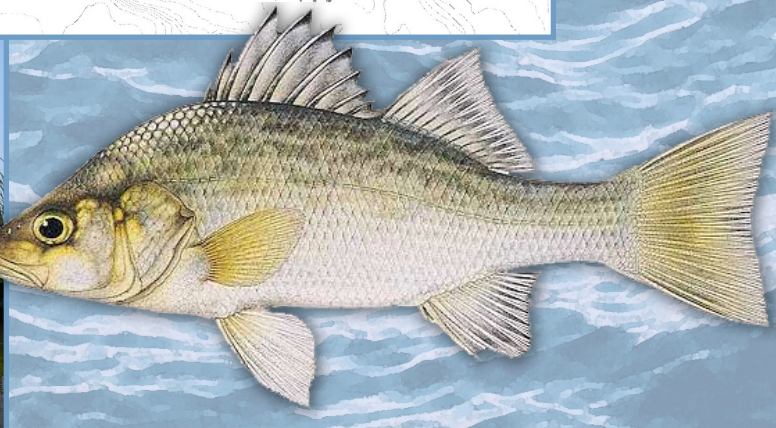
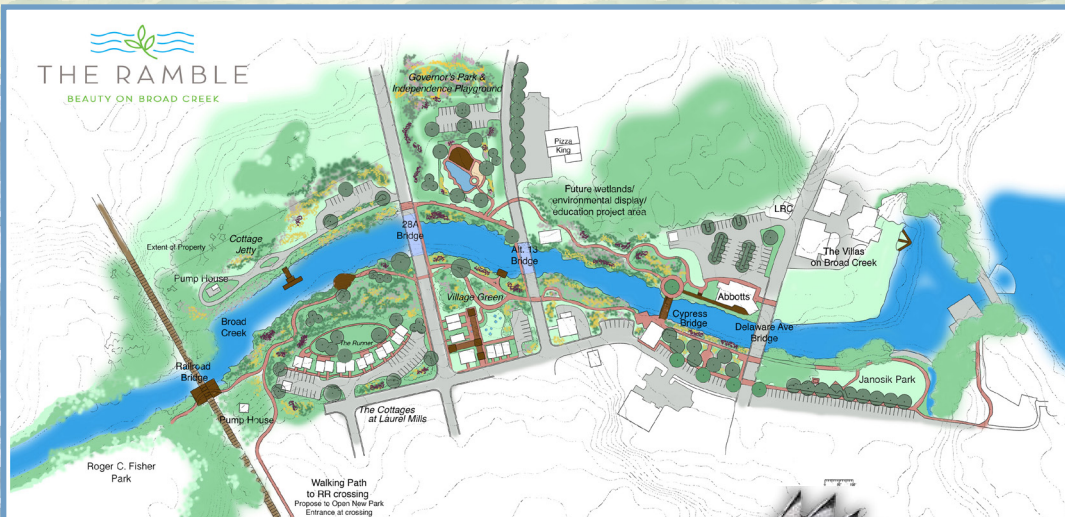


From Broad Creek to the Chesapeake

Guidance for growth in Laurel that protects our water quality



Acknowledgements

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DNREC contracted with the University of Delaware's Sustainable Coastal Communities Initiative to develop a snapshot of conditions in Delaware's western Sussex towns located within the Chesapeake Bay Watershed and develop a toolkit of recommendations to help them meet federal water quality goals.

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Cedar Creek 
Sustainable Planning Services

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Photo spread, Phillips Landing where Broad Creek meets the Nanticoke River. Inset photo, geese gather along Broad Creek in downtown Laurel. Below, a prothonotary warbler represents the diverse opportunities for nature tourism in the Nanticoke watershed.



1. Introduction & purpose

Laurel lies along Broad Creek, a tributary of the Nanticoke River that flows west into the Chesapeake Bay. The Chesapeake watershed drains half of Sussex County and one third of Delaware's land area. The watershed faces pollution from farming operations, residential fertilizers, construction practices, septic systems, sewer plants, boat fuel, parking lot runoff and many other sources. Because of Delaware's flat topography and extensive ditching, pollution has a relatively short and easy trip to the Nanticoke and into the Bay.

Towns and agriculture in this section of western Delaware are included in a regional plan to meet more stringent water quality goals in the Chesapeake by 2025. The Delaware Chesapeake Bay Watershed Implementation Plan (WIP)¹ and goals for Delaware were approved in 2010 by the U.S. Environmental Protection Agency under the authority of the federal Clean Water Act. In Delaware, the Department of Natural Resources and Environmental Control worked with a diverse group of stakeholders such as residents, farmers, government officials and developers to review these goals.

Delaware's Watershed Implementation Plan sets maximum loading rates for nitrogen, phosphorous and sediment – all of which are pollutants when they are present in excessive amounts. The limits are referred to as TMDLs – Total Maximum Daily Loads – which in essence represent a pollution “diet” for these towns, farms and developments in unincorporated areas.

“Offsetting” future development

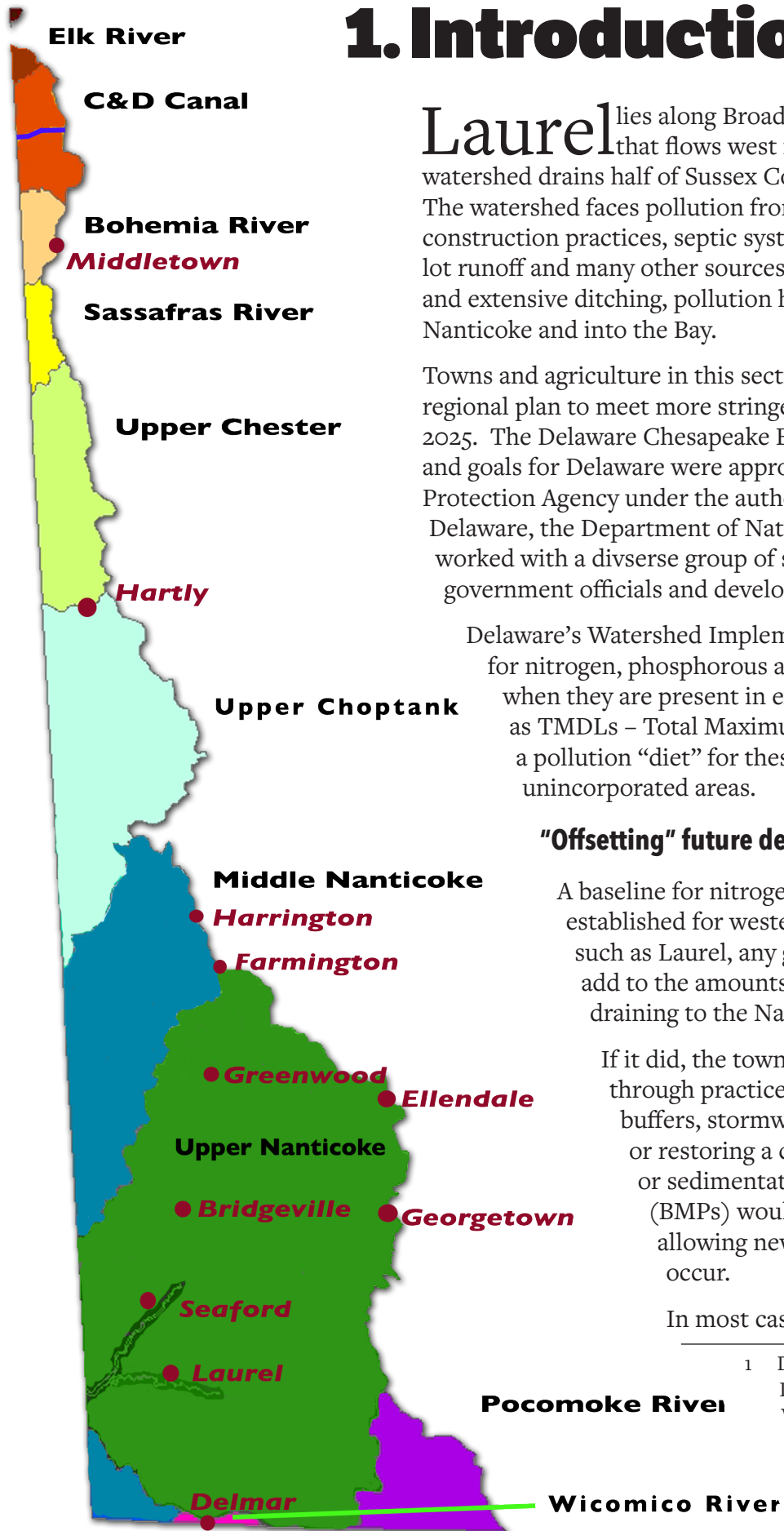
A baseline for nitrogen, phosphorous and sediment was established for western Sussex County towns in 2010. For towns such as Laurel, any growth beyond that base urban load cannot add to the amounts of these nutrients present in surface waters draining to the Nanticoke River and Chesapeake Bay.

If it did, the town would be expected to “offset” that increase through practices such as green infrastructure, vegetated buffers, stormwater retrofits, taking septic systems offline, or restoring a creek or ditch subject to erosion and/or sedimentation. Those Best Management Practices (BMPs) would remove pollutants from the watershed, allowing new residential or commercial development to occur.

In most cases, developers who meet the requirements

¹ Delaware's Phase II Chesapeake Bay Watershed Implementation Plan. Chesapeake Interagency Workgroup, March 30, 2012.

Fig. 1-1. Laurel lies within the Upper Nanticoke segment of the Chesapeake Watershed.



of Delaware's new Stormwater and Sediment Regulations will meet the requirements of the TMDL (see Section 3). An exception would be the conversion of forested areas for new development, or any addition of onsite wastewater (septic) systems within town limits.

Laurel proactively faces the future

While the offset requirement sounds onerous, the good news is that the Town of Laurel is well positioned for reasonable growth into the future. Laurel has proactively taken steps to position itself to meet the Nanticoke/Chesapeake requirements:

- Laurel's wastewater treatment facility was designed to meet tougher Maryland Enhanced Nutrient Removal (ENR) standard of 3.0 mg/liter of total nitrogen and .3 mg/liter of total phosphorous — considered the limit of current technology. Without any modifications or plant upgrades, Laurel will meet the slightly less stringent TMDL targets for discharge into Broad Creek.
- Because the treatment plant is operating at less than half of its 700,000 gallon-per-day capacity, Laurel has room to grow in an efficient manner.
- Laurel is completing a project along its U.S. 13 corridor that connected the equivalent of 138 Equivalent Dwelling Units (EDUs) to its wastewater treatment plant.
- Low-impact redevelopment efforts along Broad Creek (e.g., The Ramble) are focused on green infrastructure practices, restoration and buffering any new development from the creek and floodplain.

- An ambitious \$1.56 million stormwater retrofit project along Sixth Street will address sewer backup issues in town and remove nitrogen and phosphorous from Broad Creek.
- Laurel is focused on revitalizing its downtown business and residential district, which would utilize existing infrastructure and likely not add to nutrient loads or require an offset.

All of these positive factors will be discussed in more detail.

Challenges for the Town

A challenge that Laurel faces is its relatively lengthy and fragmented municipal boundary and the amount of working farmland still within those boundaries. While Laurel has excess sewer capacity now, a total buildout of the proposed growth scenario (see Section 3) would outstrip the capacity of the wastewater treatment plant and require an expansion.

This buildout likely would occur over 30-50 years, but a large-scale residential or mixed-use development in the northernmost end of Laurel would require the extension of sewer infrastructure sooner rather than later and could actually be counterproductive for the town.

While Laurel is required to maintain, but not reduce, its urban loads of nitrogen, phosphorous and sediment, DNREC land-use data indicate 611 acres of row crops within Town boundaries (see page 12). By 2025, working farms within Laurel's Town limits (and elsewhere in Delaware's portion of the



Laurel's redeveloping Broad Creek waterfront has a focus on green infrastructure. A combination of the Town and the Laurel Redevelopment Corporation own almost all of the parcels on both sides of the waterfront. This is Johnny Janosik Park.



watershed) are targeted to reduce their loads of these nutrients by 82 percent.

This target could be perceived as an incentive to convert agriculture to development sooner rather than later. The town only needs to maintain its baseline loads of nitrogen, phosphorous and sediment, while farmers are required to comply with the state's Nutrient Management Plan and strongly encouraged to apply best management practices to their operations.

Another pressing challenge is the pending requirement that southwestern Sussex towns obtain Municipal Separate Storm Sewer System (MS4) permits for their stormwater conveyance systems. As of the 2010 U.S. Census, Laurel falls within the Salisbury, MD-DE Metropolitan Statistical Area. Towns within these urbanizing areas are federally required to seek a Phase II MS4 permit to prevent and manage stormwater pollution – runoff from streets, parking lots, roofs, and other paved and manmade surfaces.

The MS4 requirement will compel towns to comply with TMDL requirements for their urban loads as a condition of their federal permit. It represents a regulatory “stick” that has not existed before except in larger urbanized areas such as New Castle County, Dover, Newark and Middletown.

Perspective and path forward

This document discusses the unique circumstances of Laurel and its location in the Nanticoke/Chesapeake watershed. It further considers both proactive steps the town has taken with regard to water quality, as well as challenges and potential trouble spots that may make it difficult to meet the 2025 water quality goals.

It proposes actions the town can take to ensure that it continues to grow, prosper and meet its water-quality obligations. The proposals are geared toward not just checking boxes on a DNREC list and staying out of trouble with the EPA, but ensuring that Laurel remains an attractive town where people will want to visit, live, shop and start a business.

