University of Maryland Environmental Finance Center
June 2020

Contrasts and Comparisons between Oxford Region Project and Nanticoke River Watershed Project

Summary

To meet the Chesapeake Bay pollution reduction goals, hundreds of communities throughout the watershed in six states have to overcome barriers to implement water quality projects. What are the barriers to local implementation of water quality projects? Are there common barriers across communities or are the barriers more likely to be locally specific? Addressing these questions was the essence of two EFC projects funded by the National Fish and Wildlife Foundation's Chesapeake Bay Stewardship Fund Small Watershed grants from September 2018 through March 2020. Because there are long-standing, effective structures in place for engaging with agricultural landowners in both project areas, the bulk of our analysis focused on non-agricultural lands. The following summary points outline the results of the analysis.

Similarities:

- Investment in water quality education. Across both project areas, education was seen as catalytic to meeting the Chesapeake Bay TMDL goals.
- Engagement with residential/large lot landowners in water quality project implementation. To date, residential landowners and large lot owners have not been specifically targeted for water quality project implementation, including enrollment in existing state and federal cost-share programs.
- Better access to federal dollars and strategies to meet match requirements. In both landscapes, municipalities need help in identifying state and local match and using that match to better leverage existing federal resources to implement water quality projects. Municipalities also do not have experience in how to access state revolving fund support to implement water quality projects.
- Additional strategies to implement agricultural BMPs at the scale. Because both project areas are dominated by agricultural land uses, meeting Chesapeake Bay TMDL goals requires substantial engagement with agricultural landowners and producers. There are some promising initiatives in Pennsylvania partnering with producer cooperatives. In Delaware, partnering with the Middle Chesapeake Sentinel Landscape program could be catalytic. However, getting the scale of agricultural BMP implementation that is needed and having those BMPs remain in place and maintained over time remains a significant water quality challenge in both areas.

Differences:

- Local government structures. In Delaware, municipalities each have their own charter and they do not have many revenue streams to help with match. In Pennsylvania, municipalities seem to have more revenue streams, they are more experienced in generating match and they have common committee structures, such as the Environmental Advisory Councils for which there is a state support structure.

- Water management structures. Delaware has tax ditches, with a small revenue stream and existing watershed governance structure that could be leveraged. Pennsylvania does not have tax ditches.
- Road management. Many Pennsylvania municipalities manage the majority of road miles in their jurisdiction, and some of these municipalities are leveraging road revenues and state funding through the Dirt and Gravel/Low Volume Road program to implement BMPs. In Delaware, the state Department of Transportation (DelDOT) manages the vast majority of roads in the Nanticoke River watershed and they have not been implementing road BMPs.
- Experience with municipal collaboration. Six of the municipalities in the Oxford Region have been collaborating on planning for almost 10 years, greatly facilitating their ability to collaborate on stormwater management. While the municipalities in western Sussex County in Delaware have been discussing collaboration with support from the Sussex Conservation District around an anticipated municipal separate storm sewer system (MS4) permit, it will be several years before they will be able to leverage that relationship to benefit water quality project planning and implementation across the region.
- Size. The portion of southern Chester County in the Chesapeake Bay watershed is approximately 50,000 acres; the Nanticoke River watershed in Delaware is approximately 270,000 acres. As a result, getting to scale in the Nanticoke River watershed will require more capacity.

Community Context

The two locations were selected because of their limited size and similar context in meeting the Chesapeake Bay TMDL. They also provide the opportunity for analysis of similarities and differences across local communities around water quality project implementation, focusing on stormwater management. For one project, EFC partnered with the Brandywine Conservancy to focus on communities in the Elk Creeks and North East Creek watersheds of Chester County, Pennsylvania. Six of the municipalities in the region – Oxford Borough, East Nottingham Township, West Nottingham Township, Lower Oxford Township, Upper Oxford Township and Elk Township – formed the Oxford Regional Planning Committee (ORPC) in 2010. The ORPC served in an advisory role throughout the project, with other municipalities and partners invited to ORPC meetings when project updates were provided. For the other, the Nanticoke Watershed Alliance was our local partner in Sussex County, Delaware. Both landscapes include small towns surrounded by agricultural land uses. An advisory committee was formed with representatives from municipalities, state agencies, the Sussex Conservation District, the state extension program and the Sea Grant program. The agricultural land use in the Oxford Region includes cropland and dairy farms, with a fair number managed by Amish farm families. The poultry industry dominates agriculture in Sussex County, with cropland dedicated to growing poultry feed and a substantial number of poultry houses throughout the region.

Local government structure in Pennsylvania results in all parts of the county being part of a smaller jurisdiction, whereas in Delaware, with county-based government, all areas outside of chartered municipalities are considered unincorporated areas that are governed by the county. The two tables below include community characteristic information for the two regions. However, while the information for the Oxford Region does provide a complete picture of the communities, the information available for the Nanticoke River watershed does not allow for presenting Sussex County data so as to include only the unincorporated part of the county in the watershed. It is important to remember that

the eastern part of Sussex County has a significant number of second homes recently developed as part of the beach communities.

Oxford Region Municipality	Population	Median Household Income**	Poverty Rate***	Percent of pop 65 years +	Total Number of Households
Atglen Borough	1,406	$53,802	11.5%	8%	483
East Nottingham Township	8,877	$94,617	4.1%	10%	2,793
Elk Township	1,689	$78,068	5.0%	14%	639
Franklin Township	4,474	$118,068	6.2%	12%	1,584
Lower Oxford Township	5,045	$72,308	11.1%	8%	988
New London Township	5,903	$120,234	3.8%	10%	1,894
Oxford Borough	5,327	$51,100	22.0%	16%	1,969
Penn Township	5,504	$74,335	6.8%	30%	2,281
Upper Oxford Township	2,526	$90,550	3.0%	16%	823
West Fallowfield Township	2,591	$72,645	4.4%	13%	909

West Nottingham Township	2,721	$57,564	12.0%	14%	906
West Sadsbury Township	2,297	$68,929	6.3%	17%	800
Chester County	524,989	$96,726	6.7%	17%	189,592

