

Land Conservation and the Community Rating System

Mapping Open Space Preservation Opportunities in Maryland Communities



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Executive Summary

The increasing prevalence and destructive nature of floods has created a demand for effective, long-term flood mitigation strategies. A burgeoning development in the field is to incorporate nature into flood mitigation plans, utilizing the landscape's natural processes to reduce the impacts of flooding. The permanent protection and restoration of undeveloped land is one such nature-based solution that can lower a community's flood risk by preserving the land's natural functions and preventing people from inhabiting flood-prone areas.

Land protection can also earn communities discounts on flood insurance via the Federal Emergency Management Agency's Community Rating System. Open space preservation, as it is known in the Community Rating System, rewards the protection and restoration of floodplains with an up to 10% decrease in community flood insurance rates, creating an economic and environmental incentive for land protection.

Combined with the Chesapeake Bay Watershed Agreement goal to protect an additional two million acres of land within the Chesapeake Bay watershed by 2025, there is a pertinent opportunity to benefit multiple stakeholders through open space preservation.

This report represents a first step in that process by identifying open space preservation opportunities in the floodplains of selected Maryland communities. The Chesapeake Conservation Partnership mapped and calculated the acres of preserved open space and unpreserved open space in each analyzed community, highlighting the properties that could be preserved for open space preservation credit. Additionally, one community was selected for a pilot restoration analysis in which natural functions open space and best management practice suitability was identified. The analysis found that three of the five communities are currently eligible for a 5% discount on flood insurance rates, with all communities having the potential to earn the maximum 10% discount. In addition, there are substantial opportunities for open space preservation in each community that can be achieved through collaboration among stakeholders.



Storm surge in Annapolis, MD 2010^a

The Risk Posed By Flooding

Flooding is the most frequent and widespread natural hazard facing the United States. As such, it poses a major risk to public safety. From 2010–2020 an average 104 people died from flooding each year in the United States¹. But lives aren't the only thing that can be lost; flooding also causes extensive damage to property, costing the United States an average \$6 billion per year during the same ten year period². The cost and fatalities associated with flooding can be expected to rise in coming years as flood-prone areas become more urbanized and global climate change increases the number and intensity of flood events.

The Chesapeake Bay region is particularly at risk. Land around the Chesapeake Bay is sinking, or subsiding, at rates up to 4.8mm/year³. Combined with predicted sea level rise, communities along the Bay's coast are at a great risk of flooding in the near future. Inland areas are at risk as well, as the steep topography of the Appalachian Mountains and intense rainfall from severe storms can create flash floods. Projected growth of the Chesapeake Bay watershed's population—from 18.7 million in 2020 to 22.5 million by 2050⁴—could exacerbate these risks. These statistics demonstrate a serious need to consider how we will reduce the risk and impacts of flooding for current and future residents.

¹ NWS Preliminary US Flood Fatality Statistics. NOAA National Weather Service. May 26, 2020. <https://www.weather.gov/arx/usflood>

² U.S. Billion-Dollar Weather and Climate Disasters. NOAA National Centers for Environmental Information (NCEI). April 8, 2020. <https://www.ncdc.noaa.gov/billions/>, DOI: 10.25921/stkw-7w73

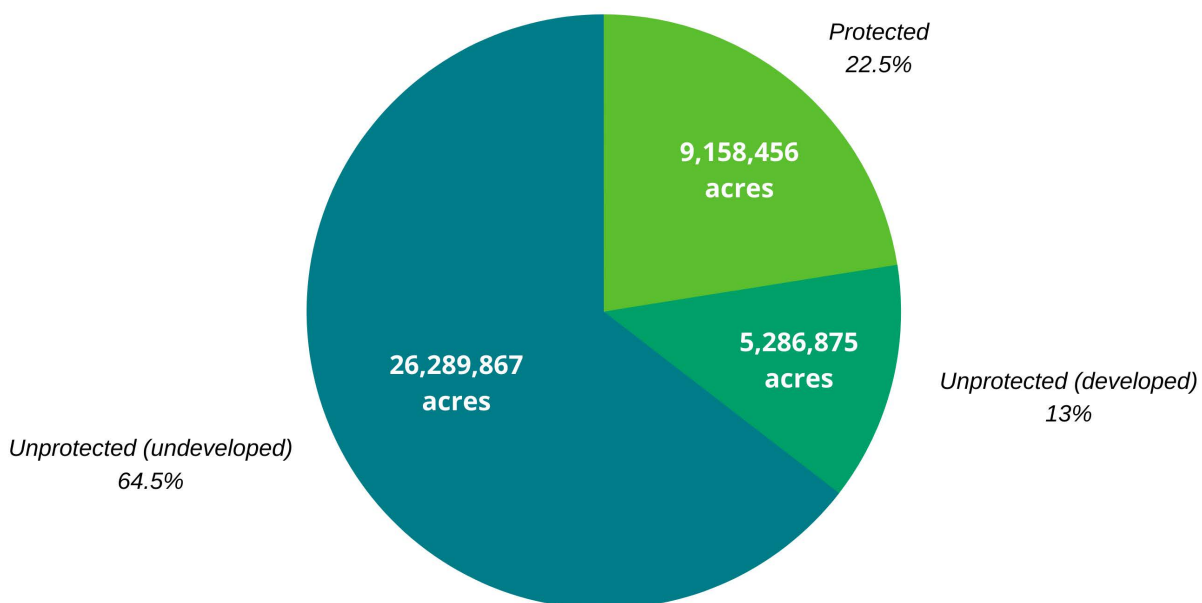
³ Eggleston, Jack, and Pope, Jason. "Land Subsidence and Relative Sea-Level Rise in the Southern Chesapeake Bay Region." U.S. Geological Survey Circular 1392. 2013. <http://dx.doi.org/10.3133/cir1392>

⁴ Population. Chesapeake Bay Program. Accessed June 17, 2020. <https://www.chesapeakebay.net/state/population>

Land Conservation as a Solution

An increasing amount of flood mitigation strategies have focused on using nature to solve this problem. Nature-based solutions rely on natural processes to overcome socio-environmental challenges, like planting trees to improve air quality or reduce soil erosion⁵. Efficient and sustainable, nature-based solutions require little to no built infrastructure and often produce multiple benefits. Land conservation is one such nature-based solution to flooding. Conserved lands that maintain or enhance natural land cover allow floodwaters to better infiltrate into the soil, while conserving floodplains prevents people from settling in flood-prone areas. Additionally, land conservation protects processes that increase biodiversity, improve air and water quality, and provide opportunities for recreation⁶.

Total Acres of Protected Land in the Chesapeake Bay Watershed 2018⁷



⁵ "Implementing nature-based flood protection: Principles and implementation guidance." World Bank. 2017. <https://www.gfdrr.org/en/publication/implementing-nature-based-flood-protection>


⁶ "Appendix F: Ecosystem Services Provided by Floodplains." USDA Forest Service. Draft as of August 4, 2017. https://www.fs.usda.gov/nfs/11558/www/nepa/98306_FSPLT3_4130975.pdf

⁷ "Marking Milestones." Chesapeake Conservation Partnership. 2019. https://www.chesapeakeconservation.org/wp-content/uploads/2019/08/CCP_publication_SD_FD-R-FINAL.pdf

The FEMA Community Rating System

One of the goals of the Federal Emergency Management Agency (FEMA) is to mitigate the impacts of flooding before flood events occur. FEMA uses aspects of the National Flood Insurance Program (NFIP) to incentivize policy and practices toward this end. The NFIP provides flood insurance to property owners, renters, and businesses in jurisdictions that implement the program's minimum floodplain management standards. Of the 22,000 communities in the NFIP, 1,500 participate in the Community Rating System (CRS), a voluntary program within the NFIP that rewards additional floodplain management strategies with discounts on community flood insurance premiums⁸. Each activity is worth points and obtaining 500 points moves a community up a class in the CRS ranking system, earning them the associated discount. The largest discount a community can receive is 45%, which can be achieved by earning 4,500 points.

CRS Class	10	9	8	7	6	5	4	3	2	1
Discount %	0	5	10	15	20	25	30	35	40	45



Communities can earn up to 1,450 points by preserving undeveloped open space in their floodplains. Doing so reduces the amount of people and insurable property in harm's way and protects the floodplain's ability to temper floods. Open Space Preservation (OSP) credit is distributed based on the proportion of the floodplain preserved; protect a third of the floodplain, receive a third of the 1,450 points. An additional 1,420 points can be earned through related activities such as legally restricting development on protected land or preserving eroding shorelines.

Natural Functions Open Space (NFOS) credit is one such form of additional OSP credit. Communities can earn up to 350 points by preserving or restoring the natural functions of floodplains preserved as open space. Natural functions of floodplains include, but are not limited to, flood and erosion control, water quality maintenance, groundwater recharge, biological productivity, and provision of wildlife habitat⁹. Like OSP, NFOS credit is distributed based on the proportion of the floodplain preserved or restored to its natural, pre-development state.

⁸ "NFIP CRS Fact Sheet 2020." Federal Emergency Management Agency (FEMA). Accessed June 17, 2020. <https://www.fema.gov/media-library/assets/documents/186374>

⁹ "National Flood Insurance Program Community Rating System Coordinator's Manual." Federal Emergency Management Agency (FEMA). Accessed May 26, 2020. <https://www.fema.gov/media-library/assets/documents/8768>

Visualizing Open Space Preservation

The purpose of this project is to identify open space preservation opportunities in flood-vulnerable communities in Maryland. Two types of properties are identified: those that currently qualify for OSP credit and those that would qualify for OSP credit if preserved. In addition, one community was selected for an analysis identifying suitable locations for best management practice projects that would restore the floodplain to its natural state, earning the community NFOS credit.

Study Area

The analysis was conducted in 5 Maryland communities applying to the CRS: Annapolis, Baltimore County, Charles County, Laurel, and Queen Anne's County. Maryland was selected as the focus of this project due to its coastal and riparian flood risk. Mapping was limited to communities in the CRS application process because they likely had yet to identify existing OSP credit or act on preservation opportunities; further, the Chesapeake Conservation Partnership wanted to use these communities as models for mapping similar communities around the Chesapeake Bay watershed.