Some perspective is in order: Urban sources of nitrogen add up to about 10 percent of the total load within Delaware's portion of the Chesapeake watershed. Agricultural sources contribute 78.5 percent. For phosphorous, agriculture contributes 90 percent of the load in Delaware.

Agricultural best management practices such as cover

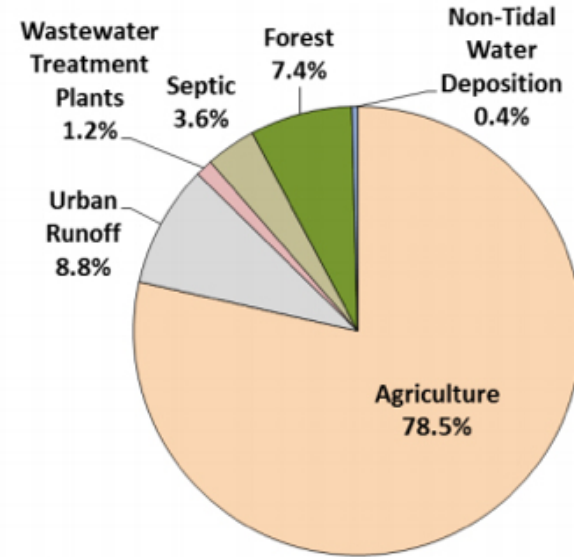


Fig. 1-2: 2010 sources of nitrogen in Delaware's Chesapeake calculated by EPA. Source: Delaware's Phase II Watershed Implementation Plan

crops and vegetated riparian buffers are generally more cost-effective than the remedies available in urban areas – wastewater treatment plant upgrades, stormwater retrofits, and pervious pavement.

Laurel is a town with a low median household income, estimated at \$32,781 in 2013. It is already struggling to provide affordable wastewater treatment and recently secured 100 percent loan forgiveness from the state for a stormwater retrofit project that will fix a combined sewer overflow problem. Development in town will be required to meet the state's new, tougher sediment and stormwater regulations, and the town itself will be required to meet and enforce new municipal stormwater (MS4) permit requirements.

Growth strategies that focus development in and around existing towns – traditional neighborhood design, revitalization, infill, higher density, walkability – are better for water quality than low-density, leapfrog development in rural areas.²

Any path forward needs to keep these factors in perspective. The most cost-effective solution for both water quality and quality of life is for Laurel to grow thoughtfully and systematically, attracting jobs and people that will contribute to the livability and sustainability of this town.

² “Protecting Water Resources with Higher Density Development,” 2006, US Environmental Protection Agency.

2. Planning to grow

Laurel, a town of 3,708 in 2010, actually lost 2.2 percent of its population since 2000, according to the US Census Bureau. With approximately 600 acres of farmland within its boundaries, however, the town has the land capacity for significant growth. Also, its wastewater treatment plant is currently operating at about half its permitted capacity.

The University of Delaware Sustainable Coastal Communities Initiative, Office of State Planning Coordination, and town leaders worked together in 2013-14 to visualize how and where Laurel should grow. Innovative, hands-on mapping techniques were used to define a study area and guide participants to suggest where different types of growth should occur.

Because development activities in a town can have an impact on water bodies well beyond town boundaries, the original study area was quite large and included the Town of Bethel. Bethel was considered a candidate for connection to Laurel's wastewater treatment plant.

That prospect, as of November 2015, is unlikely. The study area was significantly scaled back in September 2015 to include only the Town of Laurel and its proposed annexation area. The map on page 8 (Fig. 2.2) shows the original study area in 100-acre tiles, and the map on page 9 (2.3) shows the final growth scenario map, in parcel form.

Painting the towns' future

The land-use modeling process uses a set of 100-acre tiles or squares to describe the land uses of a particular area. Each 100-acre square represents a community of varying land uses and housing densities – either in existence today or as a possibility in the future. The communities represented include:

- Rural Communities (a 100-acre farm or natural preserve; 5-20 acre farms or agricultural business; or a rural village);
- Residential Communities (a suburban community of single-family and/or multi-family homes);
- Mixed Use Communities with both residential and non-residential properties and
- Non-residential Communities (Employment Centers such as business parks, large schools and institutions, or government centers and regional retail centers).

Rural Communities are the least dense, at one dwelling unit per 100 acres. The spectrum continues through low-density rural development to suburban to mixed use to commercials (see Fig. 2-1 below).

With each tile, there is a set of assumptions about

Continued on page 10

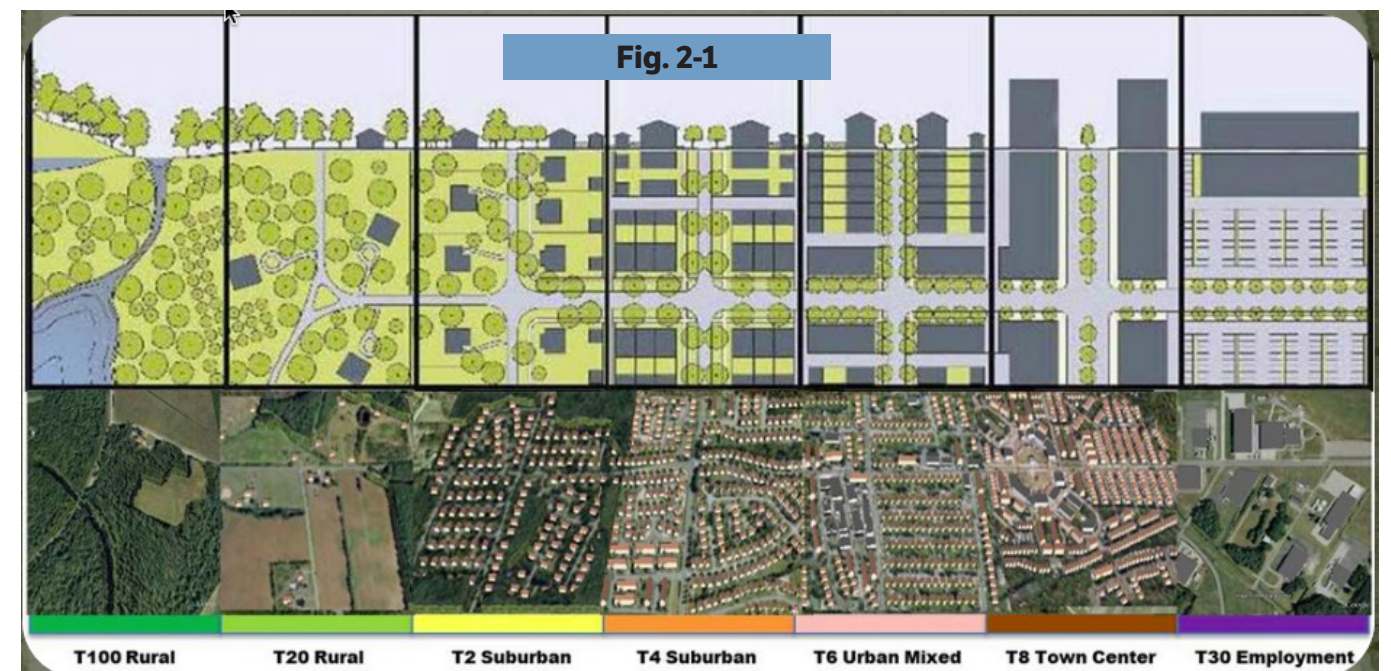
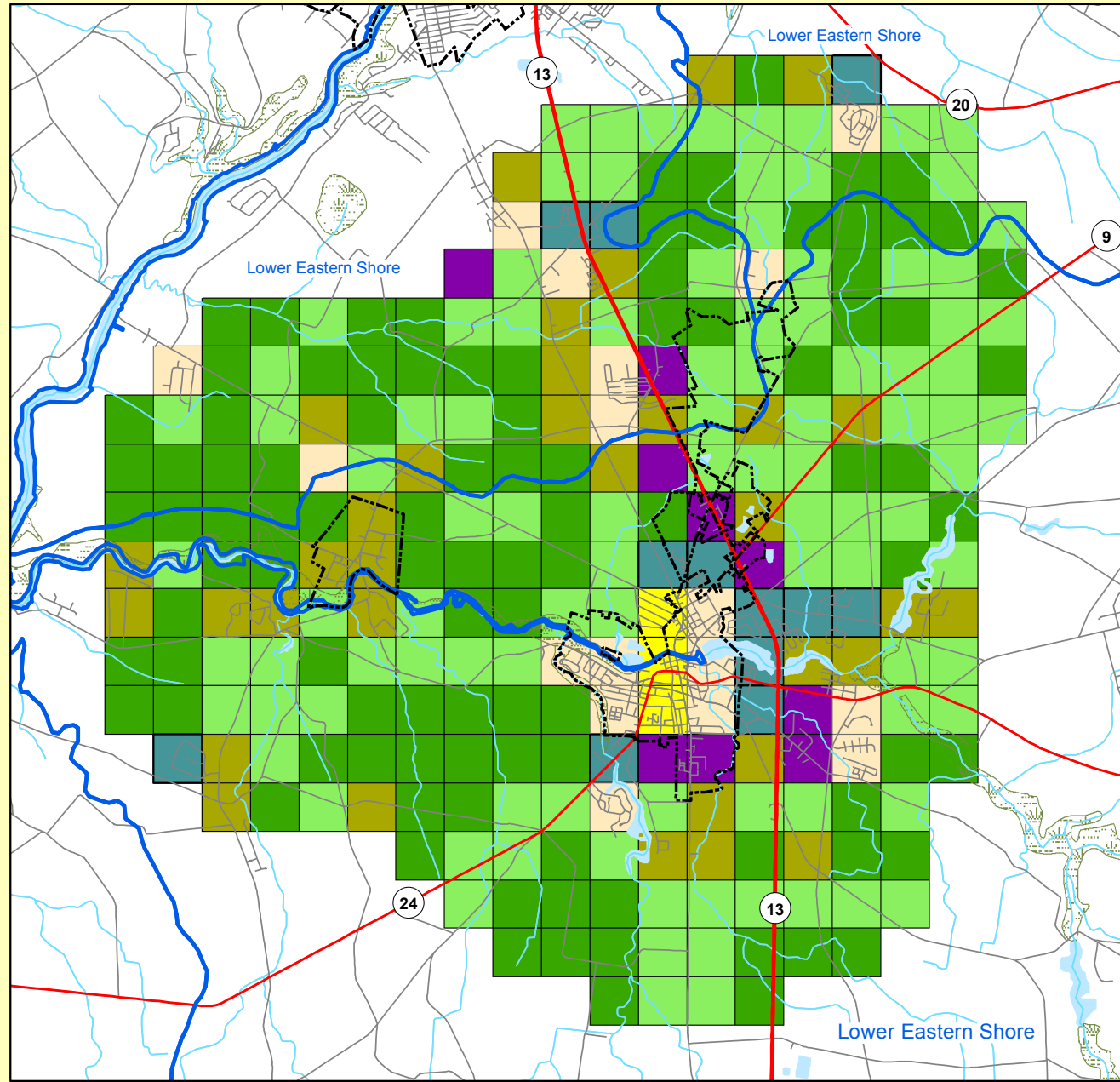


Fig. 2-1. The transition of density and land uses from rural to urban employment centers was used to model current and future uses in the Laurel study area. Planners refer to this transition as a “transect.”



Scenario Profile: Existing Base

Laurel and Bethel Master Plan - Chesapeake Bay Watershed Implementation Plan (WIP)

