal. Urban sprawl and the loss of farmland and waterfront threaten the County's rural character. The Maryland Land Use/Land Cover data prepared by the Maryland Department of Planning geographically captures the details of land use changes in the County[1].

The MDP Land Use/Land Cover data classifies Urban Land into eight types:

1. **Low-density residential land:** detached single-family/duplex dwelling units, yards and associated areas, with 0.2-2.0 dwelling units per acre
2. **Medium-density residential:** detached single-family/duplex dwelling units, yards and associated areas, with 2-8 dwelling units per acre

[1] MDP has produced a statewide Land Use/Land Cover map, representing different points in time. MDP currently makes the 1973, 2002 and 2010 datasets available. The MDP Land Use/Land Cover dataset uses the Anderson Level 2 Classification System, a standard classification system used by land planners, to display land use/land cover for each county and Baltimore City, This dataset is representative of both statewide and county trends in development (acres by type), and its primary purpose is to track the conversion of resource land to development.

3. **High-density residential land:** attached single-unit row housing, garden apartments, high-rise apartments/condominiums, mobile home and trailer parks, with more than 8 dwelling units per acre;
4. **Commercial:** Retail and wholesale services
5. **Industrial**
6. **Institutional:** such as schools, military installations, churches, medical and health facilities, and government offices and facilities;
7. **Extractive:** surface mining operations
8. **Open urban land:** Urban areas whose use does not require structures, or urban areas where non-conforming uses characterized by open land have become isolated.

Agriculture Land is categorized into six types:

1. Cropland
2. Pasture
3. Orchards/vineyards/horticulture
4. Feeding operations: for animals, such as cattle feed lots, hog feeding lots, poultry houses
5. Agricultural buildings, such as breeding and training facilities, storage facilities, built-up areas
6. Row and garden crops

Analysis of the Maryland Department of Planning Land Use and Land Cover mapping

indicates that, in 2002, there were 60,307 acres of agriculture land and 48,242 acres of urban land. In 2010, the acreage of agriculture land use dropped to 51,511 acres, while the urban land uses increased to 51,284 acres. There was a 14.6% drop in agriculture land and a 6.3% increase in urban land use during the same period. Table 17 also lists the details and changes for each type of agriculture and urban land uses.

	Land Use in Acres		Land Use Change	
	2002 Acres	2010 Acres	2002-2010 Acres	Percent
Agriculture				
Cropland	54,358	46,969	-7,390	-13.6%
Pasture	5,349	3,950	-1,400	-26.2%
Orchards/vineyard/horticulture	23	20	-3	-12.6%
Feeding operations	22	59	37	164.0%
Agricultural building	108	144	36	33.4%
Row and garden crops	445	369	-76	-17.1%
Total	**60,307**	**51,511**	**-8,796**	**-14.6%**
Urban				
Low-density residential	31,774	34,529	2,755	8.7%
Mid-density residential	5,096	4,715	-381	-7.5%
High-density residential	717	815	98	13.6%
Commercial	3,203	3,065	-138	-4.3%
Industrial	394	501	107	27.1%
Institutional	6,089	6,793	704	11.6%
Extractive	233	221	-12	-5.1%
Open urban land	735	644	-91	-12.4%
Total	**48,242**	**51,284**	**3,042**	**6.3%**

Source: MDProperty View Data, Maryland Department of Planning

Table 17. *Land Use Change in St. Mary's County*

The land use changes are net numbers and do not solely imply a shift of an agricultural parcel to an urban use. There are possibly land use changes into and out of other categories of land use, such as:

1. Forest land
2. Water: Rivers, waterways, reservoirs, ponds, bays, estuaries, and ocean.

3. Wetlands: Forested or non-forested wetlands, including tidal flats, tidal and non-tidal marshes and upland swamps and wet areas.
4. Barren land
5. Transportation: Miscellaneous transportation features not elsewhere classified. Includes park and ride facilities and transit stations.

The net land use changes in tables 18 and 19 indicate that of the 11,619-acres loss of agricultural lands since 2002, 4,865 acres were converted into urban land uses, and 6,754 acres shifted into alternative land uses.

Land Use Change (2002-2010) in Acres							
	Net Changes	Remained from 2002	Percentage*	Lost After 2002	Percentage**	Newly Increased After 2002	Percentage***
Agriculture Land	**-8,796**	48,688	80.7%	-11,619	-19.3%	2,823	5.5%
Urban Land	**3,042**	39,916	82.7%	-8,326	-17.3%	11,368	22.2%

*Note: * & ** Compared to the 2002 Agriculture/Urban Land Acreage; *** Compared to the 2010 Agriculture/Urban Land Acreage*

Source: MDProperty View Data, Maryland Department of Planning

Table 18. *Aggregate Land Use Change in St. Mary's County 2002-2010*

		Total (Acres)	**Percentage**
2010 Urban Lands Converted from 2002 Agriculture Lands		**4,865**	**100%**
Converted Categories:	Low-density residential	4,023	82.7%
	Mid-density residential	150	3.1%
	High-density residential	10	0.2%
	Commercial	259	5.3%
	Industrial	51	1.0%
	Institutional	299	6.1%
	Extractive	43	0.9%
	Open urban land	31	0.6%

Source: MDProperty View Data, Maryland Department of Planning

Table 19. *2010 Urban Lands Converted from 2002 Agriculture Lands*

Agriculture Land Use Change

A total of 11,619 acres of agricultural land in St. Mary's County were converted from agricultural use between 2002 and 2010. In the same period, 2,823 additional acres were converted to agricultural land, resulting in an 8,796-acre net loss of agricultural land. Crops, still the leading agriculture land use, were met with a 7,390-acre loss from 2002 to 2010. Other plant or cultivation land use, such as orchards/vineyards/horticulture, pasture, and row and garden crops, experienced a similar loss — 12.6% — in acreage from 2002 to 2010. The land used for agriculture-related facilities such as feeding operations (164%) and agricultural buildings (33.4%) quickly grew during those years.

According to St. Mary's County 2010 Comprehensive plan, the County created Rural Preservation Districts (RPD) to preserve farmland. RPD zoning consists of 182,558 acres. The acreage is substantially larger than land zoned agriculture because it includes land outside designated growth areas — such as forests, rural subdivisions, farmstead lots, and vacant lands.

The RPD areas are mainly parcels with an existing concentration of profitable agricultural or forestry enterprises or large enough to support commodity crops (corn, wheat, soybeans), fodder and feed operations, small- to medium-scale livestock operations, equine operations, and specialty farm operations (including organic farming). Preservation of these agriculture lands should help stabilize the County's heritage and rural character. Figure 28 shows the location of agricultural land uses and

that the majority share of agricultural land use is cropland.

While Figure 28 shows the agricultural land in 2002 and 2010, Figure 29 shows the parcels that transitioned into and out of agricultural use. Combining the agriculture conversion data with St. Mary's County's jurisdictional location map in Figure 29, it is obvious that the general transition of land out of and into agriculture is geographically scattered. The largest concentrated areas of new agriculture land and consistently agriculture land is in the northwest Charlotte Hall areas. This may be explained by the fact that many of the farms in the northwest portion of the County are operated by the Amish and Mennonite communities.

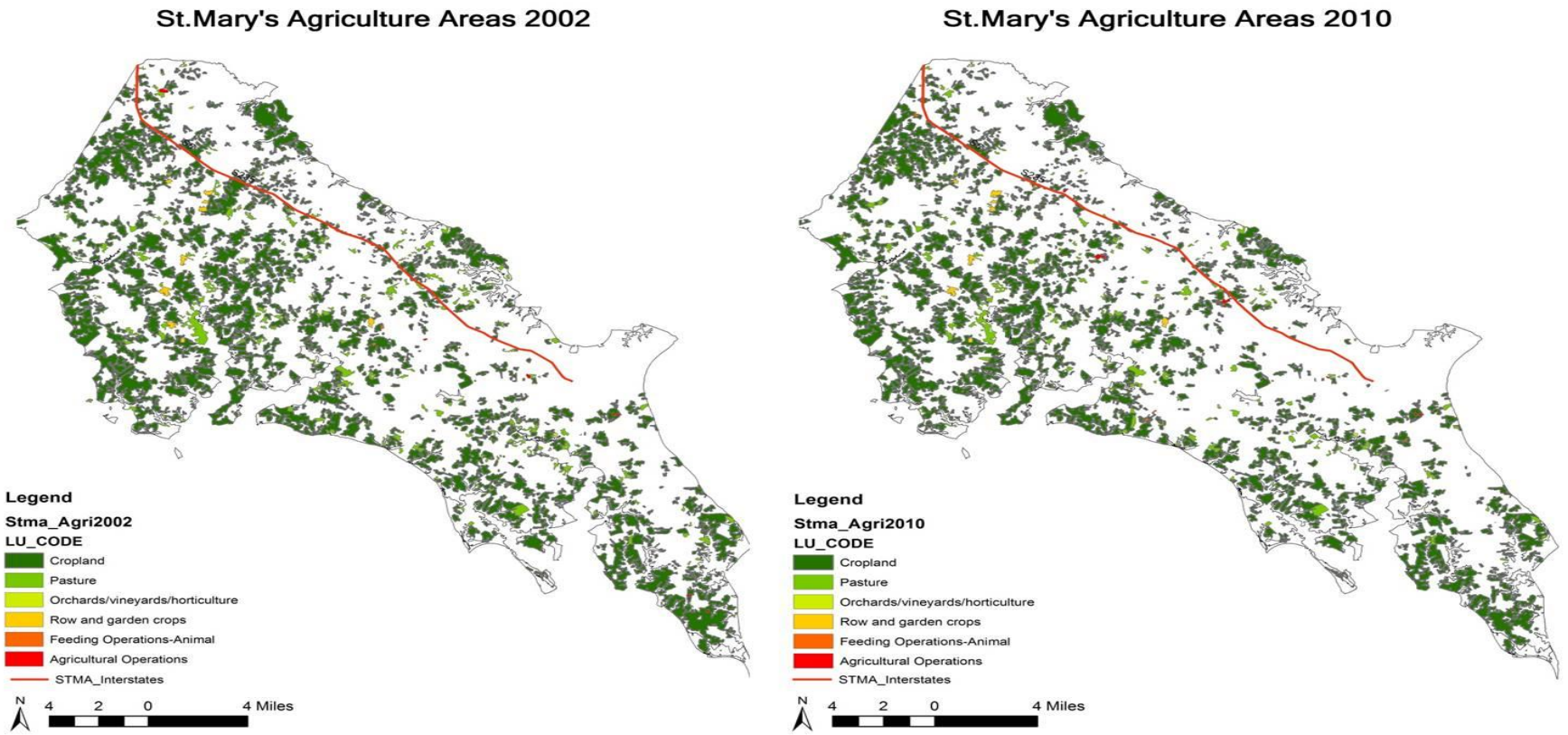


Figure 28 *Agriculture Land Use Change in St. Mary's County 2002-2010 Source: MDProperty View Data, Maryland Department of Planning*

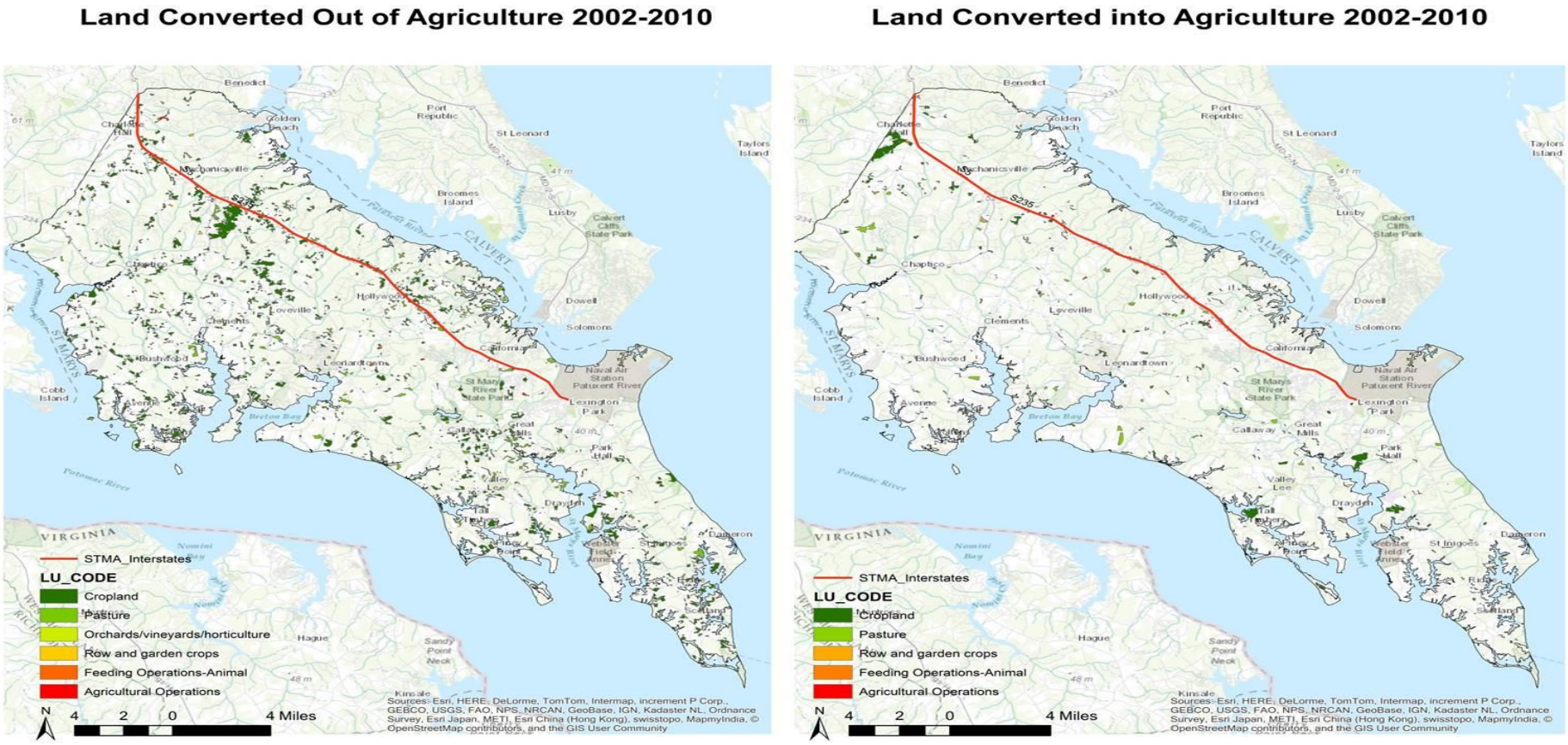


Figure 29 *Agriculture Land Use Change in St. Mary's County 2002-2010. Source: MDProperty View Data, Maryland Department of Planning*

Urban Land Use Change

A total 11,368 acres were converted into urban use from 2002 to 2010. Over the same period, 8,327 acres transitioned out of urban use. Thus, the total gain in urban land was 3,041 acres, as shown in Table 19. Not all urban land transitioned to agriculture or vice versa. Figure 30 shows that urban land parcels are dispersed across the County, but there are a few concentrations of developments along Route 235, around the County seat of Leonardtown, and in Lexington Park.

As calculated in Table 19 and geographically illustrated in figures 30 and 31, residential land still accounted for the majority of urban land use and the largest share of the acreage increase. The residential land portion of urban land grew from 77.9% in 2002 to 78.1% in 2010.

The residential growth was largest in low-density development area. As shown in Table 19, the low-density residential developments increased by 2,755 acres from 2002 to 2010, mid-density residential land use dropped by 381 acres, and the high-density residential lands maintained nearly the same level in those eight years. The low-density residential land use grew 8.7%. Figure 32 shows the detailed map of residential land use and further demonstrates the growth of low-density residential and its spread throughout the County.

Land transferred from agricultural to urban land from 2002 to 2010 accounted for 4,865 acres. Of that, 4,023 acres switched to low-density residential development, which constitutes 82.7% of agricultural land lost to urban land during the same period.

Institutional land use ranked as the second largest absolute land acreage increase, receiving 299 acres of agricultural land. This is not because of the expansion of the NAS Patuxent River, but rather the creation of several schools in the County.

An agricultural focus group on December 11,2014 at the St. Mary's Agricultural Service Center and interviews with agricultural extension workers in the County highlighted farmers' concern about the encroachment of residential development into farming areas. Land use conflicts arise when homeowners complain about the use of pesticides, fertilizer smells, and tractor traffic, were are all activities necessary for successful farming. Given the amount of agricultural land lost to low-density residential and the dispersed pattern (figures 32 and 33) of it, it is worth noting the spatial relationship between newly converted agricultural-to-urban land parcels. Figure 32 shows the pattern of new residential land and Figure 33 shows the pattern of agricultural land converted to urban uses. Most of the conversions were to low-density residential and very few were to high-density residential, commercial, industrial, or institutional.

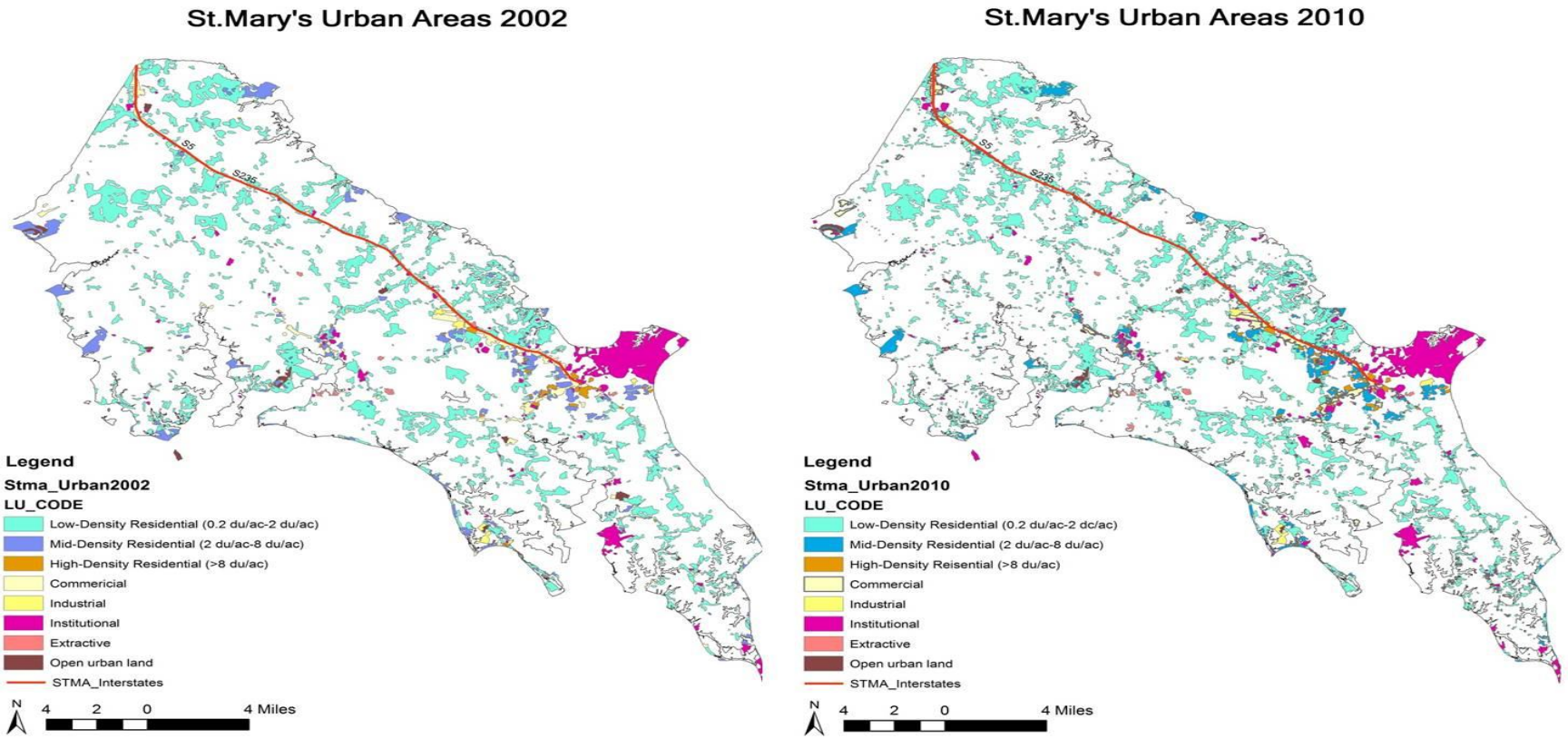


Figure 30 *Urban Land Use Change in St. Mary's County 2002-2010. Source: MDProperty View Data, Maryland Department of Planning*

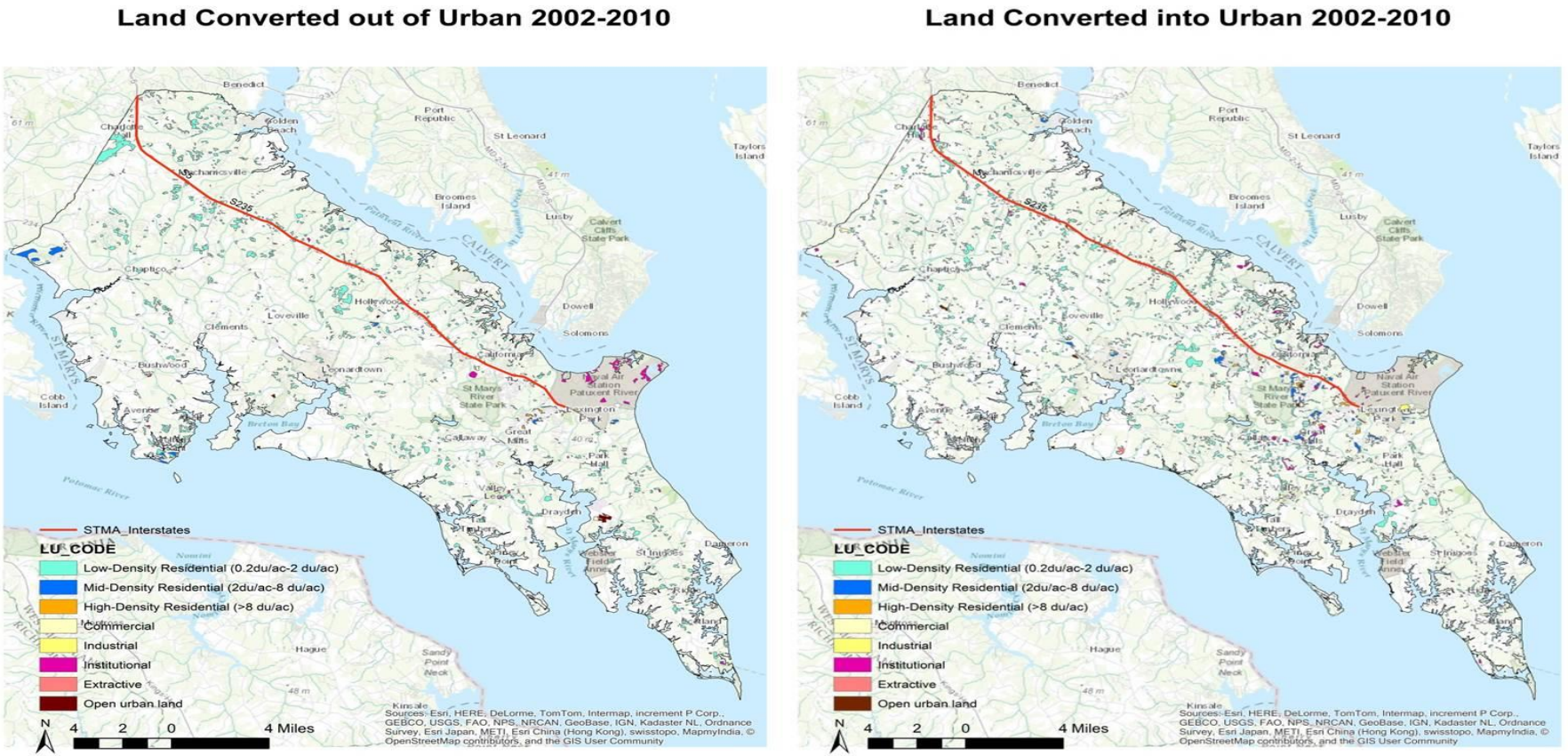


Figure 31 *Urban Land Use Change in St. Mary's County 2002-2010. Source: MDProperty View Data, Maryland Department of Planning*

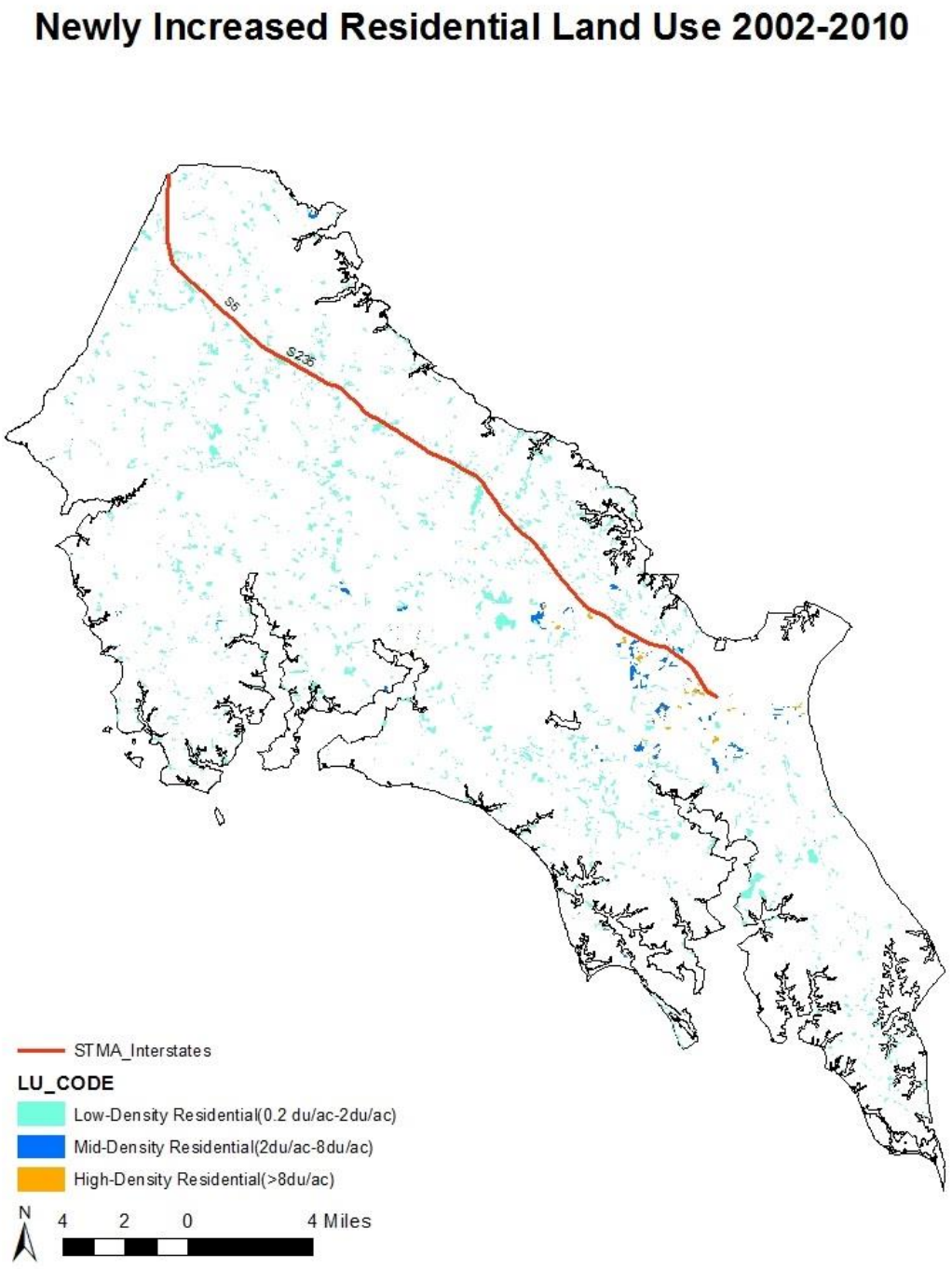


Figure 32 *Newly Increased Residential Land Use 2002-2010.*
Source: MDProperty View Data, Maryland Department of Planning