Mapping Methodology

OSP credit is typically applied to land in the special flood hazard area (SFHA), also known as the 100-year floodplain, where there is a 1% chance of flooding each year. For this project the SFHA was delineated using floodplain data from FEMA's National Flood Hazard Layer. The SFHA was then adjusted to remove excluded areas such as large bodies of water and federal land, which were identified using the National Hydrography Dataset and ESRI's USA Federal Lands data layer. Using land cover data from the Chesapeake Conservancy, open space was considered to be any area within the adjusted SFHA that had a wetlands, tree canopy, shrubland, low vegetation, or barren land cover value. Land classified as impervious was removed from the adjusted SFHA. The resulting layer was then split into preserved open space and unpreserved open space based on its intersection with the Chesapeake Bay Program's (CBP) protected lands dataset. Parcel data from Maryland Department of Natural Resources's (DNR) MDProperty View was layered on top, with the acres of open space and associated credit value calculated for each parcel.

Open space preservation and flood insurance discounts have the potential to greatly benefit disadvantaged communities that suffer from economic, health, or environmental burdens. Since the CRS incentivizes flood risk reduction with an economic reward, selection for the best management practice analysis was based on community income status. Baltimore County was selected for the analysis as it had the highest low income population of the 5 communities based on demographic data from the Environmental Protection Agency's EJScreen tool. The County's existing NFOS credit was calculated via three processes. The first identified preserved open space that is managed to remain in its natural state, or what is referred to as NFOS1 credit. A parcel qualified for NFOS1 credit if

it had a gap status code of 1 or 2 in the CBP's protected lands dataset (indicating the parcel was maintained in a natural or primarily natural state). The CBP's protected lands dataset is a compilation of various local, state, and federal data, so some parcels did not have a registered gap status. Therefore, this calculation should be considered an underrepresentation of NFOS1-qualifying land in Baltimore County.

Natural Functions Open Space Credit

NFOS1	Preserved open space parcels that are in or have been restored to an undeveloped natural state; preserved natural open space
NFOS2	Preserved natural open space that is designated in a plan to protect natural functions
NFOS3	Preserved natural open space that is critical habitat for threatened or endangered species
NFOS4	Preserved natural open space that is in a designated open space corridor or connected network

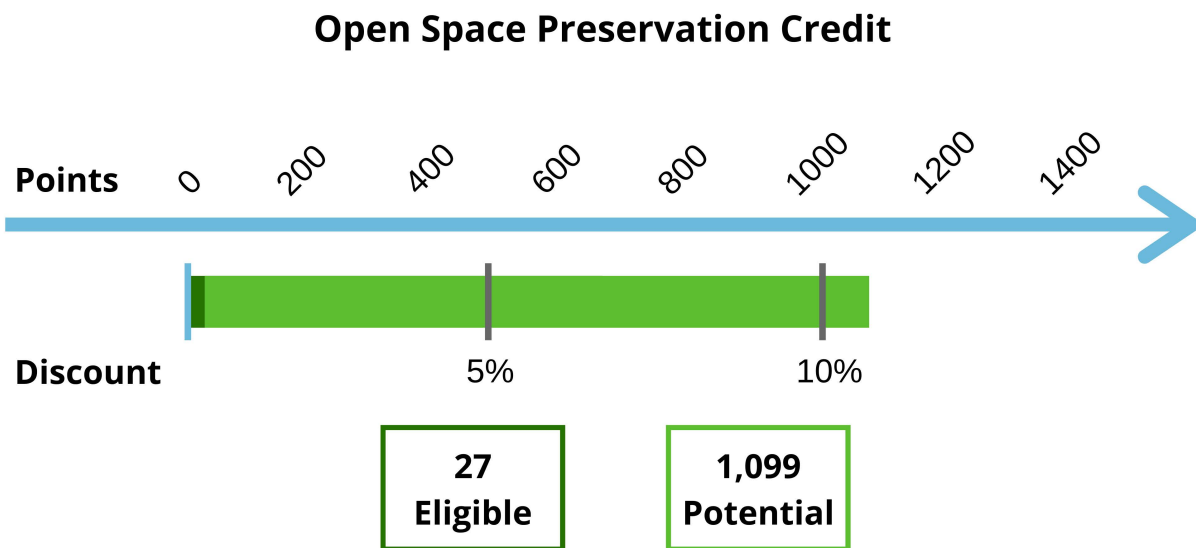
The second and third processes identified NFOS1-qualifying open space that had additional ecological values. NFOS3 credit, which rewards preserved natural open space that is also critical habitat for threatened or endangered species, was calculated by intersecting the NFOS1 open space layer with Maryland DNR's Sensitive Species Project Review Areas. Preserved natural open space that is in a designated open space corridor or network qualifies for NFOS4 credit, which was identified by intersecting the NFOS1 open space layer with the hubs and corridors of Maryland DNR's Green Infrastructure Assessment. The acres of qualifying land and the associated discount for NFOS1, NFOS3, and NFOS4 was calculated for each preserved open space parcel.

Wetland restoration and riparian habitat restoration are both best management practices recognized for their ability to restore the land's natural functions, making them invaluable tools in earning NFOS credit. Suitable locations for these restoration projects were mapped for Baltimore County using data from the Maryland Watershed Resource Registry (WRR). The WRR has created a model ranking areas in Maryland that are ideal for wetland and riparian habitat restoration. The resulting shapefiles rank an area's suitability from 0 (not suitable) to 5 (most suitable). Areas with a rank between 1 and 5 were clipped to Baltimore County's open space layer. While the WRR wetland restoration data took into account soil type and land cover, it did not acknowledge slope, which can influence surface runoff and drainage¹⁰. Using Maryland DNR's digital elevation model of Baltimore County, areas with slopes greater than 15% were erased from the Baltimore County wetland restoration layer. The wetland and riparian habitat restoration layers were then intersected with the parcel data. A parcel was considered suitable for wetland or riparian habitat restoration if it contained one or more acres of the appropriate restoration layer.

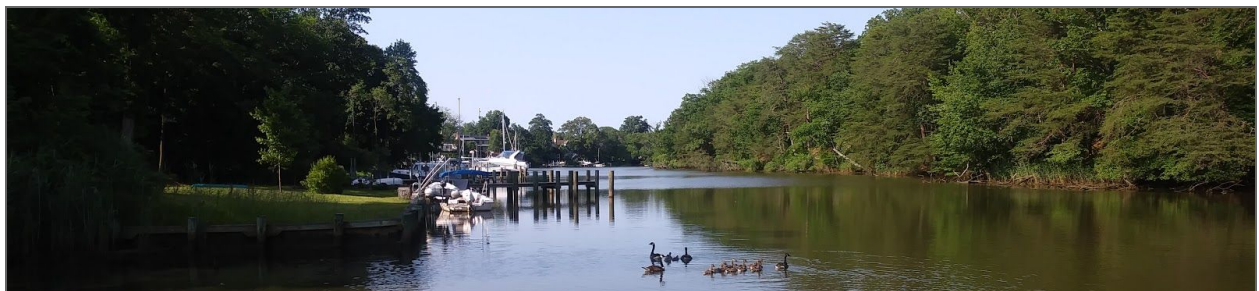
¹⁰ Lin, J.P., Bourne, S.G., and Kleiss, B.A. "Creating a Wetland Restoration Decision Support System Using GIS Tools." ERDC TN-EMRRP-EM-05. 2006. Accessed July 9, 2020. http://ccrm.berkeley.edu/resin/pdfs_and_other_docs/background-lit/TN_EMRRP_EM_05_CreatingWetlandRestorationGISTools.pdf

Annapolis

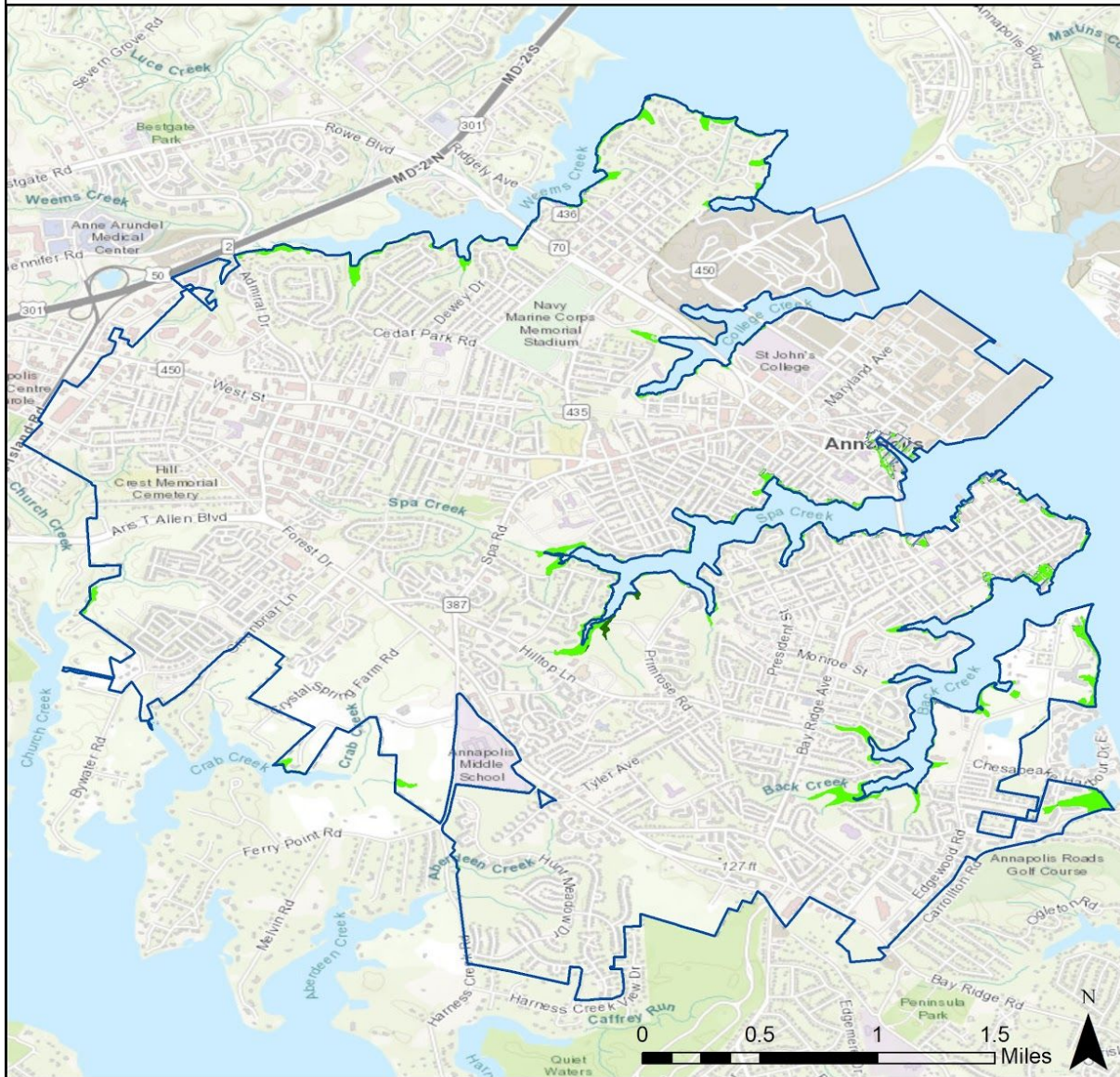
Annapolis has an 84 acre floodplain, 75% of which is open space. The City has 1.5 acres of preserved open space in its floodplains, making it eligible for 27 points. The City would need to protect an additional 27.5 acres to obtain a 5% discount. There are 62.5 acres of unpreserved open space in the City's floodplain, spread over nearly 500 properties. Preserving the 7 parcels containing at least one acre of open space would get Annapolis 40% of the way to the next class. The City may benefit from examining parcels containing less than one acre of open space to determine how many may be able to be preserved.