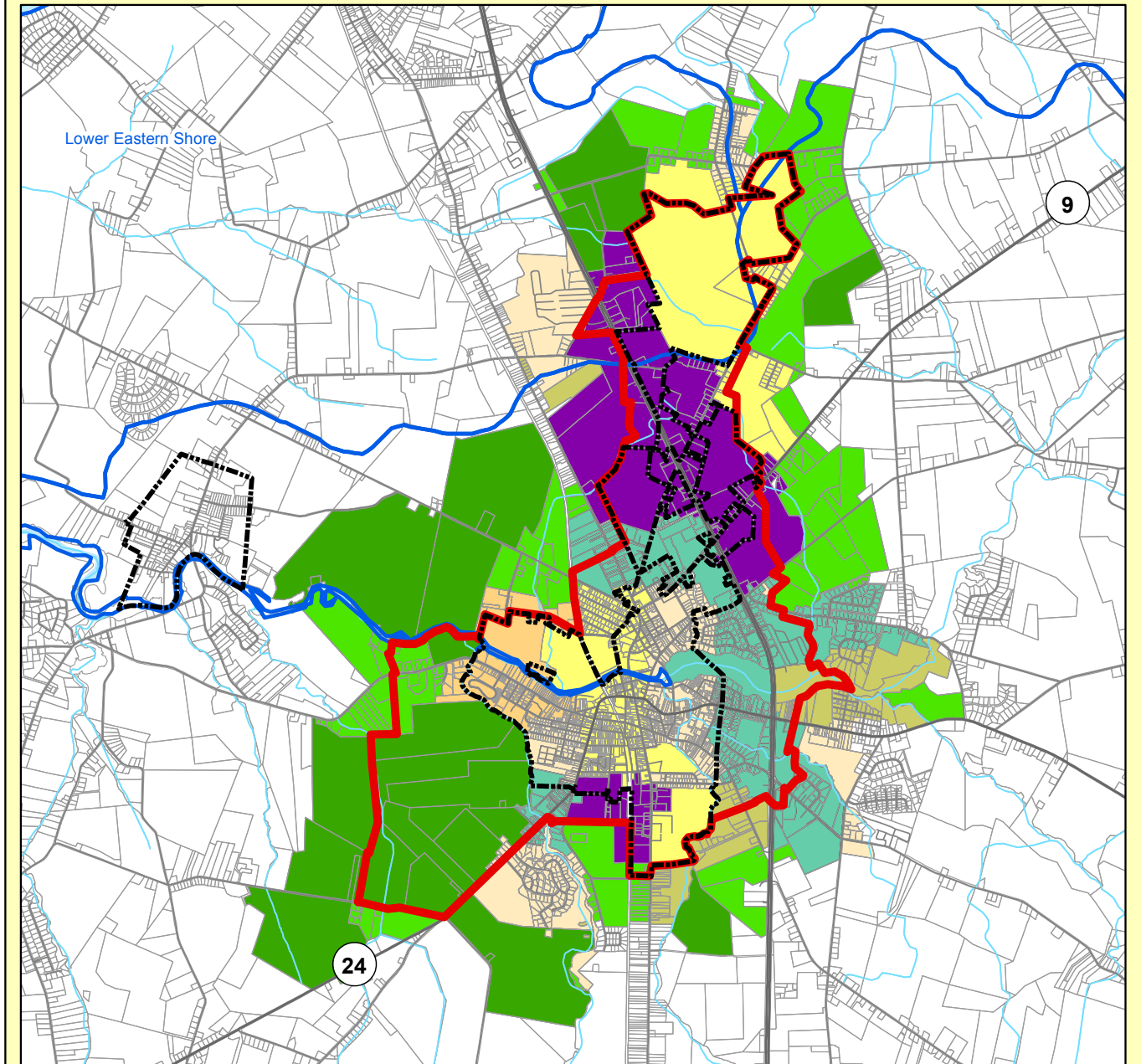


<ul style="list-style-type: none"> T100A - Rural T20A - Rural T5A - Rural T1 - Rural Village T2 - SubUrban T4 - Mixed SubUrban T30K Employment Municipal Boundaries Watershed Boundaries 	<ul style="list-style-type: none"> State of Delaware Major Routes Minor Roads Rivers and Streams Lake/Pond Swamp/Marsh 	<p>Fig. 2-2</p> <p>DRAFT - December 10, 2014</p>	<p><small>Source: Existing Base Scenario - Developed by the UD, Sustainable Coastal Community Initiative (SCCI), 10/13. Municipal Boundaries - Office of State Planning Coordination (OSPC), 11/14. Watershed Boundaries - U.S. Geological Survey. Roads - Delaware Department of Transportation, 11/14.</small></p> <p><small>Note: This map is provided by the University of Delaware, Sustainable Coastal Community Initiative (SCCI) solely for display and reference purposes and is subject to change without notice. No claims, either real or assumed, as to the absolute accuracy or precision of any data contained herein are made by SCCI. No will SCCI be held responsible for any use of this document for purposes other than which it was intended.</small></p>
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Fig. 2-2. This map of 100-acre tiles reflects the current land uses in the original study area in and around Laurel, including Bethel.

Scenario Profile: Growth and Annexation

Laurel and Bethel Master Plan - Chesapeake Bay Watershed Implementation Plan (WIP)



<ul style="list-style-type: none"> T100A - Rural T20A - Rural T5A - Rural T1 - Rural Village T2 - SubUrban T4 - SubUrban T4 - SubUrban Mixed T30K - Employment 	<ul style="list-style-type: none"> Municipal Boundaries Annexation Area Watershed Boundaries State of Delaware Parcel Boundaries Major Routes Minor Roads Rivers and Streams 	<p>Fig. 2.3</p> <p>DRAFT - November 2015</p>	<p><small>Source: Growth and Annexation Scenario - Developed by the Town of Laurel and UD, Sustainable Coastal Community Initiative (SCCI), 09/15. Municipal Boundaries - Office of State Planning Coordination (OSPC), 09/15. Growth and Annexation Area - Office of State Planning Coordination (OSPC), 09/15. Watershed Boundaries - U.S. Geological Survey. Roads - Delaware Department of Transportation, 11/14.</small></p> <p><small>Note: This map is provided by the University of Delaware, Sustainable Coastal Community Initiative (SCCI) solely for display and reference purposes and is subject to change without notice. No claims, either real or assumed, as to the absolute accuracy or precision of any data contained herein are made by SCCI. No will SCCI be held responsible for any use of this document for purposes other than which it was intended.</small></p>
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Fig. 2-3. This map, converted from the original 100-acre tiles to parcels, is scaled back to include just the current boundaries of the Town of Laurel and its annexation area. Bethel is excluded.



density, percentage of residential vs. commercial development, type of wastewater treatment, amount of commercial square footage, people per household, etc. Based on those assumptions, the University calculated what a buildout over time (approximately 30-50 years) would yield in terms of dwelling units, residents, school-age children, employees, water and wastewater use, and tax revenues.

Observations about the buildout scenario

Laurel's future land use map (Fig. 2-5) depicts a checkerboard pattern with many enclaves. The northernmost parcels totaling 480 acres were once slated for an ambitious mixed-use development that included 1,400 residential units and 1.3 million square feet of commercial space.

While there is merit to filling in the enclaves to increase revenues and deliver services more efficiently, the buildout table below reflects commercial and residential wastewater use that will require the equivalent of almost two more 800,000 gallon-per-day treatment plants. When the town expands its treatment plant, it plans to use spray irrigation which will require purchasing or leasing significant amounts of land and/or securing agreements with area farmers.

In addition, the Growth and Annexation Scenario would add almost 2,000 children to Laurel's public schools over time (an estimated 30-50 years). An unplanned influx could burden local residents who also pay school and state taxes and create overcrowding in classrooms.

If a sizable residential project were to locate in the northernmost parcel before development close to the town center filled in, it could put a financial strain on Laurel and services such as wastewater, water, police and schools. An attractive, environmentally friendly design that includes mixed commercial and residential uses and avoids forested and riparian areas would yield more revenue, fewer school children and a smaller impact on water quality.

A mostly wooded parcel west of the town's sewage treatment lagoon (see Fig. 2-5) is zoned for medium-density residential development. Conversion of forest acreage for development likely would require significant mitigation under state and federal stormwater regulations.

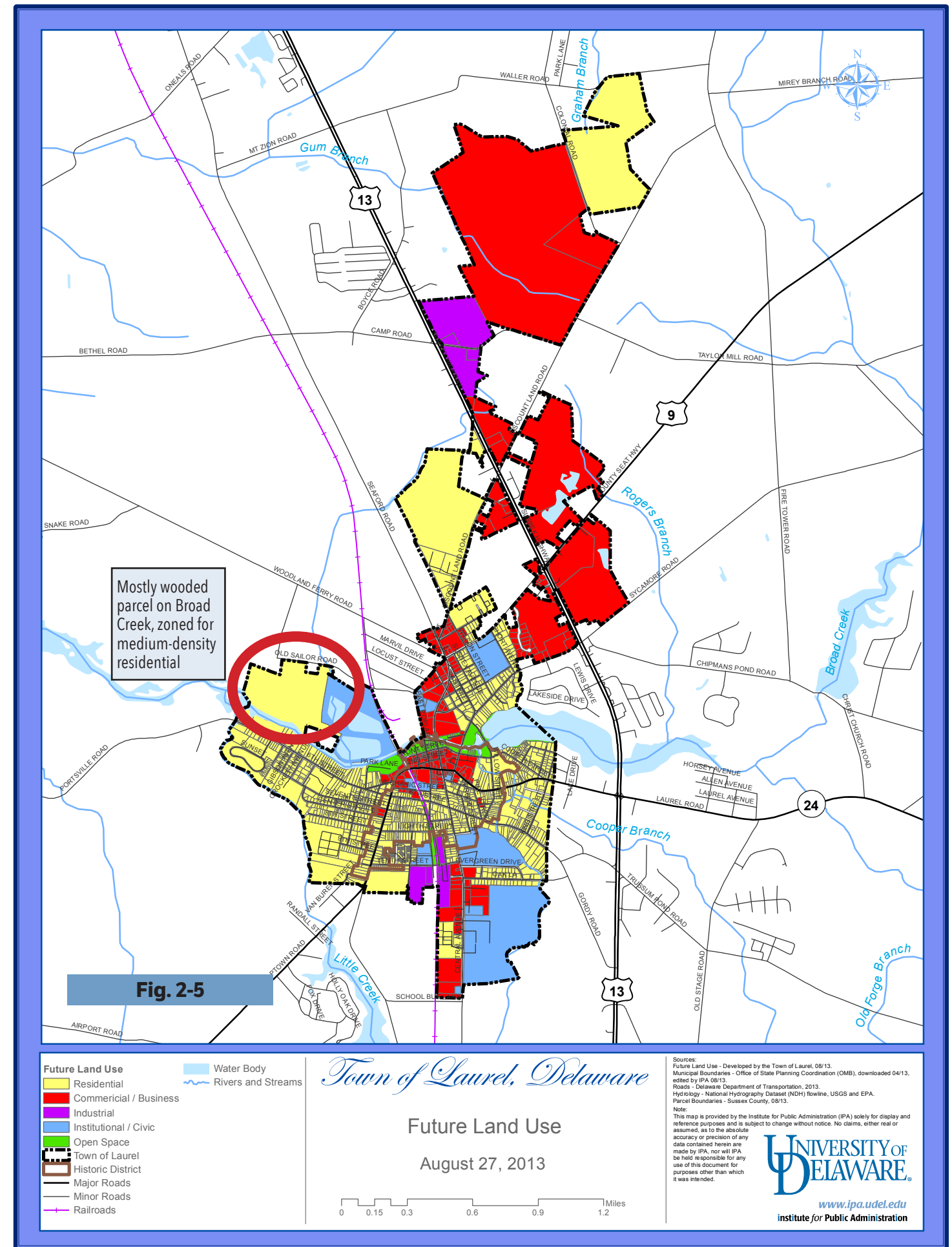
Laurel is at a place in its history where it can choose to grow thoughtfully while preserving its essential character that includes the Broad Creek waterfront. The town has already taken several significant steps toward protecting water quality while also declaring its intention to grow. Those steps are documented in this report.

What buildout will look like in Laurel study area

Fig. 2-4

Name	Base Build-Out Scenario (on the ground in 2014)	Future Land Use per town and county plans	Growth and Annexation scenario
Children	2,973	4,888	5,306
Commercial floor area	2,252,765 square feet	3,707,034 square feet	3,767,700 square feet
Commercial daily vehicle travel	58,411 miles	100,775 miles	101,561 miles
Commercial wastewater (gpd)	103,397	155,764	161,552
Commercial water use (gpd)	129,246	194,705	201,940
Dwelling units	4,520	8,240	9,280
Employees	5,185	7,929	8,390
Residential property taxes	\$429,199	\$805,396	\$911,798
Residential daily vehicle travel	45,200 miles	82,400 miles	92,800 miles
Residential wastewater use (gpd)	1,275,997	2,181,991	2,453,994
Residential water use (gpd)	1,275,997	2,181,991	2,453,994
Residents	11,532	21,635	24,050

Fig. 2-4. This table forecasts buildout in the revised study area (Fig. 2-3) for three different scenarios. The Base Buildout Scenario reflects land-use conditions as they existed in 2014. The Future Land Use scenario is based on the comprehensive plans of Sussex County and the Town of Laurel. The Growth and Annexation Scenario represents a revised buildout based on the visioning exercise conducted with the University of Delaware and the Office of State Planning Coordination. It will be incorporated into the 2016 update of Laurel's comprehensive plan. **Source:** University of Delaware



3. The regulatory picture

What is the regulatory background for the requirement that Laurel not exceed its 2011 baseline (see Fig. 3-1 below) for nitrogen, phosphorous and sediment? How will this requirement be enforced?

Delaware’s Phase II Chesapeake [Watershed Implementation Plan](#) (WIP) of March 2012 details the regulatory framework as well as specific strategies for achieving the 2025 target loads. The WIP is a comprehensive encyclopedia for anyone seeking more information on this topic.

As with almost all of Delaware’s waterways, the tributaries of Chesapeake Bay—including Broad Creek and the Nanticoke River—are considered impaired, or polluted. For each impaired segment, the federal Clean Water Act requires the establishment of a “pollution diet,” or Total Maximum Daily Load (TMDL), that limits how much of certain pollutants can be discharged into a stream. The US Environmental Protection Agency was developing a TMDL for the Chesapeake Bay Watershed when President Obama signed an Executive Order in 2009

that placed increased focus and heightened emphasis on bay restoration.

Local TMDLs for Delaware water bodies and stream segments, including the Nanticoke, already had been established by the state Department of Natural Resources and Environmental Control (DNREC). A Tributary Action Team for the Nanticoke and Broad Creek Watersheds drafted a Pollution Control Strategy, and recommendations were submitted to the Secretary of DNREC. However, due to the development of the Chesapeake Bay TMDL, those recommendations were folded into the WIP development process.

Only in the Inland Bays was a specific state regulation, or Pollution Control Strategy, developed and deployed to enforce the TMDL. However, there are other federal and state regulatory mechanisms that exercise control over water quality in Delaware.

Water pollution can come from both “point” and “nonpoint” sources (see Fig. 3-2 below). Laurel’s Wastewater Treatment Plant represents a point source, while polluted stormwater running off parking lots

is a nonpoint source. Onsite septic systems also are considered a nonpoint source.