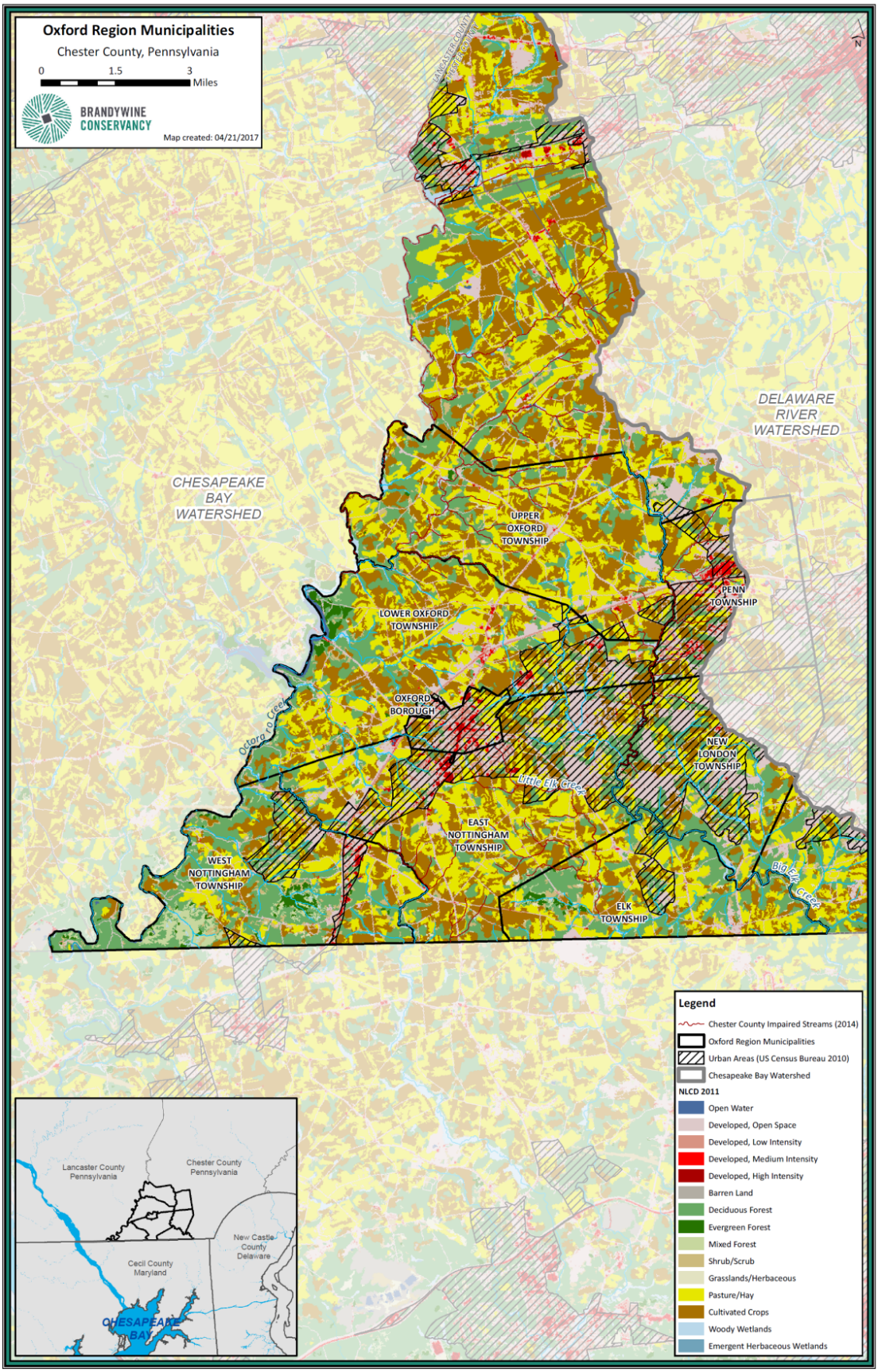
Nanticoke Municipality	Population	Median Household Income	Poverty Rate	Population 65 Years +	Total Number of Households
Blades	1,382	$43,264	24.2%	11.3%	459
Bethel	186	$66,750	4.8%	41.4%	83
Bridgeville	2,480	$51,713	23.7%	37.5%	1,142
Delmar	1,704	$34,211	17.3%	17.5%	616
Georgetown	7,002	$47,376	21.7%	15.6%	2,288
Greenwood	1,147	$49,554	15.6%	14.9%	429
Laurel	4,147	$34,291	35.1%	9%	1,278
Seaford	7,447	$44,886	21.2%	18.8%	2,872
Sussex County	215,551	$57,901	12.0%	25.2%	86,322

In general, the Oxford Region in Pennsylvania has lower poverty rates, lower numbers of people over 65 years of age and higher median household incomes than the Nanticoke River watershed in Delaware. Comparing the two counties, Chester County has more people and more households than Sussex County, a median household income of almost twice Sussex County. While the data in the tables does not allow for a direct comparison, it appears that there is more capacity to support water quality programming at the governmental and individual level in the Oxford Region in Pennsylvania than in the Nanticoke River watershed in Delaware.