Preserved Open Space: Truxtun Park ^b



Open Space Preservation Opportunities Annapolis, MD

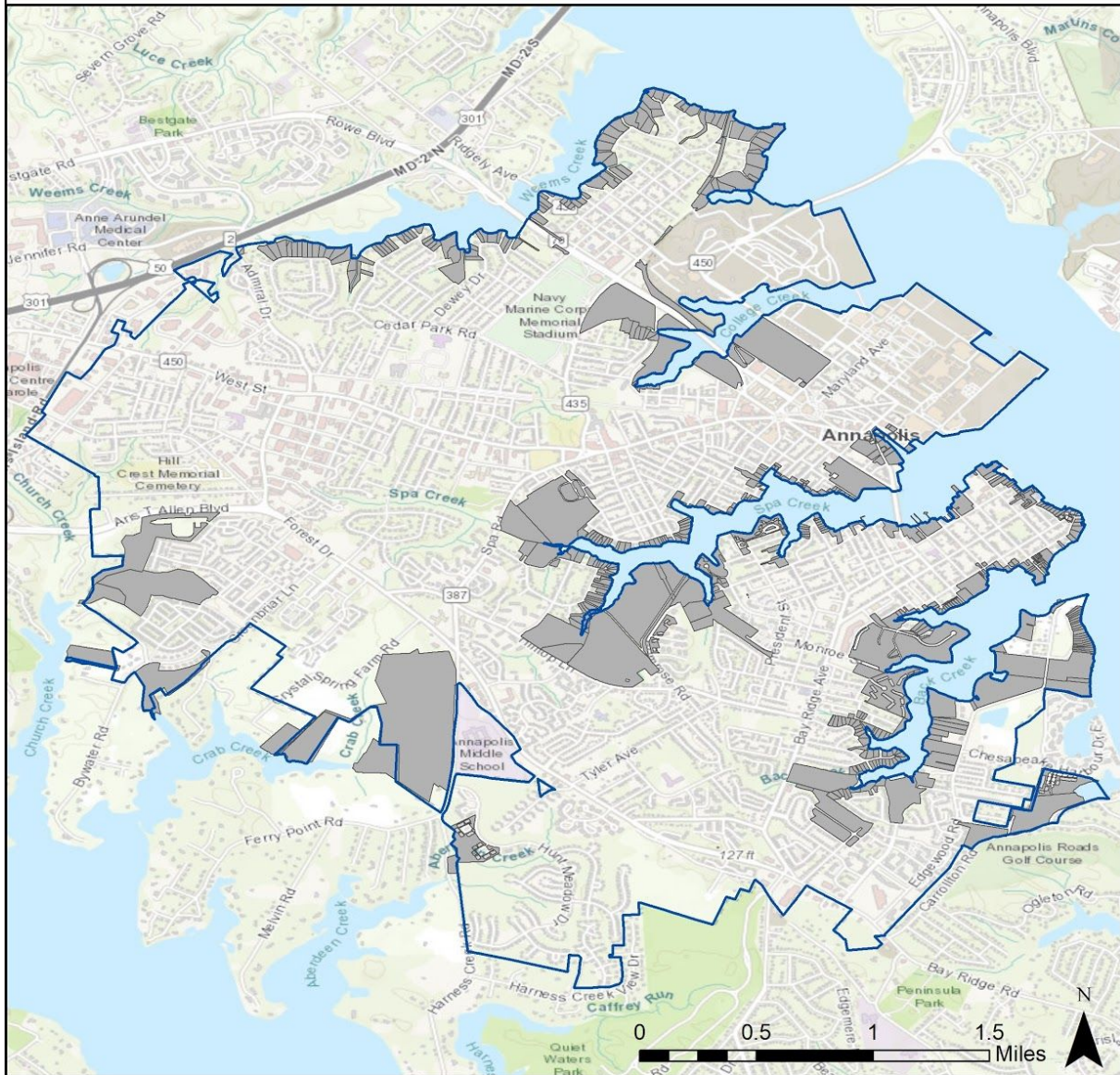


Floodplain Size: 84 acres
 Preserved Open Space: 1.5 acres
 Unpreserved Open Space: 62.5 acres
 Eligible OSP Credit: 27 points
 Eligible Discount: 0%

City Boundary
 Preserved Open Space
 Unpreserved Open Space
 100 Year Floodplain

Interact with this map at chesapeakeconservation.org/tools

Open Space Preservation Opportunities Annapolis, MD



Parcels Containing

- ≥ 1 ac. of Unpreserved Open Space: 7
- ≥ 10 ac. of Unpreserved Open Space: 0
- ≥ 50 ac. of Unpreserved Open Space: 0

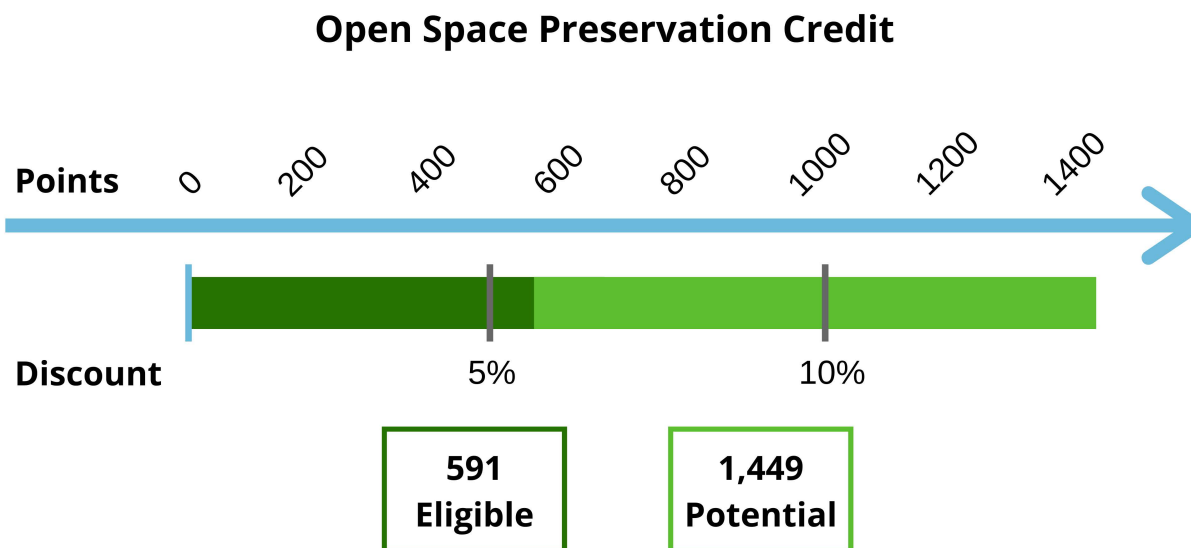
- City Boundary
- Parcels with Preservable Open Space

Interact with this map at chesapeakeconservation.org/tools

Baltimore County

Baltimore County has made considerable headway in preserving open space in their floodplain. Of the almost 18,000 acres of floodplain, 7,151 acres (or about 40%) of it is preserved open space. That means Baltimore County is eligible for 578 points in OSP credit, qualifying them for a 5% discount. To reach the 10% discount, the County would have to preserve another 5,206 acres of its floodplain. Protecting the 136 parcels with 10 acres or more of open space would get them halfway to that goal.