Point sources such as Laurel’s treatment plant are permitted through the National Pollution Discharge Elimination System, or NPDES. The EPA has delegated responsibility for this program to DNREC, which has the authority to set limits on pollution discharge for sewer plants and other industrial sources. As of November 2015, DNREC was reviewing the renewal of Laurel’s wastewater treatment permit. As described in Section 4, Laurel’s treatment plant meets the rigorous nutrient and phosphorous discharge limits set by the Chesapeake TMDL.

Regulating nonpoint sources

While it may be more difficult to pinpoint and control nonpoint sources of water pollution, the state in recent years has acquired more regulatory tools to affect water pollution caused by stormwater and onsite septic systems.

In most cases, meeting the new state sediment and stormwater requirements that became effective in 2014 will also enable new development to meet the TMDL water quality requirements. A 2011 study by the Center for Watershed Protection (documented on pages 140-143 of the WIP) ran several low- and high-density development scenarios through the Delaware Urban Runoff Management Model (DURMM). By controlling for runoff volume under the new regulations, the TMDL also was met in most cases. If not, the

regulations establish an in-lieu fee structure that will enable a development to move forward.

Note: As of November 2015, Delaware’s stormwater regulations are operating under a judicial stay while a court challenge is being appealed. DNREC is taking steps to satisfy the court’s concerns.

Delaware also adopted new onsite wastewater regulations in 2014. The regulations keep pace with changes in technology for large and small systems, protect public health and reduce pollution in groundwater, streams, rivers and bays, helping the state meet its water quality goals. The changes correspond to regulations in effect for the past four years in Delaware’s Inland Bays Watershed. They also protect homebuyers from acquiring malfunctioning septic systems.

Most notably for Laurel, the regulations require the upgrade of all new and replacement systems within 1,000 feet of tidal portions of the Nanticoke River and Broad Creek, which will assist Delaware in meeting federal targets to clean up the Chesapeake Bay Watershed. An analysis of septic data provided by DNREC indicated that within Laurel’s annexation area there are 35 septic systems located within that 1,000-foot buffer.

Municipal stormwater program

New to Sussex County, the [Municipal Separate Storm Sewer Systems \(MS4\) program](#) is a federal regulatory program that will cover nonpoint sources within Laurel and other Chesapeake towns. After the 2010 Census,

Fig. 3-1: Nutrient Baseline and Goals for Laurel

This table shows Laurel’s baseline, or starting point, for loads of nitrogen, phosphorous and sediment. It is segmented by various land uses within the town limits. Laurel (*urban land use*) needs to maintain its 2011 base of 7,373 pounds/year of nitrogen and 309 pounds/year of phosphorous. It will not be required to reduce those loads.

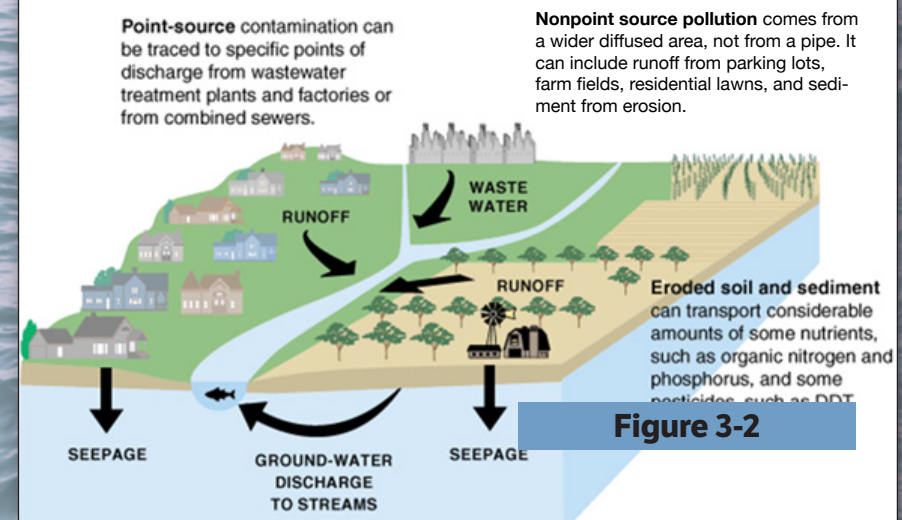
However, Laurel will be required to offset any development that increases nutrient loading above the 2011 baseline. Strategies for offsetting or avoiding the need to offset new growth are the focus of this report.

Land use	Acres	2011 Total Nitrogen (lbs/year)	2011 Total Phosphorous (lbs/year)	2011 Total Suspended Solids (lbs/year)
Construction	3.17	69.91	10.31	1,982.38
Feeding operations	0.33	1,525.86	243.09	3.49
Forest	224.71	448.01	7.80	633.04
Harvested forest	3.45	48.23	0.71	156.01
Pasture/hay	1.22	4.62	0.49	10.85
Row crops	610.98	10,237.69	682.80	15,246.62
Urban	801.85	7,373.08	308.99	40,326.41
Water	71.03	1,214.94	44.78	0.00

Source: Watershed Management and Assessment Section, Department of Natural Resources and Environmental Control.



Point Source vs. Nonpoint Source Pollution



Point sources are discharges from specific sources, such as a pipe or drain. A wastewater treatment plant is a point source.

Nonpoint sources are more diffused and sometimes harder to pinpoint. They include stormwater from street surfaces that is often contaminated with car oil, dust and the faeces of animals and soil, as well sediment run-off from construction sites.

Nonpoint sources also include onsite septic systems and agricultural runoff from fertilizer use and poultry operations.



most of western Sussex was included in the Salisbury, Md., urbanized area. Because of its inclusion in that planning area, Laurel will be covered by the federal Phase II MS4 program.

DNREC is introducing small towns such as Bridgeville, Laurel, Seaford and Delmar to the requirements of this program. In October 2015, DNREC issued a [pre-public notice](#) for its draft general permit and conducted an information session and workshop in Bridgeville in early November 2015.

The term “storm sewer system” is misleading because the MS4 reach goes beyond municipal infrastructure to anything designed for conveying stormwater— including gutters, roads and ditches.

Funding assistance through grants and low-interest loans may be available through DNREC and/or the Water Infrastructure Advisory Council to help communities meet the MS4 requirements. The six required Phase II MS4 program elements, termed “minimum control measures,” which are outlined below in Fig. 3-3.

The regulatory elements in place will help Laurel and other Delaware Chesapeake towns meet the TMDL requirements in most cases. They will enforce Laurel’s baseline for nitrogen, phosphorous and sediment loads.

As mentioned, Laurel is required to maintain this baseline and offset any development that would increase those loads. The most problematic situations

for Laurel would be a) the conversion of forestland for development, which would significantly increase Laurel’s nutrient loads; and b) the annexation of homes on septic that are unable or unwilling to connect with Laurel’s wastewater treatment plant.

As of November 2015, there was no formal offset program established to credit towns that install Best Management Practices (BMPs) that reduce nutrient loads and certify those reductions. Stormwater BMPs installed as part of a sediment and stormwater plan and septic systems are tracked by DNREC and/or the Conservation Districts. However, stormwater retrofits and projects not required to have a sediment and stormwater plan are not currently tracked by the state—practices such as street sweeping, town infrastructure upgrades, and low-impact practices on small redevelopment parcels.

Laurel should require any BMP installation or project large or small with a positive effect on water quality to document the reduction in nutrient loads. The 6th Street CSO removal project by the town’s engineering firm, George, Miles and Buhr, is documenting those load reductions.

Projects within the proposed Ramble and elsewhere in town should also calculate water quality improvements. Street sweeping, increasing tree canopy, providing vegetated buffers in riparian areas, stream restoration, constructed wetlands, septic removal are all examples of BMPs that will reduce Laurel’s nutrient load.

Fig. 3-3. Six Minimum Control Measures required for Phase II MS4s

- 1. Public Education and Outreach**—Distributing educational materials and performing outreach to inform citizens about the impacts polluted stormwater runoff discharges can have on water quality.
- 2. Public Participation/Involvement**—Providing opportunities for citizens to participate in program development and implementation, including effectively publicizing public hearings and/or encouraging citizen representatives on a stormwater management panel.
- 3. Illicit Discharge Detection and Elimination**—Developing and implementing a plan to detect and eliminate illicit discharges to the storm sewer system (includes developing a system map and informing the community about hazards associated with illegal discharges and improper disposal of waste).
- 4. Construction Site Runoff Control**—Developing, implementing, and enforcing an erosion and sediment control program for construction activities that disturb 1 or more acres of land (controls could include silt fences and temporary stormwater detention ponds).
- 5. Post-Construction Runoff Control**—Developing, implementing, and enforcing a program to address discharges of post-construction stormwater runoff from new development and redevelopment areas. Applicable controls could include preventative actions such as protecting sensitive areas (e.g., wetlands) or the use of structural BMPs such as grassed swales or porous pavement.
- 6. Pollution Prevention/Good Housekeeping**—Developing and implementing a program with the goal of preventing or reducing pollutant runoff from municipal operations. The program must include municipal staff training on pollution prevention measures and techniques (e.g., regular street sweeping, reduction in the use of pesticides or street salt, or frequent catch-basin cleaning).



An *example* of an informational brochure from Berks County, Pa.

4. Wastewater: Room to grow

An \$11 million wastewater treatment plant upgrade to Enhanced Nutrient Removal (ENR) technology went on line in 2008. It was the first treatment plant in Delaware to meet the more stringent Chesapeake water quality requirements (TMDLs) adopted in 2000.

According to Delaware’s Phase II Watershed Implementation Plan, the waste load allocation for the Laurel Wastewater Treatment Plant (edge of stream load) is shown in the table below (Fig. 4-1).

The plant’s current design flow is 700,000 gallons per day, and peak flow is 800,000 gallons per day. The plant is currently operating at about 350,000 gallons per day.¹ While the DNREC assessment projected an anticipated flow in 2020 of 1 million gallons per day, a large planned mixed-use development at the north end of town never materialized.

Plant is a built-in offset

Laurel has room to grow and annex new territory because of its investment in the advanced treatment technology, which is described below and shown in Figure 4-2. Because it meets or exceeds the WIP requirement of 4 mg/liter nitrogen and 1 mg/liter phosphorous, the plant represents a significant potential offset if septic systems within the town or within Laurel’s annexation area must be replaced or new development on septic is contemplated.

DNREC estimates that most small residential onsite systems in proper working order discharge nitrogen at 50 mg/liter. Delaware’s new on-site wastewater disposal regulations require that new and replacement systems within 1,000 feet of Chesapeake Bay tidal waters, which includes Broad Creek, will be required to treat to an advanced performance standard (PSN3) of 20 mg/liter

¹ Delaware Statewide Assessment of Wastewater Facilities, Appendix B, page B-189.



Laurel’s Wastewater Treatment Plant superintendent Mike Tipton monitors the plant’s sludge aeration process.

of nitrogen. Small commercial systems with flows up to 20,000 gallons per day also would have to meet this advanced treatment standard, according to the new regulations.

Laurel’s plant treats effluent to a standard that is 500% (20 mg/l N vs. 4mg/l N) to 12,500% (50 mg/L N vs. 4 mg/L N) better than advanced treatment or standard systems, respectively.

DNREC’s Ground Water Discharges Section estimates the cost of an advanced treatment onsite wastewater system at \$19,275 to \$27,675 over a 21-year lifespan of the system – including annual operation and maintenance costs of \$870 to \$1,318 per equivalent dwelling unit (EDU). The annualized cost of a standard septic system is roughly half to two-thirds that amount (\$410-\$898).

However, Laurel’s wastewater costs are considered high; the town charges an impact fee of \$6,000 per EDU. For non-town residents (such as Bethel) to hook up to Laurel, an additional annual service fee of \$1,668 per

Fig. 4-1	Total Nitrogen		Total Phosphorous	
	Concentration (milligrams/liter)	Waste load allocation (lbs./yr)	Concentration (milligrams/liter)	Waste load allocation (lbs/yr)
Target	4.0	8,529	1.0	2,132
Actual		6,653		1,256
Room for growth		1,876		876

Source: Phase 2 Watershed Implementation Plan (2010), DNREC, page 44



EDU was expected on top of capital and treatment costs. Laurel's wastewater treatment would be a much more valuable asset for Nanticoke-Chesapeake water quality if costs could be brought in line with other treatment options. The relative high costs could also prevent businesses from locating within Laurel's service area, including in the targeted central business district.

Redevelopment and infill are a strategy not only for economic revitalization, but also for limiting sprawling development and its effect on water quality.

For example, Laurel is completing the second phase of a corridor improvement project along U.S. 13 that extends sewer service to 62 properties, removing the equivalent of 138 EDUs from onsite septic systems. The \$12 million project was funded by the U.S. Department of Agriculture and included significant water and wastewater infrastructure upgrades, including a new water tower and regional pump station. A third phase is possible.

This first two phases of the project were included in the baseline calculations for Laurel in the Watershed Implementation Plan, according to DNREC, and therefore cannot be used to offset future growth. However, any future septic elimination projects (for example, if properties are annexed) should have its nutrient load reductions calculated and credited to the town as an offset against development elsewhere in Laurel.

Plant treatment technology

There are several stages of treatment at the Laurel plant

before the effluent is discharged into Broad Creek. An extended sludge aeration process (Biolac® System Wave Oxidation) includes an anaerobic selector for initial biological phosphorous removal. Raw influent and return activated sludge are combined in this zone under anaerobic conditions before being discharged into a single extended aeration basin.