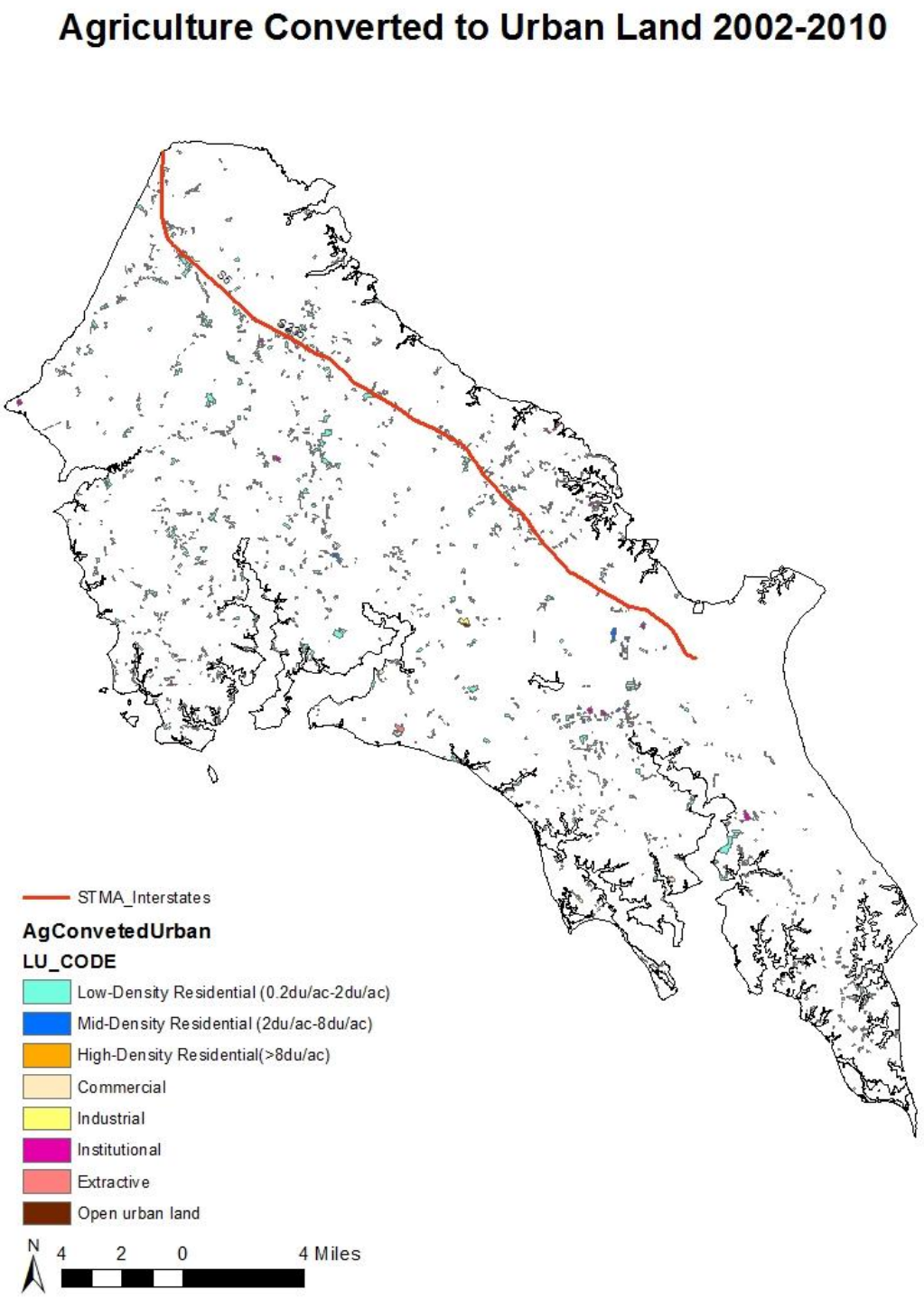


Figure 33 *Agriculture Land Use Converted into Urban Land Use by Urban Use, 2002-2010. Source: MDProperty View Data, Maryland Department of Planning*

Directly Impacted Agricultural Land

In both the focus group discussion and the interviews with University of Maryland extension faculty, land use conflicts between farmers and urban residential settlements were brought to the fore. To explore these conflicts, agricultural land parcels close enough to urban land uses to experience land use conflicts — such as neighborhood complaints about pesticides and fertilizer smells — were measured with a 0.5 mile-buffer, shown in figures 34 and 35. Agricultural land within 0.5 mile of urban land was more likely to be impacted directly by urban land development. For clarity, these agricultural parcels were labeled "Directly Impacted Agricultural Land" (DIAL). In 2002 and 2010, most agricultural lands were within 0.5 mile of urban development. The exceptions were the red-circled areas in figures 34 and 35 where farms were more than 0.5 mile from urban development. DIALs declined from 53,760 acres in 2002 to 48,250 acres in 2010 because of the decline of total agriculture lands. The proportion of DIAL land among total agricultural lands increased from 89.1 % to 93.7%. In St. Mary's County, there is no specific boundary between agriculture and urban land use. The two parcel types are generally proximate to each other.

To make a detailed estimation of DIALs converted from 2002 agriculture land into 2010 urban lands, a 0.5 mile-was used to capture the DIAL increments. Figure 36 captures the new DIAL parcels caused by the conversion. The result was 3,266 acres of new DIALs due to the conversion process.[2] The agriculture-to-urban land conversion process did not significantly alter the existing land-use pattern. To some extent, the current pattern can be seen as an integration of agricultural and urban land uses, and such integration may be the reason for the ongoing concern about conflict between urban development and farming.

[2] The vast majority of new DIALs are cropland (3,026 acres) with 226 acres of pasture and 14 acres of row and garden crops affected.

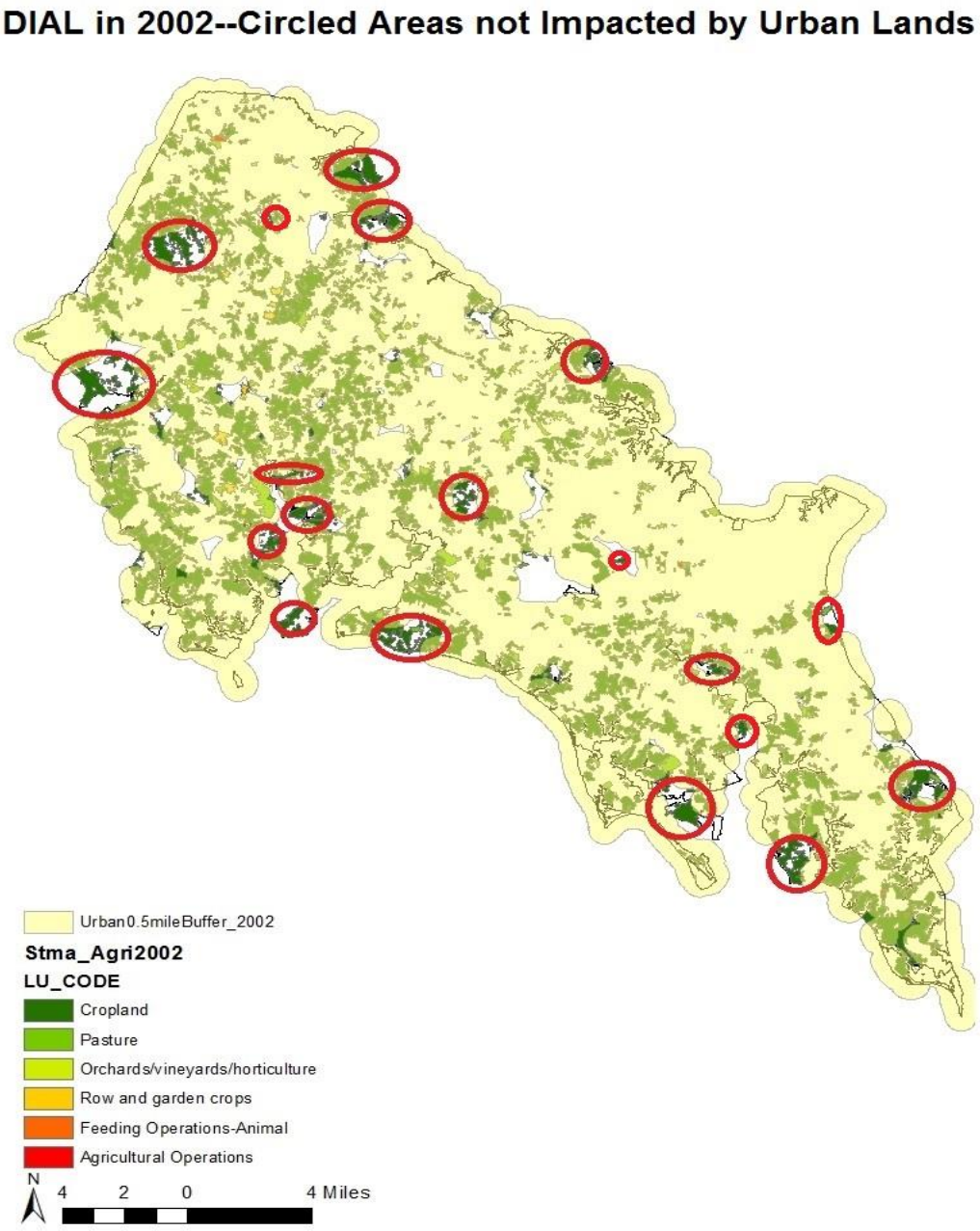


Figure 34 *DIAL in 2002--Circled Areas are not impacted by urban land.*
Source: MDProperty View Data, Maryland Department of Planning

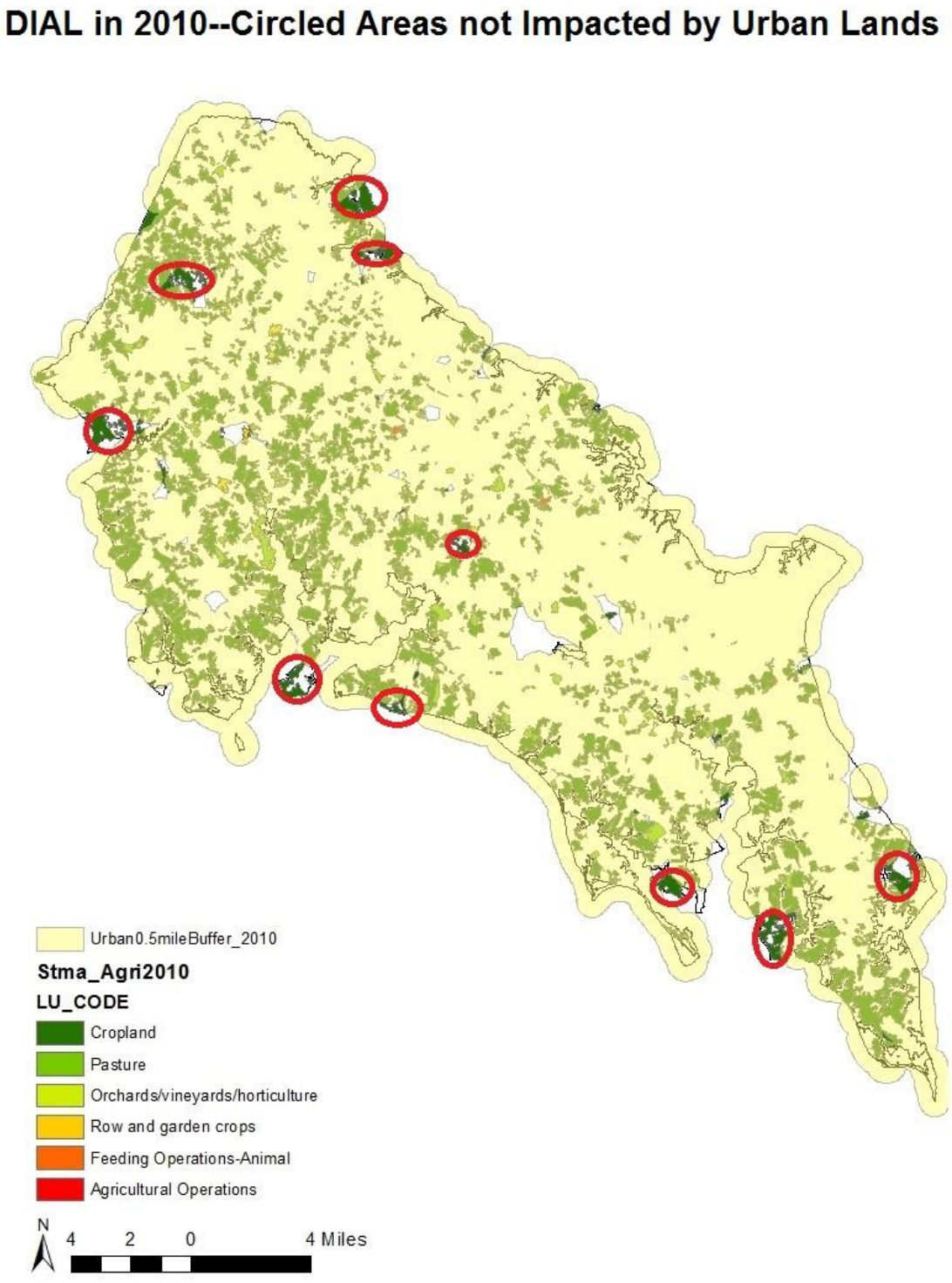


Figure 35 *DIAL in 2010--Circled Areas are not impacted by urban land. Source: MDProperty View Data, Maryland Department of Planning*

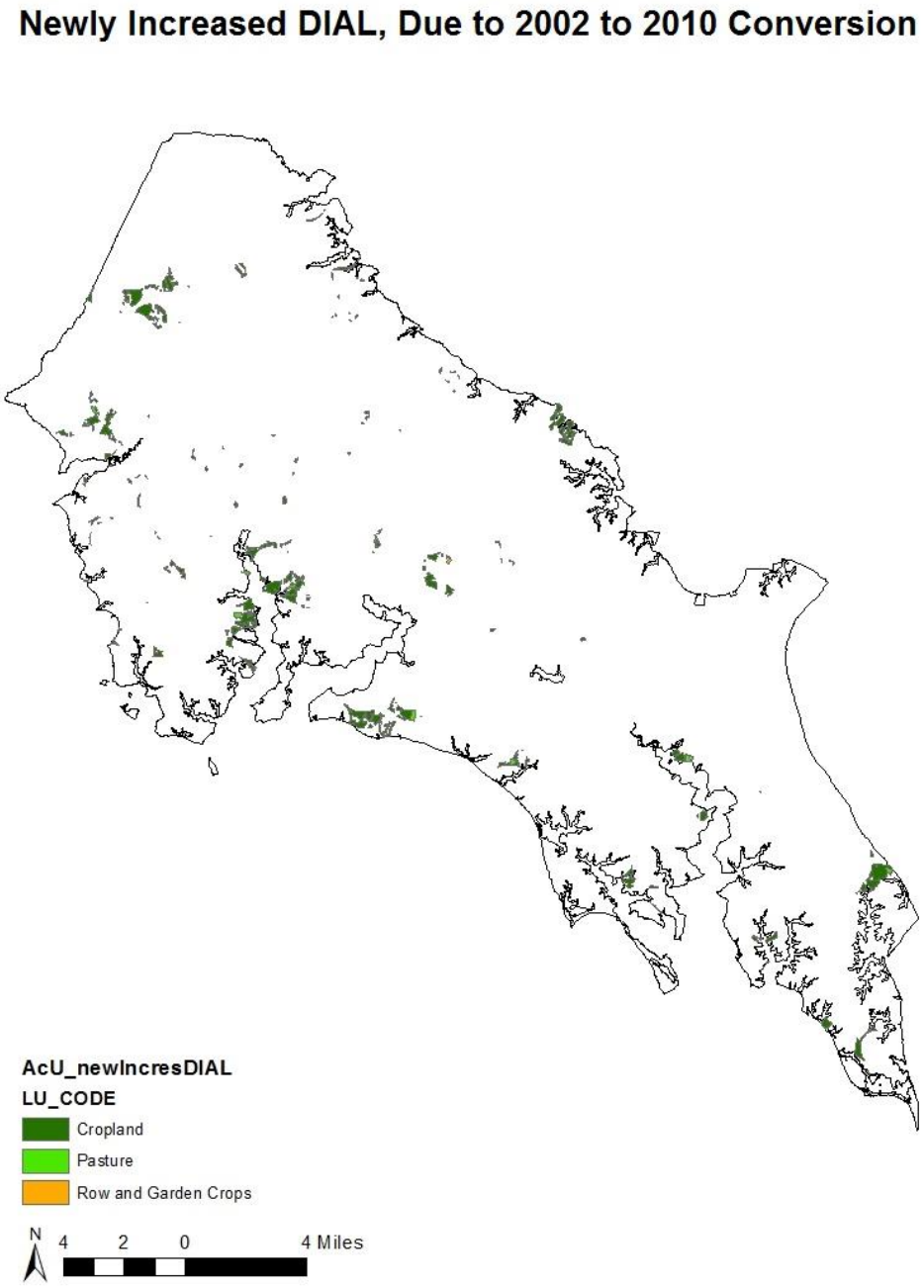


Figure 36 *Newly Increased DIAL, Due to 2002 to 2010 Conversion. Source: MDProperty View Data, Maryland Department of Planning*

Role of County's TDR Program in the Integrated Land Use Pattern

The 2007 amended Transfer Development Rights (TDR) policy continues the pattern of integrating agriculture and urban land uses. The new urban land use is primarily for low-density residential development. For a TDR program to work, demand for development rights is necessary. In St. Mary's County, the demand, in terms of acreage, is primarily for low-density residential.

Transfer Development Rights separate the development rights from the property itself as mechanism for allowing farmers to capture some of the value of their land while keeping the land in farming. Developers who purchase the development rights can add to the density or floor-area-ratio to their development elsewhere in the County. Once development rights are sold, the land is permanently restricted from further development or preserved as open space, farmland, or woodland.[3] The base for low-density residential development is 1 dwelling per acre, which may increase to five dwellings per acre with the use of TDRs. With sufficient TDRs there would be no minimum lot size and no minimum open space required.

The lifting and landing of TDRs by land use is shown in Table 20. The majority of TDRs were purchased from forest land and the majority of TDRs were applied to urban developments. Table 21 provides finer detail, including low-density residential, mid-density residential, commercial, and institutional use. The majority of TDRs used for urban land uses were in commercial areas (61%), and the share for lo- density residential (38%) was not far behind.

[3] The number of Transfer Development Rights (TDRs) is determined by the number of acres, divided by 5, subtracting the number of dwellings on the property. Purchasers of TDRs may use them to increase residential density in the Rural Preservation District (RPD) or increase the floor-to-area ratio (FAR) in commercial zones. http://stmarysmd.com/ded/TDR.asp, 4/28/2015.

Total TDRs	Lifted	Landed
Total	**1261**	**572**
TDRs Matched with 2010 MDProperty View Data*		
Total	1096	446
Agriculture	165	20
	15%	5%
Urban	169	220
	15%	49%
Forest	758	206
	69%	46%
Wetland	4	0
	.4%	0%

Note: *The total TDRS Lifted and Landed by Land use does not equal the total lifted and landed because when TDRs were matched with land use data in Property View, some TDR locations did not have matching land uses.

Table 20. *Quantities of TDRs Lifted and Landed by Land Use. TDRs as of March 2015 Source: St. Mary's County Planning Department and the 2010 MDProperty View Data from Maryland Department of Planning*

TDRs Landed on Urban Land, No. = 220	
Low Density Residential	84
	38%
Mid Density Residential	2
	1%
Commercial	134
	61%
Institutional	0
	0%

Table 21. *Quantities of Landed TDRs by Urban Land Use*
Source: St. Mary's County Planning Department and the 2010 MDProperty View Data from Maryland Department of Planning

The sale, or lifting, of TDRs is countywide, but primarily on forestland. Figure 37 shows the location of lifted TDRs through March 2015, matched with the land use categories from 2010 Maryland Property View Data. Figure 38 shows the number of lifted TDRs, by specific location. Figure 39 shows where the TDRs landed matched with land uses from the 2010 Property View data. TDRs are most often purchased to increase density of forest areas, but the use of TDRs to increase urban density is notable along Route 235 and near NAS Patuxent River. In several areas, TDRs were purchased to increase density on agricultural land. According to current zoning, farms and aquaculture in the rural preservation zone are permitted to use fertilizers, pesticides, and implements, even in the face of residential complaints.[4] Figure 40 shows the number of landed TDRs, by specific location in St. Mary's County.

[4] According to St. Mary's County Comprehensive Zoning Ordinance, Section 53.2, (EFFECTIVE SEPTEMBER 14, 2010, last amended NOVEMBER 18, 2014), "Agriculture, aquaculture and silviculture are the preferred land uses in the rural preservation district. Agriculture, aquaculture and silviculture are also allowed in other zoning districts.

Unlike more urban counties, such as Montgomery County, where a TDR program directs TDR landings to only growth areas, St. Mary's County has a pattern of landing TDRs in rural preservation zones. This policy makes sense for St. Mary's County where demand for TDRs comes primarily from low-density residential developments.

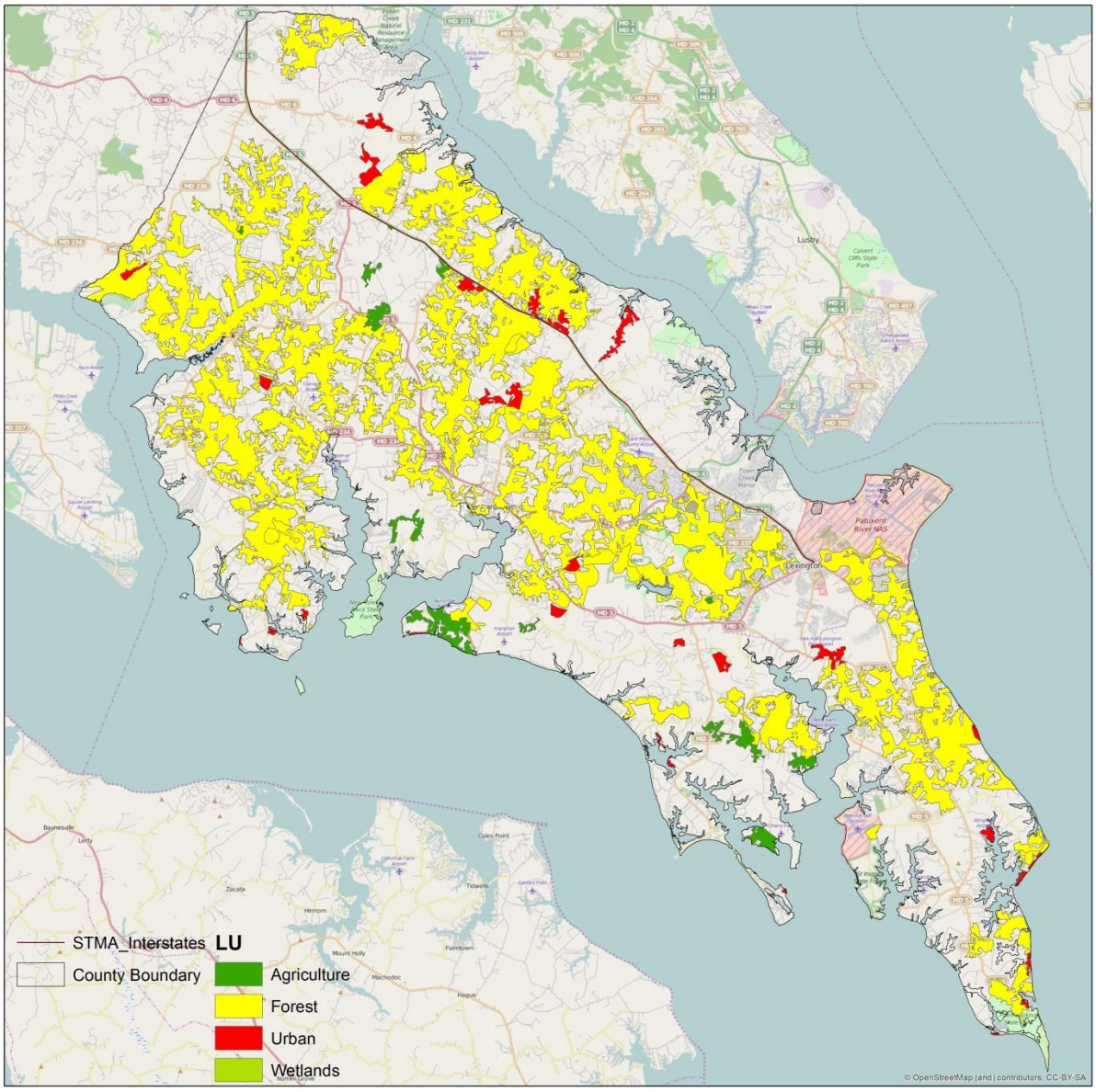


Figure 37 *Lifted TDR Parcels Matched with Property View Land Use Categories. Source: MDProperty View Data, Maryland Department of Planning*

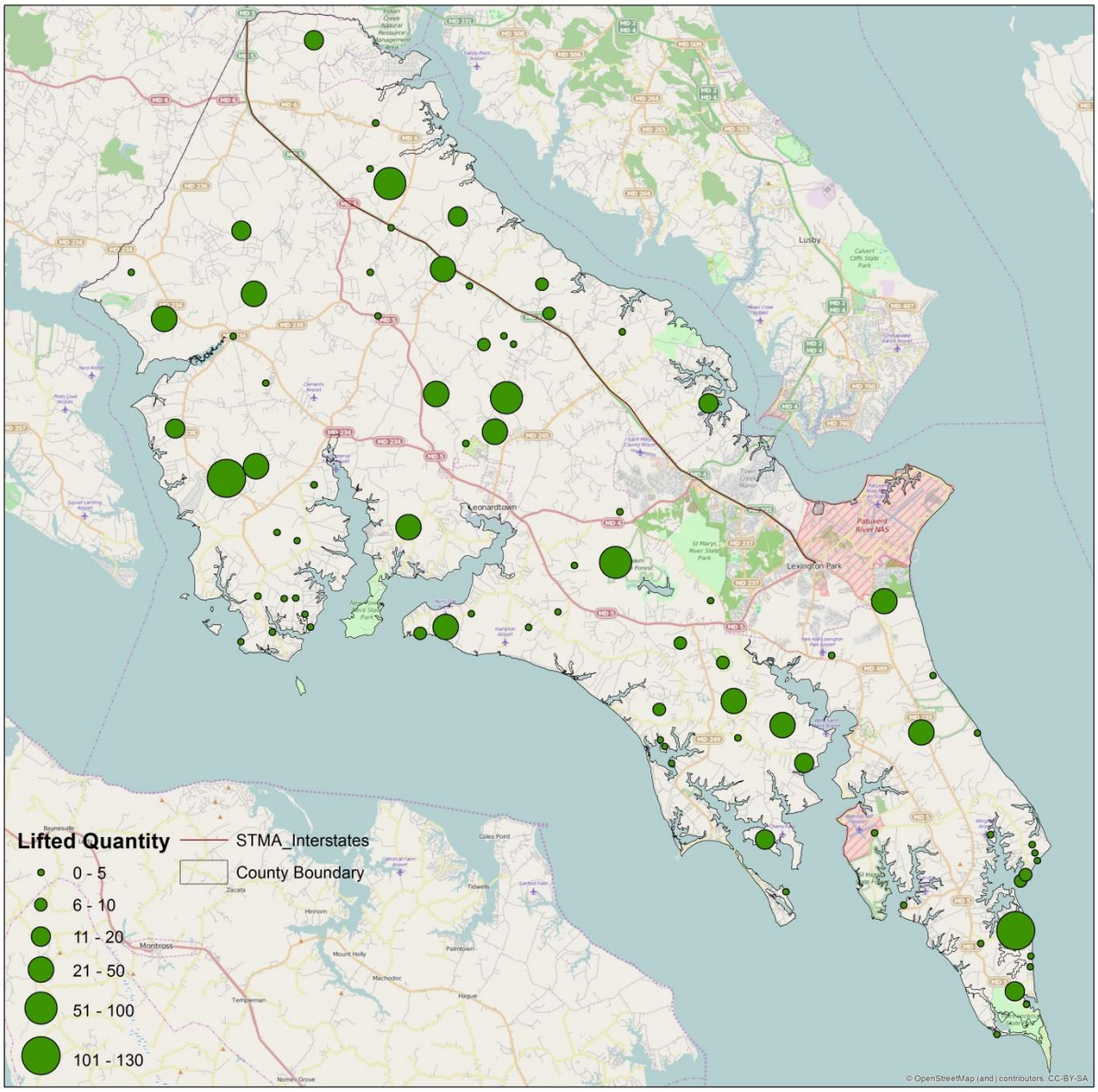


Figure 38 *Number of Lifted TDRs, as of March 2015.*
Source: MDProperty View Data, Maryland Department of Planning