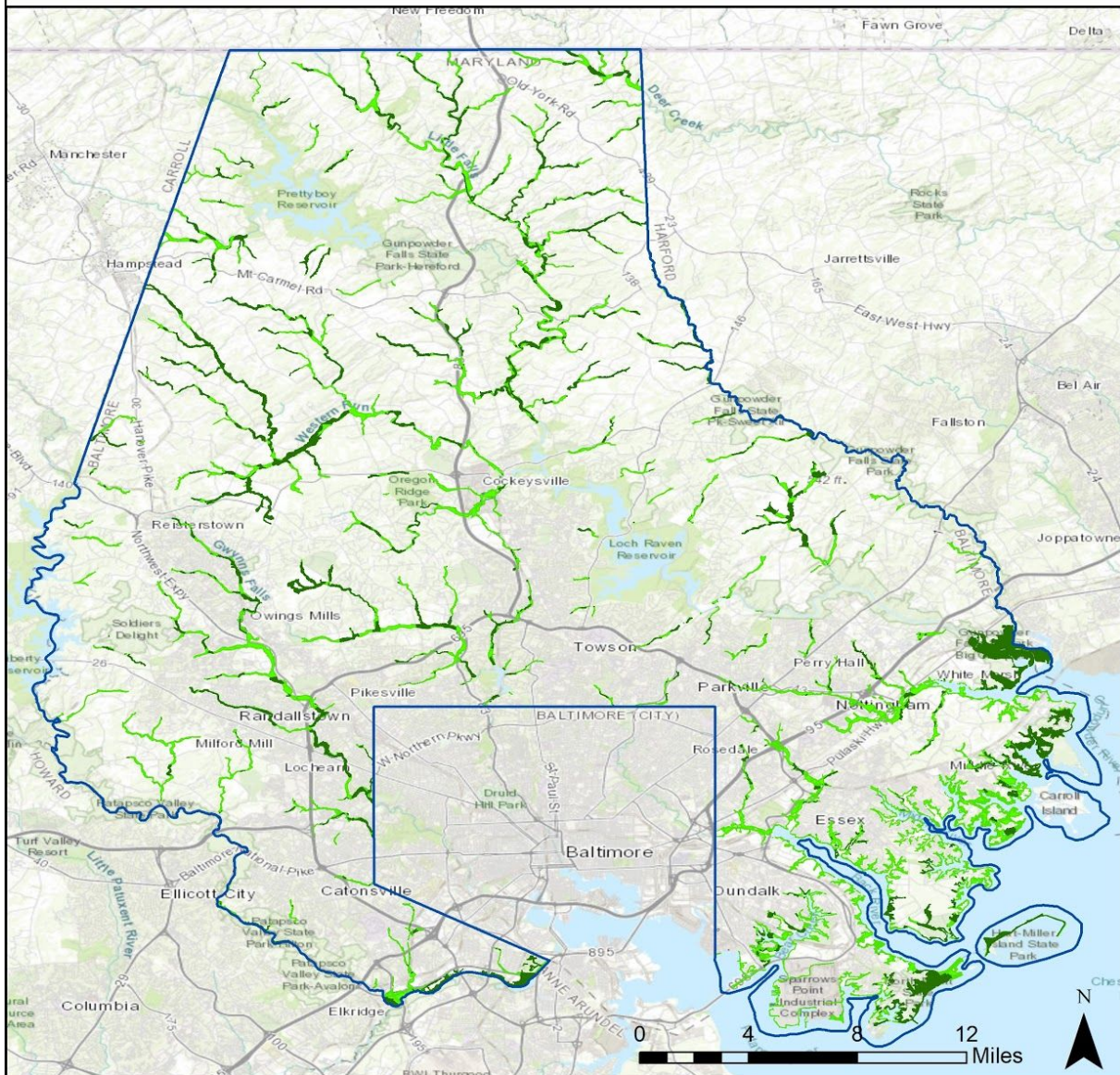
In terms of NFOS credit Baltimore County has 987 acres of preserved open space in its natural state, 146 acres of which are critical habitat for threatened and endangered species and 825 acres of which are in a green infrastructure hub or corridor. Altogether, Baltimore County is eligible for 13 points through NFOS, bringing the total OSP credit to 591 points. Baltimore County could earn more NFOS credit through wetland and riparian habitat restoration. There are 108 parcels or 443 acres of land in the County suitable for wetland restoration. Additionally, there are 971 parcels or 5,059 acres of land that can be restored to natural riparian habitat. These efforts together could qualify Baltimore County for an additional 65 points.



Preserved Open Space: North Point State Park^c



Open Space Preservation Opportunities Baltimore County, MD

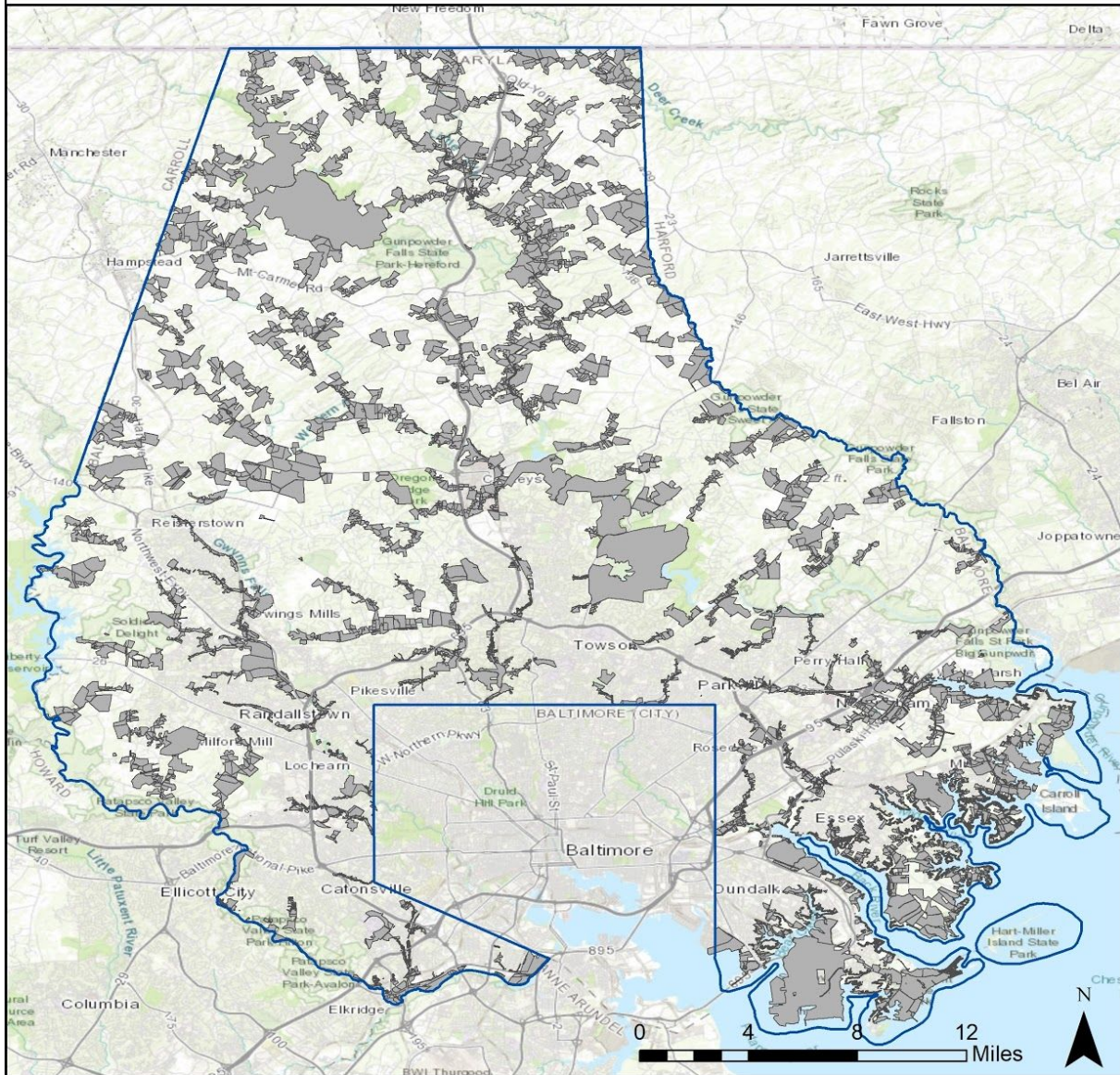


Floodplain Size: 17,918 acres
 Preserved Open Space: 7,151 acres
 Unpreserved Open Space: 9,799 acres
 Eligible OSP Credit: 578 points
 Eligible Discount: 5%

County Boundary
 Preserved Open Space
 Unpreserved Open Space
 100 Year Floodplain