Excess biological solids are wasted out of the process via two secondary clarifiers and pumped to one of two treatment lagoons. Further treatment includes a proprietary sand filter, then ultraviolet disinfection, then a step-down aeration process before the effluent finally reaches Broad Creek.

Sewer overflows and proposed remedy

The town's treatment permit expired in May 2014, and a permit renewal was under review by DNREC in November 2015. Laurel experiences some spikes in pollutant levels in Broad Creek because of a series of 10 catch basins along 6th Street that are tied into the sewer system. During heavy rains, the stormwater runoff causes the sewer to back up and overflow manhole covers, and Laurel had to treat an influx of polluted rainwater.

The National Fish and Wildlife Foundation provided funding to design a remedy for the Combined Sewer Overflow (CSO). A new storm drain line and biofiltration units will be added to the catch basins to capture excess nitrogen and phosphorous. The units usually have a planting in the middle to absorb runoff. In some cases,

where there is not enough space for the units because of sidewalk restraints or retaining walls, they will be installed at another location in town with a catch basin.

The project is estimated to cost \$1.56 million. The Water Infrastructure Advisory Council approved financing for the project, including 100 percent loan forgiveness, in October 2015.

The retrofit project will capture an estimated 2 pounds per year of phosphorous and 8.5 pounds per year of nitrogen and keep those pollutants out of Broad Creek, according to the project's engineering firm. Those reductions should be credited to the town if offsets are required in the future.

Funds for asset management

Effective management of expensive infrastructure assets such as sewer and water plants extend the life of the plants, safeguard water quality, and protect the investment of taxpayers. The Water Resources Reform and Development Act, which became law in June 2015, will require a borrower from a Clean Water State Revolving Fund (CWSRF) to have an asset management (AM) plan as a prerequisite to a loan. The AM requirement will apply to loans issued after October 1, 2014. The EPA is developing guidance, which it will issue later this year.

Through its clean water and drinking water revolving fund programs, the state is offering incentives to encourage jurisdictions to develop and implement a systemwide asset management plan for wastewater and/or drinking water utilities. The incentives include:

- Up to \$100,000 (no match required) per municipality to develop and implement an Asset Management Program (up to \$200,000 for wastewater and drinking water)

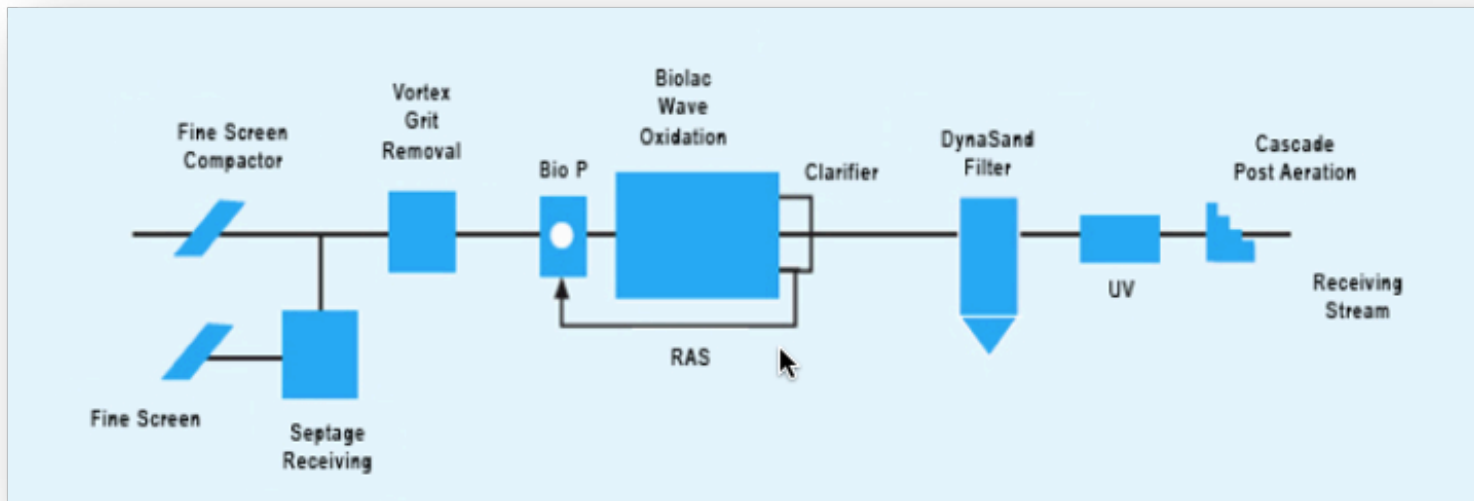
Clean Water State Revolving Fund and Drinking Water State Revolving Fund Loan Interest Rebates- Up to one half of the interest paid on new SRF loans will be rebated for up to five years after the completion of projects (from loan amortization start dates).

To receive these incentives, municipalities must sign a five-year agreement with DNREC and the Department of Health and Social Services.

The new federal SRF provisions also provide extended loan repayment periods of up to 30 years and lower interest rates. "Economically distressed" areas will receive additional assistance. Furthermore, SRF funds may now be used for:

- "Watershed partnerships" between municipalities and property owners to address non-point sources of pollution;
- Integrated water resource plans;
- Municipal stormwater management plans that identify effective stormwater management approaches;
- Technical assistance at small- and medium-size treatment works; and
- Efforts to increase resilience of treatment works from future risks and vulnerabilities to man-made or natural disasters.

Fig. 4-2: Laurel plant's enhanced nutrient removal (ENR) process



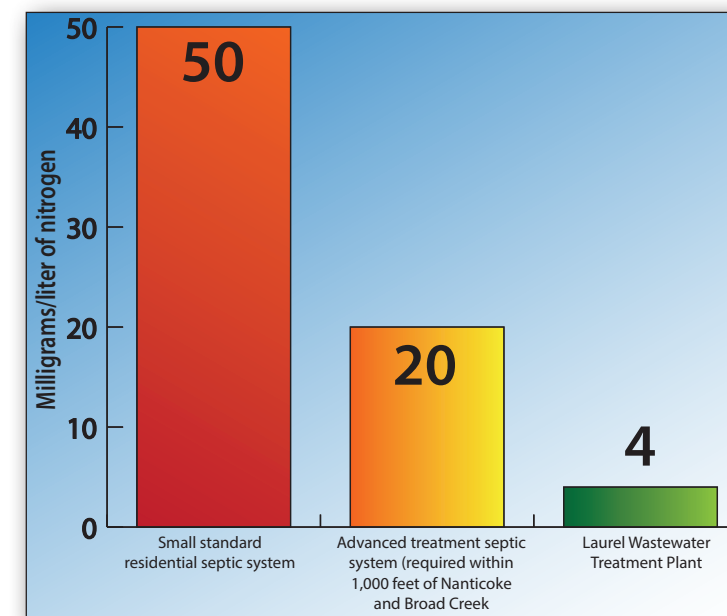
Laurel Wastewater Treatment Plant Process. From "Extended Aeration Treatment System," by Parkson Corporation. Water Today, August 2011.

Fig.4-3

Laurel plant hits the mark

This chart shows how effective Laurel's Wastewater Treatment Plant is in preventing nitrogen pollution of Broad Creek. Its effluent meets the Chesapeake TMDL standard of 4 mg/liter when discharged into the creek.

A typical residential standard (gravity) septic system discharges 50 mg/liter of nitrogen into groundwater. An advanced treatment septic system, required within 1,000 feet of the Nanticoke River and Broad Creek, discharges 20 mg/liter of nitrogen. (Numbers from DNREC)



5. Green on the ground: The Ramble

This project—to help Laurel map a strategy for complying with federal water quality standards by 2025—gave birth to The Ramble concept (Fig. 5-1 below). The University of Delaware’s Sustainable Coastal Communities Initiative (SCCI) approached town leaders in 2013 to work on a water quality strategy, and the town requested assistance with economic development in the central business district that includes the Broad Creek waterfront.

Through collaboration with the town, the Laurel Redevelopment Corporation and SCCI, The Ramble concept grew out of what many would think were competing goals: economic revitalization and environmental protection.

Specific objectives for this project included:

- Improving the sense of connectedness through a user-friendly greenway extending between existing Janosik and Roger Fisher parks.
- Designing a highly visible residential project, consistent with the architectural style of the town and ecological restoration values.

- Proposing a mixed-use design alternative for Thompson Block, to be included in the long-term vision of the Laurel Redevelopment Corporation
- Creating a unique children’s outdoor recreation area on the north side of the Broad Creek between Central Avenue and Poplar Street

The Laurel Redevelopment Corporation had an established track record of removing blight from the downtown commercial district and redeveloping portions of the waterfront. The LRC and the town control almost all of the parcels along Laurel’s waterfront, creating an opportunity to achieve its vision for The Ramble.

The ecological design goals (Fig. 5-2) for the project are directed at protecting the 100-year floodplain and enhancing water quality in Broad Creek.

The Ramble is not just a concept plan. Two grants from DNREC are putting The Ramble on a path to realization that will benefit Nanticoke/Chesapeake water quality:

- A \$25,000 Coastal Management Assistance Grant to the Laurel Redevelopment Corporation for a comprehensive drainage study and environmental assessment to determine feasibility of green infrastructure