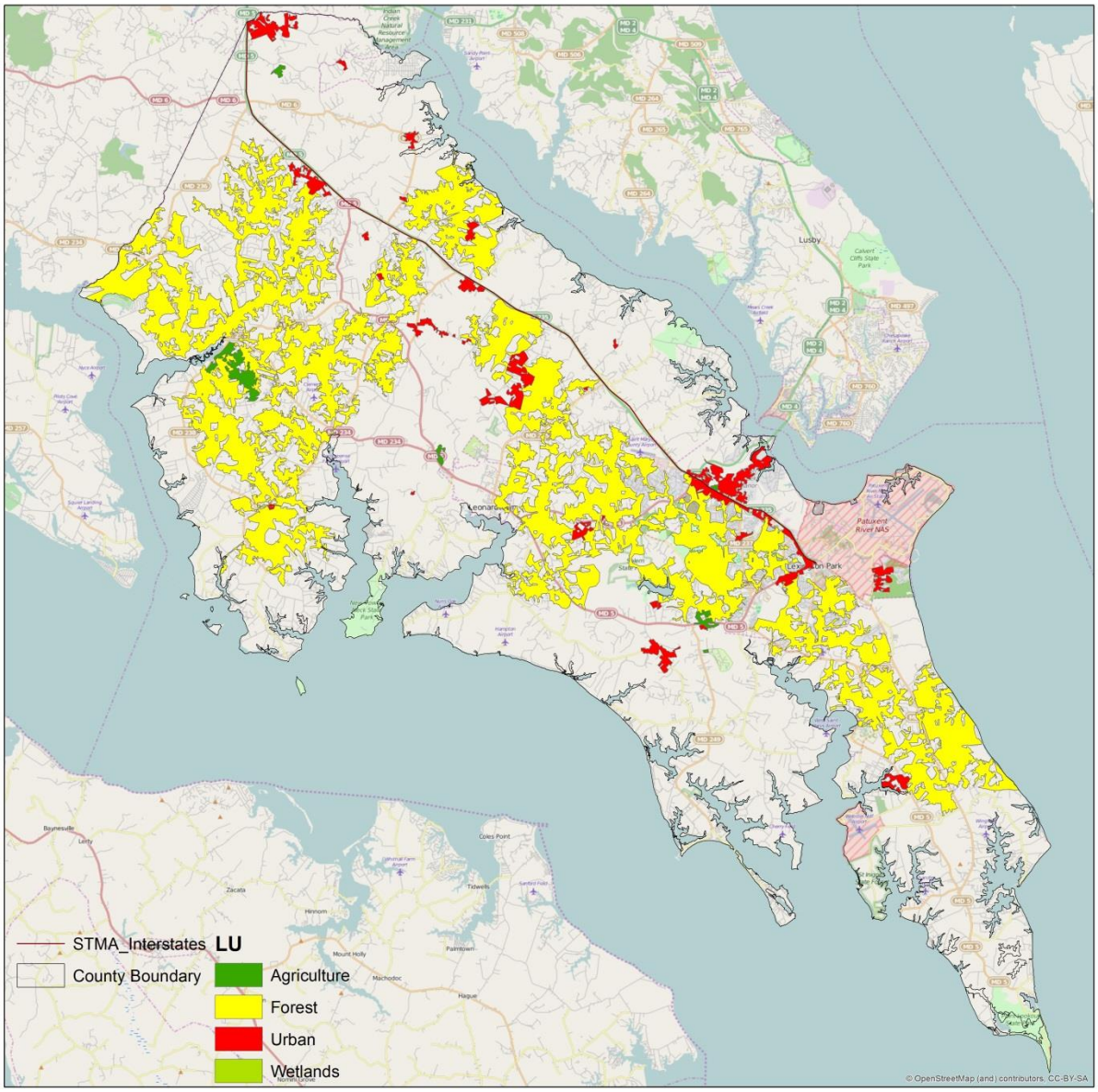


Figure 39 *Landed TDR Parcels Matched with Property View Land Use Categories, as of March 2015*
Source: MDProperty View Data, Maryland Department of Planning

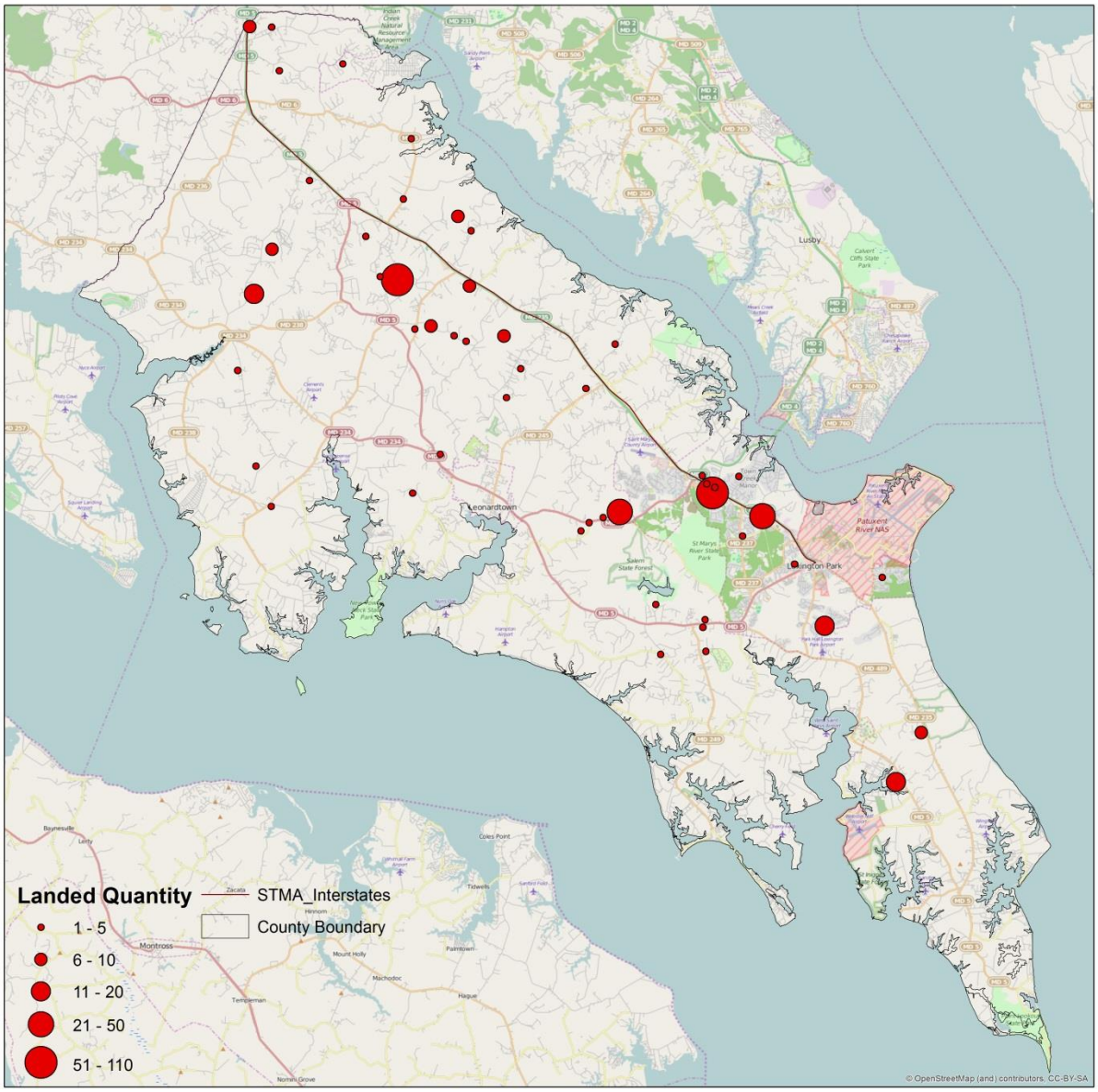


Figure 40 *Number of Landed TDRs as of March 2015.*
Source: MDProperty View Data, Maryland Department of Planning

Recommendations for the Agricultural Sector in St. Mary's County

Even though agriculture and aquaculture together contributed only 0.43% of the County's gross domestic product in 2009, the preservation of the farming and seafood industries remains a top economic development priority. The importance of farming and fishing evolves from the County's scenic beauty and historical heritage. While not the major source of jobs or income, farming and seafood remain the major share of land use and important contributors to the County economy, Table 22. The community vision is to foster economic growth while protecting the County's rural character, natural resources, and historical qualities. Preservation of the County's rural character and stewardship of the land and environment undergird the County' current economy and future development strategy. Farming and seafood, and their supporting activities, offer a foundation for economic diversity and expansion, through horticulture, wineries, and agro-tourism. The best way to keep land and workers in the agricultural and seafood sectors is to make these sectors more profitable.

A number of recommendations to increase incomes and diversity in St. Mary's farming and seafood industries include the use of digital technology to market products into the broader regional economy and expansion into wineries, horticulture farming, agricultural tourism, and the promotion of young farmers.

Recommendation #1: Use Digital Technology to Expand the Market for Agricultural Projects and Seafood

Digital technology makes it easier to connect consumers and producers. Producers can indicate supply in real time and consumers can indicate demand and digital technologies can then aid in establishing market price. A larger regional market and increased demand can drive higher market prices.

RelayFoods.com, for example, is a local online grocery company that serves as a platform to connect consumers and producers by targeting consumers in the Washington D.C. metropolitan area. Relay provides locally produced groceries including non-GMO, local, organic, conventional foods, and provides exclusive products such as in-house butchery, fresh local beef, in-house seafood, prepared food and meal-plan services.

Relay's operation connects producers and consumers with fast and efficient "Next Day, Multi-Channel Delivery." Customers place online orders by midnight. In the morning, Relay's production and fulfillment team pick and build orders. About 10 a.m., Relay's truck teams arrive at warehouses and transfer orders to markets while van teams collect last-minute items from local vendors.

Customers can pick up orders free at designated sites or have items delivered for a $30/month subscription. With its own delivery fleet, Relay is currently serving the Charlottesville, VA, Richmond, VA, Washington D.C., Baltimore, MD, and the Raleigh/Durham/Chapel Hill, NC areas.

On the producer's side, farmers and seafood producers enter online the availability of products, including type, non-GMO, organic, and the amount for sale. Relay matches the

supply and demand and schedules the pickups.

There are 190 producers from the D.C. metropolitan area and regional producers in MD, VA, and NC areas cooperating with Relay Foods. Farmers and producers have the flexibility to deliver or prepare foods according to their own schedules. No extra burden rests on producers to interrupt their farming responsibilities or schedules. There is no "middle man" between Relay and producers, which means higher profit margin than big box grocery stores offer farmers. The new technology builds on the current movement to eat fresh, local produce to expand the markets and incomes for St. Mary's County farmers and seafood producers.

Implementation in St. Mary's County

In order to implement this strategy, we suggest St. Mary's County host a daylong conference and invite potential transportation companies. The conference could identify pickup locations and introduce farmers and seafood producers to the technology. The County can help the company create distribution hubs through existing farmers markets or temporary warehouses on major commuting routes.

Recommendation #2: Promote young farmers

The graying of the farm population has led to concern about the long-term health of family farms as an American institution. Maryland has several "young farmer" initiatives, including the Beginning Farmer Success program. Beginning Farmer Success is a University of Maryland Extension partnership program that provides farmers with tools and education to explore, refine, develop, and implement farm businesses. Educators develop a curriculum for new farmers to encourage and enhance their interest and comprehension of the field.

The program also offers workshops that bridge the gap from exploring the career to on-farm apprenticeships and mentorship. The program also expands existing new farmer training programs to provide practical, hands-on, shoulder-to-shoulder training for beginning farmers. The program aims to ensure long-term success through continued support.

An additional effort is the Farm LINK mentoring program developed by the Southern Maryland Agricultural Development Commission. It also offers workshops, direct consultation, planning tools and production information to support farmers as they become established.

St. Mary's County Farm Bureau has established the St. Mary's County Young Farmers Organization for agricultural producers and enthusiasts between the ages of 18-35 who live in the County. The County should use St. Mary's County Young Farmers Organization and use the resources from Beginning Farmer Success programs, to better represent, mobilize, and engage young farmers to ensure their success. The County's support for younger farmers should encourage sustainable farming practices that maintain healthy soil, water, air, and climate; help new farmers obtain/lease high-quality, affordable land; and support training for innovative farming ideas and practices and model apprenticeship education.

Recommendation #3: Promotion of winery tourism

As part of St. Mary's economic development advertising campaign, the County should promote and advertise St. Mary's County's wineries and coordinate joint advertisements with Charles, Prince Georges, and Calvert counties. As part of this strategy, some County practices could encourage tourists to return — and bring their friends and relatives, such as

the creation of wine community partnerships with local hotels, restaurants, airports and transportation companies; hosting special events and festivals; creating unique winery tours for visitors; link winery tourism to regional tourism, such as other local tourism sites.

Recommendation #4: Promote horticulture

With the residential growth in the surrounding counties of Charles, Prince Georges, and Calvert counties, there is an expanding horticulture market, including landscaping plants and lawns. St. Mary's County farmers who move into these markets and advertise, also indirectly promote St. Mary's County.

Recommendation #5: Promote heritage tourism

Proximity to Washington, D.C. and Baltimore, and the rich array of historical sites, offers potential for agricultural and heritage tourism in the County. Heritage tourism, through which visitors seek an historic or educational experience, could be a rapidly expanding sector for the County's travel industry. Additional bed and breakfast and restaurant options are needed to expand this sector. Internet itineraries could further the public's understanding and appreciation of the historic places and help preserve irreplaceable resources.

Recommendation #6: Promotion of Agricultural and Seafood Tourism

The County could promote its agricultural and seafood tourism by advertising the opportunities to visit farms, pick your own produce, and visit the waterman and seafood lifestyle. This would require an advertising campaign in the metro Washington, D.C. and Baltimore regions.

Summary

Although farming incomes have rebounded in the past five years, the income per acre of farmland in St. Mary's County does not generate the same revenue as the rest of the state. Increasing farm incomes is a high priority. The County and the University of Maryland have existing efforts in the areas of advertising, promoting tourism, and young farmer programs. The University of Maryland extension service is encouraging the development of new markets, pest control, environmental protection, and young farmers. The County should continue and expand the promotion of these initiatives.

The main need for maintaining the rural lifestyle is to increase farming and aquaculture incomes through the adoption of digital technology linking local agricultural and seafood products to transportation networks for broader markets. Around the country, digital technology expands markets by connecting producers with customers in real time. Consumers' increasing demand for fresh produce is creating substantial market possibilities for St. Mary's County products. The digital technology and County-sponsored tourism campaigns is a way the government can increase farm incomes and strengthen the seafood and agricultural sector.

	Agriculture, forestry, fishing, and hunting (share of total GDP)	Farms (share of total GDP)	Forestry, fishing, and related activities (share of total GDP)	Agriculture, forestry, fishing, and hunting (share of total GDP)	Farms (share of total GDP)	Forestry, fishing, and related activities (share of total GDP)
	St. Mary's County			Maryland		
2001	0.65%	0.52%	0.13%	0.35%	0.30%	0.05%
2002	0.12%		0.12%	0.25%	0.20%	0.05%
2003		0.30%		0.29%	0.23%	0.05%
2004	0.46%	0.36%	0.13%	0.35%	0.30%	0.05%
2005	0.32%	0.22%	0.10%	0.30%	0.25%	0.05%
2006	0.25%	0.16%	0.09%	0.28%	0.23%	0.05%
2007	0.21%	0.11%	0.09%	0.26%	0.22%	0.04%
2008	0.42%	0.31%	0.10%	0.26%	0.21%	0.04%
2009	0.43%	0.36%	0.08%	0.27%	0.23%	0.04%
2010	(na)	0.26%	(na)	0.26%	0.22%	0.04%
2011	(na)	0.43%	(na)	0.31%	0.27%	0.04%
2012	(na)	0.36%	(na)	0.33%	0.29%	0.04%
2013	(na)	(na)	(na)	0.46%	(na)	(na)

Source: Bureau of Economic Analysis, The BEA measures St. Mary's County with the same boundaries as the California-Lexington Park, MD (Metropolitan Statistical Area) reported in the BEA data.

Table 22.*Gross Domestic Product of Agriculture, Farming, and Fishing in St. Mary's County and Maryland, 2001 to 2013*

Chapter 3

Tourism and Hospitality Situational Analysis

This chapter is included as a separate document.

Chapter 4

Predominant Industries Cluster Analysis

Industries & Clusters

Industry clusters are groups of firms in related industries and institutions in a field that compete but also cooperate. Clusters affect economic development in at least three ways: increasing productivity of constituent firms or industries; stimulating innovation; and enhancing the formation of new business. This section identifies local competitive advantage for industry clusters in St. Mary's County and where the cluster activity is spatially concentrated. The economic development policy should acknowledge clusters where St. Mary's County is strong and focus on development opportunities presented by local economies and the broader market. Results from two cluster analysis resources — U.S. Cluster Mapping and StatsAmerica — were used to analyze industry clusters in St. Mary's County.

Analysis of Industry Clusters using US Cluster Mapping

The notion of industry clusters stems from studies of agglomeration of economic activities and economic geography, first observed in the early 1920s by British economist Alfred Marshal. The field received renewed attention during the 1990s with the rapid advance of technology and globalization where economists focused on three key drivers of agglomeration: input-output linkages, labor market concentration, and knowledge externalities. Michael Porter of Harvard Business School built on these foundations and popularized the cluster model of agglomeration drivers that included local demand conditions, specialized organizations and institutions, structure of regional businesses, and social networks.[5] He offered a definition of clusters as "geographic concentrations of interconnected companies, specialized suppliers, service providers, firms in related industries, and associated institutions (such as universities, standards agencies, trade associations) in a particular field that compete but also cooperate."

[5] See Michael Porter, "The Economic Performance of Regions" www.clustermapping.us/resource/economic-performance-regions

Over the past decade, the cluster-based economic development approach has been adopted by hundreds of governments all over the world, as well as reputable multinational organizations such as Organization for Economic Cooperation and Development (OECD), The World Bank, and the European Union. In the United States, more than two dozen large-scale initiatives at state and local levels have adopted the approach. At the federal level, the U.S. Economic Development Association is funding the U.S. Cluster Mapping Project which aims to strengthen the country's competitiveness and assist regions in identifying and building stronger clusters.

U.S. Cluster Mapping, in collaboration with Harvard Business School's Institute for Competitiveness and Strategy, provides a user friendly, interactive website that allows users to explore the data on state and regional clusters within the country. Other governments in Europe, Africa, and Asia have also adopted cluster strategies to boost business investments and spur economic growth. International organizations such as the United Nations (UN) and the International Monetary Fund (IMF) have also embraced the cluster-based approach in complementing others models of economic and business growth.

Traded vs Local Clusters

Clusters are categorized as traded or local. Traded clusters are groups of industries based in a specific region that sell their products and services to other regions. An example of this would be an industry clustered in Maryland that manufactures precision and analytical instruments or legal and management consulting in Washington, D.C..

While trade industries' total employment averages about 31%, they are responsible for almost all innovation. Traded industries command higher average wages and higher productivity than local industries. By contrast, local clusters and industries are bound by geography to primarily serve local markets. Local cluster industries include real estate services, local hospitals, food establishments, some retail, and personal services such as hair salons and drycleaners.

	Traded	Local
No. industries (NAICS, 2007)	778	310
Employment	36%	64%
Payroll	50.5	49.5%
Patents	91.2%	5.0%

Table 23.*Comparison of Traded vs Local US economy, 2009. Source: County Business Patterns and U.S. Cluster Mapping: Delgado, Bryden, and Zyonitz.*

Figure 41 *Map of major clusters in the United States (Source: U.S. Cluster Mapping Project)*

Maryland Clusters

As a high-tech, knowledge-based economy, Maryland benefited from a concentration of clusters diverse in industrial scope, economic activity, and that provide high-paying jobs for. Maryland's traded cluster portfolio is dominated by business services, education and knowledge creation,

financial services, aerospace vehicles and defense, hospitality and tourism, and distribution and electronic commerce clusters.

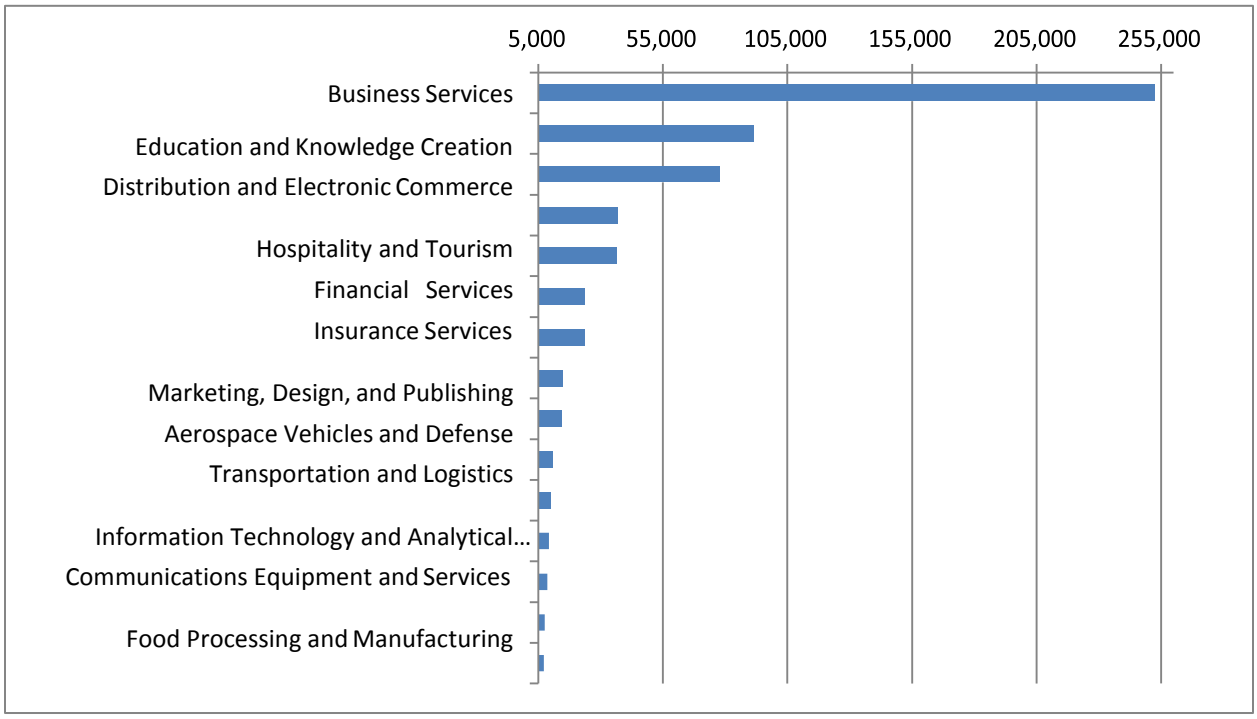


Figure 42 *Maryland traded cluster portfolio by employment, 2012. Source: U.S. Cluster Mapping*

St. Mary's County Clusters

Unlike most counties in Maryland, St. Mary's County's traded cluster share (42%) is large, second only to Howard County. In St. Mary's County, the two most-important traded clusters are business services and transportation and logistics, which together employ more than 12,000 people. Other traded clusters with smaller employment include hospitality and tourism, distribution and electronic and commerce, and education and knowledge creation. Since 2000, employment in the business services and transportation and logistics clusters has significantly increased.

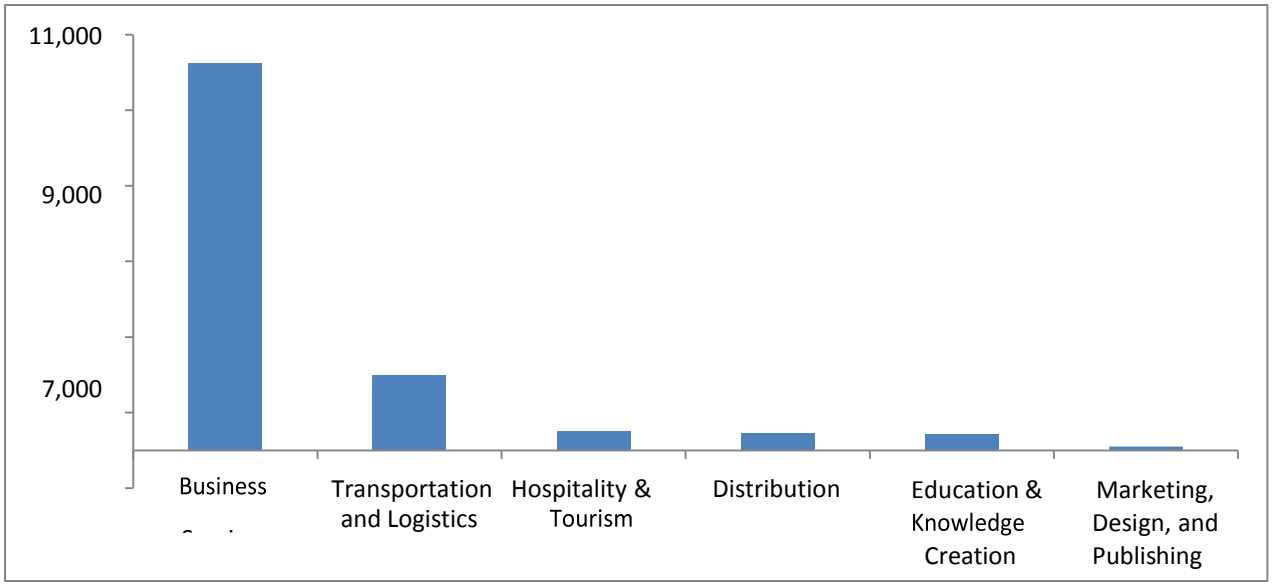


Figure 43 *St. Mary's traded cluster portfolio by employment, 2012 (Source: U.S. Cluster Mapping)*

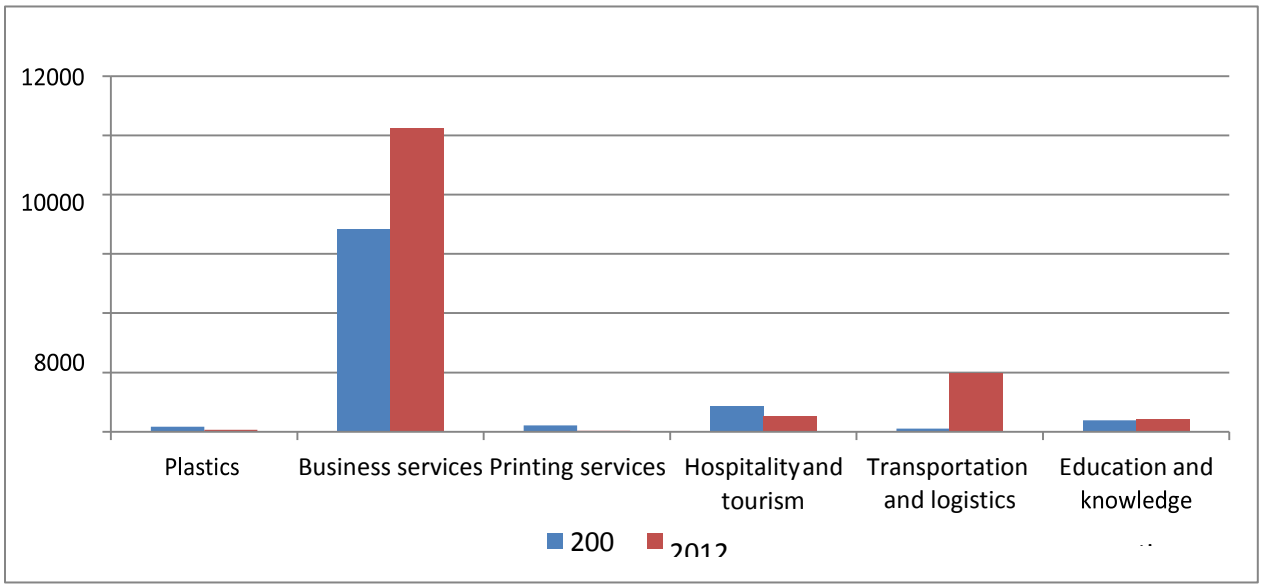


Figure 44 *Changes in employment by traded cluster in St. Mary's county, 2000-12. Source: U.S. Cluster mapping: Harvard University and U.S. Economic Development Administration*

Clusters that affected jobs in the post-recession era

Business services and transportation logistics led job growth during the post-recession period of 2010-2012. Both clusters remain the largest in the county among traded sectors in terms of job growth and the overall employment. Transportation and logistics added 1,810 jobs from 2010 to 2012, while business services added another 1,157 positions. On the other hand, employment in marketing, design and publishing shrank by 810 jobs.