Interact with this map at chesapeakeconservation.org/tools

Open Space Preservation Opportunities Baltimore County, MD



Parcels Containing

≥ 1 ac. of Unpreserved Open Space: 1,589

≥ 10 ac. of Unpreserved Open Space: 136

≥ 50 ac. of Unpreserved Open Space: 3



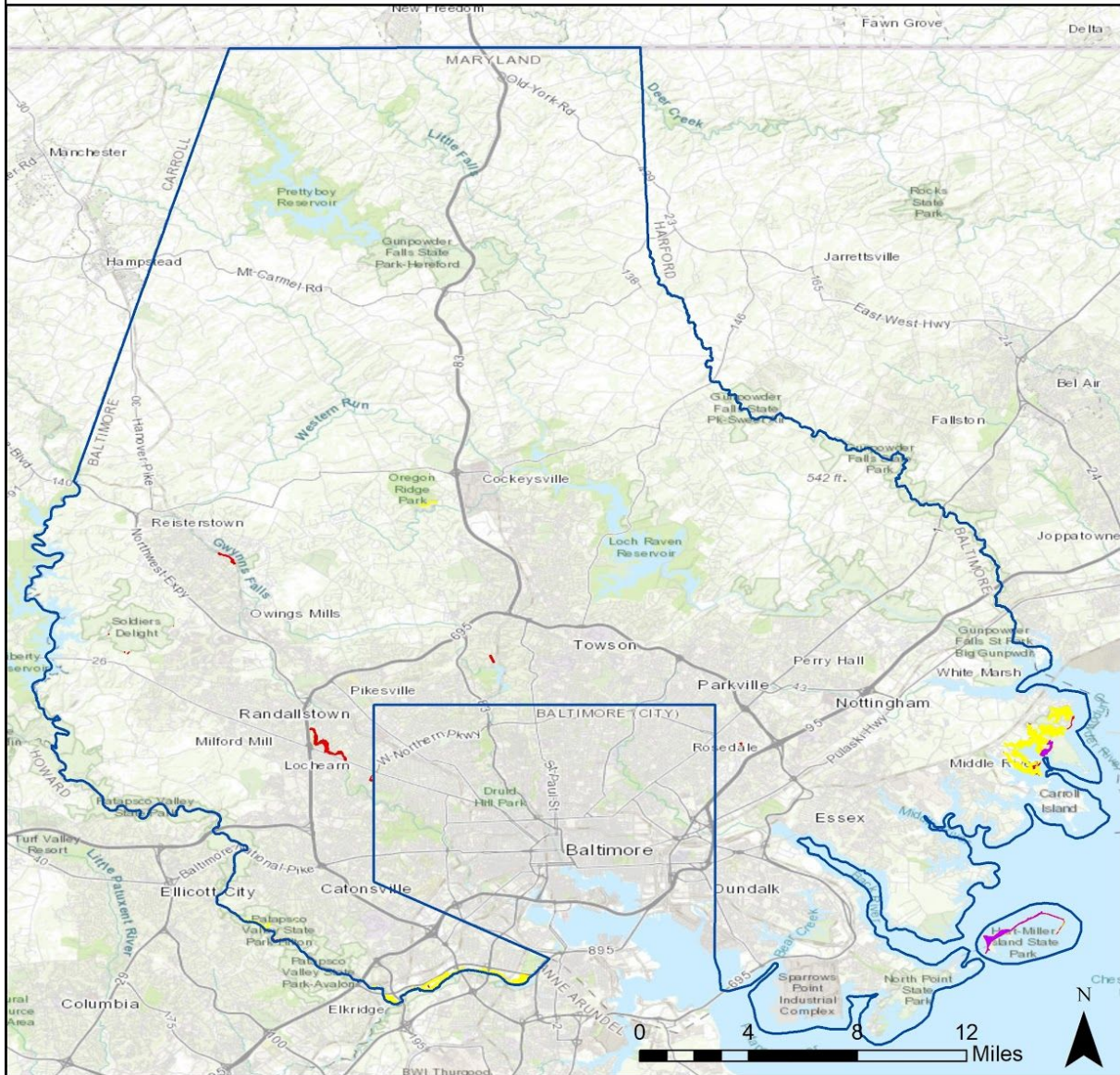
County Boundary



Parcels with Preservable
Open Space

Interact with this map at chesapeakeconservation.org/tools

Open Space Preservation Opportunities Baltimore County, MD



Preserved Open Space: 7,151 acres

Natural Functions Open Space (NFOS1): 987 acres

Critical Habitat (NFOS3): 146 acres

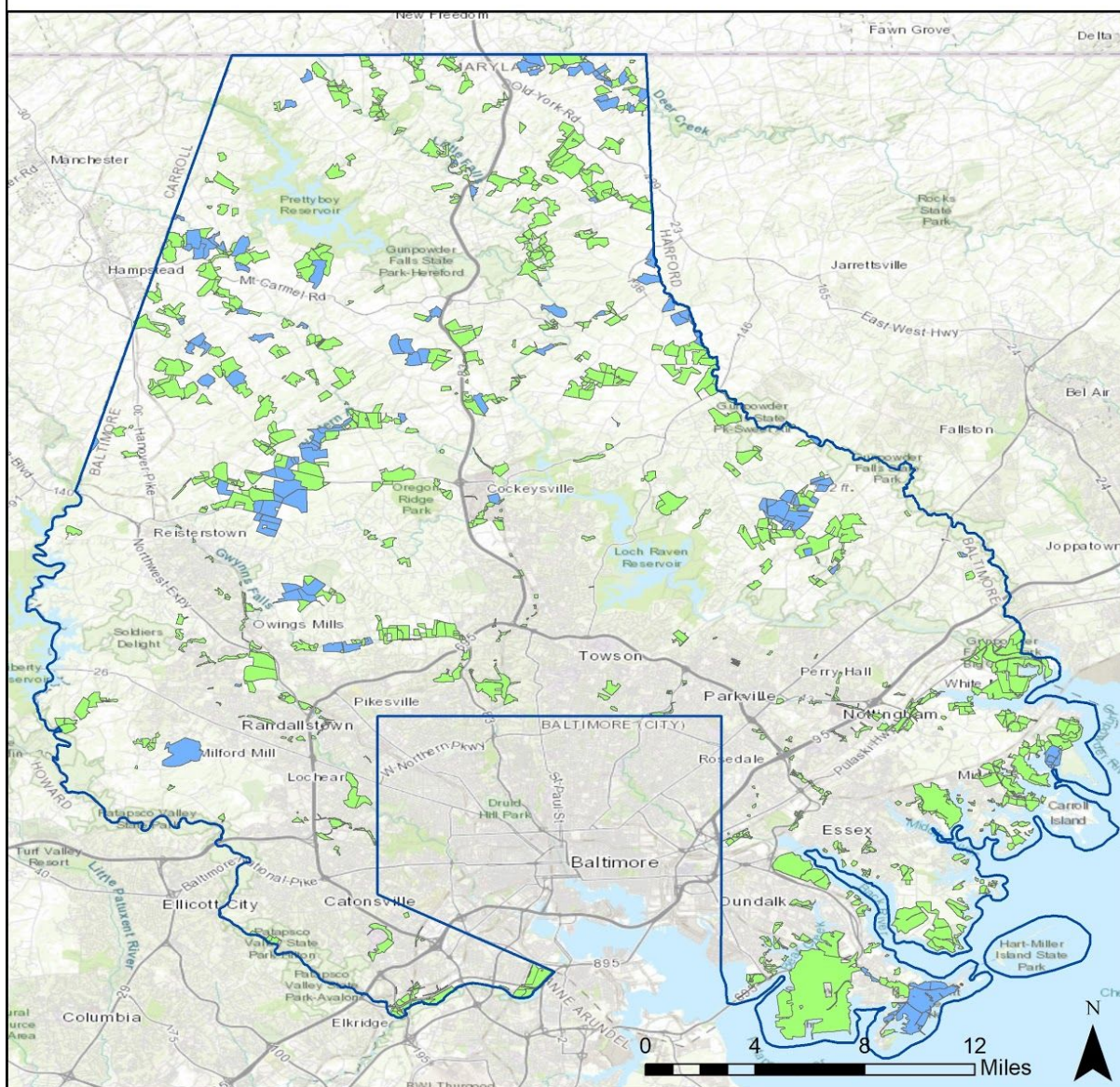
Open Space Corridor (NFOS4): 825 acres

Eligible NFOS Credit: 13 points

Interact with this map at chesapeakeconservation.org/tools

- County Boundary
- NFOS1
- NFOS3
- NFOS4
- NFOS3 & NFOS4

Best Management Practice Suitability Baltimore County, MD



Parcels Suitable for

Wetland Restoration: 108

Riparian Habitat Restoration: 971

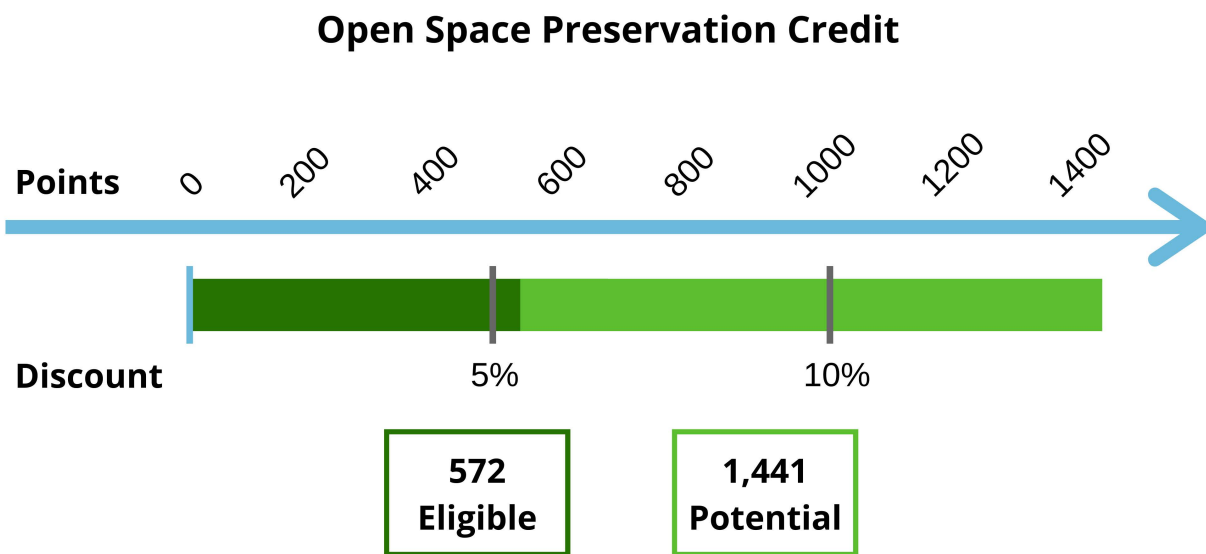
Note: All parcels suitable for wetland restoration are also suitable for riparian habitat restoration