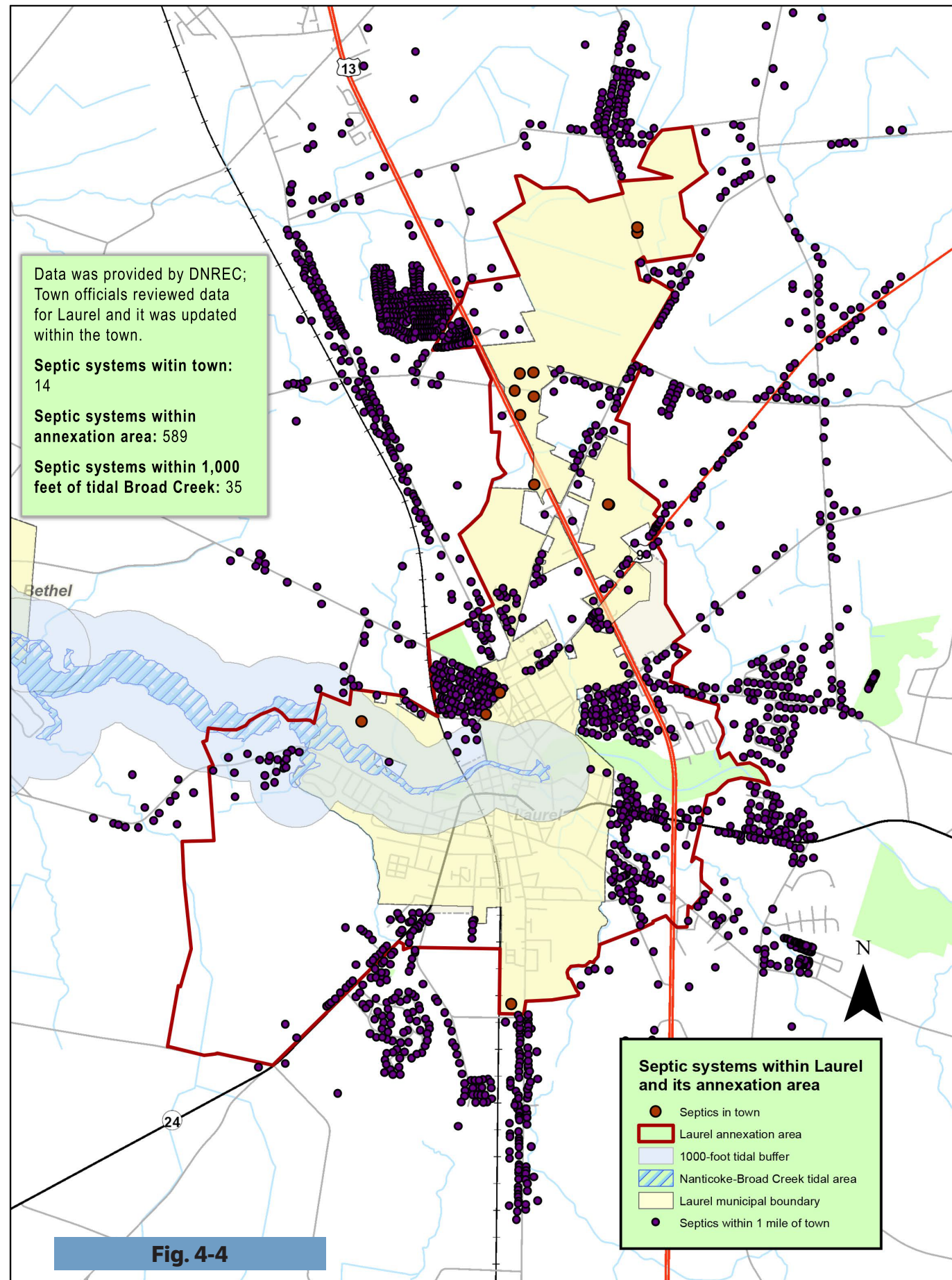


Fig. 4-4

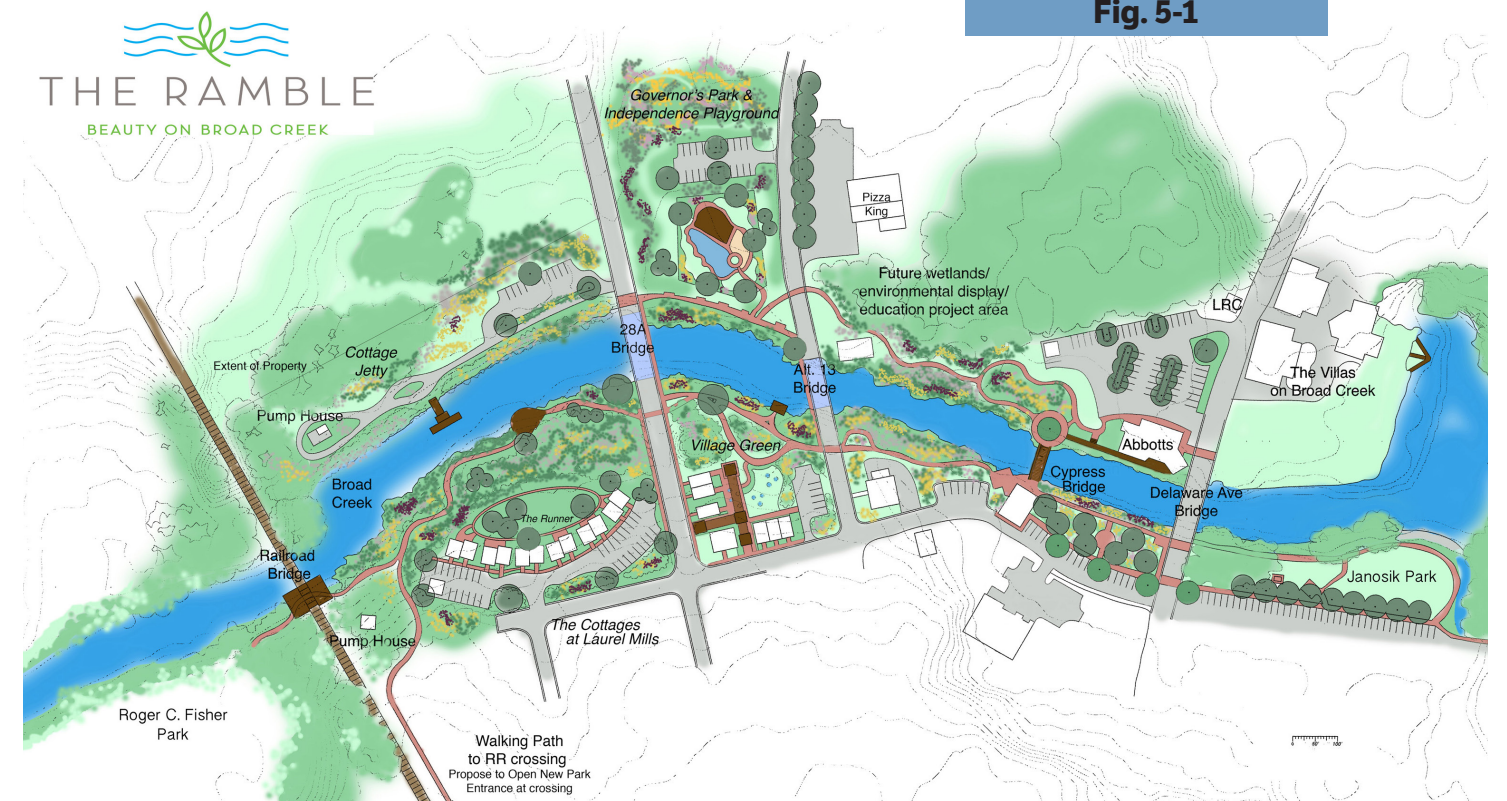


Fig. 5-1



flood abatement techniques at The Ramble. The impacts of sea level rise will be incorporated into the assessment. As a result of the assessment of existing and future conditions, recommendations and designs for green infrastructure will be provided. This project will serve as an example for other towns in the region seeking to conduct resilient waterfront redevelopment.

- A \$37,000 Surface Water Matching Planning Grant to “design, permit and provide construction documentation for green infrastructure that will manage stormwater, reduce erosion and build resilience along Broad Creek in Laurel . . . this project specifically includes design and permitting as well as construction drawings and specifications for the design of two green infrastructure stormwater management treatment systems to serve the existing drainage system, and an area of shoreline restoration to replace the existing riprap revetment shorelines.

There will also be a study of the feasibility and design schematics for utilizing floating wetlands closer to the dam.”

Both projects lead toward the implementation of green infrastructure along the Broad Creek. In April 2016, ForeSite Associates will make recommendations regarding the effectiveness of different treatment strategies in specific locations throughout the Ramble area. Green infrastructure practices ForeSite will recommend include constructed wetlands, bioretention areas such as rain gardens, vegetated channels, filter strips, and a living shoreline.

Part of the implementation strategy includes documenting improvements to loadings of nitrogen, phosphorous and sediment in Broad Creek. Students at the University of Delaware are working with scientists in the Plant and Soil Sciences Department to develop innovative floating wetlands for the Broad Creek, and they are considering strategies for how to monitor the wetlands’ effectiveness.

The full [University of Delaware report](#) includes many recommendations for green infrastructure improvements, including rain gardens, riparian buffers, rain barrels, bioswales, permeable pavement, green parking, increasing the tree canopy and green roofs.

Community engagement

The Laurel community has become engaged with The Ramble vision. A September 26, 2015 Fall Ramble based

Fig.5-2

Ecological design goals for The Ramble

Aspect	Recommendation
Water	<p>Adopt open drainage systems (i.e. swales, ditches, dry stone beds) to convey storm water and renovate closed systems (i.e. piping, drain inlets, catch basins) if necessary, to improve water quality of Broad Creek</p> <p>Restrict development within the 100-year floodplan</p> <p>Curtail the use of impervious surfaces and adopt green parking strategies</p> <p>Use rain barrels on new development and encourage use on existing buildings within The Ramble</p> <p>Consult experts at DNREC and the Army Corps of Engineers for best practices</p>
Soils	<p>Protect soils by controlling for erosion during and after construction</p> <p>Amend soils based on analysis to promote favorable conditions for trees</p>
Vegetation	<p>Plant native trees and eliminate exotic invasives</p> <p>Plant large deciduous trees to minimize heat island effect</p> <p>Plant in layers, including large, medium and small trees as well as masses of shrubs and perennials</p> <p>Use best management practices for landscape maintenance, including appropriately timed fertilizer applications and limited herbicide and pesticide usage based on Integrated Pest Management Plan for landscape maintenance that allows for natural succession</p> <p>Create Laurel Greening Programs (i.e. tree planting, town environmental amenities, street planters and flower baskets).</p>
Wildlife	<p>Plan for integration of other organisms into the landscape (wildlife, birds and insects)</p>
Land Use	<p>Conserve public open space</p> <p>Reclaim and restore any brownfield lands</p>

on [Better Block](#) placemaking tactics brought aspects of The Ramble to life for the community to experience: popup shops, a farmer’s market, play areas, a tap room, art gallery, kayak and bicycle availability, live music and food, crosswalks to promote walkability, and many other features.

In addition, the US Department of Agriculture is funding a nature tourism assessment study. A well-planned focus on nature tourism will create new jobs; generate interest in Laurel as a “base camp” or gateway for exploration of the Nanticoke region for bicycling, birding, kayaking and other nature tourism pursuits; and protect and enhance water quality in the Nanticoke/Chesapeake watershed.

Project collaborators commissioned a logo to be used to market The Ramble.

Community engagement and integration of The Ramble concept into the future of Laurel will continue as the town pursues both a Downtown Development District designation and a full update of its comprehensive plan in 2015-2016.

An opportunity for model practices

The Ramble, with its focus on landscape architecture and ecological design, presents an opportunity to

model best management practices for water quality. As this project was not included in Laurel’s 2011 baseline for nitrogen, phosphorous and sediment, any BMPs implemented here should be calculated, documented and credited to the town as a potential offset against other projects elsewhere in Laurel that may increase nutrient loads.

Such a calculation should be a requirement for any proposed BMP in The Ramble or elsewhere throughout town. (For example, reduction in nitrogen and phosphorous loads were calculated for the proposed stormwater retrofit project that will eliminate combined sewer overflows in town.)

As The Ramble continues to be designed and eventually built, it should be sure to incorporate best practices that protect water quality, both as suggested in this report and as identified in the future. An example is management of Canada geese, whose fecal matter present a water quality and public health hazard. Recommendations included in this report should be incorporated into design and engineering of The Ramble.



Community planning and execution for the September 2015 Fall Ramble brought the town’s vision for The Ramble to life for a day with music, a brewpup, kayak and bike rentals, pop-up shops, art gallery, food and a farmer’s market.



6. Recommendations

Because of infrastructure investment and focused planning and engagement along its waterfront, Laurel has laid some significant groundwork toward meeting the 2025 federal water quality goals for Broad Creek. Those steps have been described in this report.

Laurel and other towns within the Nanticoke/Chesapeake watershed will face some regulatory challenges with the pending Municipal Separate Storm Sewer System program (MS4). However, the town is about to update its 10-year comprehensive plan and can “lock in” a sustainable growth strategy that allows for growth and increasing revenues while keeping water quality in check.

In fact, Laurel’s focus on green infrastructure, downtown redevelopment and nature/heritage tourism will depend on waters that are clean, fishable, swimmable and scenic.

These recommendations are divided into six sections:

1. Credits for best management practices
2. Long-range planning and the comprehensive plan
3. Using The Ramble as a credit “bank”
4. Wastewater and infrastructure
5. Ordinance/zoning code revisions, and
6. Additional best management practices (BMPs).

Maintaining Laurel’s baseline

It’s important to remember that Laurel is required only to maintain its 2011 baseline for loads of nitrogen, phosphorous and sediment (page 12). In contrast, the agricultural sector is targeted for significant reductions (82% for row crops). There are 611 acres of row crops located within the town limits of Laurel, according to Delaware’s Watershed Implementation Plan.

The expectations for the agricultural sector could have the unintended consequence of encouraging farmers to sell out and avoid the nutrient management requirements and targets for reducing nutrient pollution caused by agricultural operations. But while farmers will be off the hook, any new development on those parcels potentially will add net new loads of pollutants to Laurel’s bottom line. By complying with both the new

sediment and stormwater regulations and the new MS4 requirements, most new development will meet the state and federal water quality requirements.

Obvious exceptions would be development on forested parcels (such as the parcel circled in Fig. 2-5 on page 11), which would significantly increase pollutant loads, or the annexation of existing development on septic systems that cannot or will not connect to Laurel’s wastewater treatment plant.

In that case, the town could be required to offset the net new pollutant loads with other projects, such as septic elimination, stormwater retrofits, stream restoration, installation of green infrastructure, street sweeping, vegetated buffers, tree plantings, and other best management practices.

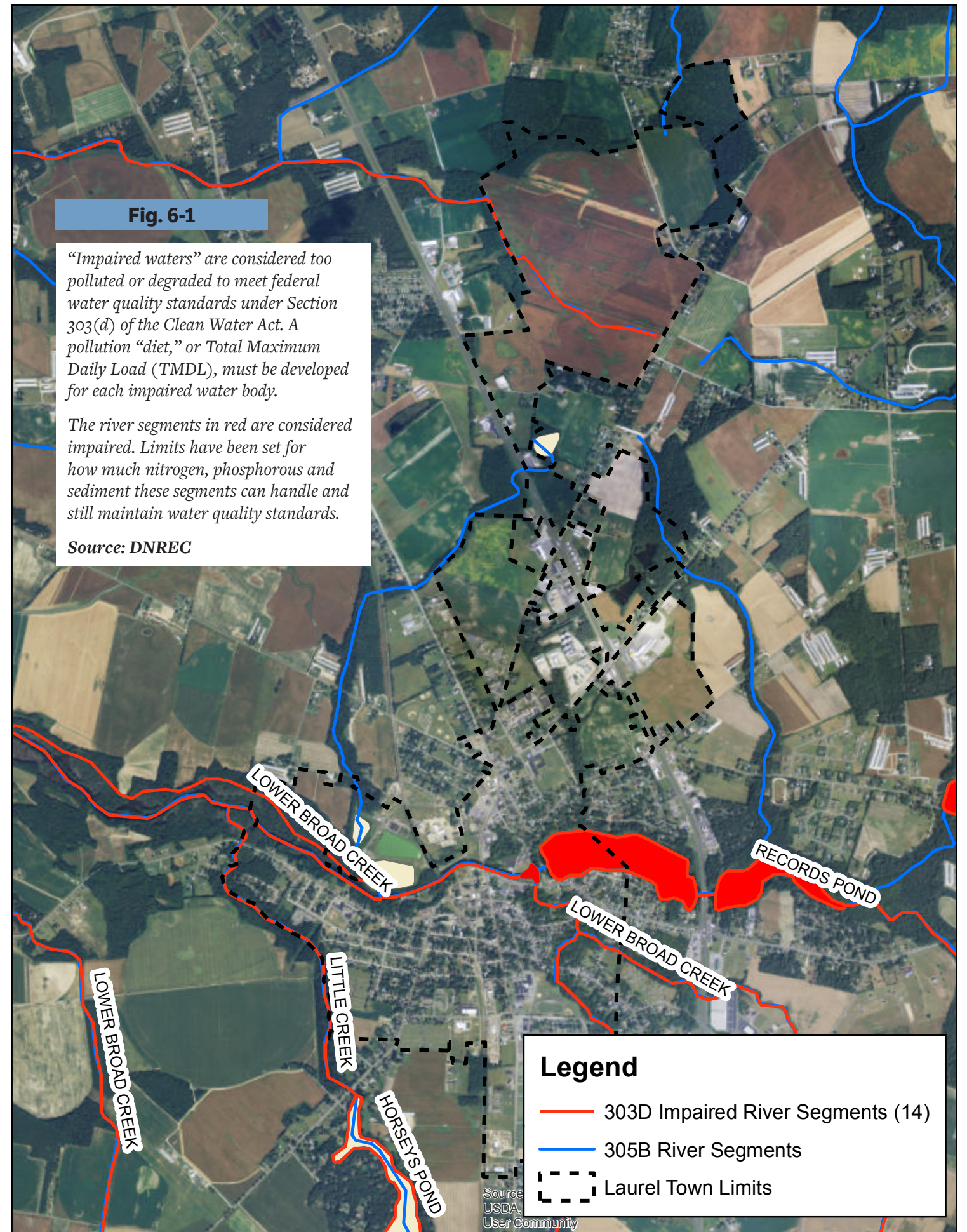
At this time (March 2016), DNREC does not have a formal offset program with a credit registry or centralized database or bank, although it does track and report BMPs to the US Environmental Protection Agency. The town needs to ensure that water quality investments and benefits are being captured, credited to the town, and reported by the state.