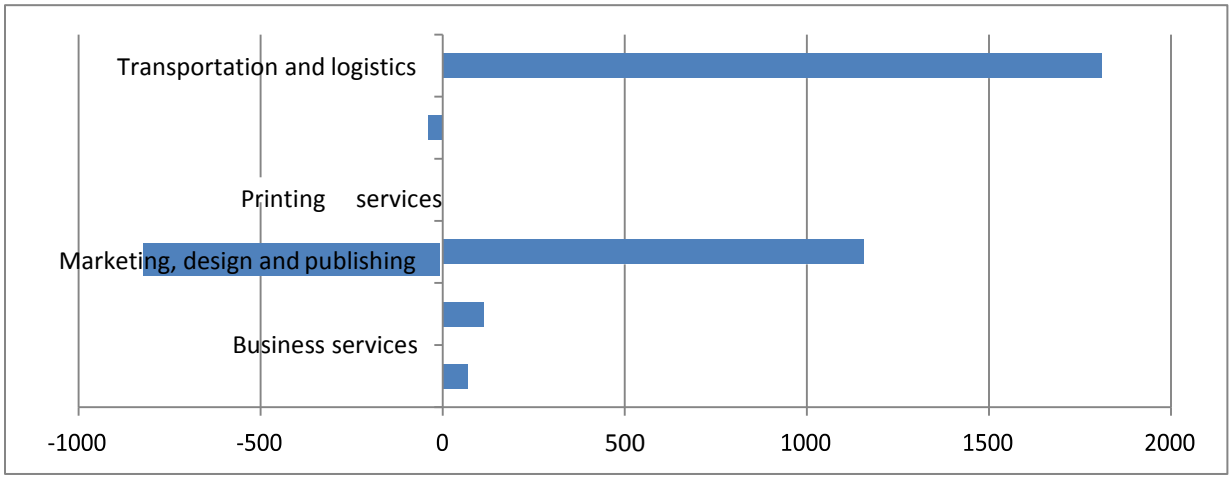


Figure 45 *Job Creation by traded cluster in St. Mary's County 2010-12. Source: U.S. Cluster mapping: Harvard University and U.S. Economic Development Administration*

Top clusters by location quotient, according to StatsAmerica/QCEW

In 2012, three industry clusters had employment LQs higher than 2.0, including defense and security, business and financial services, and information technology and telecommunications. The StatsAmerica clustering report indicated strength in the energy cluster. However, after further investigation it was declared a "false positive" cluster result because of the high concentration of engineers in St. Mary's County. While US Cluster Mapping clusters are *exclusive* meaning that each NAICS code is assigned to only one cluster, Stats America clusters are *non-exclusive* and NAICS codes may be included in all the clusters that they contribute to. In St. Mary's County, NAICS 54171 pertains to the defense and security cluster, not energy.

In 2012, the defense and security industry cluster had the highest employment LQ (4.95) and the most employment (11,451) in the County. The business and financial services industry cluster had a LQ of 2.19 and an employment of 8,141. Information technology and telecommunications industry cluster has a LQ of 2.1 and an employment of 3,388.

Industry cluster	Employment, 2012	Employment LQ, 2012
Defense & security	11,451	4.95
Business & financial services	8,141	2.19
Information technology & telecommunications	3,388	2.1

Table 24.*Key Industry Clusters from StatsAmerica. Data source: StatsAmerica/QCEW*

Within industry clusters, sub-clusters exhibit local competitive advantage in St. Mary's County. According to StatsAmerica/QCEW in 2012, the top six industries with employment LQ higher than 2.0 include: architectural and engineering services; management and technical consulting services; scientific research and development (which includes NAICS 54171); office administrative services; computer systems design and related services; and support activities for air transportation. High employment LQ indicates the concentration of these industries in St. Mary's County is higher than the national average.

Industry (NAICS description)	2004 Employ-ment	2012 Employ-ment	Net Change	2004 LQ	2012 LQ	Nat. Share	Indust. Share	Local Shift
Architectural and Engineering Services	3718	3914	196	10.19	9.31	70	116	10
Management and Technical Consulting Services	803	1545	742	3.53	4.3	15	337	390
Scientific Research and Development	525	1091	566	3.32	5.39	10	77	479
Office Administrative Services	263	350	87	2.78	2.56	5	79	4
Computer Systems Design and Related Services	1697	2080	383	5.12	4.02	32	683	-332
Support Activities for Air Transportation	1360	1465	105	33.37	28.47	25	180	-100

*Table **25.**Data source: StatsAmerica/QCEW*

All six industries that exhibited strength also experienced employment growth from 2004 to 2012. However, the growth was driven by different factors. From 2004 to 2012, the management and technical consulting services industry and the scientific research and development industry, which grew the fastest in the county, also topped the national average for those industries at 92% and 108%, respectively.

According to the change in employment LQ from 2004 to 2012, the management and technical consulting services industry and the scientific research and development industry increased employment LQ. Employment LQ for management and technical consulting services industry increased from 3.53 to 4.3 while the scientific research and development industry increased from 3.32 to 5.39, which suggests an increase in concentration of these two industries in St. Mary's County. From 2004 to 2012, employment LQ decreased for architectural and engineering services, office administrative services, computer systems design and related services, and support activities

for air transportation. The statistic suggests a decrease in concentration of these four industries in St. Mary's County.

According to shift-share analysis, from 2004 to 2012, both national growth effect (National Share) and industry mix effect (Industry Share) in the six industries in Table 25 were positive, which implies that the national economy and the performance of the specific industry did well and led to increase in employment in St. Mary's County. Computer systems design and related services industry and support activities for air transportation industry have negative local share effect (Local Shift). Local factors in St. Mary's County actually led to a decrease of 332 employees in computer systems design and related services industry and 100 employees in support activities for air transportation industry. The results suggest that the increase in employment in these two industries is mainly attributable to the booming industries themselves rather than local factors.

Architectural and engineering services industry and office administrative services industry have a positive, but small, local share effect. Local factors in St. Mary's County led to an increase of 10 employees in architectural and engineering services industry and four employees in office administrative services industry. However, the increase in employment in these two industries still mainly attributable to the booming industries themselves, considering the industry mix effect is much higher than local share effect in these two industries.

Management and technical consulting services industry and scientific research and development industry have very large positive local share effect. Local factors in St. Mary's County led to an increase of 390 employees in management and technical consulting services industry and 479 employees in scientific research and development industry. These two industries should be highlighted in the economic development strategies for St. Mary's County, because the increase in employment in these two industries mainly attributable to local factors. Management and technical

consulting services industry and scientific research and development industry presented the local competitive advantage in St. Mary's County from 2004 to 2012.

Industries connected to management and technical consulting services and scientific research and development through input-output flows are shown in figure 46. These industries are organized into four sub-clusters, one of which includes most of the local, (downstream) non-basic supporting industries. The telecom and publishing cluster largely represents upstream customers for industries in the two main clusters. The structure of the two main clusters is markedly different. The management and technical consulting services cluster exhibits a classic star pattern, which suggests that growth in this industry will have limited multiplier impacts on the St. Mary's County economy. The scientific research and development cluster exhibits a more complex structure and a denser, more interconnected network. This suggests that every dollar of growth in these industries will flow through more network nodes, increasing the multiplier effect. Concentrating resources and effort in this cluster will yield higher overall impacts.

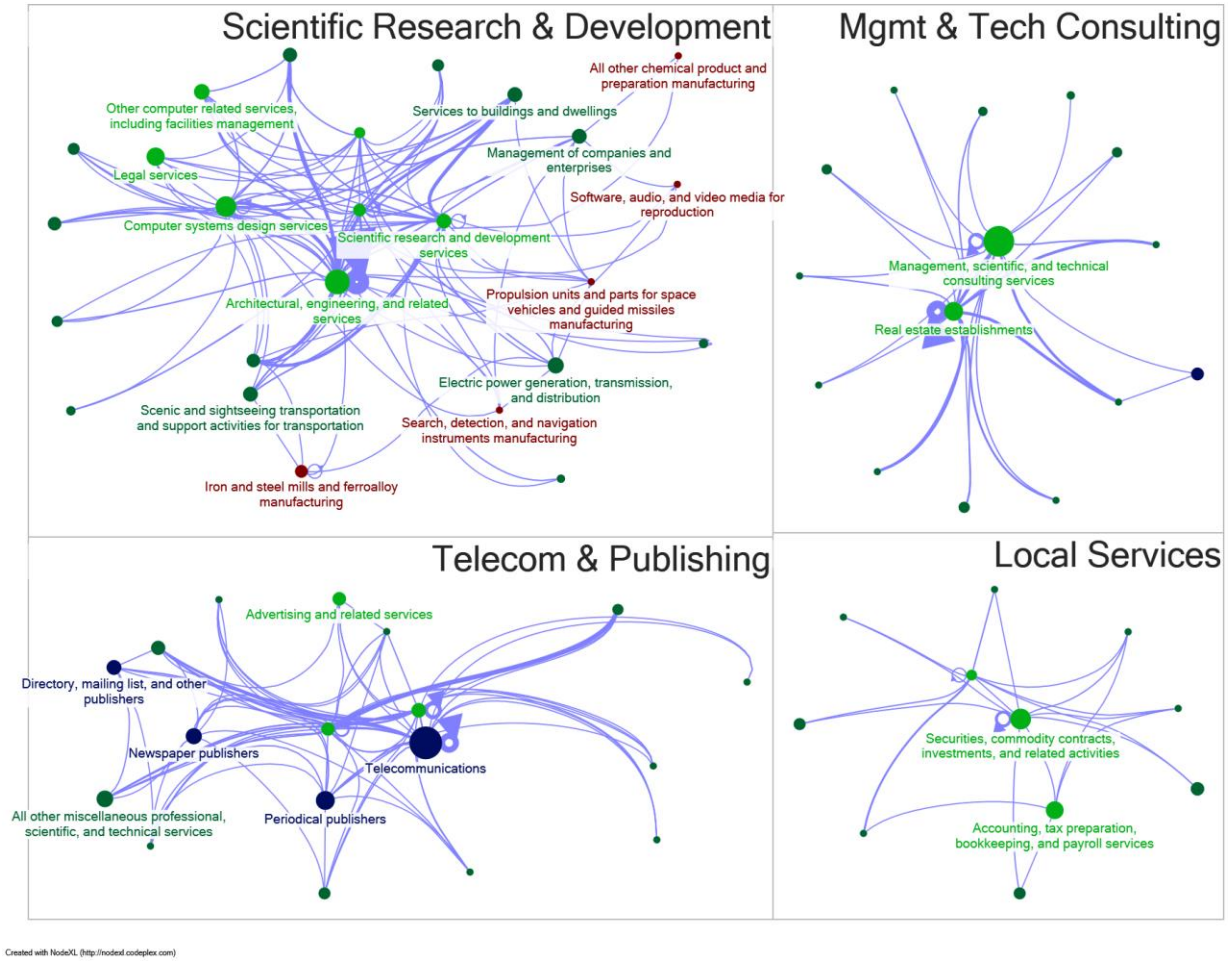


Figure 46 *Network model of St. Mary's County Industry Clusters*

The scientific research and development sub-cluster includes five manufacturing industries (red nodes in Figure 46) along with the electric power generation, transmission and distribution industry. These industries suggest focus areas for economic development efforts intended to grow light manufacturing and technology-based industries.

Geography

Hot Spot analysis could identify the market-based geography of clusters that span jurisdictional boundaries. Hot Spot analysis could inform us of the broader market of clusters in the region, and reveal the development opportunities in neighboring counties that spill over into St. Mary's County. Hot Spot is a measure of geographic concentration developed by Getis and Ord. Hot Spot identifies groups of counties with high cluster employment and in proximity to other counties with a similarly high level of cluster employment. An isolated county with high cluster employment but surrounded by counties with very little cluster employment would not be identified in the Hot Spot.

Since the industry cluster employment comes from QCEW and is by place of work, Hot Spot for industry cluster could reveal the geographic concentration of employers or workplaces. Since the occupation cluster employment is derived from LAUS and is by place of residence, Hot Spot for occupation cluster employment could identify the geographic concentration of residential location of cluster employment or labor force.

Figure 47 maps the hot spot for business and financial services industry cluster in a seven-state region (D.C., MD, DE, NJ, PA, WV, VA). The map reveals extensive concentration of business and financial services industry cluster in D.C. and the counties around D.C (the darker color on the map indicates higher concentration). Montgomery, Prince George's, Charles, and Howard counties, and Baltimore City are identified in the most significant Hot Spot in Maryland, which suggests that cluster employment (by place of work), employers or establishments in Maryland are highly concentrated in these counties.

Corresponding to the financial services industry cluster, Hot Spot for managerial, sales, marketing and HR occupation cluster could identify the geographic concentration of residential location of cluster employment. Figure 48 reveals extensive geographic concentration of cluster employment in D.C. and its neighboring counties. In Maryland, the occupation cluster employment (by place of

residence) is highly concentrated in Charles, Prince George's, Montgomery, Howard, and Baltimore counties, and Baltimore City, and is moderately concentrated in Frederick, Carroll, and Kent counties. The result suggests that the residential location of cluster employment (labor force) is concentrated in these counties.

The business and financial services industry cluster is identified as a local competitive advantage in St. Mary's County based on location quotient analysis. Although St. Mary's County is not highlighted in the Hot Spot, the county is located on the edge of the regional cluster market in both maps. St. Mary's County is adjacent to both the labor market and the area where business is highly concentrated. This identifies potential development opportunities to strengthen the local competitive advantage for the business and financial services cluster in St. Mary's County.

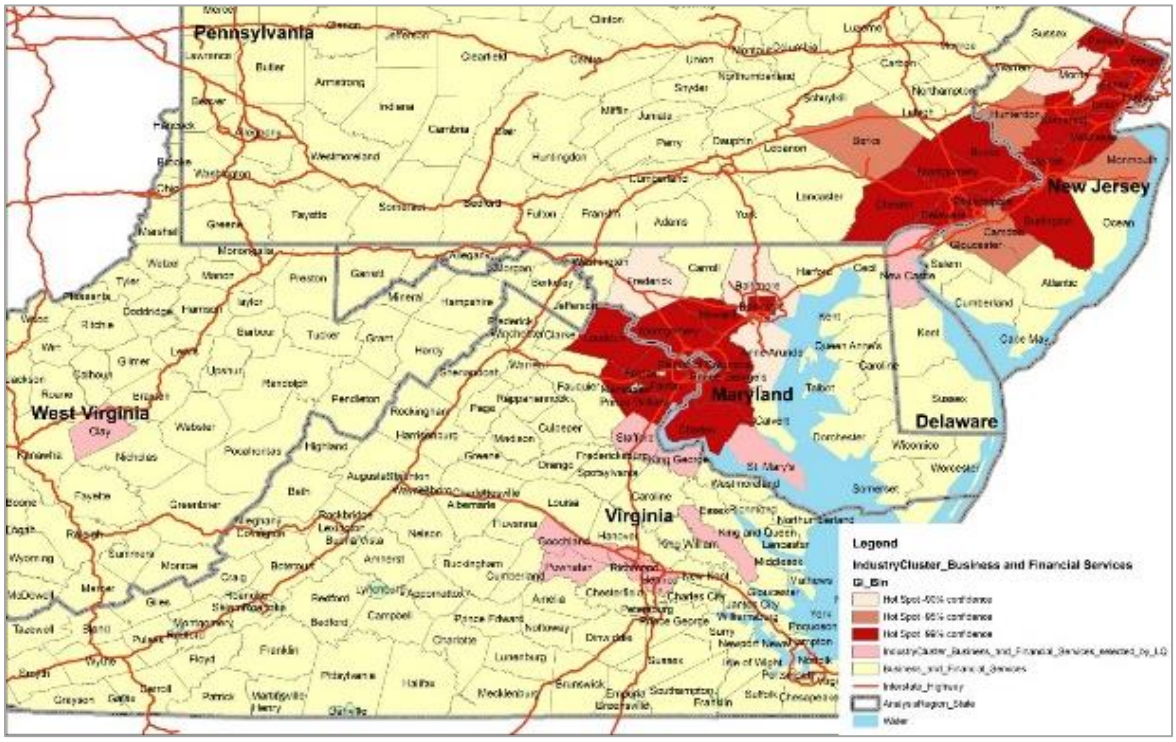


Figure 47 *Hot Spots for Business and Financial Services Industry Cluster. Data source: StatsAmerica / QCEW*

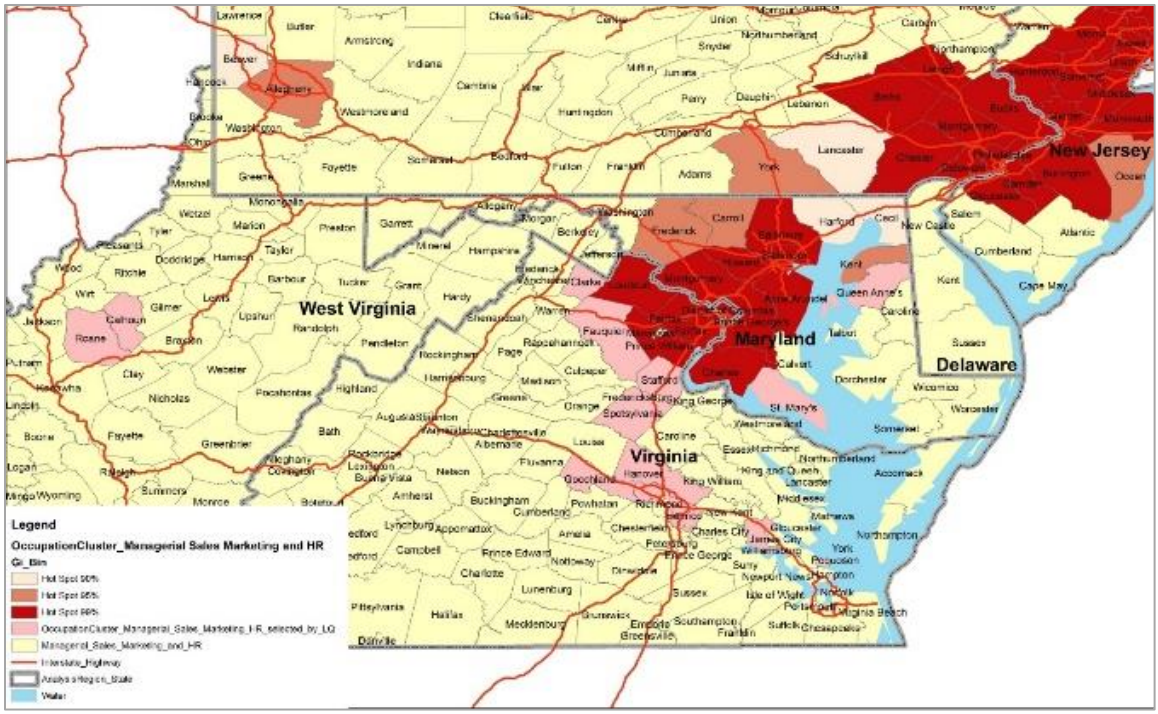


Figure 48 *Hot Spots for Managerial, Sales, Marketing and HR Occupation Cluster. Data source: StatsAmerica/LAUS*

The Hot Spot analysis for the information technology & telecommunications industry cluster and the information technology (IT) occupation cluster (Figure 49) maps the Hot Spot in a seven-state region (D.C., MD, DE, NJ, PA, WV, VA). The map reveals extensive concentration of information technology & telecommunications industry cluster in D.C. and the surrounding counties. Charles, Prince George's, Montgomery, Howard, and Frederick counties are identified in the most significant Hot Spot in Maryland. The result suggests that cluster employment (by place of work), employers or establishments in Maryland are highly concentrated in these counties.

Corresponding to information technology & telecommunications industry cluster, the Hot Spot for IT occupation cluster could identify the geographic concentration of residential location of cluster employment. Figure 50 reveals extensive geographic concentration of cluster employment in D.C. and its neighboring counties. In Maryland, the IT occupation cluster employment (by place of residence) is highly concentrated in Charles, Prince George's, Montgomery, Howard, and Frederick

counties and Baltimore City, and is moderately concentrated in Anne Arundel County. The result suggests that the residential location of IT occupation cluster employment (labor force) is concentrated in these counties.

Information technology and telecommunications industry cluster is also identified as a local competitive advantage in St. Mary's County based on location quotient analysis. Although St. Mary's County is not highlighted in the Hot Spot, the county is located on the edge of regional cluster market in both maps. St. Mary's County is adjacent to both the labor market and the area where IT business is highly concentrated. This could also present potential development opportunities to strengthen the local competitive advantage for IT cluster in St. Mary's County.

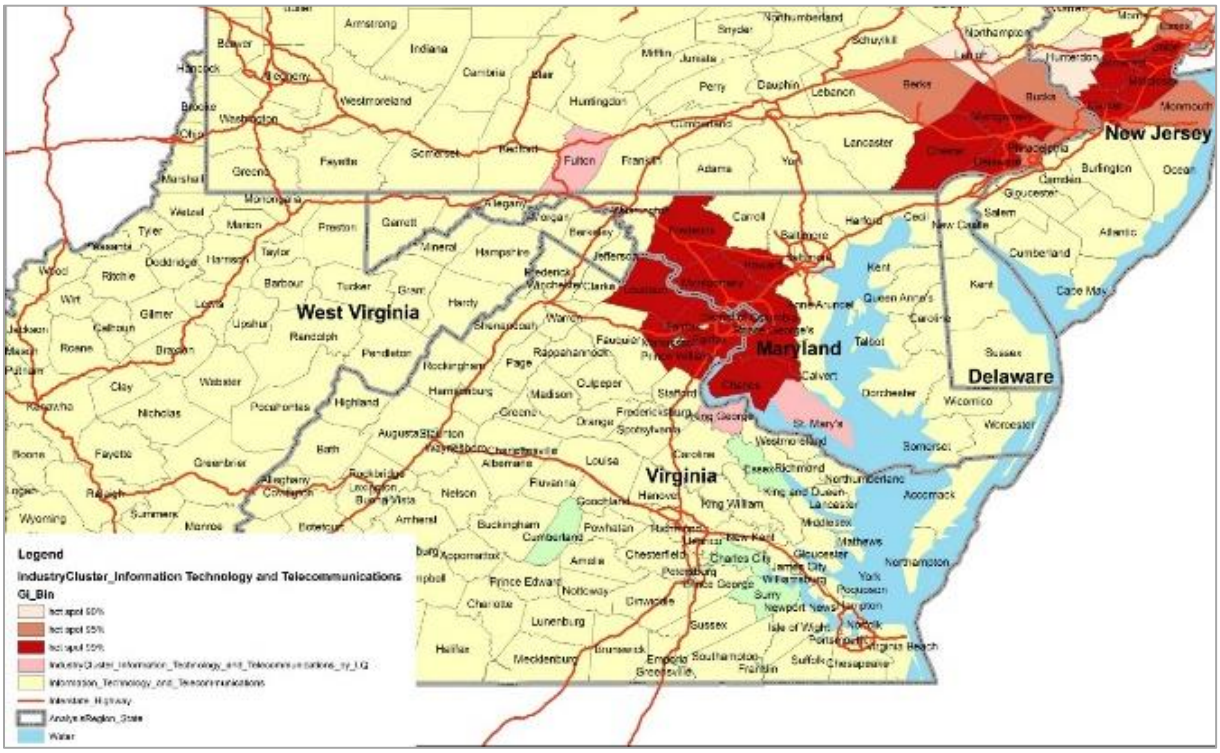


Figure 49 *Hot Spots for Information Technology & Telecommunications Industry Cluster. Data source: StatsAmerica/QCEW*

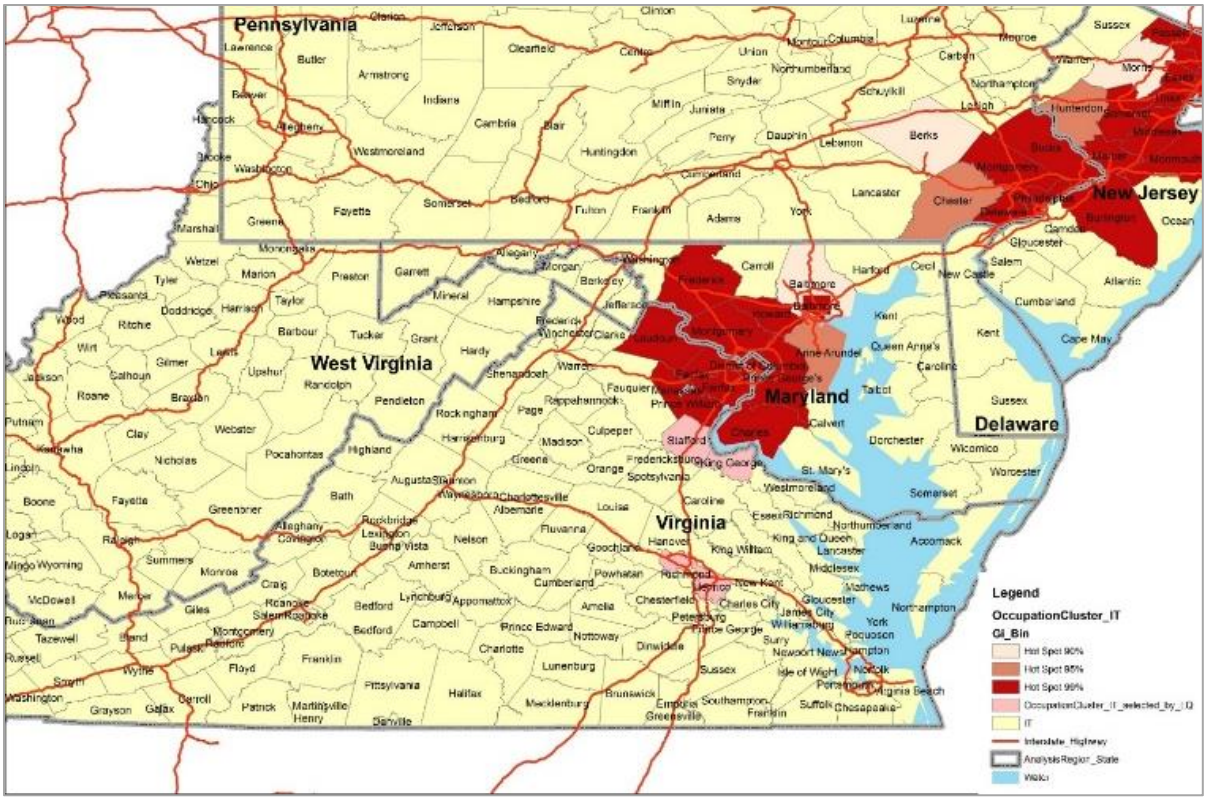


Figure 50 *Hot Spots for Information Technology (IT) Occupation Cluster.*
Data source: StatsAmerica/LAUS

Targeted Growth Cluster: Information Assurance

Prepared by the Regional Economic Studies Institute, Towson University

The Regional Economic Studies Institute (RESI) of Towson University used existing information regarding the information assurance (IA) industry to conduct a comparative analysis of St. Mary's County and other previously identified counties nationwide from 2005 to 2014. Through this comparison, RESI highlighted areas where St. Mary's County has a competitive advantage within the IA industry.

According to the Quarterly Census of Employment and Wages (QCEW), the IA industry in St. Mary's County has seen overall growth from 2005 to 2014. In 2005, St. Mary's County had a total of 54 IA establishments employing approximately 1,800 individuals, and the average weekly wage for

individuals in the industry was approximately $1,300. Moreover, the average annual wage associated with the IA industry within St. Mary's County was approximately $70,000 in 2005—significantly higher than the countywide average annual wage of $46,012 for all industries in 2005.

Between 2005 and 2014, St. Mary's County saw a 57 percent increase in the number of IA-related establishments, and a 9 percent increase in the number of employees in IA-related establishments. There also was a 40 percent increase in the average weekly wages and the average annual wage in IA-related establishments.

According to QCEW data, the 85 IA establishments in St. Mary's County employed approximately 2,000 individuals, with an average weekly wage of $1,900 in 2014, and average annual wage of $98,000 in 2014—significantly higher than the countywide average annual wage of $63,320 for all industries.

In 2015, the IA industry generated an estimated 3,800 jobs, $527.9 million in output, and nearly $235.3 million in wages. The total fiscal impacts associated with the County's IA industry amounted to $10.3 million of state and local tax revenues annually.