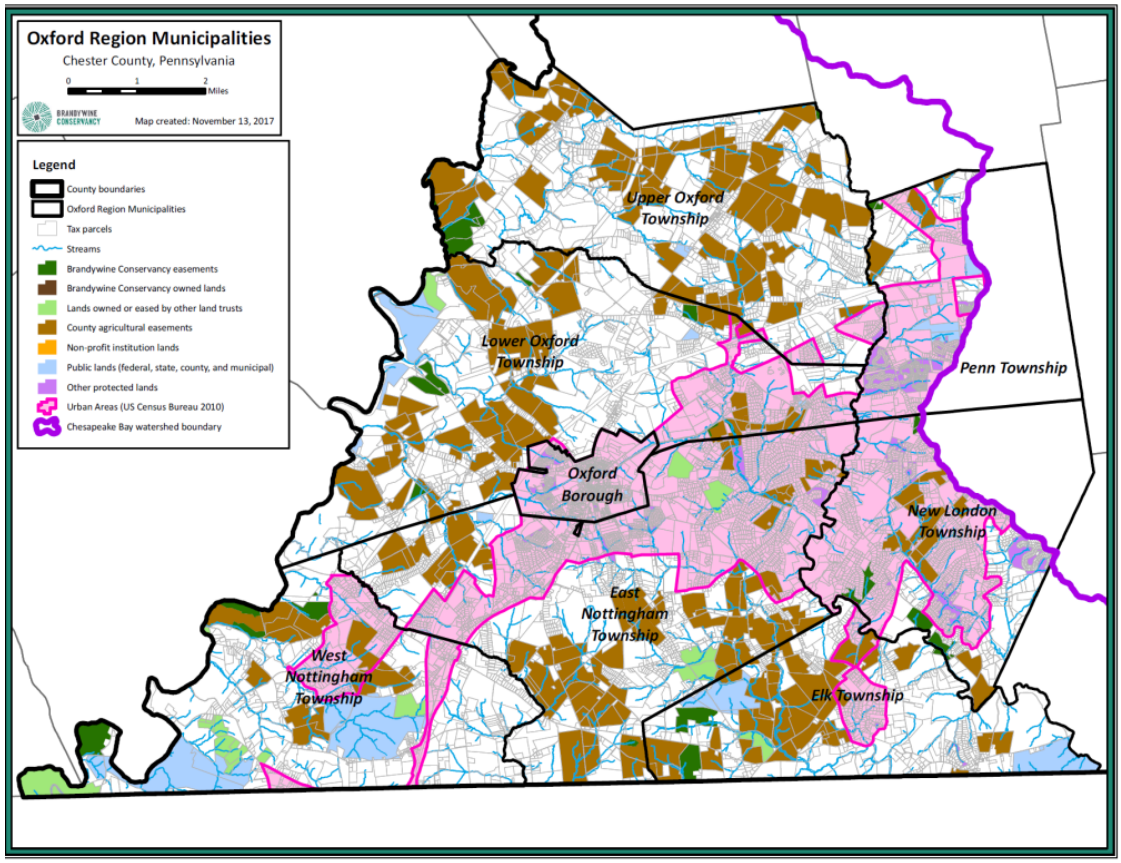
Land Use

The project area in the Oxford Region of Pennsylvania is approximately 50,000 acres. It is substantially larger in the Nanticoke River watershed at approximately 270,000 acres. As set out in the table below and shown in the map, the land use in the 52,000-acre Oxford Region is primarily agricultural (53%), with wooded (24%) and residential (15%) the next largest land use categories.

Land Use Cover	Acres in Oxford Region	Percentage of Oxford Region
Agricultural	27,772	53%
Wooded	12,236	24%
Residential	7,866	15%
Undeveloped	1,142	2%
Commercial/Industrial	679	1%
Institutional	316	1%
Recreation	472	1%
Utility	762	1%
Transportation	303	1%
Water	458	1%

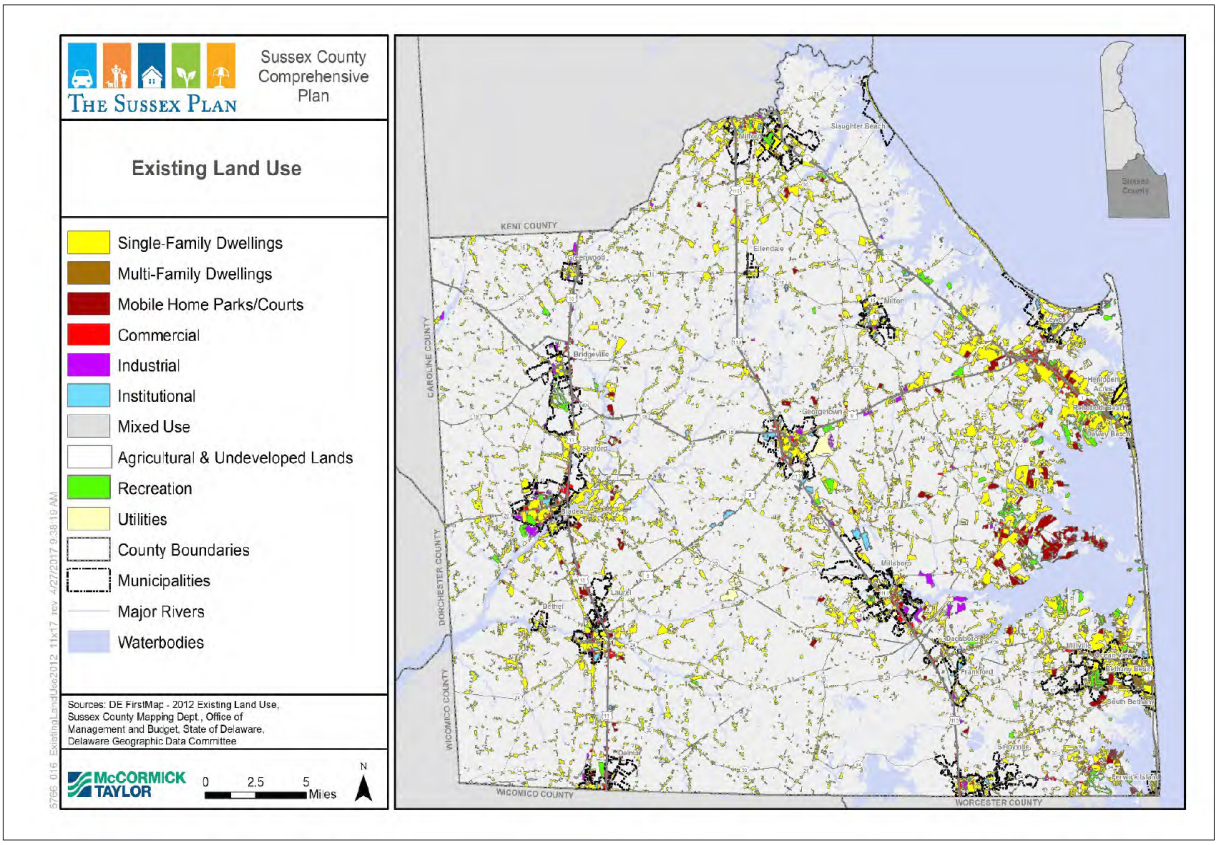

Oxford Region Municipalities
Chester County, Pennsylvania
0 1.5 3 Miles
BRANDYWINE CONSERVANCY
Map created: 04/21/2017
N
LANCASTER COUNTY PENNSYLVANIA
DELAWARE RIVER WATERSHED
CHESAPEAKE BAY WATERSHED
UPPER OXFORD TOWNSHIP
PENN TOWNSHIP
LOWER OXFORD TOWNSHIP
OXFORD BOROUGH
NEW LONDON TOWNSHIP
EAST NOTTINGHAM TOWNSHIP
WEST NOTTINGHAM TOWNSHIP
ELK TOWNSHIP
Octoraro Creek
Little Elk Creek
Big Elk Creek
Lancaster County Pennsylvania
Chester County Pennsylvania
New Castle County Delaware
Cecil County Maryland
CHESAPEAKE BAY
Legend
Chester County Impaired Streams (2014)
Oxford Region Municipalities
Urban Areas (US Census Bureau 2010)
Chesapeake Bay Watershed
NLCD 2011
Open Water
Developed, Open Space
Developed, Low Intensity
Developed, Medium Intensity
Developed, High Intensity
Barren Land
Deciduous Forest
Evergreen Forest
Mixed Forest
Shrub/Scrub
Grasslands/Herbaceous
Pasture/Hay
Cultivated Crops
Woody Wetlands
Emergent Herbaceous Wetlands