1. Credit for best management practices

- A. **Calculate load reductions.** As a deliverable of any infrastructure, retrofit or BMP project in town, Laurel should require the calculation of estimated reductions in nitrogen, phosphorous and sediment loads. The Delaware Urban Runoff Management Model (DURMM) or other approved model should be used.
- B. **Report load reductions.** Laurel should ensure, perhaps through a Memorandum of Agreement with DNREC, that nutrient load reductions achieved in Laurel are officially, accurately and consistently reported and transmitted to federal authorities.

2. Long-range planning

As Laurel embarks on updating its 10-year comprehensive plan, some considerations about how and where Laurel will grow also impact water quality. If it is adopted in 2016, the new plan will be in effect



beyond 2025—the year Nanticoke/Chesapeake water quality standards are supposed to be met.

- A. **Smart Growth Self-Assessment.** As part of the early preparation for the comprehensive plan, consider completing all or part of the [Smart Growth Self-Assessment for Rural Communities](#), published in 2015 by the EPA’s Office of Sustainable Communities. The tool is a compilation of strategies, organized by 11 common “goal areas,” that villages, towns, and small cities can use to evaluate their existing policies to create healthy, environmentally resilient, and economically robust places. Goals include “Strengthen the Local Economy,” “Protect Natural Habitat and Ecosystems,” and “Revitalize Village and Town Centers.”
- B. **Adopt and stick to a growth strategy.** The town needs to grow in a planned, systematic, “town-like” manner and follow a strategy for promoting infill and redevelopment in the central business district already served by infrastructure. Ongoing efforts to create a Downtown Development District, promote nature tourism, and bring The Ramble to life follow that strategy.
- C. **Align funding with overall growth goals.** Laurel has attracted significant funding from the US Department of Agriculture for infrastructure projects. USDA’s [Rural Development](#) section has ex-

tensive grants and loans available for small rural towns—from rehabilitating homes to seed money for revolving loan funds to business development grants. Laurel should understand and pursue this funding in alignment with their growth and economic development goals, including downtown redevelopment and nature tourism.

- D. **Have a proactive annexation strategy.** Be proactive rather than reactive regarding annexations. Residential annexations should be in accord with the comprehensive plan. Annexations should be well connected to the town and not allowed to be enclaves. New development should feature town-like design standards, grid streets and walkability. Don’t be reactive. Fill in existing enclaves within the town’s municipal boundaries.

Avoid annexing homes and businesses with onsite wastewater systems unless sewer hookup is readily available and affordable.
- E. **Understand fiscal impacts.** It is understandable that the town seeks to grow its revenues through new development. However, studies in Delaware and across the country (Fig. 6-2) demonstrate that stand-alone residential developments generate more need for government services than they deliver in taxes, fees and other revenues. New development that is not sustainable could damage Laurel’s quality of life and strain its resourc-

es. Requiring a fiscal impact analysis of certain development proposals is not anti-growth. Government’s first responsibility is to its ratepayers and taxpayers.

Laurel could contract in advance with a firm that performs fiscal impact analyses for governments and agree on a methodology before a specific development proposal is on the table. The cost of the study would be borne by the developer.

3. Use The Ramble as a credit “bank”

Because of its vision and uniqueness, The Ramble along the Broad Creek waterfront in Laurel has attracted attention, effective partnerships and funding. As a green infrastructure project driven by ecological design principles, it not only has the potential to be a catalyst for revitalizing downtown Laurel; it can also serve as laboratory for best management practices to improve water quality and as a credit “bank” of sorts where documented nutrient reductions can be achieved, deposited and used to offset development activity elsewhere if required in the future.

- A. **Align Ramble project with water quality goals.** Several large initiatives are moving forward in Laurel simultaneously (e.g., Ramble, comprehensive plan, Downtown Development Districts, nature tourism, this Chesapeake/Nanticoke toolkit.

- B. **Ensure that all projects document nutrient load reductions.** This requirement should be written into any project specifications.
- C. **Seek funding for more “green” BMPS.** The Ramble has attracted dollars for feasibility studies and planning grants. As it develops, it should pursue opportunities to install more green best management practices that improve water quality. Examples include pervious pavement for walking trails, native tree and vegetative plantings, floating wetlands, goose control, rain gardens, fertilizer application, installing green infrastructure to support the cottages and nature playground, and restoration along Rossakatum Creek.
- D. **Make The Cottages at Laurel Mills models of sustainable design.** There is a great deal of interest in the camp-style cottages planned for The Ramble area. The town and Laurel Redevelopment Corporation should insist on a site plan and design that complements the setting and has a net-zero effect (or better) on water quality. Following a third-party rating system such as LEED (Leadership in Energy and Environmental Design) will ensure that the cottages become a state or even national model for waterfront redevelopment. Engage a master developer who has experience with these principles.

Fig.6-2

Can towns afford residential-only development? Not really.

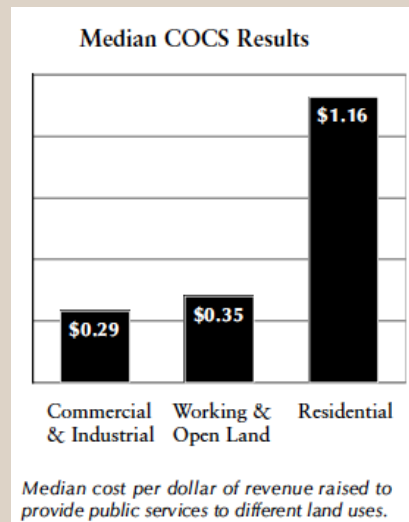
Studies across the country have demonstrated that stand-alone residential development does not pay for itself – its residents require more in government services and infrastructure than they pay in taxes, fees and other revenues.

These Cost of Community Services studies collect data on local revenues and expenditures; allocate those revenues and expenditures to a community’s major land-use categories; and analyze that data to calculate revenue-to-expenditure ratios for each land use category.

The median outcome of all studies: Working and open lands only require 35 cents in government services for every \$1 they generate in revenues; commercial and industrial lands require 29 cents in government services for every \$1 they generate in revenues. But residential development requires \$1.16 in services and infrastructure for every \$1 generated in revenues.

Towns should seek infill and mixed-use development projects with more than temporary construction employment so they (and the state) do not wind up paying more for growth than they generate in revenues from it.

After all, towns are incorporated in order to provide a range of services and land uses to all its residents, businesses and visitors.



Source: American Farmland Trust



Right, during the Fall Ramble in September 2015, a facade was created to help visitors envision what the cottages on Broad Creek would look like. Above, these small homes arrayed around a village green were built by The Cottage Company of the Pacific Northwest. The cottages are less than 1,000 square feet but loaded with amenities. They are built with sustainable design principles and very popular; all communities are sold out.



4. Wastewater and infrastructure

Laurel's wastewater treatment plant has made it relatively easy (compared to other towns in the Delaware portion of the Chesapeake Watershed) to meet federal and state water quality goals by the target date of 2025. The plant's technology already meets the Delaware WIP requirement for effluent discharge of 4 milligrams/liter of nitrogen and 1 milligram/liter of phosphorous.

The plant is currently operating at about half of its design-flow capacity of 700,000 gallons per day. To ensure that town growth does not become unsustainable or require premature expansion of its sewer plant, the town should consider the following recommendations:

A. Pursue asset management planning grants.

As described on page 17, there are new borrower requirements for the Clean Water State Revolving Fund. Towns will be required to have asset management plans in place for their water and wastewater infrastructure.

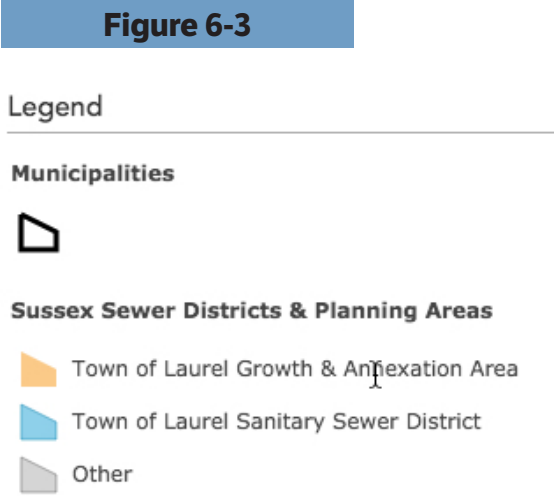
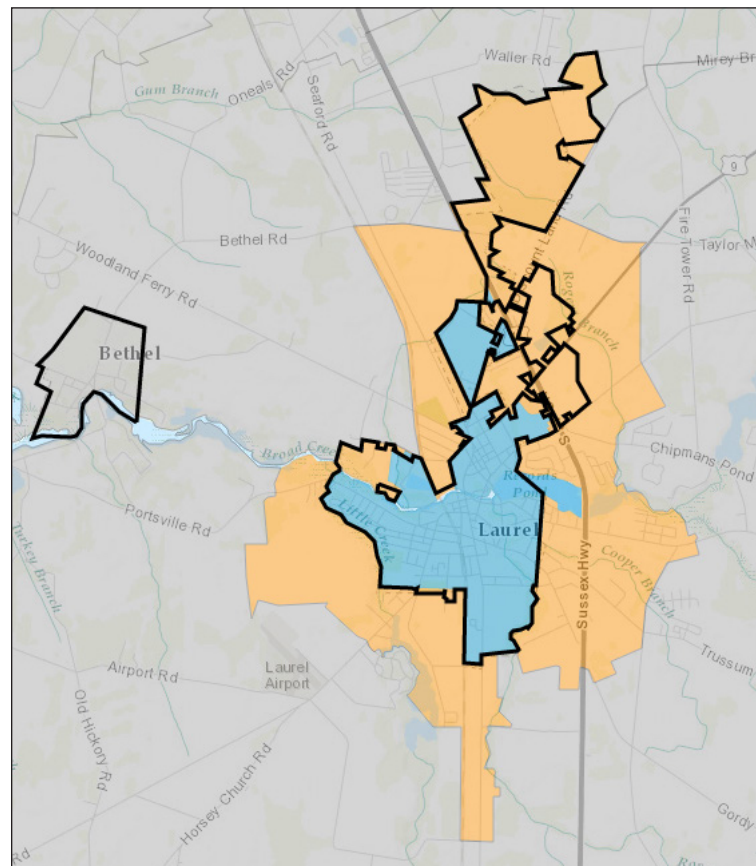
The state is offering up to \$100,000 (no match required) per municipality to develop and implement an Asset Management Program (up to \$200,000 for wastewater and drinking water).

Such a study should consider how Laurel will

expand its wastewater and water infrastructure to sustainably accommodate future growth.

The sewer district map below (Fig. 6-3) shows an ambitious growth plan in relation to the town's current sewer service availability.

- B. Annexation strategy should take wastewater issues into account.** Many of the residential developments within Laurel's annexation area are on septic (Fig. 4-4). Both the town and those residents should weigh the pros and cons of annexation and the impact on Laurel's wastewater treatment system. If these residents are unable or unwilling to connect to Laurel's sewer plant, these septic systems would add tremendously to the town's nutrient load (Fig. 4-3). There is very little economic benefit and significant downside to annexing these types of developments without a plan to connect them and bank the resulting nutrient credits.
- C. Align Phase 3 of Rural Development infrastructure project with growth goals.** A third phase of the US Department of Agriculture's water-wastewater infrastructure [improvement project](#) has not yet been planned or funded. If and when planning begins, the objectives should be closely tied to Laurel's comprehensive plan goals and efforts to maintain or reduce nutrient loads to meet the



Laurel's current wastewater district is in blue, and its annexation area is in orange. The areas bounded in black are Laurel's current town boundaries. Growth should occur in a manner that forestalls the need to expand Laurel's treatment plan capacity—now at 800,000 gallons per day.



2025 water-quality goals. Any net load reductions resulting from this project should be calculated and credited to the town.

- D. 6th Street Stormwater retrofit project.** Funding for the project described on page 16 has been approved. The retrofit project will capture an estimated 2 pounds per year of phosphorous and 8.5 pounds per year of nitrogen and keep those pollutants out of Broad Creek, according to the project's engineering firm. The town should ensure that DNREC credits those reductions to the town.

5. Ordinance/zoning code revisions

Many communities find that their ordinances and zoning code actually create barriers to low-impact development that protects water quality and their natural assets. DNREC contracted with TetraTech in 2012 to review all the relevant codes and ordinances of towns within Delaware's portion of the Chesapeake Watershed.