Targeted Growth Cluster: Irregular Warfare

Prepared by the Regional Economic Studies Institute, Towson University

RESI used existing information regarding the irregular warfare (IW) industry to conduct a comparative analysis of St. Mary's County and other previously identified counties nationwide from 2005 to 2014. Through this comparison, RESI aimed to highlight areas where St. Mary's County has a competitive advantage within the IW industry.

According to QCEW, the IW industry in St. Mary's County has seen growth on all counts from 2005 to 2014.

In 2005, St. Mary's County had a total of four IW establishments employing approximately 6,400 individuals with an average weekly wage of approximately $1,600, and an average annual wage of $83,000—higher than the countywide average annual wage of $46,012 for all industries.

Between 2005 and 2014, the number of IW-related establishments in St. Mary's County remained constant, but there was a 33 percent increase in the number of employees in those establishments and a 28 percent increase in the average weekly wages.

In 2014, a total of four IW-establishments employed approximately 8,500 individuals with an average weekly wage of approximately $2,000 and an average annual wage of approximately $109,000—significantly higher than the countywide average annual wage of $63,320 for all industries.

In 2015, the IW industry in St. Mary's County generated an estimated 12,672 jobs, $2.4 billion in output, and nearly $1.1 billion in wages. The total fiscal impacts associated with the County's IW industry amounted to $36.7 million in state and local tax revenues annually.

Targeted Growth Cluster: Unmanned Autonomous Systems

Prepared by the Regional Economic Studies Institute, Towson University

RESI used existing information regarding the unmanned autonomous systems (UAS) industry to conduct a comparative analysis of St. Mary's County and other previously identified counties nationwide. Through analyzing this comparison, RESI aimed to highlight areas where St. Mary's County has a competitive advantage within the UAS industry.

In 2014, the UAS industry in St. Mary's County had a total of 290 UAS establishments that employed nearly 8,700 individuals with an average weekly wage of approximately $2,000.

The UAS industry in St. Mary's County has seen growth on all counts since 2005, when St. Mary's County had a total of 207 UAS establishments that employed approximately 6,800 individuals with an average weekly wage of approximately $1,600.

Since 2005, St. Mary's County has seen a 40 percent increase in the number of UAS-related establishments, a 27 percent increase in the number of employees in UAS-related establishments, and a 38 percent increase in their average weekly wages.

In 2015, the UAS industry in St. Mary's County generated an estimated 16,996 jobs, $2.4 billion in output, and nearly $1.0 billion in wages. The total fiscal impacts associated with the UAS industry in St. Mary's County amounted to $45.9 million in state and local tax revenues annually.

Key findings

The analysis reveals clues to local competitive advantage in St. Mary's County. According to StatsAmerica/QCEW, St. Mary's County is strong in three industry clusters: defense and security, business and financial services, and information technology and telecommunications.

Six industries exhibit strength in the county, including: architectural and engineering services, management and technical consulting services, scientific research and development, office administrative services, computer systems design and related services, and support activities for air transportation. Among these six industries, the growth of management and technical consulting services industry and scientific research and development industry has benefited from local factors in St. Mary's County.

According to Harvard Cluster Mapping Project, the business services cluster is the largest traded cluster in St. Mary's County. Within business services cluster, the county is strong in engineering services, computer services, business support services, and consulting services.

St. Mary's County is frequently on the edge of regional clusters — adjacent to the area where cluster businesses and labor force are concentrated.

Clusters or industries that exhibit local competitive advantage in St. Mary's County are crucial to the local economy. Strategies should strengthen these advantages by maximizing competitive cooperation among cluster members and related industries or institutions while minimizing barriers to formation of new business, expansion, and innovation.

In the shift share analysis, local share effects should be the primary concern to local economic analysis. Strategies should strengthen the local factors that lead to growth of industries, such as management and technical consulting services industry and scientific research and development industry in St. Mary's County. Strategies also need to mitigate the local factors that lead to decline of

industries, such as computer systems design and related services industry and support activities for air transportation industry in St. Mary's County.

Hot Spot analysis identifies the market-based geography of cluster and St. Mary's County is located on the edge of the broader market. When designing strategies to strengthen the local competitive advantage, the market and the development opportunities presented by neighboring counties should be considered For example, to strengthen the local competitive advantage for IT cluster in St. Mary's County, the economic strategies might include business attraction by targeting firms in the neighboring counties to relocate to St. Mary's County. In addition, another strategy could be to increase access to the labor market with strategies to attract workers in the Hot Spot for occupation cluster to relocate or commute to St. Mary's County.

Chapter 5

A Deeper Look at Defense and Manufacturing

A Deeper Look at Defense and Manufacturing

Innovation networks are comprised primarily of the people and organizations involved in innovation and the connections they share through those innovation activities. Science, Technology and Innovation (STI or herein simply 'innovation') requires research, invention, proof-of-concept, commercialization, and diffusion activities carried out by people in various roles — researchers, inventors and entrepreneurs — and the organizations they are connected to. Other people and organizations in the network may be involved in supporting roles – providing funding, resources, ideas, know-how or social capital that advances the innovation process. In the network models people (nodes or vertices) are connected to each other by lines (ties or edges) representing the relationships.

The various activities produce tangible and intangible outputs including publications, intellectual property (IP), startups, prototypes and products. Figure 51 shows a representation of innovation activities, inputs, and outputs connected through citation relationships. For example, a patent (IP) may cite publications describing concepts important to the patent; or a journal article (publication) may cite a research grant (input) that supported the research. These products of innovation activities are also connected to the people and organizations involved through author, inventor, founder, and ownership ties.

Another important set of relationships (a 'relation') is location. People and organizations are associated with specific places — where they live, work, and engage in innovation activities. In many cases, people and organizations are associated with multiple places, making it difficult to assign a single location attribute to them. To resolve this, places are included as nodes or vertices in the network. The locations of people and organizations involved in innovation activities are then represented by ties to those nodes.

In theory, given perfect knowledge of every activity and relationship (and unlimited computing power), a complete innovation network representation could be constructed. However, in reality, many — if not most — innovation activities are undocumented or proprietary. Nevertheless, robust partial network models can be constructed from available data sources. While incomplete, these models are remarkable in what they reveal about the structure of the innovation ecosystem. By layering multiple data sources and relations, useful models of the core of that ecosystem can be constructed. Since network models are inherently open, additional data may be added at any time. Thus the network models are 'base' models that users can continue to refine over time with additional data. A listing of data sources including both 'base model' and potential sources is shown in Table 26.

Innovation ***Activities***

Research, discovery, invention, development & commercialization of new or improved products and services

Innovation ***Events***

Documented milestones in the innovation process

Sources of Data for Network Analysis

Administrative Records	Direct / Indirect Data	Primary Data Collection	Citations	Publications	Social Media
Patent Data • Applications • Grants • Assignments	**Open Source** • CrunchBase • AngelList	**Organizational Structure** • Universities • Companies • Regions / governance	**Patent Cites** • Patent chain • Other cites	**Journal Publications** • Coauthoring • Institutional • Publication	**Twitter**
NIH • Projects (funded research) • Abstracts • Related docs / patents	**Reference / ResearchData** • Universities + consortia • Federal Labs • NBER, BEA, BLS, Census	**Collaborations** • Project-based networks • Formal / informal support networks	**Journal Cites** • Citation chains • Coauthoring • Institutional	**Other Scholarly Pubs** • Coauthoring • Institutional • Publication • Scholarly reports	**LinkedIn**
NSF / NASA • Projects (funded research) • NASA / NSF source • NSF only source	**Proprietary** • D & B, Hoovers, Mfg News • Implan, REMI • NETS	**Accelerators / Incubators** • Internal networks • Inter-organizational networks	**Other Cites** • Books • Web • General media • Subscription networks	**Web / General** • Blogs • General pubs • Op-Eds • Professional reports	**ListServ networks**
SBIR / STTR • Projects (funded research) • Phase I / II • Company Profiles	**University Research** • Sponsored research • Licensing	other			**Academia.edu**
Other / pending sources • STAR METRICS • WIPO / IPC • NIST	**Intermediaries** • Economic Dev. Orgs • Professional Associations • Conferences	other			**Other social media**

Table 26. *Sources of data for network analysis*

It is useful to think of each innovation activity in terms of an "activity network" comprised of the people, organizations, places and documents (outputs) associated with that activity. The information necessary to model these activity networks may be extracted from individual documents or records in our data sources. By themselves, activity networks are not very interesting or useful. However, when all of the activity networks are aggregated they form more complex networks through shared nodes and overlapping connections. The process of extracting activity networks from source documents and then combining them into larger product or innovation networks is depicted in Figure 50.

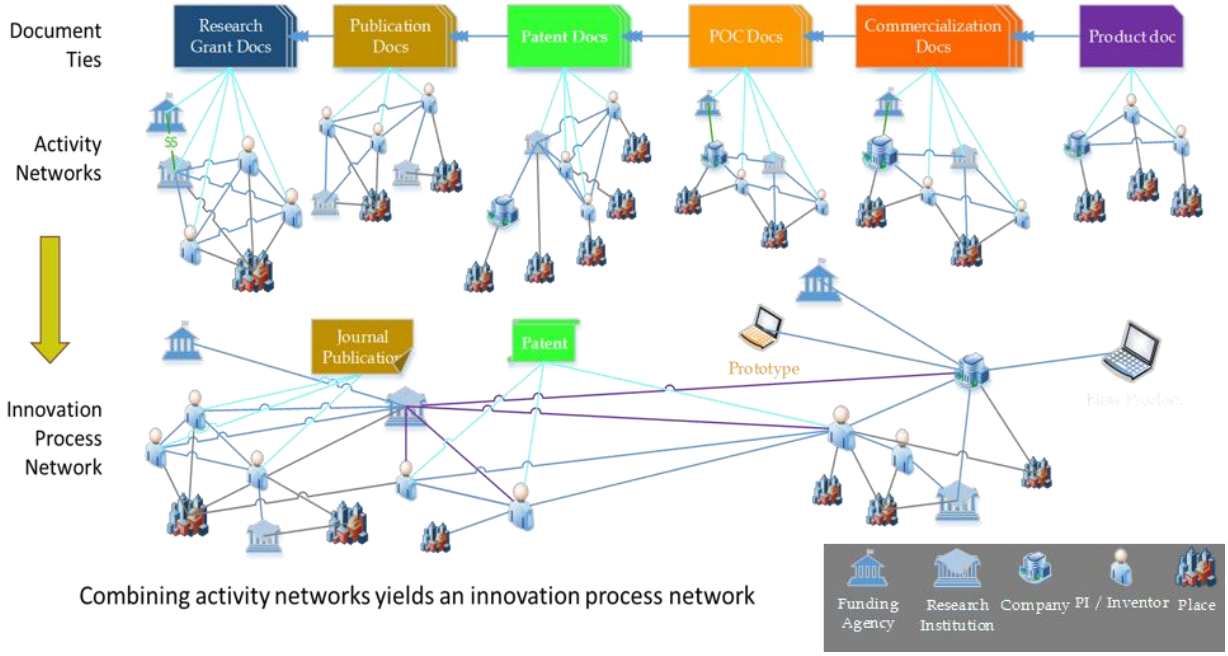


Figure 51 *Every activity involves a network that can be modeled from information provided in the source documents.*

Once the larger innovation network is assembled, network analysis software (in this case, NodeXL) can identify specific subnetworks called *connected components*. Connected components are subgraphs in which every node is connected by a path, but not connected to nodes in other supergraps. In many cases, connected components end up being the networks of individual

companies. In other cases, the connected components may reveal organizations that are connected to each other through collaboration or shared people. These cases may also represent merger and acquisition activity, or they may represent funding or ownership ties. Whatever the reason, connected components with more than one organization should be investigated to determine the reason(s).

Using NodeXL, vertices can be connected by component then represent the network using the 'group-in-a-box' layout which presents each connected component in a separate box. The largest component is always in the upper left corner and the smallest is always in the lower right corner of the graph, which provides a useful structure for targeting economic development strategies based on the size, complexity and stage of development of the components.

While connected components are useful in revealing organizational structures, they are primarily descriptive. Industry cluster theory is based on the defining idea that clusters involve networks of organizations and people that are connected through collaborative and competitive relationships. For example, firms may be connected through supply chain relationships, or they may be competitors in the same market, drawing from the same labor pool. Organizations may also be connected to each other as (actual or potential) collaborators or competitors in terms of innovation. While we often do not have data on actual cluster relationships, we can model potential relationships that may then be verified by economic developers in the field.

To do this, a new relation (technology clusters) involving a new type of tie (weak ties) between existing people and organization vertices is introduced. Weak ties may be thought of as potential ties based on mutual connection to a third node. In this case, the third node is a technology classification — patent classifications, keywords, and topics — that describe a specific technology field. These classifications may be extracted or derived from the individual source documents.

Documents with similar technology classifications would be weakly connected, thus generating weak ties between respective organizations and people.

Data Sources and Network Relations

The networks modeled and analyzed for this report include data from the following sources:

- Patents – USPTO
- Research Grants – NIH, NSF, NASA
- Proof-of-Concept / Commercialization Grants: SBIR/STTR Phase I and Phase II

Data sources under development/available for later inclusion:

- TEDCO funding
- University of Maryland, College Park – sponsored research & licensing data
- CrunchBase data[6]
- Federal contract data from USASpending.gov[7]

Records were extracted from the listed data sources according to the following criteria:

- Record date between 1/1/2010 and 7/30/2015 (application date for patents; award date or contract start date for all others)
- Records in which any party listed on the document other than federal government agencies had an associated location in St. Mary's County; or any records associated with Maryland research universities (primarily Johns Hopkins and member institutions in the University System of Maryland including University of Maryland College Park, University of Maryland Baltimore, and University of Maryland Baltimore County, among others).

Names were matched across all data sources. Variants of the same name were collapsed into a single label for matching and network purposes. Relations included research, patenting, commercialization (SBIR) and technology-based weak ties based on patent classifications.

[6] This source has recently become proprietary and restricted. Negotiations on the continued use of the data are ongoing.

[7] This is a very recent and very good data source discovered after the St. Mary's County networks were modeled and analyzed. There was insufficient time to add this data into the network, however table 3 summarizes FY2015 Defense contracts by company and location in St. Mary's County.

Company Data			Defense contracts by city (dollars)										St. Mary's
Company Name	Employees	Annual Revenue	California	Charlotte Hall	Great Mills	Hollywood	Hughesville	La Plata	Leonard-	Lexington Park	Lusby	Mechanics- ville	Total
AAROW CONTRACTING INC	20	3,500,000	-	-	-	-	-	-	-	-	-	17,561	17,561
AIRTEC, INC.	45	32,850,300	5,123,030	-	-	-	-	-	-	-	-	-	5,123,030
ALLIED TECHNOLOGY GROUP, INC.	9,150	80,000,000	-	-	-	-	-	-	-	(446,545)	-	-	(446,545)
AMERICAN ELECTRONIC WARFARE ASSOCIATES	205	39,781,000	72,068,076	-	-	-	-	-	-	-	-	-	72,068,076
AMERICAN ELECTRONICS INC	182	19,580,064	71,798,523	-	-	-	-	-	-	-	-	-	71,798,523
AMS-RHEA JV	-	1	-	-	-	-	-	-	73,776	-	-	-	73,776
ASSISTED MANAGEMENT SOLUTIONS, INC.	7	300,000	-	-	-	-	-	-	461,197	-	-	-	461,197
AUSLEY ASSOCIATES INC	100	17,533,000	-	-	-	-	-	-	-	22,817,984	-	-	22,817,984
AV3, INC.	30	6,793,068	-	-	-	-	-	-	-	-	-	337,293	337,293
AVIAN ENGINEERING , LLC	112	18,044,075	-	-	-	-	-	-	-	14,172,362	-	-	14,172,362
AVIATION SYSTEMS ENGINEERING COMPANY INC.	152	30,862,345	-	-	-	-	-	-	-	12,999,409	-	-	12,999,409
BATTLE CREEK CONSTRUCTION, LLC	18	6,892,314	-	-	-	-	-	7,664,811	-	-	-	-	7,664,811
BEARINGPOINT, INC (FORMERLY K	-	-	-	-	-	-	-	-	-	-	-	-	-
BLAZER-CADENCE JOINT VENTURE	41	12,495,138	-	-	15,464,724	-	-	-	-	-	-	-	15,464,724
BLAZER'S CUSTOM CONSTRUCTION, LTD	48	20,093,400	-	-	2,137,481	-	-	-	-	-	-	-	2,137,481
C & G MECHANICAL,LLC	2	500,000	-	-	-	-	-	165,263	-	-	-	-	165,263
CHESAPEAKE PLASTICS MANUFACTURING	7	1,000,000	-	-	-	-	-	-	-	-	238,008	-	238,008
CHESAPEAKE SECURITY AND WIRING COMPANY	1	98,000	-	-	-	-	-	-	-	-	-	450	450
CHESAPEAKE TECHNOLOGY INTERNATIONAL	42	6,474,622	7,151,683	-	-	-	-	-	-	-	-	-	7,151,683
COALITION SOLUTIONS INTEGRATED	13	990,000	-	-	-	3,407,539	-	-	-	-	-	-	3,407,539
COHERENT TECHNICAL SERVICES, INC.	99	13,311,613	-	-	-	-	-	-	-	62,874,422	-	-	62,874,422
COLLEGE OF SOUTHERN MARYLAND, THE	590	72,000,000	-	-	-	-	-	690	-	-	-	-	690
COMMIT ENTERPRISES INC.	50	10,000,000	-	-	-	-	2,202,343	-	-	-	-	-	2,202,343
COMPASS SYSTEMS, INC.	183	29,838,548	-	-		-	-	-	-	41,949,532	-	-	41,949,532
COMPLIANCE CORPORATION	80	7,930,032	-	-	-	-	-	-	-	-	-	-	-
CYBER SECURITY RESEARCH AND SOLUTIONS	7	2,000,000	-	-	-	-	-	(330,839)	-	-	-	-	(330,839)
DIAL & ASSOCIATES, LLC	3	375,000	-	-	-	-	-	-	-	-	-	-	-
EAGLE SYSTEMS INC	275	38,976,228	39,445,878	-	-	-	-	-	-	-	-	-	39,445,878
ELITE VERTICAL, INC.	6	3,480,000	(82,865)	-	-	-	-	-	-	-	-	-	(82,865)
GOOD'S EQUIPMENT REPAIR, LLC	2	75,000	-	-	-	-	-	14,228	-	-	-	-	14,228
GREAT MILLS CONSTRUCTION CO., INC.	85	5,500,000	-	-	(23,843)	-	-	-	-	-	-	-	(23,843)
GREAT MILLS TRADING POST CO	70	12,607,631	-	-	34,145	-	-	-	-	-	-	-	34,145
GREENFIELD ENGINEERING CORPORATION	10	1,200,000	-	-	-	-	-	-	29,705,690	-	-	-	29,705,690
HERON SYSTEMS, INC.	26	3,000,000	-	-	-	-	-	-	-	1,144,537	-	-	1,144,537
HONU'APO I, LLC	6	1,571,700	-	-	-	-	-	75,800	-	-	-	-	75,800
ILUMINA SOLUTIONS INC.	38	15,900,000	(654,440)	-	-	-	-	-	-	-	-	-	(654,440)
INNOVATIVE GLOBAL SECURITY SOLUTIONS LLC	5	1,750,000	-	-	-	-	1,144,489	-	-	-	-	-	1,144,489
INTEGRATED ELECTRICAL TECHNOLOGIES CORP.	55	13,500,000	-	-	-	78,320	-	-	-	-	-	-	78,320
INTEGRATED SYSTEMS SOLUTIONS, INC.	25	7,652,000	45,000	-	-	-	-	-	-	-	-	-	45,000
J F TAYLOR INC.	225	50,000,000	-	-	-	-	-	-	-	-	-	-	-
J. AGUINALDO GROUP, INC	56	3,901,732	-	-	-	-	-	-	-	62,167	-	-	62,167
J. F. TAYLOR, INC.	324	85,500,000	-	-	-	-	-	-	-	11,189,835	-	-	11,189,835
JAHN CORP	60	6,500,000	-	-	-	-	-	-	-	13,580,789	-	-	13,580,789
KETHINK SFS	26	3,700,000	-	-	-	-	-	-	-	53,051	-	-	53,051
MARYLAND SELECT HARDWOODS, LLC	1	120,000	-	-	-	-	-	8,000	-	-	-	-	8,000

Company Data			Defense contracts by city (dollars)										St. Mary's
Company Name	Employees	Annual Revenue	California	Charlotte Hall	Great Mills	Hollywood	Hughesville	La Plata	Leonard-	Lexington Park	Lusby	Mechanics- ville	Total
MEM CORPORATION	23	5,000,000	-	-	-	8,635,080	-	-	-	-	-	-	8,635,080
MSSI, LTD.	10	5,000,000	-	890,535	-	-	-	-	-	-	-	-	890,535
NAVAL SYSTEMS, INC.	80	8,500,000	-	-	-	-	-	-	30	23,824,110	-	-	23,824,140
NETLOCITY VA, INC.	31	4,500,000	-	-	-	-	-	164,673	-	-	-	-	164,673
NORTHROP GRUMMAN PRB SYSTEMS INC.	122,000	28	-	-	-	3,762	-	-	-	-	-	-	3,762
PIONEERING DECISIVE SOLUTIONS, INC.	20	2,429,912	14,130,401	-	-	-	-	-	-	-	-	-	14,130,401
PLATFORM SYSTEMS, INC.	20	2,000,000	-	-	-	-	-	-	-	10,189,925	-	-	10,189,925
POC TECH GROUP LLC	3	70,000	-	-	-	-	-	-	-	-	-	-	-
PORT TOBACCO CONSULTING,LLC	12	1,500,000	-	-	-	-	-	(500)	-	-	-	-	(500)
PRECISE SYSTEMS INC	179	27,313,692	-	-	-	-	-	-	-	45,004,688	-	-	45,004,688
PREMIER CABLING SOLUTIONS, INC.	4	70,000	-	-	-	-	-	-	-	-	-	-	-
PROTOCAD CORPORATION	5	1,200,000	-	-	-	-	-	65,160	-	-	-	-	65,160
PSI PAX, INC.	148	15,400,000	6,313,422	-	-	-	-	-	-	-	-	-	6,313,422
PSI SIERRA LIMITED LIABILITY COMPANY	1	1	-	-	-	-	-	-	-	(5,460)	-	-	(5,460)
R & T PINKNEY, LLC	5	1,532,000	-	-	-	-	-	-	-	-	823,902	-	823,902
R CUBED ENGINEERING, LLC	12	1,200,000	-	-	-	-	-	-	-	-	-	-	-
RADNOR MANUFACTURING LLC	6	480,671	-	-	-	-	-	-	4,966	-	-	-	4,966
RESEARCH AND ENGINEERING DEVELOPMENT, INC.	60	46,035,240	-	-	-	-	-	-	-	3,824,753	-	-	3,824,753
RESOURCE MANAGEMENT CONCEPTS INC	95	10,336,386	-	-	-	-	-	-	-	56,212,200	-	-	56,212,200
SHADOWOBJECTS LLC	16	1,450,000	-	-	-	-	-	-	852,463	-	-	-	852,463
SIERRA MANAGEMENT AND TECHNOLOGIES, INC.	130	18,200,000	8,359,308	-	-	-	-	-	-	-	-	-	8,359,308
SILVERBLOCK SYSTEMS INC.	9	991,029	-	-	-	-	-	-	-	-	-	-	-
SMARTRONIX, INC.	603	113,000,000	312,988	-	-	2,933,007	-	-	-	-	-	-	3,245,995
SOLUTION ENGINEERING ASSOCIATES, INC	3	1,130,931	-	-	-	-	-	-	-	6,760,879	-	-	6,760,879
SOLUTIONS DEVELOPMENT CORPORAT	-	-	-	-	-	-	-	28,670,898	-	-	-	-	28,670,898
SPALDING CONSULTING, INC.	111	19,863,180	-	-	-	-	-	-	-	17,954,870	-	-	17,954,870
STAUFFER'S MACHINE SHOP INC	8	585,798	-	-	-	-	-	-	-	-	-	5,860	5,860
STRICKER & COMPANY	2	60,000	-	-	-	-	-	7,793	-	-	-	-	7,793
TECHNOLOGY SECURITY ASSOCIATES, INC.	67	9,766,666	918,114	-	-	-	-	-	-	-	-	-	918,114
THE CENTER FOR LIFE ENRICHMENT	139	5,130,000	-	-	-	25,225	-	-	-	-	-	-	25,225
THREE MULES WELDING SUPPLIES	10	2,000,000	-	-	-	-	-	-	-	-	-	11,027	11,027
TRITON METALS, INC.	90	15,344,975	-	-	-	(10,451)	-	-	-	-	-	-	(10,451)
WYLE LABORATORIES, INC.	4,654	993,737,666	-	-	-	-	-	-	-	377,412	-	-	377,412
Median | Total	*28*	*5,000,000*	224,929,118	890,535	17,612,507	15,072,483	3,346,831	36,505,977	31,098,122	344,540,920	1,061,910	372,191	675,430,593

Table 27.*FY 2015 Department of Defense Contracts to Companies in St. Mary's County, Maryland. Data source: USASpending.gov*

Network Characteristics

The network using these data sources includes 410 vertices and 1,873 ties (edges) for the research/invention and patent-based technology ties combined (Table 27). A more robust "research group" with ties to Maryland's major research universities was expected, but was not the case. There were no ties to the University of Maryland and only a few to Johns Hopkins. The research component consisted of only two sponsored research projects with St. Mary's College and the College of Southern Maryland. The remaining 19 connected components comprise the "industry group." Based on further investigation, the absence of a robust research group simply reflects the County's stage of development. There is clear evidence of a nascent research group with the University System of Maryland and its member institutions. However, most of the interaction to date has involved corporate or locally sponsored research for which data is not consistently available.

Technology-based weak ties for this network are based only on patenting in the same class and subclass. There are 144 such ties in this network. However, the relatively small number of such ties and the fact that all but a few connect companies and people within already connected components was another unexpected finding. As with the lack of a robust research component, this unusual outcome may be attributed to the stage of development of St. Mary's County's economy. What it suggests is that firms in St. Mary's County may share similar industries, but they are highly diversified at the level of specific products and technologies. In the context of economic development strategies, this diversity is actually a good thing. Additional technology-based weak ties could be added based on keywords and/or full-text search comparisons of patent and research grant abstracts as this technology matures.

Identifying Technology Clusters

Technology clusters are groups of components connected by technology-based weak ties. Without any cross-component weak ties, the connected components are the technology clusters at present. Future network models should have more weak ties as the economy matures, and multi-component technology clusters should emerge over time.

Interpreting the Network Models

The network models developed for St. Mary's County are interactive NodeXL files and are most useful when used interactively. The network images that follow are useful for illustrating the overarching structure of the models and certain key findings. Even with a relatively small network, no single image adequately represents the overall network and the details at the same time. Images that capture the whole network do not show complete detail, while detailed cluster images exclude much of the network to focus on the clusters. Images of the entire network may appear overwhelming. Figures 52 (Southern Maryland) and 53 (St. Mary's County) demonstrate the complexity or the structure of innovation activities in their communities.