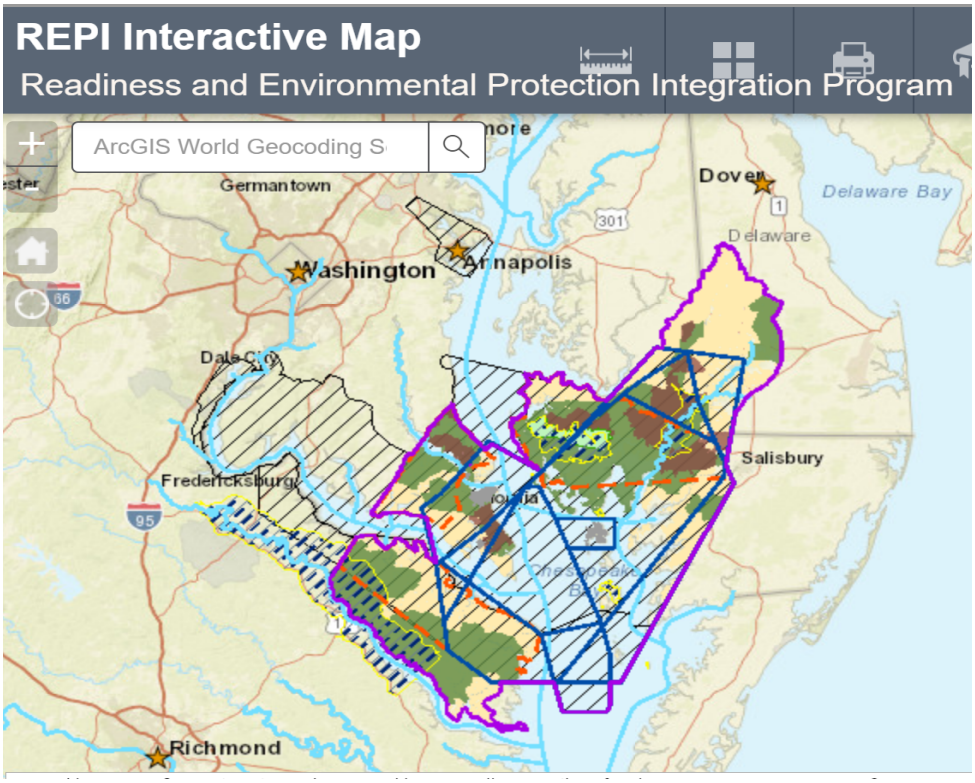
There is a significant amount of acreage within the six municipalities that are part of the ORPC that is in some form of preservation as set out in the map below.



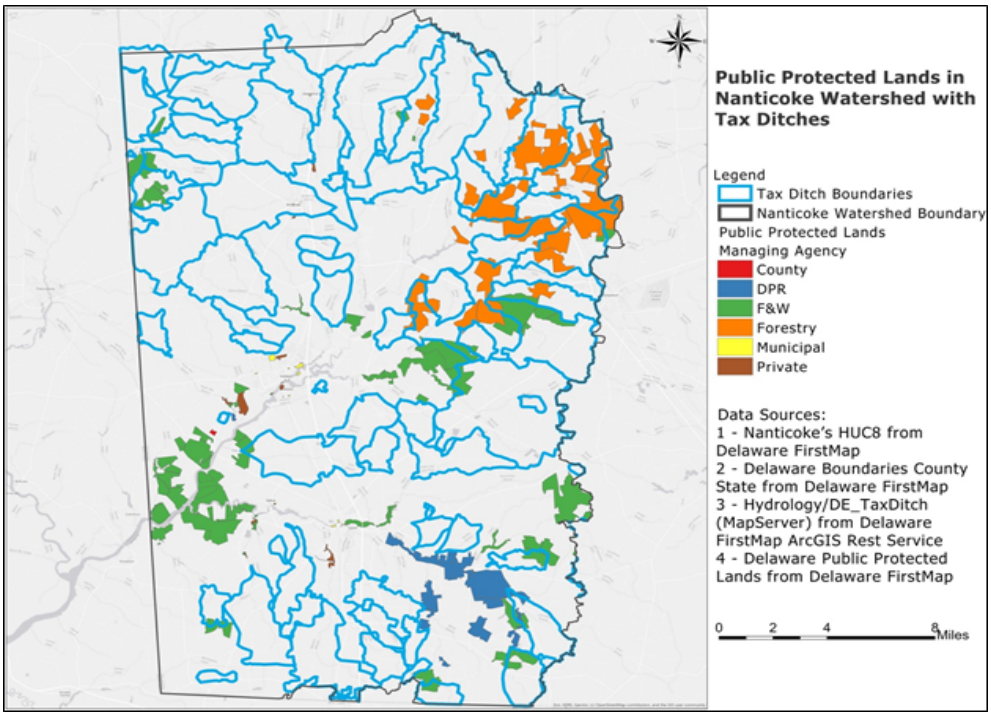
The Nanticoke River watershed covers pretty much the entire western half of Sussex County. Land use is also dominated by rural and agricultural uses as can be seen in the existing land use map below. The municipalities are small – Seaford is the largest with a population of less than 8,000 people – with the majority of the development and population in the eastern half of the county. The Nanticoke River watershed is also part of the Middle Chesapeake Sentinel Landscape (MCSL) as shown in the map. The goal of the MCSL is to work with regional partners to ensure military readiness by working to help ensure that military uses are compatible with the surrounding community uses. The military uses for the MCSL includes pilot training so that agricultural lands and open space are seen as more compatible than densely populated residential and commercial land uses. Finally, while the Nanticoke River watershed does have significant acreage in public lands in the protected lands map that could facilitate implementation of water quality projects. Future land use is not predicted to change substantially in the region as shown the future land use map.