TetraTech identified [potential barriers](#) in current ordinances and codes and also recommended [model language](#) to overcome those barriers.

This document makes additional suggestions for zoning code changes that can be discussed as part of the comprehensive plan update process.

- A. Review and incorporate appropriate TetraTech recommendations. Tetra Tech recommendations.** TetraTech used an ordinance review checklist with the following seven goals:

1. **Minimize effective or connected impervious area**
 - Reference state stormwater regulations in subdivision ordinance
 - More flexibility in locating BMP techniques on site
 - Street widths and parking requirements
 - Incentives for infill and redevelopment (Downtown Development District, Ramble)
 - Permit and encourage pervious paving materials where appropriate
2. **Preserve and enhance the hydrologic function of unpaved areas**
 - Require riparian buffers (100 feet for primary waterbodies and 60 feet for secondary waterbodies); tie into Laurel's existing Conservation and Open Space Standards
3. **Harvest rainwater**
 - Provide more certainty about and encouragement for rainwater harvesting (rain barrels, cisterns, mulch basins, etc.)
4. **Allow and encourage multi-use stormwater controls**
 - Allow Low-Impact Development (LID) techniques in required landscape, screening and open space areas
 - Give credit for LID techniques that provide landscape and natural open space functions



- Exempt bioretention, bioswale and similar LID techniques from town weed control height requirements

5. Manage Stormwater to Meet WIP and DNREC Regulations

- Reference the state Sediment and Stormwater Regulations
- Allow for offsite mitigation if a proposed development cannot meet stormwater and/or TMDL requirements onsite

6. Manage construction site stormwater to meet WIP and DNREC regulations

- Reference State Sediment and Stormwater Regulations in subdivision ordinance

7. Manage on-site wastewater systems to meet WIP and DNREC regulations

- There are a dwindling number (about 14) of onsite septic systems within Town of Laurel, but many more within town’s growth and annexation area
- Require inspections, cleaning, repair – arrange for low-interest loans or grants

B. Consider other ordinance and zoning-code changes in the context of Laurel’s comprehensive plan update. The comprehensive planning process will begin in 2016 and will likely identify additional changes to the town’s zoning code. Any changes should enhance, not threaten, Laurel’s efforts to maintain its character and protect its water quality.

6. Additional BMPs and programs

There are additional best management practices and other programs that the town can consider—not only to meet the Nanticoke/Chesapeake water quality standards but to enhance the town’s attractiveness and overall quality of life.

A. Preserve and expand Laurel’s tree canopy. The Watershed Implementation Plan (page 236) estimated Laurel’s tree canopy within 100-foot riparian (streamside) buffers at 49 percent, or 98 of 198 acres. Overall within municipal boundaries, the Delaware Forest Service estimated the town’s urban tree canopy at 20.4 percent (Fig. 6.4 at

right). A recent recalculation puts the percentage at 21.18%, according to DNREC.

Besides being attractive and providing shade, trees and tree canopy modify stormwater runoff in two ways: by reducing the impact from precipitation and by treating stormwater runoff flowing from other lands. Tree structure—from roots to canopy—allow for greater interception of precipitation and more opportunity/time for evapotranspiration (ET) and water infiltration into soils to occur.

Modeling results suggest that the urban forest canopy reduces stormwater runoff volumes by 8-27% more than grass and is more effective over impervious surfaces than over pervious areas.¹

Laurel mentioned urban tree canopy extensively in its 2011 comprehensive plan. The town set a 10-year overall canopy of 30.4%; however, there was no followup with a corresponding ordinance, resolution or incentives.

Laurel should revisit a tree canopy goal and program as a best management practice and ensure that the nutrient reduction benefits can be calculated and credited.

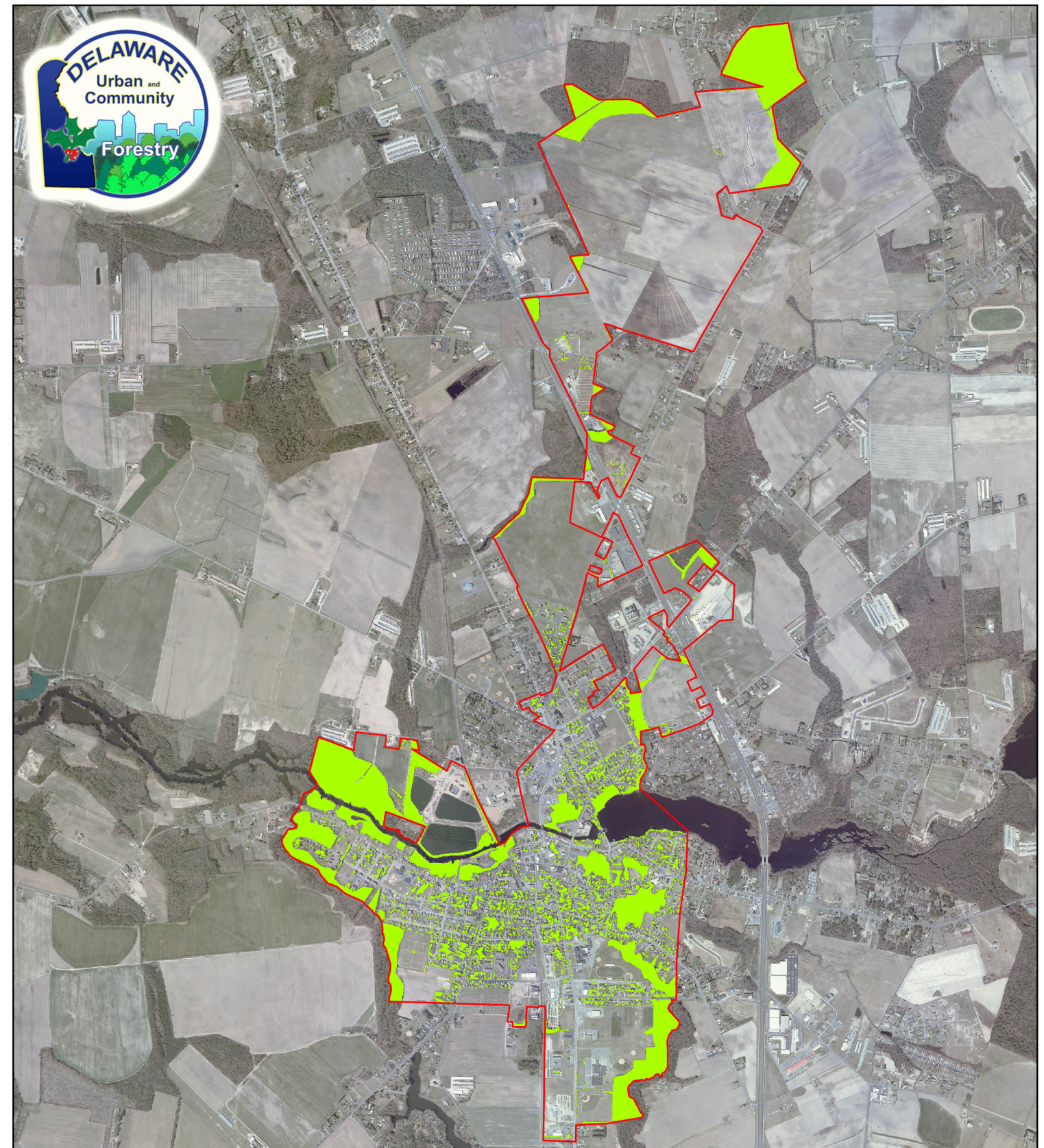
The Delaware Department of Agriculture’s Urban and Community Forestry program has [tree-planting grants](#) for towns in the Chesapeake watershed. A 50-50 cost-share match is required. Laurel participated in this program in 2014 and planted 18 trees.

According to guidance provided by the Chesapeake Bay Program Forestry Workgroup, planting 100 trees is equivalent to converting one acre of urban land to forest.²

B. Continue the street-sweeping program. Street sweeping in urban areas is a practice that keeps debris and other pollutants from entering water bodies. Street sweeping is also considered a good housekeeping practice for compliance with an MS4.

Laurel and DNREC agreed to a project that

¹ “Information and Citations on Urban Tree Canopy and Water Quality,” retrieved from [http://www.chesapeakebay.net/channel_files/22534/summary_utc_benefits_for_cbwm_\(3\).pdf](http://www.chesapeakebay.net/channel_files/22534/summary_utc_benefits_for_cbwm_(3).pdf)
² “Chesapeake Bay Program Forestry Workgroup’s BMP Verification Guidance,” retrieved from http://www.chesapeakebay.net/channel_files/22928/appendix_b2--forestry_bmp_verification_guidance_2015_update_clean.pdf



Community Name: Laurel **Figure 6.4** **UTC: 20.40%**
 Total Area: 1,650.30 Acres
 Urban Tree Canopy (UTC): 336.58 Acres
 Map is for information only and is not intended as a survey



increased the frequency of street sweeping to every other week and meets the Chesapeake Bay program's requirements to be counted as a best management practice. DNREC contributed up to \$30,000 against a \$10,000 match from Laurel. The project was to continue through December 2015.

DNREC and the town should examine the results of the project, make any necessary adjustments, and continue it beyond December 2015.

C. **Adopt a goose-control program.** A single Canada goose can produce up to 1.5 pounds of fecal matter every day. Besides making parks and walking paths unattractive, the fecal matter can pose a health hazard and also pollute the water body where geese flock.

The town should work with DNREC to develop an integrated management strategy³ for Canada geese that will be acceptable as a Best Management Practice (BMP). Elements of program could include:

- Educate public about the problems caused by proliferation of geese
- Do not allow feeding of geese
- Place walking paths close to water
- Avoid or eliminate long, straight, uninterrupted shorelines

³ [“Managing Canada Geese in Urban Environments.”](#) Smith, Arthur E.; Craven, Scott R.; Curtis, Paul D. Cornell Cooperative Extension, 2009.

Canada geese produce up to 1.5 pounds of fecal matter per day, which poses a public health and pollution hazard for waterfront communities. There are many tactics for controlling them.



- Modify or create habitat so that geese are less attracted to it
- Reduce size of mowed grassy areas
- Plant less palatable trees and grass species – for example, geese prefer Kentucky bluegrass; they tend to avoid mature tall fescue, periwinkle, pachysandra, hosta, euonymus, and ground junipers (although non-invasive, native alternative species should be used)
- New sports fields should be at least 450 feet away from water bodies
- Provide dense vegetation or rock barriers along shoreline where appropriate
- Reduce or eliminate mowing
- Reduce fertilizer use
- Do not water during summer months
- Deploy a combination of visual hazing or scaring techniques
- Annually oil or addle goose eggs to keep them from hatching
- Approved chemical repellents such as Flight Control those that use the biodegradable food ingredient called methyl anthranilate(MA)
- Remove any artificial nesting structures
- Provide alternative feeding sites; this practice works best in suburban or rural fringe areas

Apparently, urban goose control currently is not an accepted urban best management practice within the Chesapeake Bay Program. It would



be worthwhile for DNREC and the program to explore developing this BMP, as many waterfront municipalities have an abundance of Canada geese.

D. **Pursue and implement Broad Creek green infrastructure projects.** The town is requestin technical assistance from the National Fish and Wildlife Foundation for two projects that would reduce pollutants reaching Broad Creek:

- Technical assistance to develop engineering and construction design plans for a green street design to treat stormwater from 6th Street between West and King streets before directing it for discharge into Rossakatum Branch. Rossakatum Branch is a small headwater stream that runs through town before joining Broad Creek; the town also requests a downstream analysis and stream corridor assessment of the water body to determine the capacity and condition of stormwater outlets discharging into the branch.
- Engaging residents and adjacent property owners to develop a concept plan and engineering design for a stream bank restoration project that would establish a greenway to connect three existing parks - Janosik Park, Waterfront Park and Laurel Park. Storm drains from Park Drive and other sections of town discharge directly into Broad Creek in this area, and there is room to treat urban stormwater, improve the stream bank, increase local awareness of Broad Creek, and improve recreational opportunities.

E. **Consider becoming a Community Wildlife Habitat.** The [Community Wildlife Habitat](#) program is sponsored by the National Wildlife Federation. The community provides habitat for wild-



life throughout the community—where people live, work, learn, play and worship.

Communities do this by certifying individual backyards, school grounds and public areas like parks, community gardens, places of worship and businesses, as NWF Certified Wildlife Habitats®. Each individual certified site within the community provides the four basic elements that all wildlife need: food, water, cover and places to raise young. These habitats help to create new corridors for wildlife to thrive.

NWF communities also do outreach to educate residents about sustainable gardening practices such as reducing or eliminating chemical fertilizers and pesticides, conserving water, planting native plants and trees, composting and more. The community hosts workshops about gardening for wildlife and holds community events such as stream clean-ups and invasive species removal to make the community healthier for people and wildlife alike. Local citizens become knowledgeable advocates for wildlife and sustainability.

Such a program is ambitious and would require community champions, support from schools and local organizations, as well as partnerships with DNREC and wildlife organizations such as the NWF and Delaware Nature Society. However, given Laurel's focus on nature tourism, it would be an appropriate pursuit for the town.

Newark, Slaughter Beach and Townsend are Delaware's certified Community Wildlife Habitats.

Former DNREC Secretary Collin O'Mara (center in blue shirt), now executive director of the National Wildlife Federation, congratulates Slaughter Beach on its designation as a Community Wildlife Habitat in August 2015.

(Cape Gazette photo)