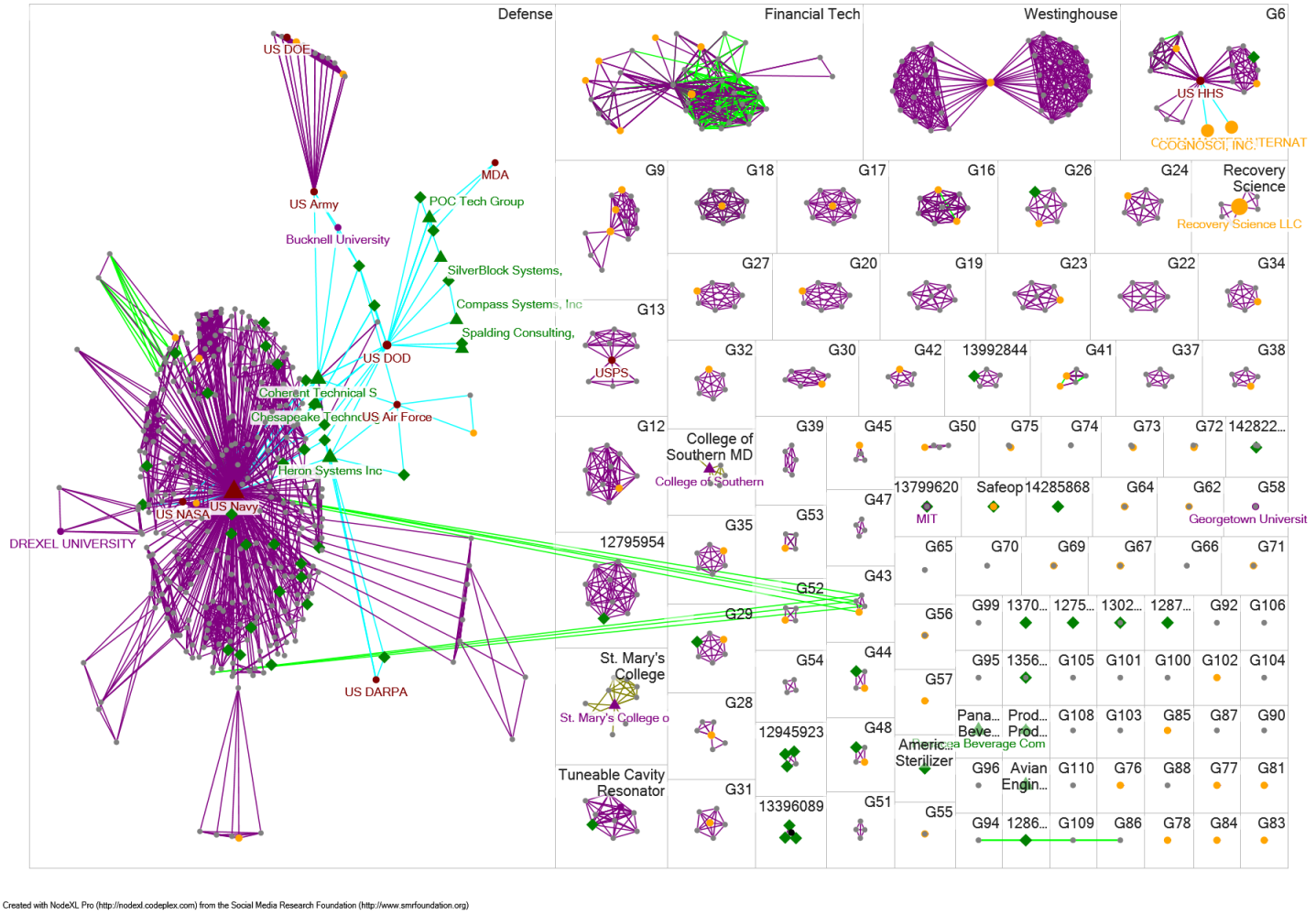


Figure 52 *Full Southern Maryland Innovation Network, 2010 - 2015.*

The layout algorithm used in network figures 52 and 53 lays out the components (or 'groups' using NodeXL notation) in order of decreasing size from the upper left to lower right corners. In practice, this pattern organizes the components to provide structure for targeting economic development strategies. The defense component is the largest component in St. Mary's County (Figure 53) and Southern Maryland (Figure 52). The strategies developed around this cluster focus on growth and diversification.

As the cluster diversifies, the defense network will spur new components around companies or groups of companies. These new components will take their place among the components on the right hand side of the network. When that happens, it is also likely that new weak ties will be

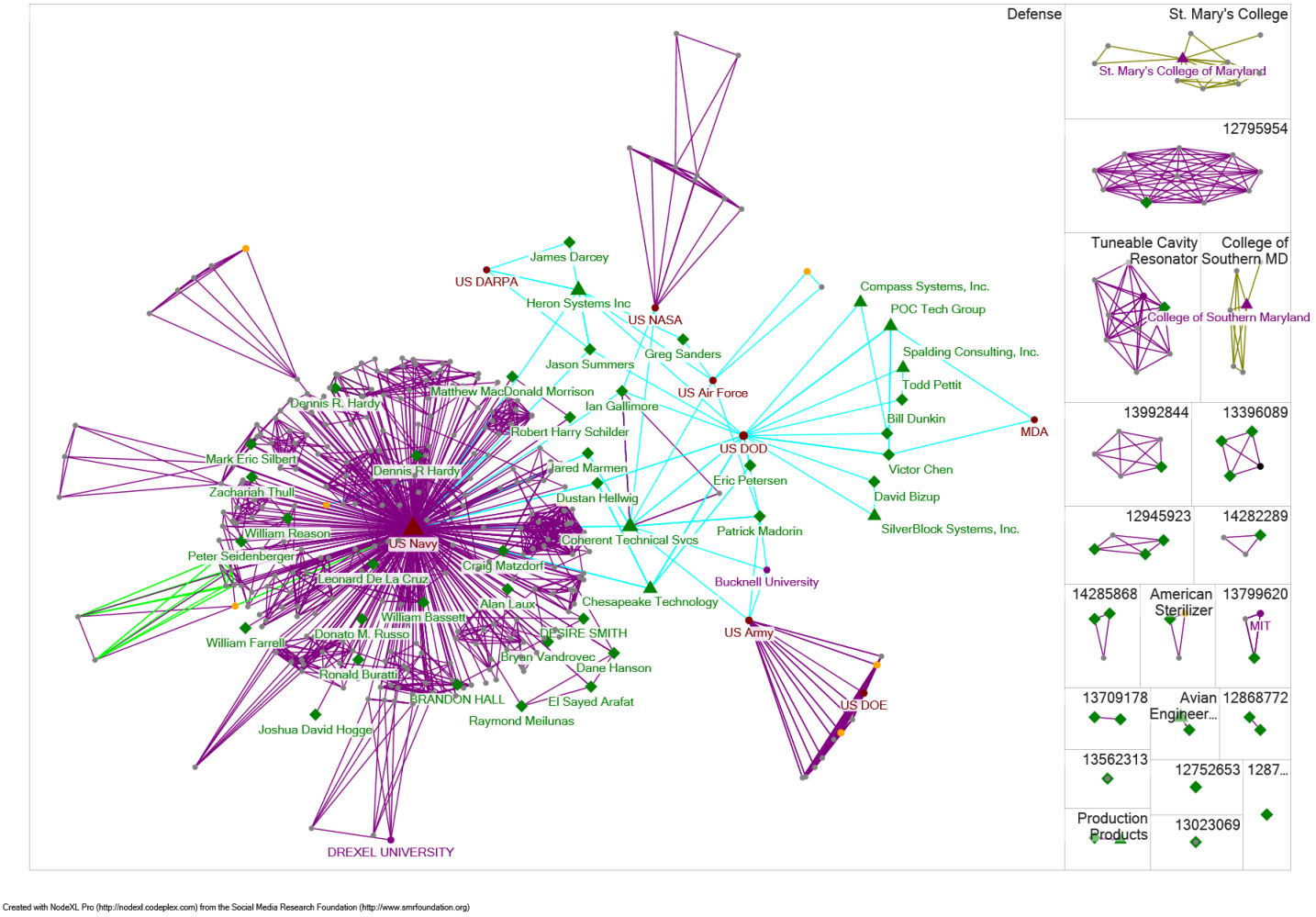


Figure 53 *St. Mary's County Innovation Network, 2010 - 2015*

created between the vertices in the new components and the remaining defense component. Over time, this creates a more complex defense and related industries cluster. Those related industries depend on which technologies are commercialized, and what aspects — most importantly manufacturing —gain traction within the County.

The Defense Network Component

The St. Mary's County defense innovation network component is shown in Figure 54. This component is comprised of three relations or types of ties: patents (purple); technology-based weak ties (lime); and commercialization or SBIR ties (aqua).

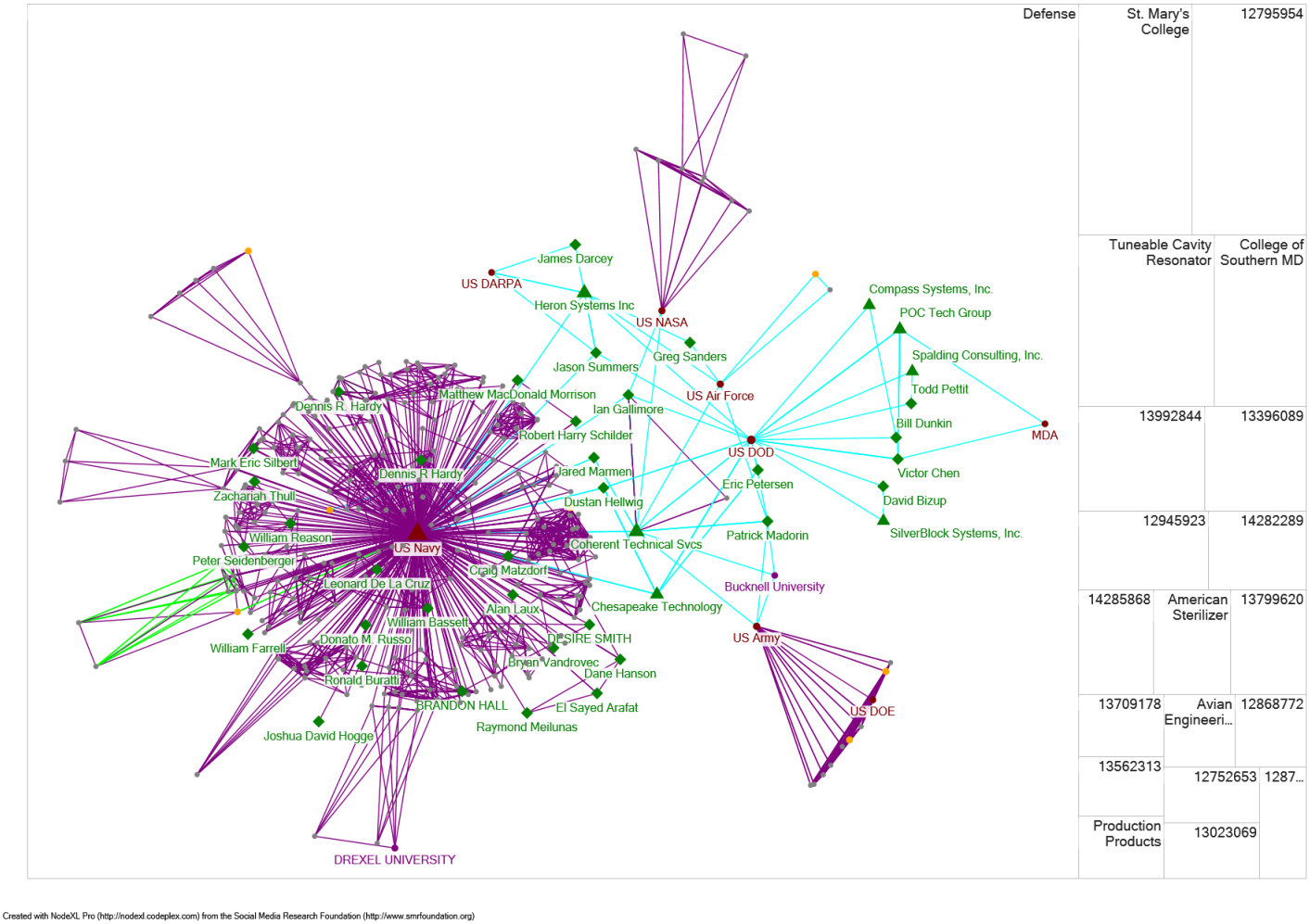
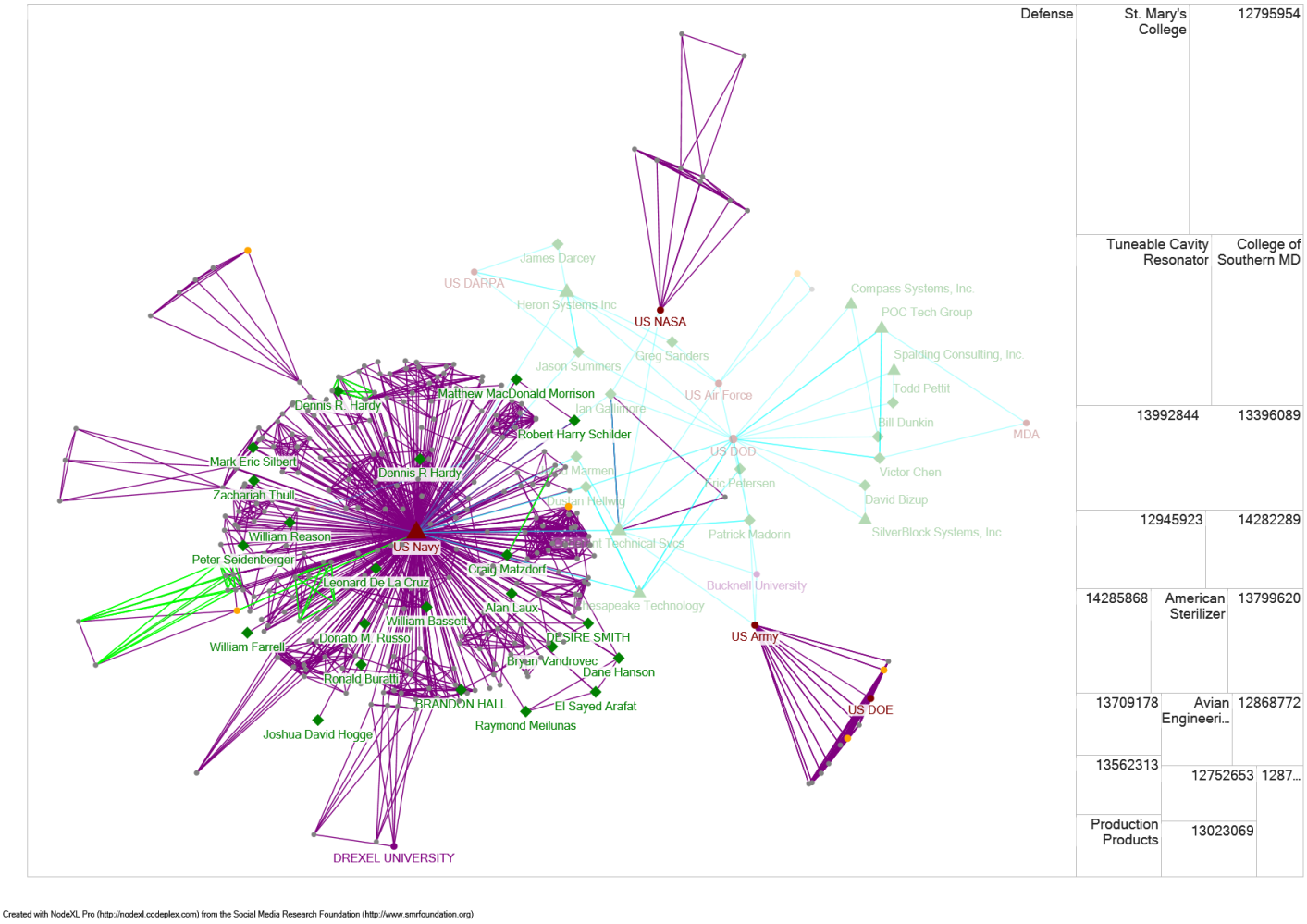


Figure 54 *St. Mary's County Defense-related Innovation Network, 2010 - 2015*

The patent relation is comprised of people and organizations engaged in invention and protecting those inventions through US patents. The purple lines connect people and organizations listed on the same patent. Most of these patents are assigned to the US Navy, located in the center of Figure 55.



Created with NodeXL Pro (http://nodexl.codeplex.com) from the Social Media Research Foundation (http://www.smrfoundation.org)

Figure 55 *Defense patent networks (purple), 2010 - 2015*

Notice in Figure 56 that within the larger patent network there are small, densely connected subnetworks. Within organizations like the US Navy, small subnetworks may represent specific labs or projects — groups of people that work closely together. This close interaction tends to build social capital that facilitates effective collaboration in the future, either on new projects directly for the Navy, or perhaps as a spin-off business that seeks to commercialize specific technologies.

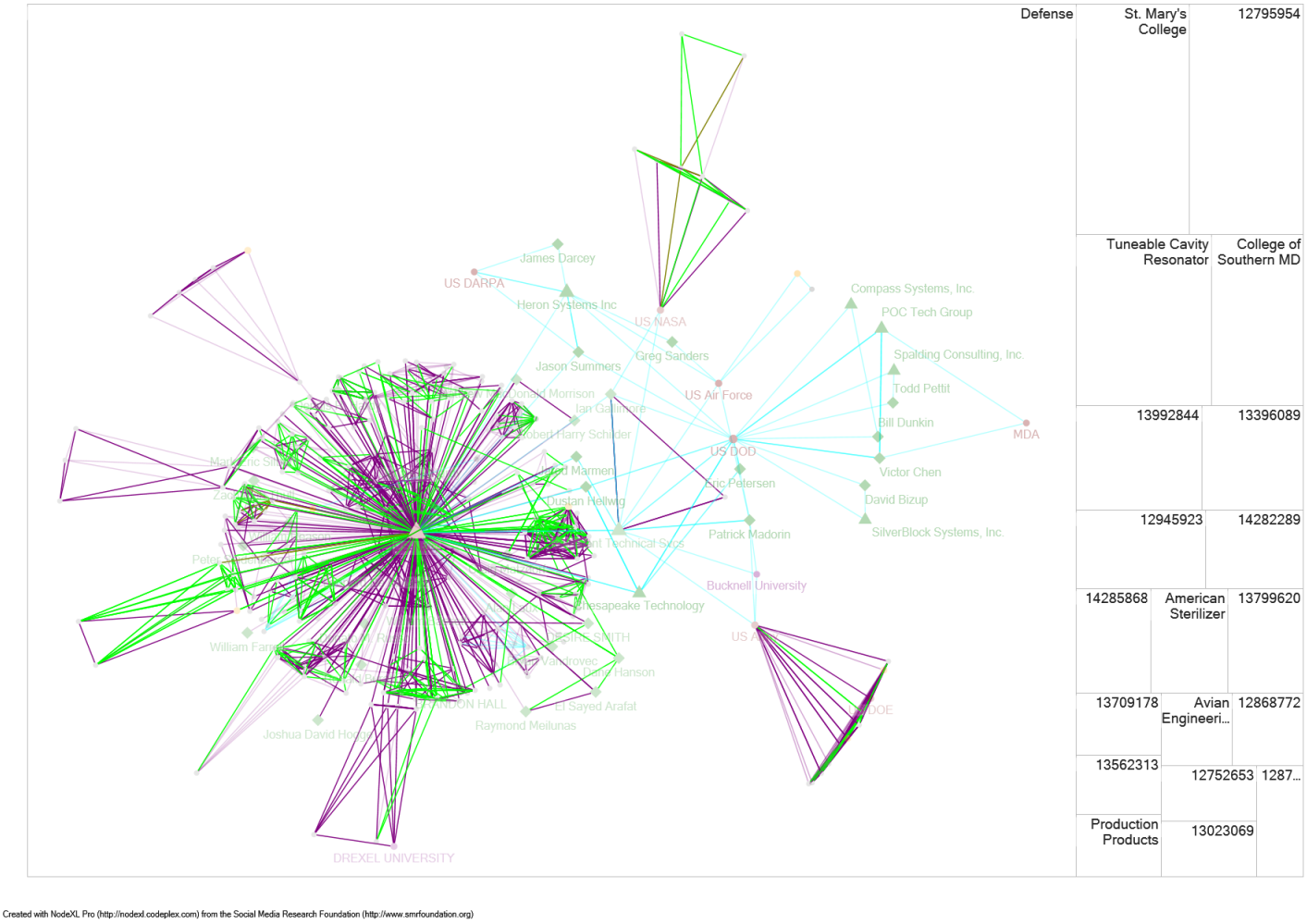


Figure 56 *Defense-related weak ties (lime green)*

Intertwined with the patent network are a number of lime green weak ties that connect people and organizations that are not necessarily working on the same patent, but are patenting in the same technology class and subclass (Figure 56). Unlike the purple patent ties, these weak ties represent possible or probable relationships based on similarities in the technologies that they are working on. These ties — existent or not — are of interest to economic developers. If there is an actual relationship, economic developers can update their network model and adjust their strategy. If they don't exist, economic developers broker a relationship that could lead to innovation and economic growth. Each weak tie provides a specific lead where there may be potential for economic development.

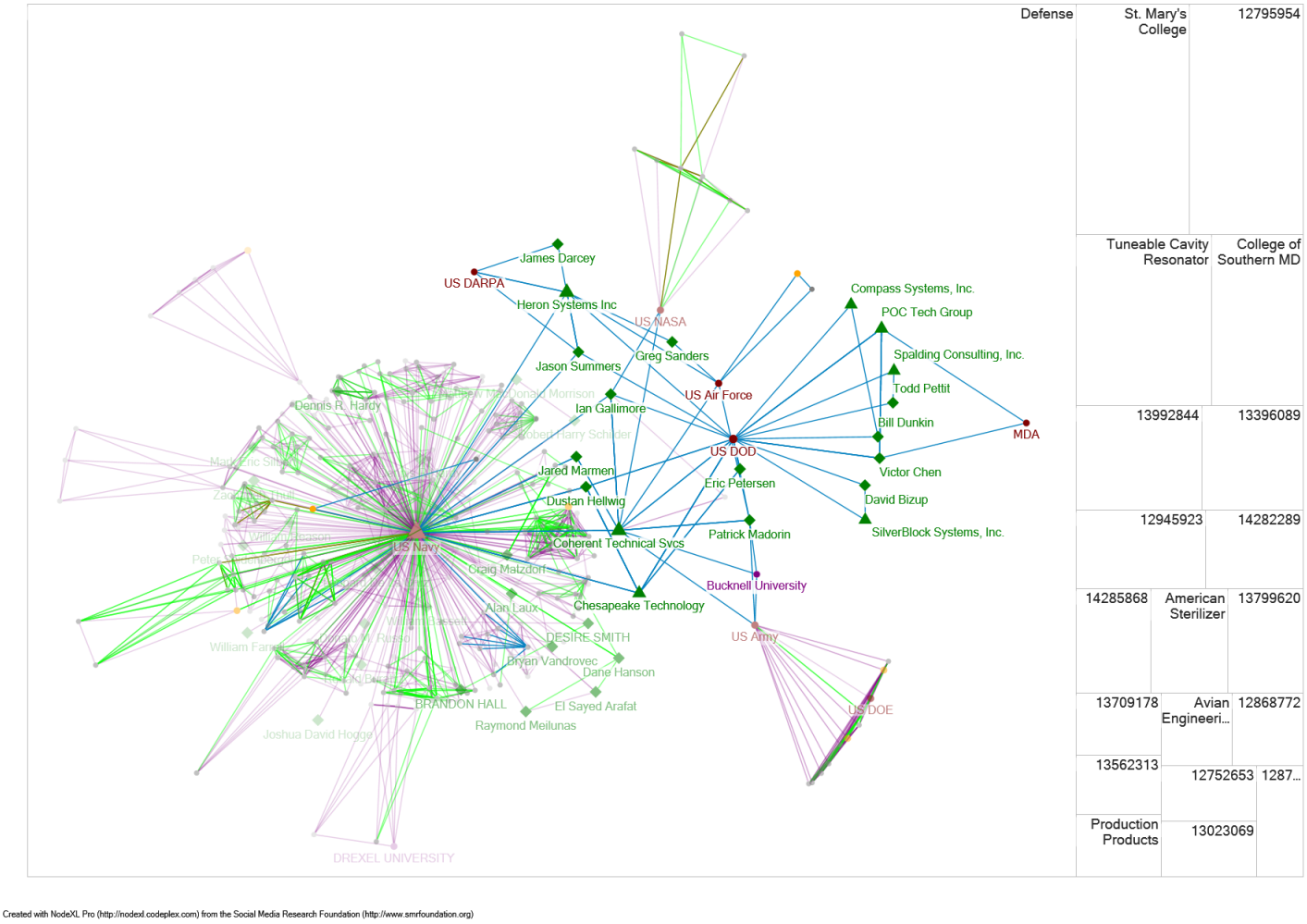


Figure 57 *Defense-related SBIR/STTR networks (aqua)*

Finally, the defense network contains the Small Business Innovation Research (SBIR)-commercialization relation, connecting people and companies that are developing prototypes and pursuing applied research leading to commercialization of new products and services (Figure 57). SBIR grants are provided directly to small businesses to advance technologies deemed of national interest. Phase I SBIR grants are typically up to $150,000 and 18 months and are intended to demonstrate proof-of-concept. If successful, phase I grants may be followed up with phase II grants that typically last 2-3 years and can range into the millions of dollars. Phase II grants are intended

to advance promising technology toward commercialization[8]. Small business Technology Transfer (STTR) grants are similar to SBIR's but must also involve at least university researcher.

SBIR's (hereinafter assumed to include STTR) are administered jointly by the US Small Business Administration (SBA) and specific partner agencies within the federal government. The department of defense and its sub-agencies — Navy, Army, Air Force, DARPA — are among the largest SBIR partners. This is clearly the case in St. Mary's County. This portion of the network represents innovative people and companies actively engaged in prototyping and commercialization of new technologies. These companies, and the technologies they are working on represent high priority targets for economic development.

Why densely connected networks and components are important

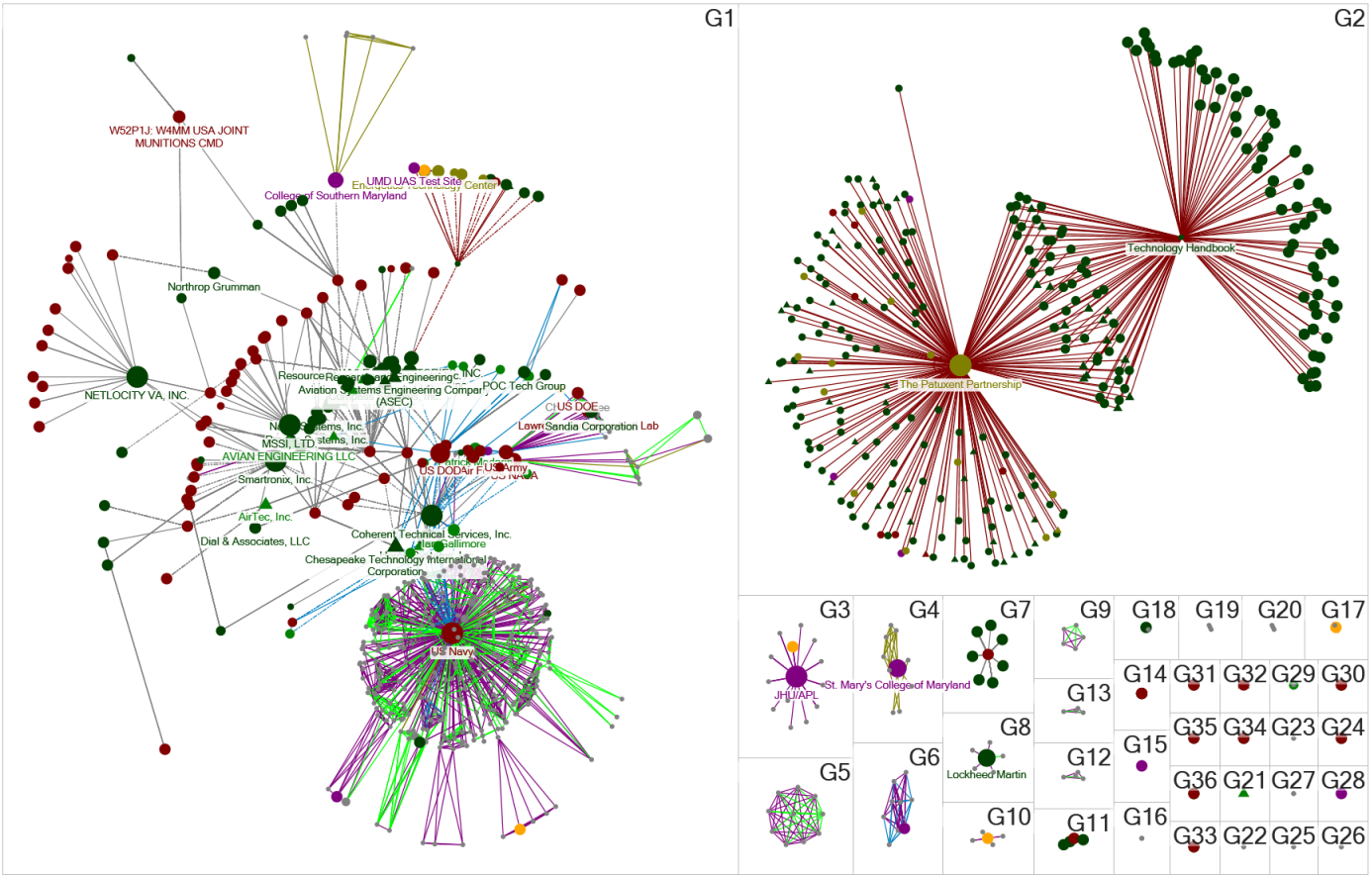
The three main economic development strategies are business attraction, retention and expansion (BRE), and entrepreneurial growth. In each case, the density and complexity of the network (or lack of it) contributes to the ability of economic developer to implement these strategies. More robust networks and clusters make it easier to attract new firms. New startups seeded in dense networks and clusters have a better chance of survival and success; and firms embedded in dense, complex networks have more established social capital that makes them less likely to relocate.