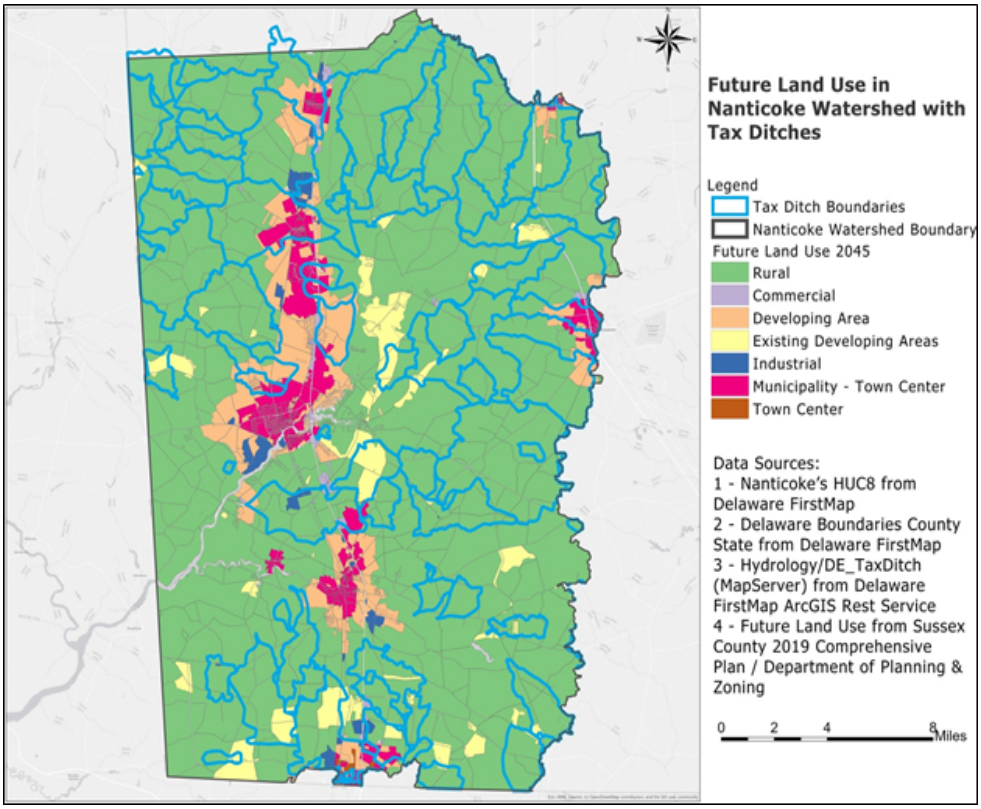
Figure 4.2-1 Existing Land Use





Middle Chesapeake Sentinel Landscape


Public Protected Lands in Nanticoke Watershed with Tax Ditches
Legend
Tax Ditch Boundaries
Nanticoke Watershed Boundary
Public Protected Lands
Managing Agency
County
DPR
F&W
Forestry
Municipal
Private
Data Sources:
1 - Nanticoke's HUC8 from Delaware FirstMap
2 - Delaware Boundaries County State from Delaware FirstMap
3 - Hydrology/DE_TaxDitch (MapServer) from Delaware FirstMap ArcGIS Rest Service
4 - Delaware Public Protected Lands from Delaware FirstMap
0 2 4 8 Miles


Future Land Use in Nanticoke Watershed with Tax Ditches
Legend
Tax Ditch Boundaries
Nanticoke Watershed Boundary
Future Land Use 2045
Rural
Commercial
Developing Area
Existing Developing Areas
Industrial
Municipality - Town Center
Town Center
Data Sources:
1 - Nanticoke's HUC8 from Delaware FirstMap
2 - Delaware Boundaries County State from Delaware FirstMap
3 - Hydrology/DE_TaxDitch (MapServer) from Delaware FirstMap ArcGIS Rest Service
4 - Future Land Use from Sussex County 2019 Comprehensive Plan / Department of Planning & Zoning
0 2 4 8 Miles

Research Findings from Parcel Mapping

In both project areas, conservation districts are actively engaging with agricultural landowners to enroll them in water quality cost-share programs with the goal of meeting the Chesapeake Bay TMDL goals. Because smaller land area and number of farms in southern Chester County that drain to the Bay, Chester County Conservation District appears well positioned to address this challenge. In the Nanticoke River watershed, the challenge is much larger both in terms of area and number of farms. However, the Sussex Conservation District has a long history of engaging with farmers and should lead this effort. To be clear, reducing the pollution loads from agricultural runoff is the most significant challenge to meet the Chesapeake Bay TMDL goals. However, we were not able to obtain sufficient information about the status of BMP implementation in either project area so as to be able to adequately assess the states' WIP strategies regarding agricultural runoff. It is clear that there are experienced partners with substantial, long-term relationships with farmers in both areas so it appears that capacity to reach out to farmers and funding for cost-share programs are likely the significant limiting factors to meeting WIP goals for agriculture in both project areas.

The project partners conducted an in-depth analysis of parcels in both project areas. Without access to enrollment information, parcel size is a reasonable surrogate to differentiate between agricultural and non-agricultural land uses. In order to get a better sense of the potential audience of non-agricultural landowners, we assumed that most agricultural parcels would be larger than 10 acres. Because most water quality cost-share programming is targeted to agricultural landowners and because most of the area in both landscapes are not currently subject to MS4 permits, these landowners are likely not a target audience for most water quality education and project implementation programs.

The Brandywine Conservancy conducted a GIS review of parcels in the Chesapeake Bay watershed of Chester County. The analysis showed that the majority of parcels (in terms of numbers) in the Chesapeake Bay drainage Chester County are five acres or less and they are in residential use. A substantial number of these landowners are not within an urbanized area and most likely are not accessing funding support from cost-share programs to implement water quality BMPs. In addition, the presence of road front lots outside urbanized areas shows sprawl trends that will have an effect on population density over time, potentially forecasting the future expansion of the Urbanized Area in upcoming MS4 permit cycle in Pennsylvania. An analysis of parcels five acres or less show that there are opportunity areas to engage residential landowners. Currently there are few programs that cater to this category. Parcels five acres or less comprise 10% of the Oxford Region and the majority are located within the Urbanized Area. A concerted outreach effort to parcels of this size can result in modest reductions within the Urbanized Area. Rain gardens, rain barrels, and small riparian buffer projects are recommended BMPs for parcels less than 5 acres. Landowners on the upper end of this category who do not live off the land may be willing to implement BMPs such as riparian buffers with 35-feet or more setbacks.