Interact with this map at chesapeakeconservation.org/tools

- County Boundary
- Wetland Restoration
- Riparian Habitat Restoration

Charles County

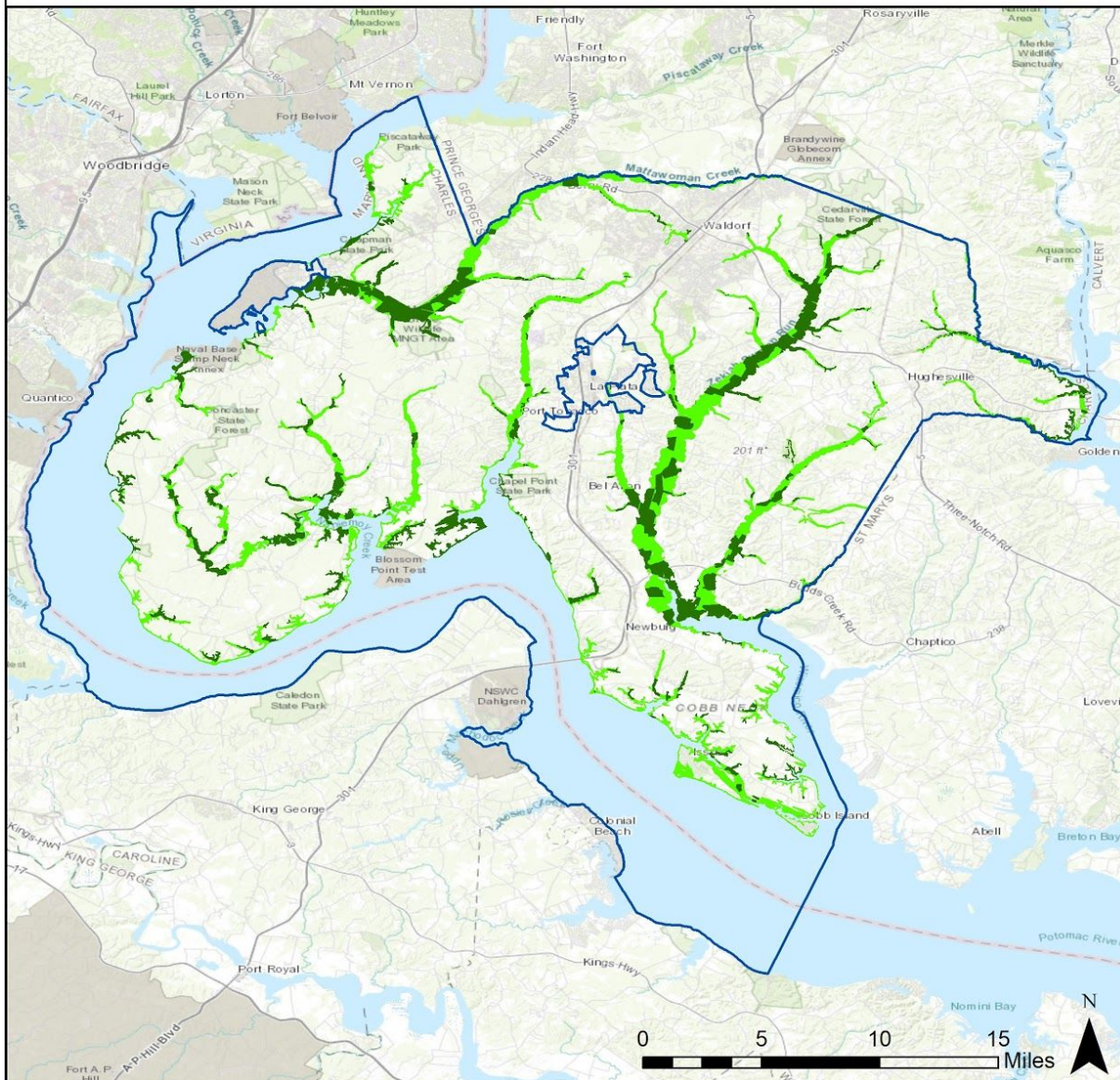
At 27,684 acres, Charles County has the largest floodplain of the 5 communities. This also suggests that Charles County has the greatest risk of flooding. Fortunately 40%, or almost 11,000 acres, of the floodplain have already been preserved, making the County eligible for a 5% discount at 572 points. The County could reach the next class by preserving an additional 8,168 acres of open space. To do this, the County could preserve a portion of the 377 parcels containing 10 acres or more of unpreserved open space.



Preserved Open Space: Cedarville State Forest^d



Open Space Preservation Opportunities Charles County, MD

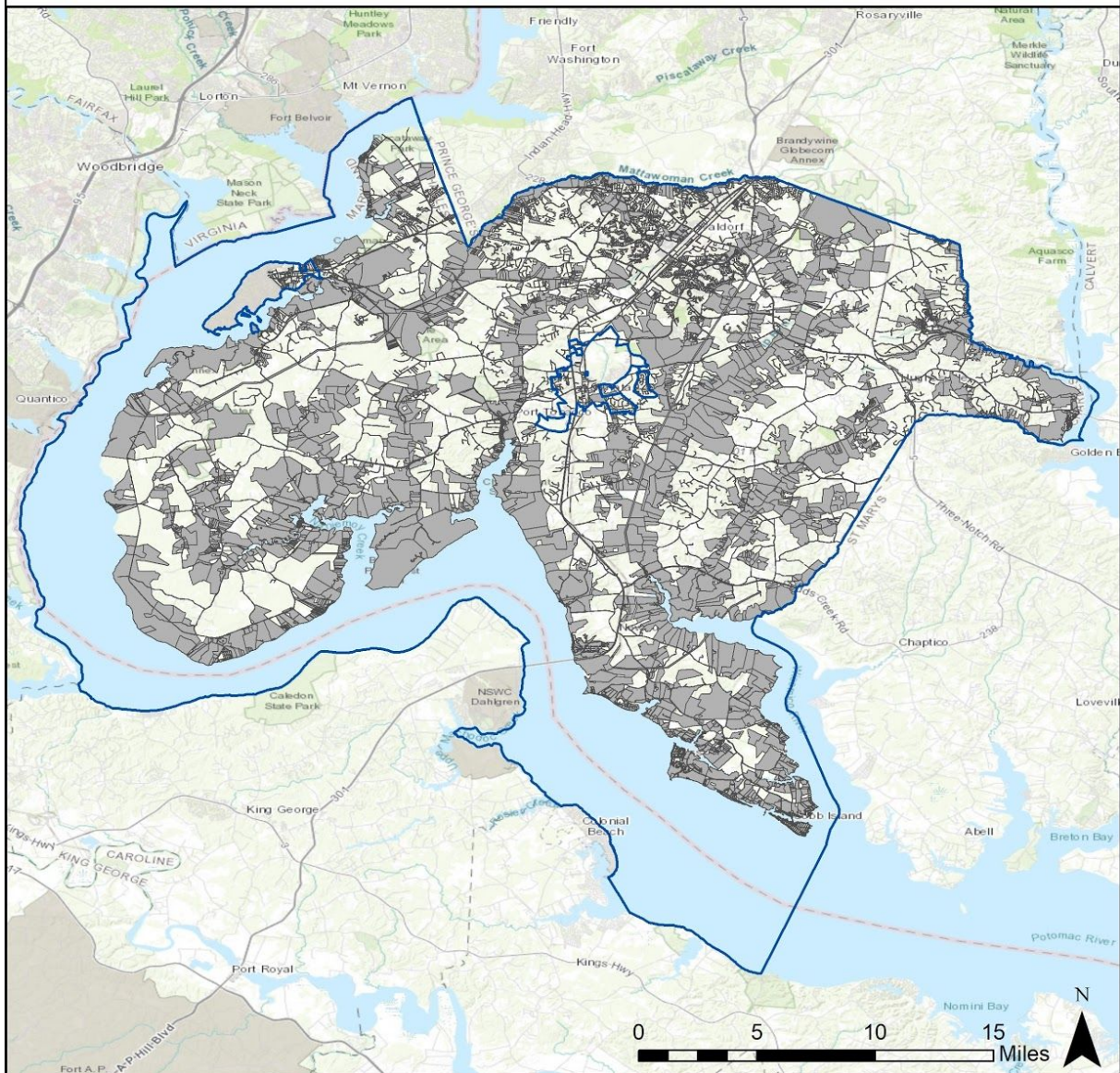


Floodplain Size: 27,684 acres
 Preserved Open Space: 10,925 acres
 Unpreserved Open Space: 16,604 acres
 Eligible OSP Credit: 572 points
 Eligible Discount: 5%

- County Boundary
- Preserved Open Space
- Unpreserved Open Space
- 100 Year Floodplain

Interact with this map at chesapeakeconservation.org/tools

Open Space Preservation Opportunities Charles County, MD



Parcels Containing

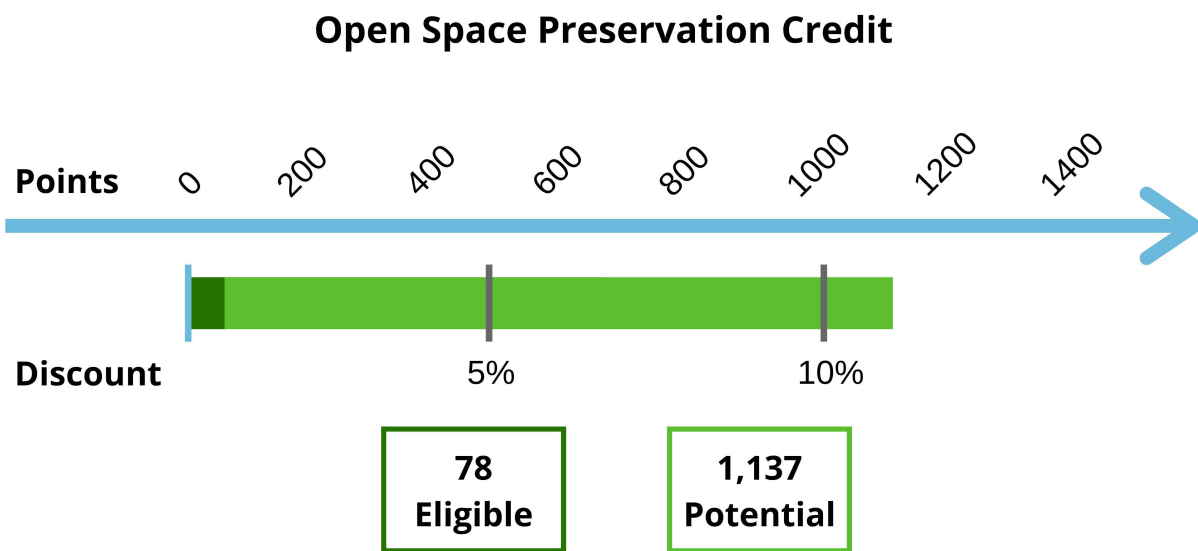
- ≥ 1 ac. of Unpreserved Open Space: 1,381
- ≥ 10 ac. of Unpreserved Open Space: 377
- ≥ 50 ac. of Unpreserved Open Space: 52