Innovation networks show a relatively small but critically important part of the broader networks that connect people, firms, agencies and institutions into robust innovation and industry clusters. If the network models are used as interactive tools, economic developers can add additional network relations over time to improve the quality and usefulness of the network model. Adding supply chain relationships may give economic developers a better picture of which companies frequently work together. Adding volunteer and community networks can help identify which executives are strengthening their connections and building social capital over time.

[8] Sponsoring agencies may provide additional investments post phase II. These typically require matching private sector investments and may be referred to as phase III.

Table 27 identified 78 St. Mary's County companies awarded DOD contracts during FY 2015. While some of these are branch operations of large multinational firms, many are home-grown startups and mature defense contractors. In addition to SBIR and other grant funds awarded to these firms, they were awarded a combined total of $675 million in defense contracts last year. Geographically, 51% went to firms in Lexington Park; 33% to firms in California, MD; 5% to firms in La Plata; 5% to firms in Leonardtown; 3% to firms in Great Mills; and 2% to those in Hollywood, MD. The remaining 1% was distributed to firms in Charlotte Hall, Hughesville, Lusby and Mechanicsville.

Local industry leaders are an essential part of the innovation ecosystem. The leaders — both firms and the people behind them — are referred to as "keystones" by Hwang and Horowitt in their book The Rainforest. Regardless of what they are called, developing a cadre of private sector leaders who are engaged in the local innovation ecosystem is critical to maintaining and growing a healthy innovation ecosystem. The 78 firms identified in Table 27 can easily provide three to four times more leads than many keystone prospects from which economic developers can develop strong, talented civic leaders who can guide network, cluster and community growth. Figure 58 shows the innovation network combined with these 78 firms plus others identified from the Patuxent Partnership and the St. Mary's County Technology Handbook.



Created with NodeXL Pro (http://nodexl.codeplex.com) from the Social Media Research Foundation (http://www.smrfoundation.org)

Figure 58 *Combined innovation network with defense contracts and ties to the Patuxent Partnership and the Technology Handbook (Group G2). Inter-group ties are hidden to simplify the image.*

Toward growth and diversification strategies

There are significant opportunities for commercializing Unmanned Aerial Vehicle (UAV) technology originally developed for military applications. Working with the University of Maryland's UAV Test Site at St. Mary's County Airport, five potential markets have been identified where UAV technology is ripe for commercialization. These markets include agriculture, environment, utility and transportation infrastructure, building inspections, and disaster response/search and rescue. The 15 firms highlighted in Figure 59 as prospects to drive innovation and entrepreneurial growth in these areas.

Entrepreneurial and Startup Strategies

Startups and entrepreneurial ventures represent the other end of the spectrum; the firms and people engaged in such ventures tend to occupy the lower-right corner of the innovation network graph (Figure 51). New startups also have a very different set of needs and economic development strategies than the firms and groups on the left side of the graph. Such strategies include access to capital and markets, accelerators, incubators, innovation districts, and access to research and specialized facilities/equipment. The network model helps economic developers figure out where to focus those efforts.

Figures 59 and 63 are enlarged and reorganized views of the right side of Figure 58 — the larger St. Mary's County innovation network. Figure 59 identifies groups of people in St. Mary's County connected by one or more patent but not associated with a specific firm. While additional research is needed to determine whether these inventions can be commercialized and whether the people involved have such intentions, figure 59 nevertheless presents prospects for St. Mary's County economic developers to engage as potential startups.

Figure 60 identifies several groups of people with connections to St. Mary's County who are already associated with a local firm. While a few of these are more established, many are either early growth or nascent startups that may need assistance to reach the next growth stage. While the more advance firms in this group may be better addressed through BRE strategies, many may need the same type of startup assistance considered for those in Figure 59.

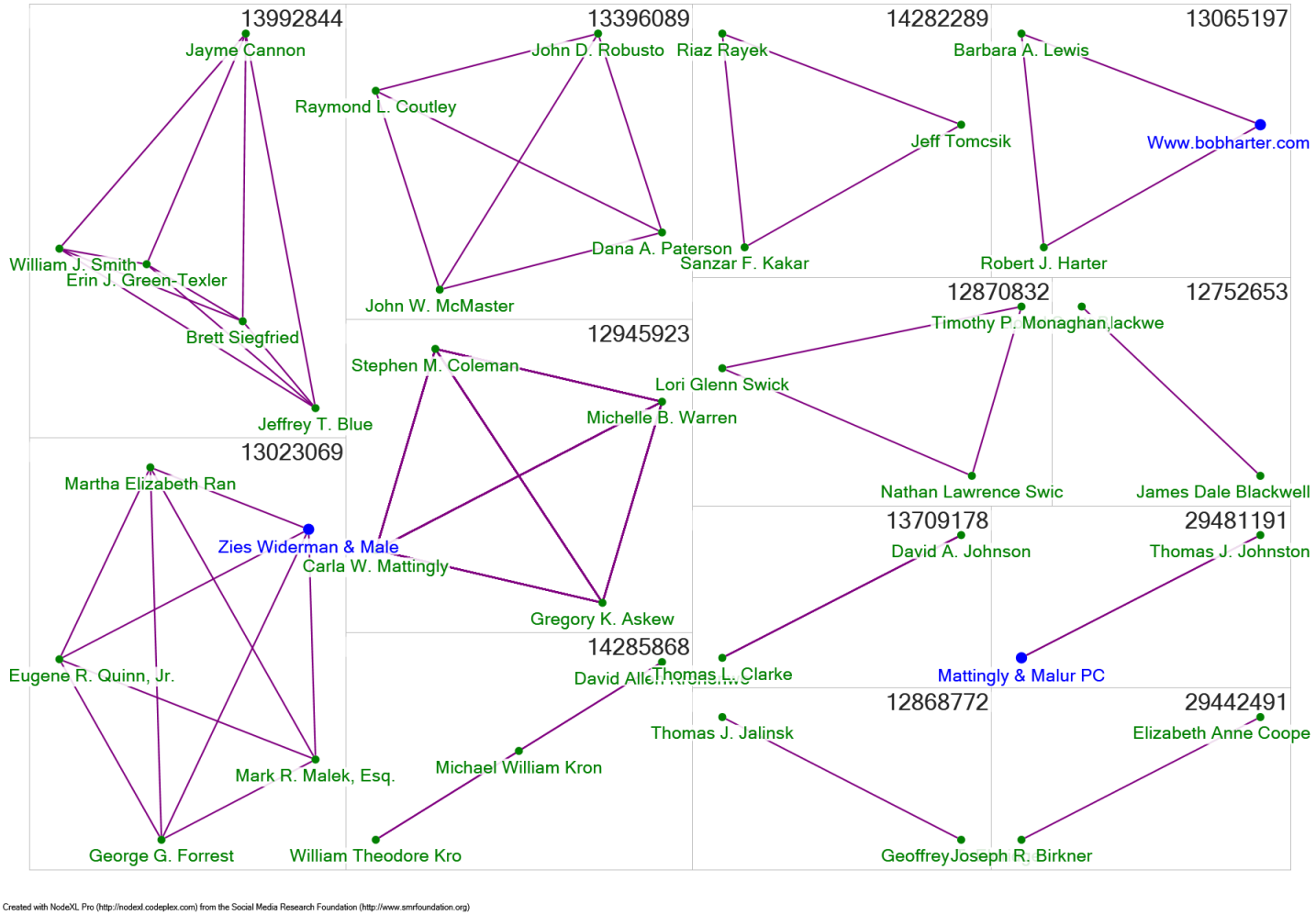


Figure 59 *Possible prospects for startups based on commercializing patented technology. These patents were unassigned at the time of application. St. Mary's County inventors (at the time of patent application) are named in green. Patent attorneys are named in blue.*

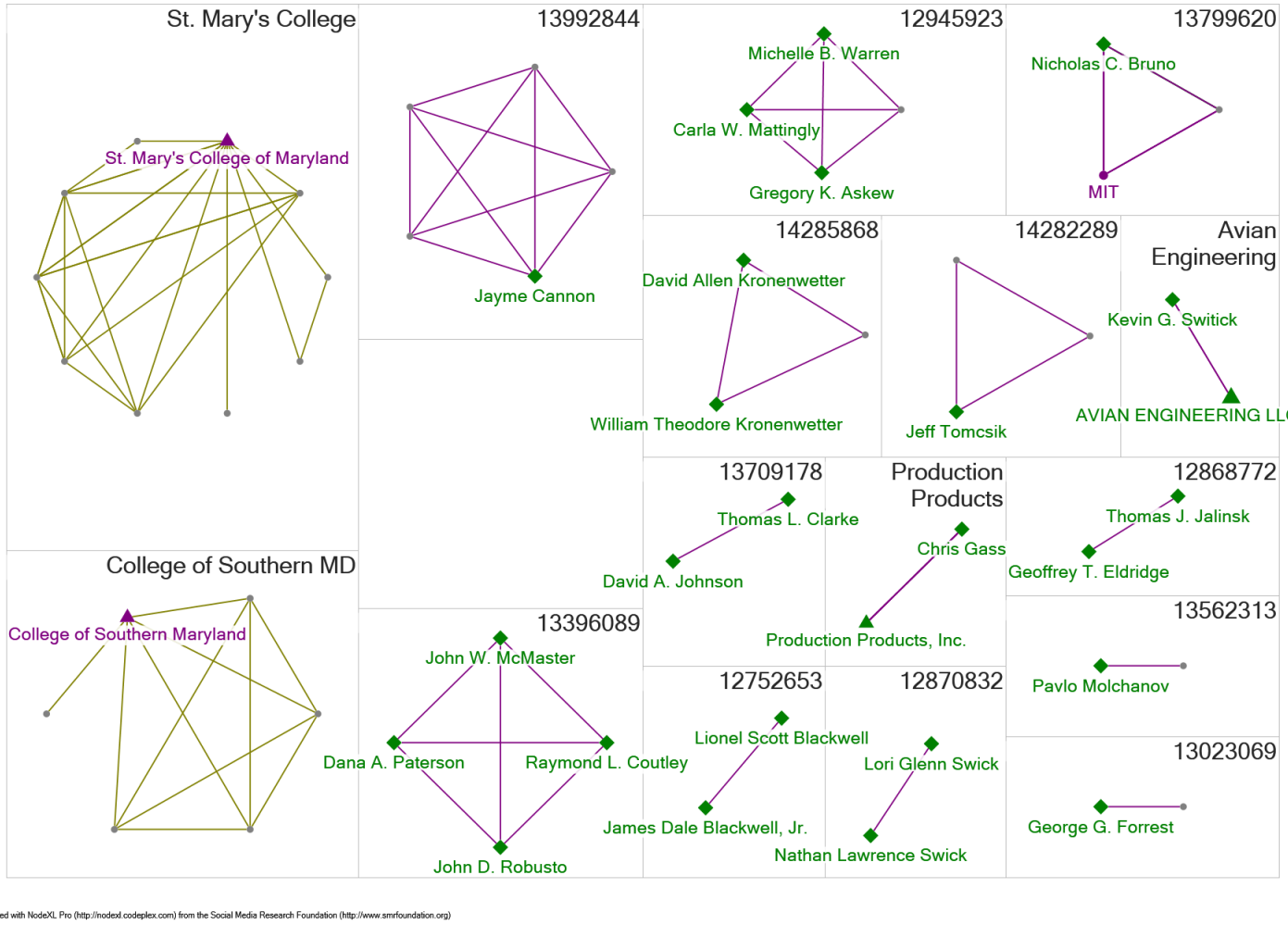


Figure 60 *Growth/BRE/nascent startup prospects.*

Entrepreneurial Development Prospects

The following components represent patents and patent applications with one or more inventors from St. Mary's County, which have not yet been assigned to a company or organization. One possibility is that the inventors intend to commercialize the technology and need assistance to get started. It is also possible that there is a pending assignee. A third possibility is that the inventor(s) would like to assign or license the technology and may need some assistance. Or, the technology represented in the patent might not have direct commercial applications. Opening a dialogue with each group of inventors will help economic developers understand the prospects for each patent and identify what assistance, if any, the inventors may need.

Patents Assigned to the US Navy

Many patents and patent applications by St. Mary's County inventors have been assigned to the US Navy. Together these may represent a small cluster of independent inventors providing technical innovation services to naval operations at NAS Patuxent River and beyond. The economic development opportunity here lies in the potential to provide supporting infrastructure that can accelerate these innovation activities and potential startups supporting defense industries. Concurrent with the preparation of this CEDS a separate study is underway with NAWCAD's Technology Transfer Office, Maryland TEDCO and Hyperion Technologies to identify patents in the Navy's portfolio that could be licensed for private commercial use.

Other Patent Assignments

These patents were assigned after the initial application for unspecified reasons. This group adds numbers and depth to the list of St. Mary's County inventors. Some in this group may wish to pursue entrepreneurial activities or assist existing companies with their innovation activities. Collectively, St. Mary's County inventors represent a talent pool from which the County might form an advisory committee on innovation-led economic development.

University Research Components

A significant finding from the network analysis is the lack of connection to university-based research through patents and/or federal research grants in areas that could lead to technology transfer or commercialization. This was surprising given the presence of the University of Maryland's UAV Test site and the higher education center. The network analysis does not include corporate or foundation-sponsored research where data is restricted[9].

Both St. Mary's College and College of Southern Maryland have NIH/NSF sponsored research projects that are relevant to the broader economic development plan, particularly workforce development. While valuable and useful in their own right, these projects are not expected or intended to yield commercial results.

Although not yet in the innovation network, the University of Maryland's UAS Test site opened in 2014 and is building network connections in the County around commercialization of UAS technology.

The conclusion to be drawn from these findings is that the research and bridging components of the innovation networks for St. Mary's County are in their formative stages. This is to be expected given the size of the County and the rapid growth over the past decade. Local professional networks including the Patuxent Partnership (TPP) and the St. Mary's Innovation and Technology (SMIT) meetup, along with other formal and informal networks within the County and Southern Maryland are actually far more robust than expected. These networks play key roles in advancing Innovation-Led Economic Development (ILED) strategies.

[9] A request for access to UMD's sponsored research and licensing data was made and approved by the Vice President for Research in October 2015, however that data is not yet available.

Sponsored Research at St. Mary's College and College of Southern Maryland

St. Mary's College

This component represents NIH Grant #8975245, Diversifying student-centered quality research at a public liberal arts college. This project has relevance to the workforce development and education goals identified in the CEDS.

The goal for the NIH project and desired impact of the institutional development plan (IDP) is to build a deeper culture of research at St. Mary's College, and better support the education of well-prepared, diverse students interested in research careers. The Research and Sponsored Program (RSP) office is effective but underfunded and cannot address increasing demands for pre-and post-award services. The teacher-scholar faculty is talented and engages undergraduates in research, but delivering high-quality research experiences for undergraduates is becoming more costly, both in terms of money and time needed to ensure student preparedness. The NIH BRAD award will partially fund an increase in RSP staff and capacity-building activities for research and research administration.

The specific aims are to increase faculty research productivity and competitiveness through faculty development activities and improved mentor/collaborator networks, and improve support for research and research administrative services by providing leadership, internal policy changes, and enhanced research administration competencies. The specific outcomes used to evaluate success will be: the number of submitted proposals for external funding, quality of proposals, proportion of faculty and students engaged in research, number of research proposals developed in collaboration with external institutions, and amount of staff participation in competency training. The EA will combine the role of research developer and administrator, and a strong team will govern the NIH BRAD project and IDP. St. Mary's College is an accessible, affordable public institution whose leadership and faculty embrace diversity, student engagement, and research as part of an

innovative liberal arts curriculum. Successful implementation of the NIH BRAD program will provide increased opportunities for faculty and students to excel in research. Given that 23% of all students and 11% of underrepresented students graduate in STEM disciplines at St. Mary's College, increased research opportunities in STEM will affect a large number of graduates. To facilitate underrepresented students' transition to the academic culture of STEM courses, St. Mary's College has a well-established set of support structures and innovative interventions such as Treisman-style STEM Emerging Scholars Program workshops, summer research opportunities, and a system of mentoring, advising, and tracking student progress.

College of Southern Maryland

This component represents NSF Award# 1060035 CSM STEM Scholars. This project has relevance to the workforce development and education goals identified in the CEDS.

This project is designed to recruit 102 academically talented, financially needy students to STEM programs at the college. By providing scholarships and a continuum of support services, the project seeks to increase retention and assist graduates in transitioning to further education or employment at one of the private sector companies, military installations, or government agencies in the region. Targeted programs include applied sciences and technology, biological sciences and biotechnology, computer information systems, computer science, engineering, engineering technology, environmental technology, information services technology, information systems security, and mathematics and physical sciences.

Project objectives include:

- increasing enrollments by capitalizing on extensive K-16 STEM activity in the region;
- increasing student retention through community building, weekly cohort contact, mentoring, tutoring, and enrichment experiences;

- expanding and streamlining articulation to facilitate transfer to four-year institutions, and engaging employers in recruiting, mentoring; and
- providing work-based enrichment experiences for students.

The project is introducing a customized, one-credit College Success Skills course as the vehicle for shaping students from diverse STEM disciplines who attend programs on three different campuses into small learning communities. The approach uses lessons learned from improving retention and academic performance by student athletes. By bringing students together over four semesters, offering them shared enrichment experiences, and providing mentors from both academia and the employment communities, the initiative is demonstrating a replicable approach for increasing success within STEM populations.

The project is increasing the number of academically talented, financially needy students, many of whom are first-generation college students, who have the opportunity for advanced careers. In an institution where females comprise 63% of the student body, and nearly half the full-time science majors are minorities, significant numbers of participants are expected to be from groups typically underrepresented in STEM careers. Outcomes for varied student population groups are being tracked and disseminated via the project website, presentations, and/or scholarly articles.

Working with the Network Models

NodeXL network models are included in this package. See appendix F for additional information. To view/use these models, download and install NodeXL (https://nodexl.codeplex.com/). The free version is sufficient for viewing and modifying the networks without calculating metrics.

Chapter 6
Analysis

Analysis

Several factors shape this analysis of economic development strategy options in St. Mary's County. Geography, demographics, and an analysis of the County's competitive industries and industry clusters influence the potential for economic growth through cluster-based strategies, for example, as well as the likelihood that business attraction, retention and expansion strategies will help the County achieve its goals of increasing manufacturing and diversifying the economy. These strategies are built on principles of agglomeration, which explain how and why regions and cities grow in both size and density. Changes in spatial, demographic, and cluster metrics are generally attributed to one or more factors of agglomeration. While agglomeration-based strategies are likely to facilitate growth of the County's business services cluster, sources of comparative advantage do not otherwise favor St. Mary's County.

At the same time, the County's business networks are extensive and well established among defense-based business and engineering services firms. The County's innovation networks — nascent and heavily skewed toward defense agencies and contractors — are growing in size and complexity. Recent and pending investments by the University System of Maryland and its member institutions — particularly University of Maryland College Park and its Unmanned Aerial Systems Test Site — have increased the University's presence in business networks like the Patuxent Partnership, and set the stage for greater engagement through innovation networks and more opportunities for innovation-led economic development (ILED) strategies[10]. There is also an alignment of expertise among St. Mary's County firms and emerging commercial applications of military UAS technology and autonomous systems in general. This critical alignment in an emerging technology presents St. Mary's County with a unique and timely opportunity to gain competitive advantage in several industries through disruptive innovation.

[10] Also known as technology-led economic development (TLED) or technology-based economic development (TBED).

Key Characteristics Shaping Economic Development Options

Geography: St. Mary's County is surrounded on three sides by water where the Potomac and Patuxent rivers meet the Chesapeake Bay. The relative isolation of the County, given that it's northern border lies just 40 miles southeast of Washington, D.C., has made it historically well suited for certain military operations. In recent decades, NAS Patuxent River has emerged as an important research and development test site for unmanned aerial vehicle (UAV) or unmanned aerial systems (UAS). In 2014, UAS test capability was extended to civilian applications with the opening and FAA approval of the UMD UAS Test Site at the County airport in California, MD. This development and testing capability for military and civilian autonomous systems in close proximity to Washington, D.C. creates the potential for locational advantages driven by innovation processes rather than agglomeration.

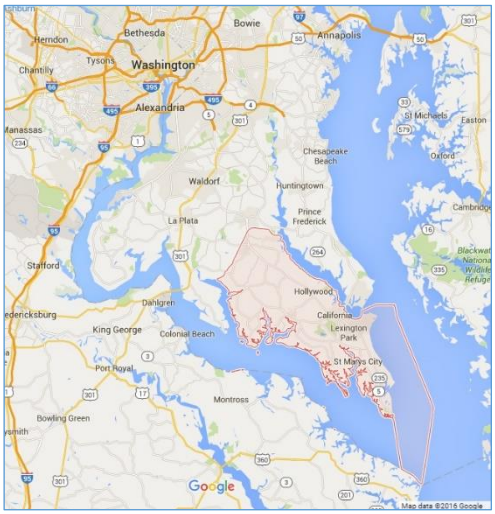


Figure 61 *Location of St. Mary's County, Maryland*

Demographics: The full background study included with this CEDS parses a wide range of demographic statistics. While each is useful, a few of those statistics are shaping current conditions and specific economic development goals. Specifically, the County's total population of 110,382 in 2014 and average density of 294 people per square mile make the County decidedly rural. Yet the median household income for the County ranked 45th in the US at $84,686.

Both population and median incomes have grown rapidly over the past decade. That growth has exacerbated a bimodal income distribution with concentrations of households at the low and high ends of the income distribution, with relatively fewer households in the middle. Despite high

average wages of $64,456 per job in manufacturing, along with the presence of many technical and engineering firms, just 1.1% of the County's jobs in manufacturing (35 establishments with 459 workers). In contrast, 21.7% of County workers are employed in professional, scientific, and technical services (369 establishments with 9,192 workers) with an average income of $87,613. Another 21% of the jobs are in government.

The Bureau of Economic Analysis (BEA) statistics reported on StatsAmerica for 2014 show that of the 65,076 workers in St. Mary's County, nearly 27% were self-employed (proprietor income), and 73% were wage and salary jobs. This represents a 5% difference from the national averages of 23% self-employed and 78% wage and salary. However, the County ranks 57th nationally in terms of average earnings for wage and salary jobs; and 2,717th in average proprietor income out of 3,113 counties reported. So, while the county is slightly more entrepreneurial than most counties in the US, the average proprietor income of $12,076 is just 53% of the median proprietor income for all US counties of $22,931. The results are consistent with and are likely influenced by the factors of agglomeration.

Industries and Industry Clusters:

The cluster analysis revealed that, according to U.S. Cluster Mapping, St. Mary's County had only one traded cluster — business services — with both substantial employment and comparative advantage. An examination of the subclusters revealed that the County's strength in this traded cluster is driven primarily by four subclusters: engineering services, computer services, business support services, and consulting services. A more detailed investigation shows that these subclusters are almost entirely oriented around defense and support for NAS Patuxent River. The same holds for other traded clusters in the County with significant employment. In total, traded clusters account for 38% of the County's employment while nontraded or local clusters accounted for 62% — comparable to the state of Maryland and the Washington, D.C. economic region.

Manufacturing in the County exists primarily as in-house support for defense contractors that need fabrication capabilities. According to the StatsAmerica cluster analysis, the manufacturing supercluster in St. Mary's County had just 10 establishments with 249 workers in 2012.[11]

The overall industry cluster picture in St. Mary's County in terms of traded clusters is almost completely dominated by defense-oriented services. This has significant implications for agglomeration-based economic development strategies and the specific goals of diversifying the economic base and growing the manufacturing cluster.

Agglomeration-Based Economic Development Strategies

Traditional economic development strategies and especially cluster-based strategies are largely applications of agglomeration theory, which explains how and why firms locate close to each other. Such strategies leverage local comparative advantages that reduce producers' costs and/or increase their sales through improved access to markets. Agglomeration works in three distinct ways.

1) ***Localization Economies*** describe how and why similar, collaborative and competitive firms locate close to one another. In addition to sharing specialized labor markets, infrastructure and other production inputs, the presence of competitors drives successful firms to be more innovative and competitive. The key point for St. Mary's County is that economic development strategies will achieve the most economic leverage of local comparative advantages in industries and clusters where there is already some strength (typically location quotients above 1.2).
2) ***Urbanization Economies*** describe how and why local economies diversify as they increase in size. As local economies grow, the increasing competition leads to greater specialization. In larger economies, more specialized firms have access to a larger customer base and specialized workforce. More innovative producers are better able to connect to early adopters and more discerning/demanding customers. The key point for St. Mary's County is that economic diversification is naturally a function of the scale and maturity of the local and regional economy.
3) ***Scale Economies*** describe how and why firms with the ability to produce and distribute more of their product are able to lower prices and/or increase profits due to decreasing marginal costs of production. In terms of local/regional economies, places with lower input and/or transport costs are able to attract and support large production firms and their

[11] http://www.statsamerica.org/innovation/anydata/ last accessed 1/26/2016.

supply chains. Such places tend to be one of the following: places close to specialized inputs or raw materials; places with large or specialized markets; or transport hubs, particularly places where shipments change mode of transport, for example port cities. The key point for St. Mary's County is that natural growth due to scale economies is a function of production input and transport costs.

Economic development strategies for St. Mary's County should consider whether and how such strategies rely on and/or leverage one or more of these three factors of agglomeration. The County faces several geographic and demographic challenges that make traditional agglomeration-based strategies difficult to implement. Take, for example, the County's agricultural transition from tobacco as the primary crop to alternative crops. One of the main reasons that sales per acre have not substantially rebounded to their 1997 levels or higher — as the state averages have — has to do with the smaller farm sizes and proportionally fewer farms larger than 179 acres. The County's farms are not large enough to achieve economies of scale with other commodity crops like corn or soybeans. Transport costs are higher too, given the relative isolation of the county by water[12].

Implementing traditional business attraction strategies or BRE strategies may successfully grow the economy, however given the nature of localization economies, that growth is likely to be defense-related. Strategies aimed at diversification of the County's economy are desirable for both economic and non-economic reasons. However, the County's economy is not large enough or mature enough for that diversification to be driven by urbanization economies. In short, achieving the important broader goals of diversifying the County's economy and expanding manufacturing will require interventions that overcome certain limitations in comparative advantage based on geography, demographics and historical development patterns.

[12] One suggestion was to re-examine barge transport from facilities previously used for the transport of tobacco, and the county should investigate the potential of this option.

Focused Background Studies and Innovation Networks

Agglomeration-based market forces and economic development strategies are likely to continue strengthening the defense cluster, but are not likely to drive significant growth in other clusters.

Growth in manufacturing and non-defense-related clusters will require innovation and entrepreneurship strategies. The BEA data findings on self-employment and proprietor income suggest some entrepreneurial efforts might already be underway. At the very least, they are an indication of a positive entrepreneurial spirit in the County.

Innovation-Based Economic Development Strategies

Strategies based on innovation are easier to implement in large, dense locations, but they are not necessarily dependent on agglomeration. This is especially true as several disruptive technologies — additive manufacturing (3D printing), wireless communications, big data, ag-tech (agricultural technology), precision agriculture and autonomous systems — are just beginning to inspire a new outlook on competitiveness. Such disruptive technologies paired with regional proximity to the Baltimore-Washington metropolitan areas creates a complex, diverse, and demanding market for innovative products to be tested and successful startups to thrive.

Specific Strategies

Strategy 1: Leverage sponsored research

Let sponsored research help build the innovation infrastructure. A strong innovation and entrepreneurial ecosystem thrives when well-developed infrastructure supports exploration, rapid prototyping, testing, collaboration, and early stage fabrication. This infrastructure takes many forms including makerspaces, coworking spaces, and innovation districts. While it is important that such spaces be "controlled" by the community, it can be costly to build, equip, and operate such spaces, which is why they are often connected to universities or nonprofit groups. The University of

Maryland's UAS Test Site is a good example. With universities, federally sponsored research can fund much of the space, equipment and operating costs. Opening up such spaces for local innovation and entrepreneurship is encouraged by federal agencies and proactive plans for doing so often make funding applications more competitive.