Number of Parcels Under 10 acres

Land Use Category	**Acreage 0-5 acres**	**Acreage 5-10 acres**
Residential	6018	513
Wooded	1192	923
Agriculture	1147	1374
Undeveloped	291	120
Commercial	253	68
Institutional	92	54
Utility	80	67
Industrial	44	43
Recreation	27	23
Water	26	37
Transportation	9	4
TOTAL	9179	3225

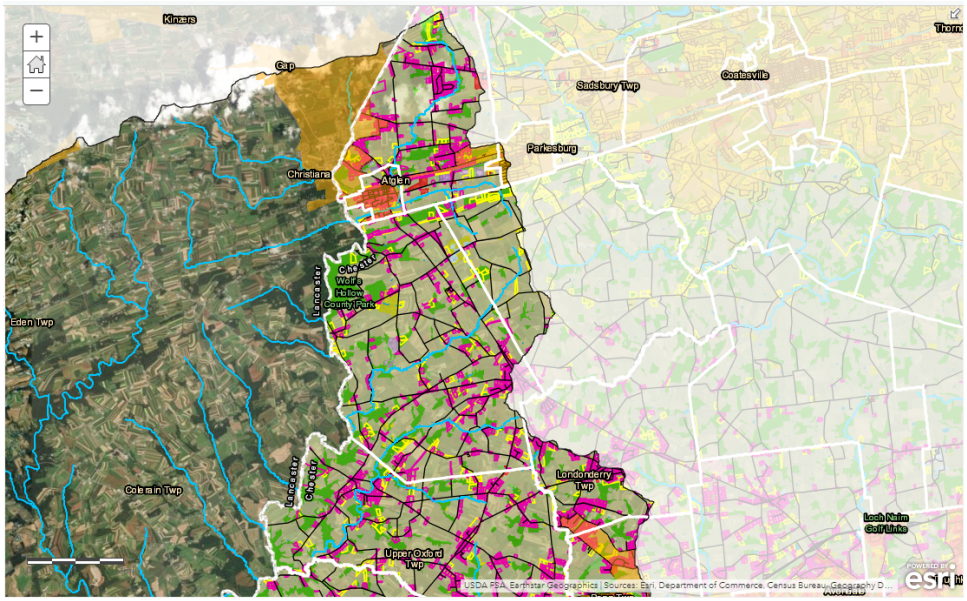
An analysis of land use greater than five acres but less than 10 show less opportunity in this area, however, there some farmettes that may be good candidate properties for BMP implementation. This category includes produce operations and small equine operations, as well as gentleman farms that do not make a living off the land itself.

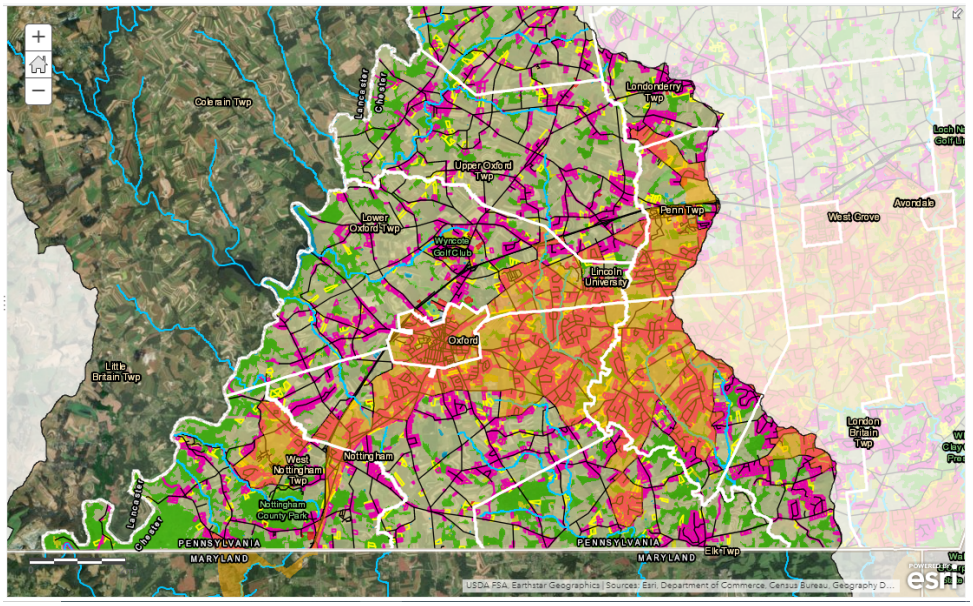
Two of the resulting maps from this analysis are presented below. The yellow area is the urbanized area where municipalities currently need or will soon need an MS4 permit to address the pollutant loading in their stormwater runoff. Parcels represented in pink (which turns orange in the urbanized area) are smaller than five acres. Parcels represented in pale green are agricultural lands. The mapping demonstrates that programming that targets these landowners would add significant coverage to a regional stormwater management strategy. The mapping also helps visualize the likely expansion of the urbanized area in the watershed. Numerically, the parcel analysis found that:

- 0 – 9.99 acres: 25% of total regional acreage (12,341 acres; 8,039 parcels)
- 10 – 49.99 acres: 34% of total regional acreage (17,189 acres; 751 parcels)
- 50 + acres: 41% of total regional acreage (20,524 acres, 229 parcels)

Water quality education and outreach to landowners of 10 acres or less is a substantially different logistical task than outreach to landowners of 10 acres or more. It also supports the conclusion that investment in education should be an essential element of a stormwater management strategy. The project team used this information to discuss with the Chester County Conservation District and other partners how to reach these landowners and what programs should be available to support their adoption of good stormwater management practices on their land.

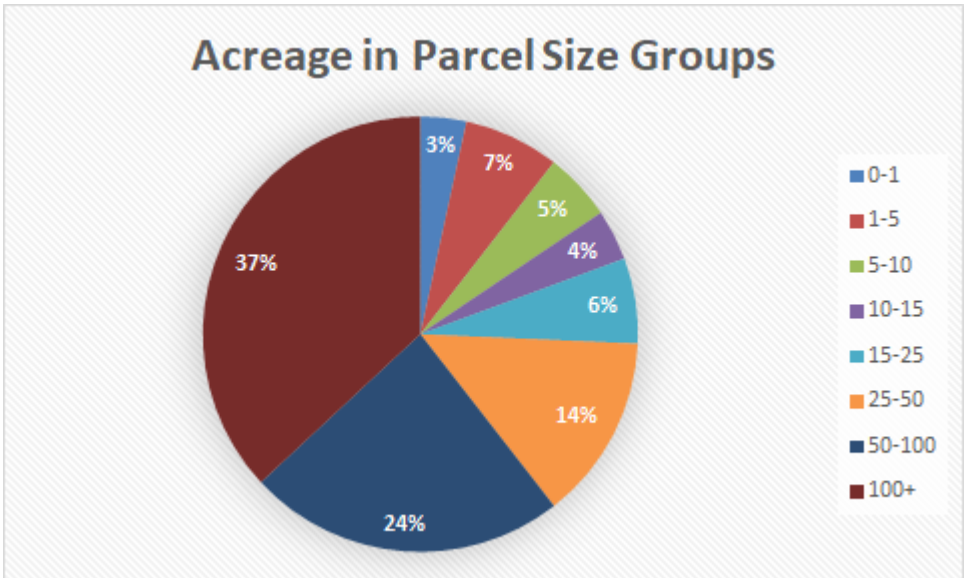
Parcel Mapping: Oxford Region, Pennsylvania