- County Boundary
- Parcels with Preservable Open Space

Interact with this map at chesapeakeconservation.org/tools

Laurel

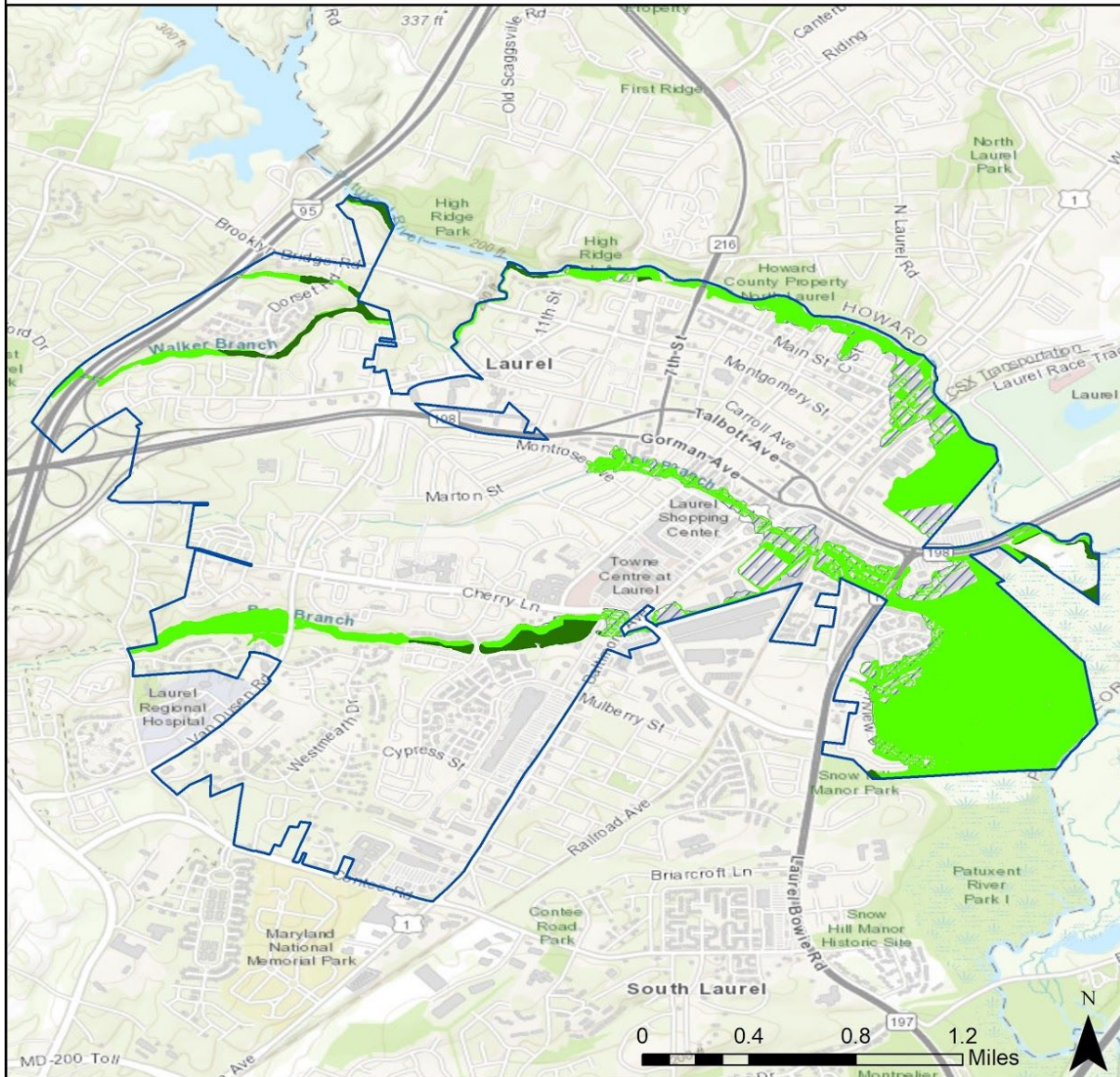
Laurel has protected 26 acres of its 476 acre floodplain, earning the City 78 points. While that constitutes only 5% of their floodplain, Laurel has a great opportunity for preserving a greater amount of open space. There are 3 properties in Laurel that account for 60% of the open space in the City's floodplain. Preserving those 3 parcels would earn the City 673 points, which is enough points for a 5% discount. There are an additional 26 properties containing at least one acre of open space which, if preserved, could bring Laurel's discount up to 10%.



Preserved Open Space: Roland B. Sweitzer Community Park ^e



Open Space Preservation Opportunities Laurel, MD

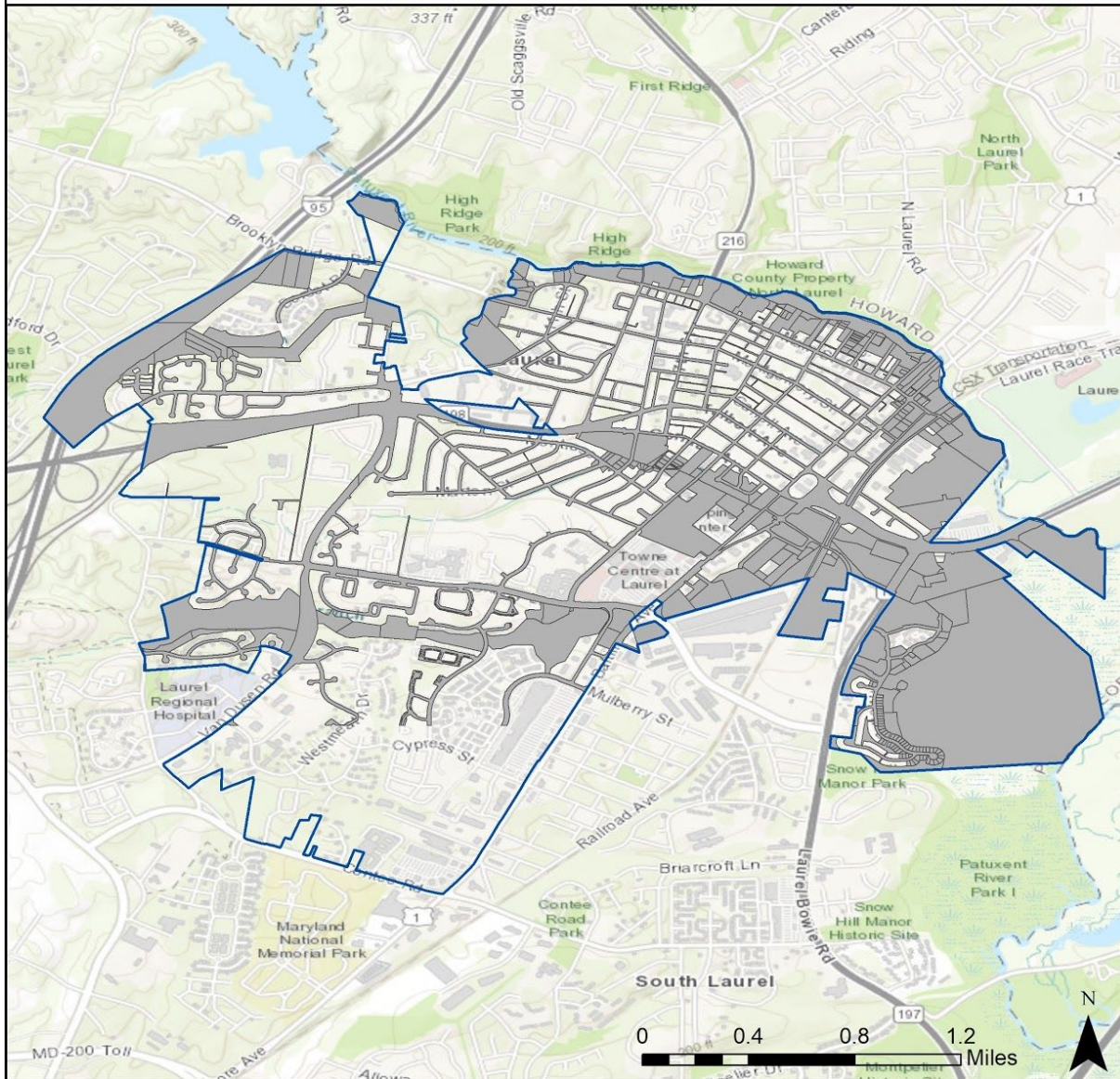


Floodplain Size: 476 acres
 Preserved Open Space: 26 acres
 Unpreserved Open Space: 348 acres
 Eligible OSP Credit: 78 points
 Eligible Discount: 0%

City Boundary
 Preserved Open Space
 Unpreserved Open Space
 100 Year Floodplain

Interact with this map at chesapeakeconservation.org/tools

Open Space Preservation Opportunities Laurel, MD



Parcels Containing

- ≥ 1 ac. of Unpreserved Open Space: 29
- ≥ 10 ac. of Unpreserved Open Space: 3
- ≥ 50 ac. of Unpreserved Open Space: 1