Strategy 2: Nurture & support the "club"

Communities-of-interest that organize around innovation related activities form a "club," a term borrowed from Andrea Foertsch, a national expert in the development and operation of disruptive spaces for innovation, including makerspaces and coworking spaces. The club facilitates the free exchange of ideas, learning, and collaboration within, and across, knowledge domains. The club, which builds relationships and social capital, is not primarily focused on business or commercial applications, but rather on exploration of the technology for its own sake — for fun and hobbies. However, serious business ideas can and do emerge, and may be pursued and accelerated independently or through an accelerator. Perhaps the quintessential example of how clubs bring people together around emerging technology and how new technology startups can emerge from those clubs is the Home Brew Computer Club and the founding of Apple Computer.[13]

Strategy #3: Innovation Accelerators

Accelerators differ from incubators in several important ways, such as program duration, focus, intensity and real estate. While incubators are often associated with a physical facility occupied by client firms for one to three years or more, accelerators may or may not provide space for program participants during the accelerator program, which typically lasts three to six months — or longer for manufacturing based programs.

[13] See Meyer, PB, (2007). Network of Tinkerers: A Model of Open-Source Technology Innovation.

Strategy #4: Locally Targeted Capital

Build relationships with capital sources that support St. Mary's County as a viable growth location.

Strategy #5: Public-Private Partnerships

Continue to build public-private partnerships with private-sector leadership around the growth of an innovation ecosystem in St. Mary's County — including the Patuxent Partnership and SMIT.

Chapter 6
Goals, Objectives and Metrics

Place-Based Economic Development

Goals	Quality of Life	Business Development	Workforce Development
How we get there			
Place-based Strategies			
Infrastructure			
Transportation Water & sewer Energy Communications	Strengthen Physical Capital to Support Growth *Metrics: Number of businesses / households affected and levels of service improvement* Identify public infrastructure, services, & amenities in need of improvement Develop strategy to make improvement (including resource identification) *Metrics: List of improvements; strategy for improvement; resources identified / applied for*		
Buildings & Land			
Industrial Commercial / Office Retail		Increase inventory of available industrial/flex space Facilitate capital investment	
	Metrics: Change in available sf of industrial / flex and retail space; Change in level of private sector capital investment in buildings and land		
Housing			
Markets & options Affordability	Improve housing options & affordability Increase diversity of housing types for multiple market segments Explore opportunities for retirement communities and services		Ensure adequate workforce housing exists (joint objective with Quality of Life)
	Metrics: Changes in the distribution of housing types; rent / price levels for each type; particular emphasis on young professional and retirement market segments. Production of a market feasibility study for retirement communities / services.		
Amenities			
Essentials Dining / Entertainment Recreation			Improve/create community amenities that are attractive to young, talented workers
	Metrics: Number of community amenities; Satisfaction surveys of young professionals.		
Community			
Learn from and partner with others in the community Identify potential community partners and best practices for collaboration Identify communities that have faced similar challenges and learn from their experiences Build Social Capital (Buy in; interpersonal trust; high-touch)			
Metrics: Number / quality of new partnerships both within and outside the County; Changes in network structure and density; changes in network metrics related to social capital.			

Table 28.*Place-Based Goals and Metrics*

People-Based Economic Development

Goals	Quality of Life	Business Development	Workforce Development
How we get there			
People-based Strategies			
Education & Training			
K-12 Comm. College / Vocational Higher Education Workforce Training			Survey businesses to determine deficiencies and gaps in workforce Work with local educators to ensure education / training matches needs of current and next generation businesses
	Metrics: Number / quality of new partnerships both within and outside the County; Changes in network structure and density; changes in network metrics related to social capital.		
Jobs & Wages			
Range of opportunities	Increase high wage primary jobs *Metrics: Increasing wage rates for all income cohorts, especially middle income*		
Career Advancement	Increase economic diversity of St. Mary's County *Metrics: Change in the number and types of jobs available*		
Growing Middle Class	*Metrics: Growth of middle income households as a percentage of all County households*		
Income / gender-wage gaps	*Metrics: Reduction / elimination of gender-wage gaps*		

Table 29.*People-Based Goals and Metrics*

Cluster-Based Economic Development

Goals	Quality of Life	Business Development	Workforce Development
How we get there			
Cluster - based Strategies			
Implement cluster strategies that foster collaboration and growth across multiple industries, especially those with high economic multiplier values *Metrics: higher location quotients; positive local share in shift-share analysis.*			
Business retention & expansion	Focus on traditional "quality of life" industries	Grow strong, existing clusters with BRE tools and strategies	Create / use industry partnerships to ensure workforce training supports targeted attraction and BRE strategies
	Focus on market growth strategies	Use BRE tools and strategies to expand manufacturing capacity	
		Focus on market growth strategies	
		Facilitate market-growth strategies in targeted clusters & industries	Facilitate workforce recruiting and training in targeted occupations
	Targeted Clusters		
	- - Hospitality	Business & Financial Services Cluster Defense & Security Cluster Information Technology & Telecommunications Cluster Agriculture & seafood Transportation & Logistics Cluster	Create / use industry partnerships to align occupational clusters with workforce needs
Business attraction		Diversify industries within strong supply chains through import substitution strategies	Create / use industry partnerships to ensure workforce training supports targeted attraction and BRE strategies
		Identify target industries based on St. Mary's County's strengths/assets and recruit firms in those industries (e.g. UAV)	
		Work with existing cluster industries to develop supply chain strategies that expand local manufacturing capacity	

Table 30.*Cluster-Based Goals and Metrics*

Innovation-Led Economic Development

Goals	Quality of Life	Business Development	Workforce Development
How we get there			
Innovation & Entrepreneurship - based Strategies			
	Leverage DOD presence to diversify economy		
	Capitalize on DoD patents and technology for commercial use (Identify appropriate IP and potential uses) Expand non-DoD technology sector (Identify parallel or similar civilian technologies) *Metrics:*		
	Develop light manufacturing capabilities in St. Mary's County		
	Work with DBED Mfg office to secure capital and other resources Create manufacturing-based innovation accelerator/makerspaces/coworking spaces Build 3D printing / additive manufacturing capacity in support of targeted industries and clusters. Enhance UAV prototyping and manufacturing capacity; Develop commercial and agricultural UAV technologies and applications; provide opportunities for local testing. *Metrics:*		
	Develop innovation commercialization strategy		
	Facilitate rapid proof-of-concept / commercialization Facilitate capital investment Facilitate the development of co-working spaces, maker-spaces, and business incubator spaces *Metrics:*		

Table 31.*Innovation-Led Goals and Metrics*

Specific ILED Strategy Proposals

Leverage sponsored research in UAV/AS

Encourage and assist partnerships between UMD's UAS Test Site and various federal agencies on specific relevant research projects:

a. USDA & EPA (along with UM-AGNR, UMCES Chesapeake Biology Laboratory)

i. Precision agriculture

ii. Precision aquaculture

iii. Environmental monitoring

iv. Water resources

b. DHS / FEMA, USCG (along with MEMA, MFRI and others)

    i. Search and rescue

    ii. Disaster preparedness, assessment and recovery

    iii. Fire and EMS services

c. US DOT, DOE, EPA (along with NCSG, NTC, CATT and CITSM at UMCP; MD SHA)

    i. Inspection and monitoring of:

        1. Transportation infrastructure — roads, bridges, rail lines, port facilities

        2. Energy infrastructure

        3. Water and wastewater infrastructure

        4. Specialized waste facilities

    ii. Event evaluation and monitoring

        1. Spills and cleanups

        2. Outages

        3. Crash and other traffic events

    iii. Inspection, monitoring, and documentation of infrastructure construction

d. NIST, NPS, GSA, DHS (Along with MAPP and UM Civil & Environmental Engineering)

    i. Building inspection and documentation

    ii. Construction inspection and documentation

    iii. Surveying and layout

    iv. Utility monitoring, mapping and inspection

Nurture and support the "club"

Clubs — formal or informal organizations that emerge from communities of interest — support the community of interest, not generate startups. Nevertheless, many clubs recognize the potential for startups and commercial technologies, and can support members in pursuit of commercial ventures. At least five such organizations deserve continued partnership or further investigation and potential support from County economic developers. Support for at least one makerspaces could provide fabrication capacity to facilitate manufacturing startups.

a. The Patuxent Partnership (TPP) is a well-established and active network that forms critical infrastructure for St. Mary's County's innovation and entrepreneurial ecosystem.

b. The Southern Maryland Innovation and Tech (SMIT) Meetup is a well-established and active network with a slightly different focus and membership than TPP. SMIT provides critical infrastructure to different parts of the County's innovation and entrepreneurial ecosystem.

c. The Energetics Technology Center (ETC) and TechFire are based in Charles County support innovation and entrepreneurship throughout Southern Maryland. Strengthening the existing partnership and value creation for St. Mary's County are reasonable goals.

d. PaxSpace Inc. is a 501(c)(3) nonprofit, member-operated Makerspace, where people can meet and work on projects. They offer workspaces and storage for members to pursue projects related to art and technology. PaxSpace's mission is to inspire lifelong learning and innovation, while strengthening the community.

e. Steve Bildman, a partner in Airtec, Inc. is reportedly considering development of a makerspace, accelerator and/or incubator at or near the St. Mary's County Airport[14]. He could not be reached for further comment.

[14] Source: Interview with Matt Scassera, UM UAS Test Site, 1/14/2016.

f. The St. Mary's County young professionals group might have information on other independent or informal groups. Some groups are ad hoc, while others become more persistent. County support at a minimum should consist of networking, information sharing and cross promotion. Additional assistance will depend on need, capacity, uniqueness or redundancy, and available resources.

Build public-private partnerships and integrate a focused UAV/AS effort into the County's innovation ecosystem

Many of the building blocks and necessary relationships are already present in St. Mary's County. Others need to be created or adapted. Private sector leadership is critical, and County leaders should focus on connecting and supporting keystone leaders to guide these efforts. The presence of a palpable innovation ecosystem and clear pathways for the commercialization of new technology is essential to attracting the kind of infrastructure-building research investment needed.

Network analysis, interviews and other research have identified a group of companies that economic developers can focus on to spark a UAV/AS innovation and entrepreneurship . This list is neither definitive nor exclusive, but simply likely prospects based on current research and activities. These companies include the following in alphabetical order:

e. Airtec, Inc.
f. Ausley Associates
g. Avian Engineering, LLC
h. Aviation Systems Engineering Company Inc.
i. Chesapeake Technology International Corporation
j. Coherent Technical Services, Inc.
k. Compass Systems, Inc.
l. The Energetics Technology Center (ETC) *located in Charles County but serving Southern Maryland; has actively investigated land-based autonomous systems.
m. Heron Systems, Inc.
n. Northrop Grumman PRB Systems Inc.
o. PAE Systems
p. PaxSpace Inc.
q. POC Tech Group
r. R Cubed Engineering, LLC
s. Spalding Consulting, Inc.
t. Silverblock Systems, Inc.

u. Technology Security Associates, Inc.
See Figure 27 for extensive lists of companies.

1. Facilitate/support one or more innovation accelerators related to UAV/AS. Both PAXspace Inc. and Steve Bildman have expressed accelerator/incubator aspirations. These and other prospects should be explored.

2. Follow-up on specific leads for technology commercialization and startups using the network analysis in the Defense and Manufacturing chapter.

3. Pursue defense-related growth opportunities in three areas identified and analyzed by RESI as particularly promising, including UAV/AS, irregular warfare, and information security.

4. Continue working with NAWCAD and other Technology Transfer Offices to identify potentially commercial applications for technology in their IP portfolios, as identified through a separate study conducted by TEDCO and Hyperion Technologies.

5. Continue business attraction, retention, and expansion efforts as opportunities become available.

Chapter 7

Implementation and Evaluation

This chapter presents a series of action steps and approaches to economic development. These include place-based strategies, people-based strategies, cluster-based strategies, and innovation-based strategies. Within each of these broad approaches there are several specific tasks listed in Table 32 with suggested metrics to assess progress toward the goals.

Place-based strategies focus on development projects including infrastructure, housing, commercial and industrial development, and building community amenities. These physical development projects are augmented with strategies for building and strengthening social and professional communities and relationships.

People-based strategies focus on education and training to prepare local residents for good, high-wage jobs. Engaging regional colleges and universities will be key to implementing these strategies. A focus on the workforce should be matched with efforts to create and sustain living-wage jobs and eliminate wage disparities based on gender and race.

Cluster-based strategies include the targeted strategies outlined at the end of chapter 4. Business retention and expansion efforts should focus on expanding existing manufacturing capacity and diversifying products and markets.

Innovation and entrepreneurial strategies are likely to lead to job creation and economic growth over the next five years. St. Mary's County has an excellent start on the implementation of these strategies. The outline in Table 32 is a starting point to assess progress and annually refine project goals.

Strategies	2016	2017	2018	2019	2020	Metrics
Place-Based Strategies						
Infrastructure						
Infrastructure assessment						published assessment
Infrastructure strategy						published strategy
Infrastructure resources						$ targeted / secured resources
Buildings & Land						
Increase Industrial / Flex			ongoing			change in #sf & occupancy
Facilitate capital investment			ongoing			# | $ investments
Housing						
Improve options & affordability			ongoing			# of units by price
Increase diversity of housing types			ongoing			# of units by type
Increase workforce housing			ongoing			# of units
Explore retirement communities						Feasibility / market study
Amenities						
Improve community amenities			ongoing			# | $ improvements
Focus on young proffesional mkt			ongoing			change in satisfaction surveys
Community						
Partnership / grow network			ongoing			network size & density
Identify best practices			ongoing			# best practices
Study comparable places			ongoing			# places | best practices
Build social capital			ongoing			Network metrics
People-Based Strategies						
Education & Training						
Employer survey						needs; satisfaction
Curriculum development						# programs / courses
Implement curriculum						# students | graduates
Jobs & Wages						
Increase high-wage jobs			ongoing			# jobs | $ wages
Increase deversity of jobs			ongoing			# jobs | # occupations
Gow middle class jobs			ongoing			# jobs | $ wages
Close income gender-wage gaps			ongoing			Wage comparisons
Cluster-Based Strategies						
Business Retention & Expansion						
Use BRE to grow mfg		ramp - up				# | $ of expansions; new jobs
BRE - general			ongoing			# | $ of expansions; new jobs
Business Attraction						
Business attraction			ongoing			# prospects; # new establish.
Target import-substitution			ongoing			# prospects; # new establish.
opportunities						
Innovation-Led Strategies						
Leverage DOD Presence						
Commercialize DOD technology			ongoing			# of projects; $ invested
License / commercialize DOD IP			ongoing			# of licenses / CRADAs
Develop Light Manufacturing						
Makerspace(s)		ramp - up				$ invested; capacity; usage
Facilitate rapid proof-of-concept		ramp - up				# | duration of projects
Enhance UAV prototyping		ramp - up				# of projects
Product Commercialization						
Facilitate capital investment		ramp - up				# | $ investments
Accelerator(s)		ramp - up				# of applicants & graduates
Followup entrepren. Opportunities			ongoing			# of projects / # of startups

Table 32.*Implementation Summary with Metrics*

Entrepreneurial Development Prospects

The following components represent patents and patent applications with one or more inventors from St. Mary's County and not yet assigned to a company or organization. The inventors might intend to commercialize the technology and need assistance to get started. It is also possible that there is a pending assignee. The inventors might want to assign or license the technology. Or, the technology might not have direct commercial applications. Opening a dialogue with each group of inventors will help economic developers understand the prospects for each patent and identify what assistance, if any, the inventors may need.

Patent Application # 14285868: Hand-held Firewood Handling Device

A hand-held firewood handling device for grasping, lifting, and placing pieces of wood in and around a bonfire. The device is made of a rod inserted into a tube, the rod formed with a handle at one end and with a rotating prong on the other end. The tube features a pair of spaced-apart stationary prongs (12) welded to its distal end, the stationary prongs positioned on the tube so that when the rod is rotated inside the tube, the rotating prong (26) is offset in the space between the stationary prongs (12). In use, the handle is rotated to move the rotating prong away from the stationary prongs and positioned over a log. Rotating the handle in an opposite direction until the prongs are securely around the log, the log is repositioned as desired and released by rotating the handle to open the prongs.

This patent application is currently unassigned. David Allen Kronenwetter of Leonardtown MD and William Theodore Kronenwetter of California MD are named inventors.

Patent # 14282289: System and Method for Increasing the Efficiency and Profitability of Deliveries from a Point-of-Sale Provider to a Retail Consumer

Abstract

A system and method for increasing the efficiency and profitability of delivery services between a point-of-sale provider for services or delivered goods, such as comestibles and a retail consumer.

This patent application is currently unassigned. Jeff Tomcsik of Avenue, MD is first named inventor.

Patent # 13023069 Vessel for interring cremated remains and associated methods

Abstract

A cremated remains containment vessel may include an outer shell including a base and sidewalls extending upwardly from the base. The sidewalls may be defined by a lower portion positioned adjacent the base and an upper portion positioned opposite the base. The outer shell may also include a plurality of interior walls extending upwardly from the base, interior the sidewalls, to define a plurality of compartments. The vessel may also include a top that is removeably connected to the upper portion of the sidewalls, and a pair of handles connected to the sidewalls of the outer shell to oppose one another. The vessel may further include a pair of grooves formed in a bottom portion of the base and aligned substantially parallel with one another. The vessel may still further include a liner carried by the outer shell adjacent an inner portion of the sidewalls and the base, and a data plate carried by a bottom portion of the top. The vessel may also include a frame member carried by an outer portion of the sidewalls. Contact between the top and the outer shell may form an airtight or watertight seal.

This patent is currently unassigned. George G. Forrest of Leonardtown, MD is first named inventor.

Patent application #12752653: Reconfigurable Security Systems and Methods

Abstract

Reconfigurable security systems, devices, and methods are provided. These can include systems having a configuration device, a reconfigurable lock system, and a reconfigurable key system, where transferable tumbler code carriers, having transferable tumbler codes, may be exchanged in order to provide controlled access to the devices or structures secured by the security system. By way of metaphor, the particular teeth configuration of a manual key may be understood as reflecting a single or fixed tumbler code. In embodiments, such a tumbler code may be exchanged, compared, and stored to allow for selective configuration of keys, mating of keys and locks, and selective access to security systems by a key system configured with a proper tumbler code.

This patent application is currently unassigned. James Dale Blackwell, Jr., and Lionel Scott Blackwell of Leonardtown, MD are the inventors.

Patent application #13562313: Multi-beam antenna array for protecting GPS receivers from jamming and spoofing signals

Abstract

Multi-beam antenna array for anti jam and anti-spoof protection of GPS satellite data using multiple directional antennas disposed in various orientations jamming or spoofing signals from any direction cannot damage all said directional antennas simultaneously. Each said directional antenna connected to filtering amplifier and to multiple GPS processors for calculating direction of signal arrival. An anti-jam/anti-spoof processor comparing directions of signals arrival with real satellites positions for arrival time from data storage filters signals from jamming or spoofing signals, which are not corresponding to the correct positions stored for each satellite at the transmit time.

This patent application is currently unassigned. Pavlo Molchanov of Lexington Park, MD is a named inventor. Two previous patents by inventors Vincent M. Contarino (Lusby, Calvert County MD) and Pavlo Molchanov have been assigned to the US Navy.

Patent # 12870832: Multiple frame topology system

Abstract

A flexible, scalable multiple frame topology system capable of a wide range of multiple frame geometric topologies. Specifically a series of photographs, a series of photographic letters, or any series of flat, semi-flat, or three-dimensional display objects are displayable in a wide variety of display geometries: a horizontal line of frames, multiple, stacked, horizontal lines of frames, a vertical array of frames, multiple vertical arrays of frames, staggered arrays of frames, diagonal arrays of frames, crossword arrays of frames, and any combinations thereof. Also the disclosed display method is capable of displaying three-dimensional objects on shelves, or glass display cases, shadow boxes, on hooks, interlocking into the display cases—and the geometric display can mix a number of different display frames, for instance, a series of flat framed items with a three dimensional objects at each end of the array. Finally, the multiple clip frame system is a cost effective, visually balanced method, and aesthetically pleasing way to show any display object.

This patent is currently unassigned. Nathan Lawrence Swick and Lori Glenn Swick of Lexington Park, MD are the inventors.

Patents Assigned to the US Navy

The following patents and patent applications by St. Mary's County inventors have been assigned to the US Navy. Together, these inventors may represent a small cluster of independent inventors providing technical innovation services to naval operations at NAS Patuxent River and beyond. The economic development opportunity here lies in the potential to provide supporting infrastructure that can accelerate these innovation activities and facilitate innovation and potential startups supporting defense industries.

Patent # 12945923: Body Core Thermo-regulation Cooling Sleeve

Abstract

The present invention is a cooling sleeve, which has a sheath and a gas cartridge. The sheath is able to slip over a user's clothed arm), and includes a chamber disposed within the sheath. The chamber is able to thermally communicate with the user's arm. The gas cartridge supplies cooling gases to the chamber such that the user's arm is cooled, whereby the user's core temperature is cooled.

This patent has been assigned to the Department of the Navy. Inventors Michelle B. Warren, Gregory K. Askew, and Carla W. Mattingly of St. Mary's County are named inventors.

Patent Application 13/396,089: Case managed Counter-terrorism System and Process

Abstract

A machine-implemented Case-Managed ontology and decision support framework provides a basis for a family of machine database architectures for use in a system for countering forces of unknown intentions including fighting and winning the Global War on Terror. The system focuses resource allocation decisions on logically derived, targeted areas of interest with an emphasis on non-kinetic, non-destructive effects. The system combines proven doctrines and novel operational approaches. It employs readily available intelligence information, an ontological understanding of the problem domain, a three-level, metrics-driven, case-managed system and process to counter the forces of unknown origin, and an entire set of operational level activities combining strategic intent, tactical approaches, expected utility analysis, mission-level simulations, and integrated cost modeling.

This patent was assigned to the US Navy. John W. McMaster, Raymond L. Coutley, Dana A. Paterson, and John D. Robusto of St. Mary's County are named inventors.

Patent application # 12868772: Colorimetric Method for Detection of Biodiesel in Fuel

Abstract

The method of detection of biodiesel (FAMEs) in fuel includes the following steps: placing test fuel in a container, adding a 0.5 N solution of hydroxylamine in ethanol to the container, adding 20% sodium hydroxide solution to the container, heating the test fuel, the 0.5 N solution of hydroxylamine in ethanol, and the 20% sodium hydroxide solution in the container such that the test fuel, the 0.5 N solution of hydroxylamine in ethanol, and the 20% sodium hydroxide solution is boiling, adding 1 N hydrochloric acid to the container, adding 10% iron (III) chloride solution to the container, such that violet or pink appears in the container when there is biodiesel in the fuel.

This patent has been assigned to the US Navy. Geoffrey T. Eldridge of California, MD and Thomas J. Jalinsk of Leonardtown, MD are the inventors.

Patent application #13562313: Multi-beam antenna array for protecting GPS receivers from jamming and spoofing signals (this patent application is currently unassigned but history suggests that it may be technology developed for the US Navy. This patent also appears in the previous section.)

Abstract

Multi-beam antenna array for anti jam and anti-spoof protection of GPS satellite data using multiple directional antennas disposed in various orientations jamming or spoofing signals from any direction cannot damage all said directional antennas simultaneously. Each said directional antenna connected to filtering amplifier and to multiple GPS processors for calculating direction of signal arrival. An anti-jam/anti-spoof processor comparing directions of signals arrival with real satellites positions for arrival time from data storage filters signals from jamming or spoofing signals, which are not corresponding to the correct positions stored for each satellite at the transmit time.

This patent application is currently unassigned. Pavlo Molchanov of Lexington Park, MD is a named inventor. Two previous patents by inventors Vincent M. Contarino (Lusby, Calvert County MD) and Pavlo Molchanov have been assigned to the US Navy.

Other Patent Assignments

The following patents were assigned after the initial application for unspecified reasons. Together this group adds numbers and depth to the list of St. Mary's County inventors. Some in this group may wish to pursue entrepreneurial activities or assist existing companies with their innovation activities. Collectively, this group represents a talent pool from which the County might seek to form an advisory committee related to innovation-led economic development.

Patent # 12795954: Highly power-efficient and broadband quantum cascade lasers

Abstract

The present invention relates generally to highly power-efficient quantum cascade sources, such as highly power-efficient quantum cascade lasers having ultra-strong coupling between injector and active regions which may be configured to provide broadband quantum cascade lasers.

This patent has been assigned to the National Science Foundation. Anthony J. Hoffman of Leonardtown, MD is one of the named inventors.

Patent Application #13907436: Tunable cavity resonator

Abstract

A tunable cavity resonator includes a housing, a post, and a controllably variable capacitive coupling. The housing defines an interior and has at least one side wall, a first end, and a second end. The post is located within the interior and extends from the first end to the second end. The post

and the housing define a resonating cavity. The controllably variable capacitive coupling is disposed in the housing.

This patent has been assigned to the Purdue Research Foundation. Joshua Azariah Small of Lexington Park, MD is one of the named inventors.

Patent #13908201: Tunable cavity resonator including a plurality of MEMS beams

Abstract

A tunable cavity resonator includes a substrate, a cap structure, and a tuning assembly. The cap structure extends from the substrate, and at least one of the substrate and the cap structure defines a resonator cavity. The tuning assembly is positioned at least partially within the resonator cavity. The tuning assembly includes a plurality of fixed-fixed MEMS beams configured for controllable movement relative to the substrate between an activated position and a deactivated position in order to tune a resonant frequency of the tunable cavity resonator.

This patent has been assigned to the Purdue Research Foundation. Joshua Azariah Small of Lexington Park, MD is one of the named inventors.

Patent # 13992844: Novel formulations which mitigate agitation-induced aggregation of immunogenic compositions

Abstract

The present invention provides novel formulations which mitigate agitation-induced aggregation of immunogenic compositions particularly those having polysaccharide-protein conjugates. Specifically, the novel formulations comprise a poloxamer within a molecular weight range of 1100 to 17,400 which provides significant advantages over previously used surfactants including polysorbate 80. In one embodiment, the present invention provides a multivalent immunogenic

composition having 15 distinct polysaccharide-protein conjugates and a poloxamer. Each conjugate consists of a capsular polysaccharide prepared from a different serotype of Streptococcus pneumoniae (1, 3, 4, 5, 6A, 6B, 7F, 9V, 14, 18C, 19A, 19F, 22F, 23F or 33F) conjugated to a carrier protein, preferably CRM197.

This patent has been assigned to MERCK SHARP & DOHME CORP of New Jersey. Jayme Cannon of Lexington Park MD is a named inventor.

American Sterilizer Company (Steris), patent # 13066362: Environmentally friendly, multi-purpose refluxing cleaner

Abstract

A solvent blend cleaner useful for reflux cleaning of chemical manufacturing equipment, including that used in manufacturing pharmaceuticals, comprises a blend of environmentally friendly and safe solvents selected on the basis of specific criteria, such as vapor pressure, vapor density, boiling point, specific heat, and heat of vaporization, among other things; achieves excellent cleaning even upon further dilution with water; and avoids the disadvantages associated with the use of conventional commodity solvents in reflux cleaning methods. Desired solvency, cleaning and wetting properties of the inventive formulations in use can be achieved through blending of solvents having the selected criteria. Additives, such as surfactants, can be added to enhance cleaning and lower solvent requirements.

This patent is assigned to American Sterilizer Company. Shahin Shahin Keller of Lexington Park, MD is first named inventor.

Patent # 13799620: Phosphine-ligated palladium sulfonate palladacycles

Abstract

Described are palladium precatalysts, and methods of making and using them. The palladium precatalysts show improved stability and improved reactivity in comparison to previously-described palladium precatalysts.

This patent is assigned to MIT. Nicholas C. Bruno of California, MD is first named inventor.

Patent application # 13709178: Meter bayonet tool and method of testing tension of meter socket jaws

Abstract

A device for testing tension between the jaws of a meter socket in an electric meter base comprising an aluminum blade having dimension similar to a blade of an electric meter designed to fit in the meter socket jaw, the device further comprising a handle having a proximal end and a distal end, the blade rigidly supported within the distal end, the handle having a weight which is distributed along the handle so that sufficient torque is exerted on the blade when the blade is inserted in a meter socket to be tested that the device rotates downwardly if there is insufficient tension. A method of testing tension in a meter socket using the device is also disclosed.

This patent application has been assigned to Southern Maryland Electric, Hughesville, MD. David A. Johnson of Leonardtown, MD and Thomas L. Clarke of Mechanicsville, MD are the inventors.

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