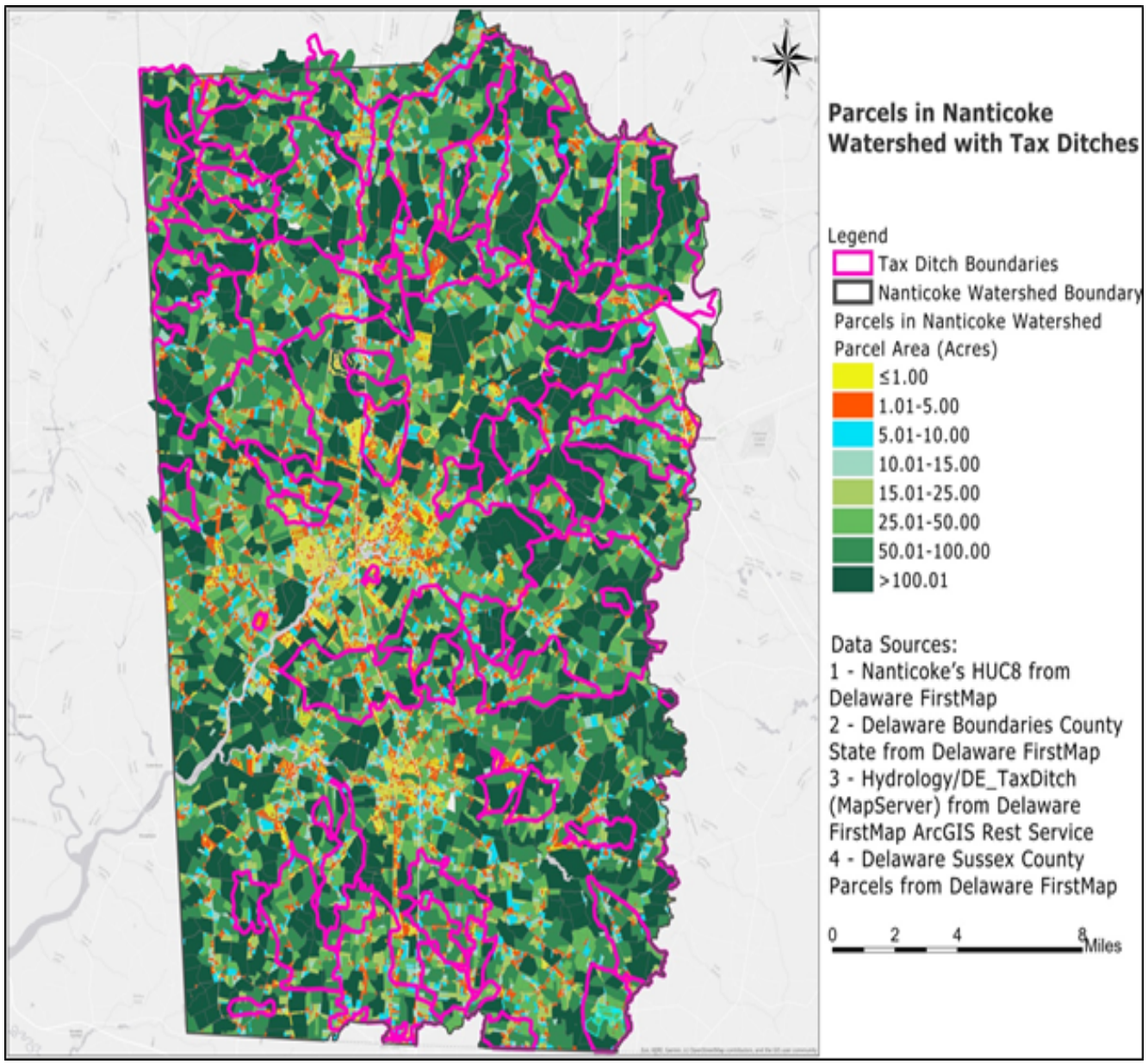
In the Nanticoke River watershed, EFC conducted GIS analysis of parcel and land use data and other information to identify opportunities and understand how to better target water quality education and programming to advance implementation of WIP strategies. Overall, the Nanticoke watershed in Delaware contains 34,852 parcels and has an area of approximately 270,000 acres. To understand the different opportunities presented by targeting different parcel size groupings, they were broken down into groups:

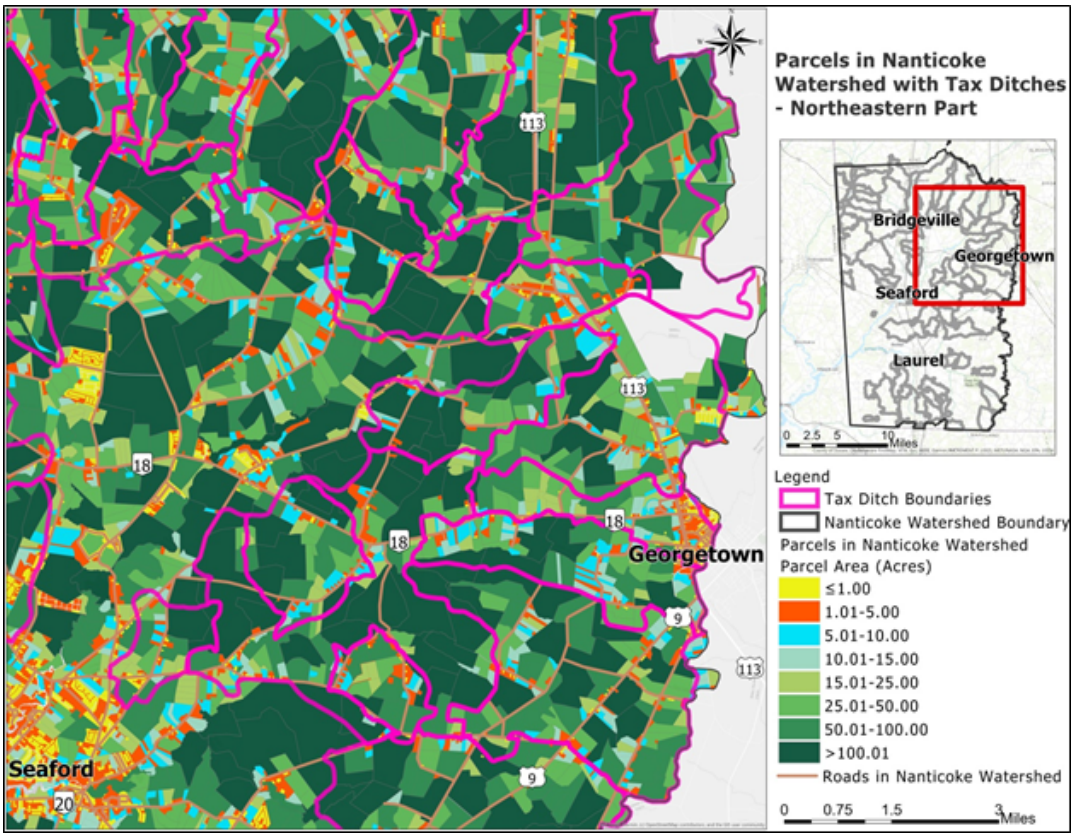
- 0 – 9.99 acres: 15% of total acreage of region
- 10 – 49.99 acres: 24% of total acreage of region
- 50+ acres: 61% of total acreage of region