City Boundary

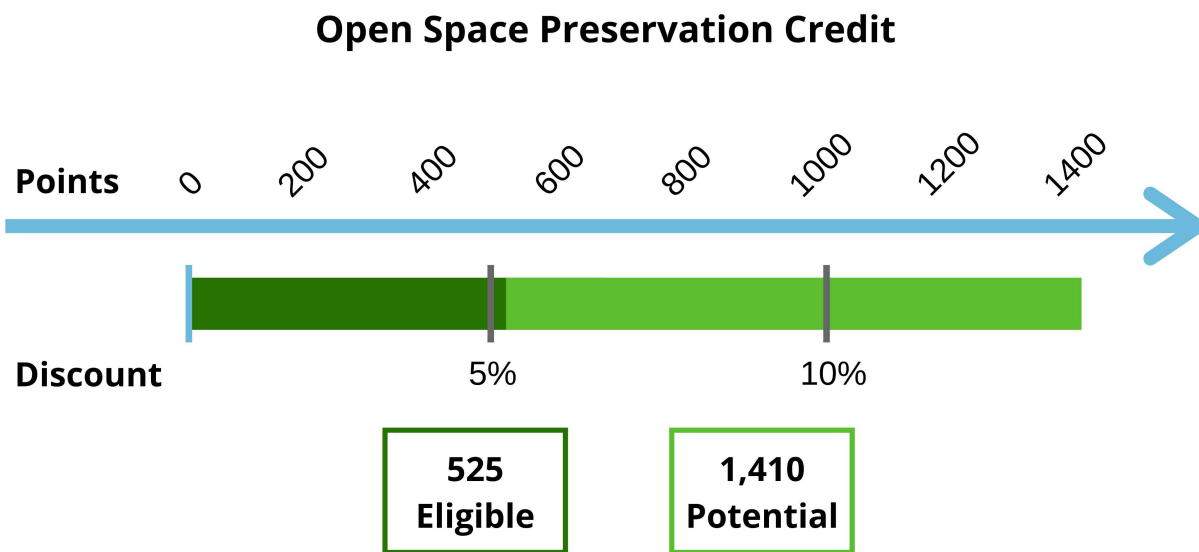


Parcels with Preservable
Open Space

Interact with this map at chesapeakeconservation.org/tools

Queen Anne's County

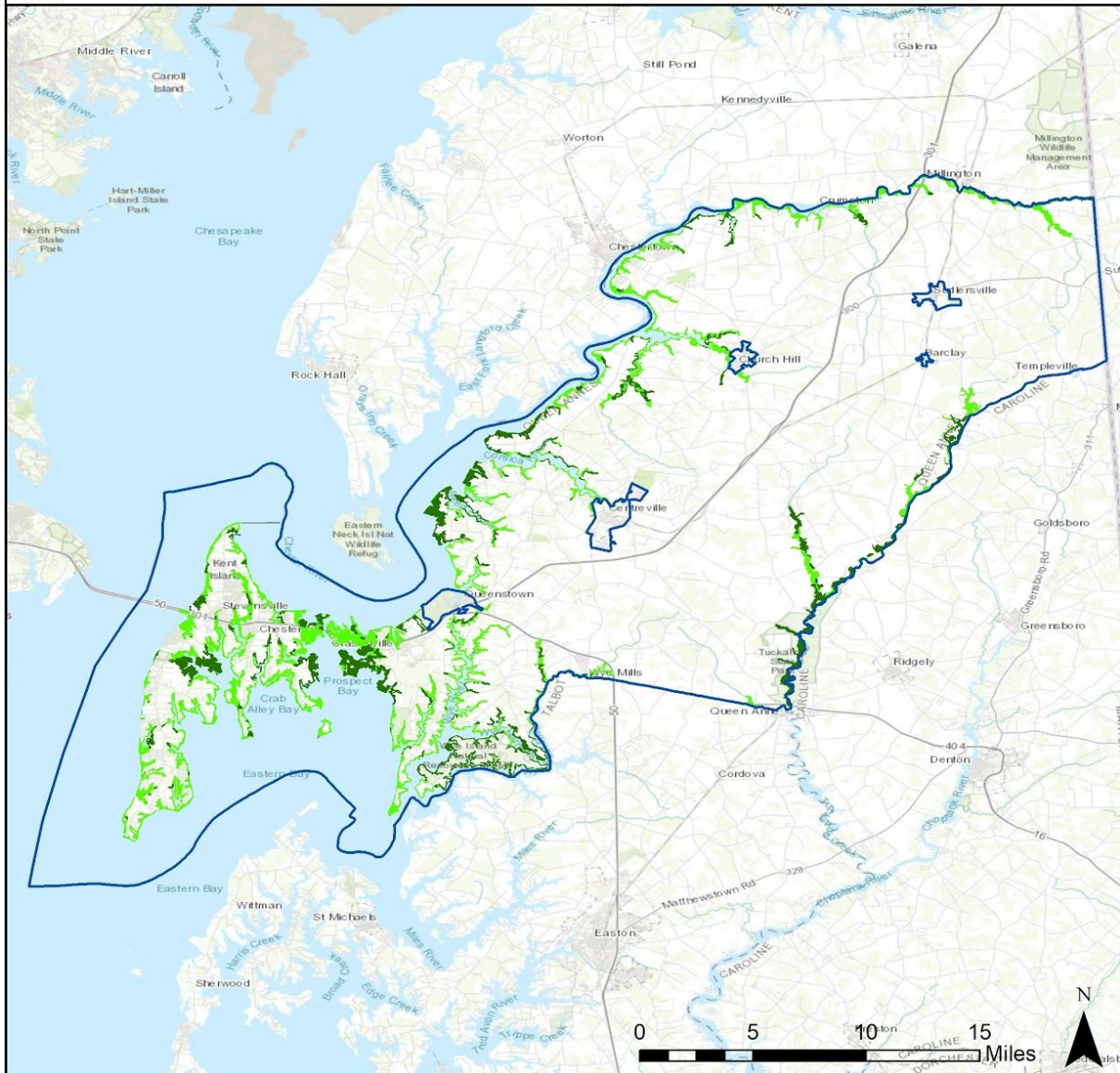
Queen Anne's County's floodplain is 12,512 acres, 36% of which is preserved as open space. Those 4,538 acres of open space qualify Queen Anne's County for 525 points, which equates to a 5% discount. Obtaining a 10% discount would require the County preserving an additional 4,091 acres. For reference, there are still 7,642 acres of unpreserved open space within the County, 3,084 acres of which are contained in 125 properties with clusters of open space that are 10 acres or larger.



Preserved Open Space: Wye Island Natural Resources Management Area ^f



Open Space Preservation Opportunities Queen Anne's County, MD

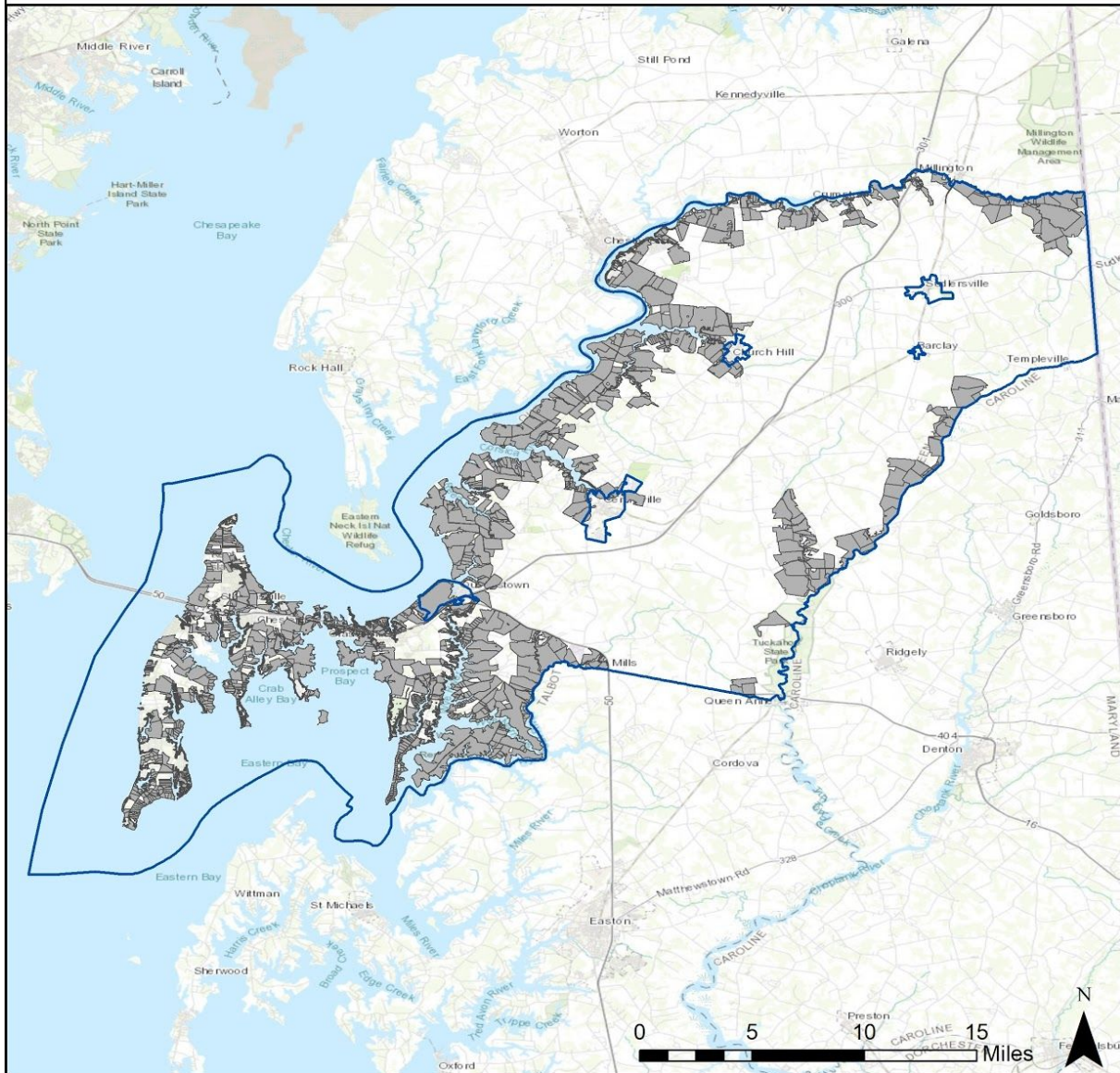


Floodplain Size: 12,512 acres
 Preserved Open Space: 4,538 acres
 Unpreserved Open Space: 7,642 acres
 Eligible OSP Credit: 525 points
 Eligible Discount: 5%

County Boundary
 Preserved Open Space
 Unpreserved Open Space
 100 Year Floodplain

Interact with this map at chesapeakeconservation.org/tools

Open Space Preservation Opportunities Queen Anne's County, MD



Parcels Containing

- ≥ 1 ac. of Unpreserved Open Space: 812
- ≥ 10 ac. of Unpreserved Open Space: 125
- ≥ 50 ac. of Unpreserved Open Space: 11

- County Boundary
- Parcels with Preservable Open Space

Interact with this map at chesapeakeconservation.org/tools

Partnering Up to Preserve Open Space

Open space preservation provides a relatively easy and sustainable method to reduce community flood risk and secure CRS flood insurance premium discounts. Even though the three counties analyzed have preserved a substantial amount of open space already, there are significant opportunities for additional open space preservation in all five of the communities. Protecting those areas requires communication and collaboration among all stakeholders. The Chesapeake Conservation Partnership can assist interested local governments in exploring possible funding sources to preserve additional parcels of land in their respective floodplains.

An interactive version of these maps is available at chesapeakeconservation.org/tools
For more information please visit chesapeakeconservation.org

Additional Resources

ASFPM Open Space Preservation Element Profile, available at
<https://www.floodsciencecenter.org/products/crs-community-resilience/element-profiles/422-a-open-space-preservation/>

FEMA CRS Factsheet and CRS Coordinator's Manual, available at
<https://www.fema.gov/national-flood-insurance-program-community-rating-system>

NOAA How to Map Open Space for Community Rating System Credit, available at
<https://coast.noaa.gov/digitalcoast/training/crs.html>

TNC Community Rating System Explorer, available at
<https://coastalresilience.org/project/community-rating-system-explorer/>

Wetlands Watch CRS Publications, available at <http://wetlandswatch.org/publications>

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