Similar patterns were seen in the Nanticoke River watershed as in the Oxford Region as a result of this mapping. Smaller lots cluster near a few major roads and in the more developed areas. Because tax

ditches are an important feature in the landscape and are potentially a large opportunity to improve water quality, spatial information on tax ditch "watershed" boundaries and channels was analyzed against parcel sizes and land use data. An analysis of tax ditch parcels found that approximately half of land (150,000 acres) in the Delaware portion of Nanticoke River watershed is in a tax ditch. Most of these parcels are one acre or smaller, though there are significant numbers of parcels in other size categories, as shown in the graph below. Of the 34,852 parcels in the study area, about 15,000 parcels are in a tax ditch, highlighting the need to address water quality issues through this lens.





Across the two project areas, there is a larger percentage of residential landowners in the Oxford Region than in the Nanticoke River watershed. And there are more large farms in the Nanticoke River watershed. However, in both areas, the mapping demonstrates that engagement with landowners of parcels under 10 acres is a substantial portion of the land area in the watershed (25% in the Oxford Region and 15% in the Nanticoke River watershed). In addition, because these parcels are disparately located throughout the areas (perhaps a bit more so in the Oxford Region) and along roads, understanding how runoff from these parcels interacts with the road network may indicate the need for a road BMP implementation strategy.

Analysis

The advisory groups in both landscapes identified investing in water quality education as catalytic to achieving the Chesapeake Bay pollution reduction goals. While there are water quality education initiatives in both locations, sometimes they are not always well-coordinated across partners and they might leave out an important audience. The Oxford Region has urbanized areas subject to MS4 permits with pollution reduction requirements; municipalities in the Nanticoke River watershed do not have a current MS4 permit and indications are that permit will not include pollution reduction requirements. As a result, the Oxford Region has more of a regulatory driver to address public education and outreach as these activities are elements of their MS4 permits. In addition, Chester County has a substantial network of governmental and non-governmental stakeholders that have been helping focus attention on water resource management for decades. For example, the Chester County Water Resources Authority helped develop watershed plans for each watershed throughout the county and it continues to conduct water

quality monitoring and support municipalities in their stormwater management activities. For this reason, it was a bit surprising that the ORPC identified water quality education as a priority. However, their perspective may reflect the difficulty in getting their residents to value water quality improvements targeted to the Chesapeake Bay as opposed to their local watersheds.

Identifying local matching funds to leverage federal or state grant support is a common challenge. While townships in Pennsylvania collect taxes and receive revenues from the state (such as liquid fuels revenue), there are multiple competing priorities for these dollars. In Delaware, most communities don't have any revenue streams or those revenues are managed at the county level, where, again, there are multiple competing priorities for those funds. In addition, many municipalities in Delaware and Pennsylvania are relatively new to the stormwater permitting program – the municipal separate storm sewer system (MS4) program – so they are not experienced in planning projects or accessing grant and governmental support for program development and project implementation. They are also not familiar with how to access state revolving fund (SRF) support, despite the fact that the SRF programs in both states are expressly trying to support more green infrastructure projects.

As for differences, one was experience with collaboration. The local governments in the Elk Creeks and North East Creek watersheds have been collaborating on planning through the Oxford Region Planning Committee since 2013. They have benefited from the efficiencies and scaling solutions that collaboration can bring. The municipalities in the Nanticoke River watershed have discussed collaborating on stormwater management so it seems likely that they will adopt collaboration as part of a funding strategy.

Another difference is the role of tax ditches. There are many tax ditches in Sussex County, Delaware. Tax ditches are special assessment districts designed with the purpose of draining excess water from the land area to enable agriculture. Members of the tax ditch pay a small annual fee for maintenance of the ditch so as to sustain drainage. Creation of these ditches has resulted in major changes to the natural hydrology of the region. However, because the ditches are drawn to address water drainage, their management boundaries still reflect the flow of water, as opposed to political boundaries, which generally ignore watershed boundaries. In addition, while the fees gathered for tax ditch maintenance are small, collectively, they could be used to match grant funding for water quality project implementation. Many residential landowners do not fully understand what a tax ditch is. Fewer people are volunteering to be tax ditch managers. There appear to be opportunities for water quality education with tax ditch members and managers, and there may be opportunities for tax ditch consolidation.

An analysis of road runoff management presents some similarities but substantially differences in terms of outcomes. Managing the pollution in road runoff is not a demonstrated priority in either project area. The project did not include any calculations of pollution loads in road runoff. In Pennsylvania, because of the structure of the MS4 permit, municipalities may be more motivated to consider road runoff BMPs to meet pollution load reductions. They have revenue streams that can assist with implementation and a state funding program through the Dirt and Gravel/Low Volume Road program that can support that work. In Delaware, the vast majority of roads are managed by DelDOT, which has not adopted a strategy to implement road runoff BMPs. Nearby jurisdictions in Maryland have adopted this kind of strategy, providing a source for cost estimates, information on efficacy, and peer-to-peer learning. If DelDOT does not change its policy on this issue, pollution from roads will continue to flow directly into the waterways in the Nanticoke River watershed.