Chapter 8: Sensitive Areas

The identification and protection of sensitive areas from the adverse effects of development is a vital component of the comprehensive plan. The sensitive areas chapter will meet all requirements set forth in the Land Use Article and will discuss additional topics. Required and additional topics are presented in the following order:

- Watersheds (Groundwater, Stormwater, Drainage)
- Streams and Their Buffers
- 1 Percent Annual Chance Floodplain
- Habitats of Threatened and Endangered Species
- Steep Slopes
- Wetlands
- Agriculture
- Forests
- Chesapeake Bay Critical Area
- Sea Level Rise
- Shoreline Erosion
- Green Infrastructure (Protected Lands, Targeted Ecological Areas)
- Fisheries
- Hazard Mitigation Planning

Sensitive Areas Requirements

The Land Use Article requires jurisdictions to protect streams and their buffers; the 100-year floodplain; habitats of threatened and endangered species; and steep slopes, wetlands and agricultural and forest lands intended for resource protection or conservation."

The article also requires a fisheries element to be included for counties located on tidal waters.

Source: Maryland Department of Planning

Note: due to the abundance of maps included in this chapter, mapping products are included at the end of the chapter and are followed by goals and strategies.

Somerset County's environment is governed to a great degree by the ecology of the Chesapeake Bay. The County has over 600 miles of shoreline along the Bay and its tributaries. Almost half of the County's area is water. Most of the coastal area is marsh or wetlands, and the high-water table underlying the remaining land area places severe restraints on development. Most farmland is dependent on artificial drainage channels.

8.1 Watersheds

Land in Somerset County drains to one of ten major watersheds (or "8-digit watersheds," referring to the numeric classification system used by the Maryland Department of the Environment). These watersheds are the Big Annemessex River, Dividing Creek, Lower Chesapeake Bay, Lower Pocomoke River, Lower Wicomico River, Manokin River, Monie Bay, Pocomoke Sound, Tangier Sound, and Wicomico Creek.[1] Watersheds are shown on Map 8-1.

8.1.1 Groundwater

In Somerset County, groundwater is the sole source of drinking water, and the source of virtually all domestic and industrially consumed water. Table 8-1 summarizes water sources and other characteristics of the public

[1] *Somerset County Water Resources Element, March 2010. https://planning.maryland.gov/Documents/OurWork/compplans/10_WRE_Somerset.pdf*

drinking water systems in the County. Approximately 5,223 dwelling units in Somerset County (slightly more than half of all dwelling units in the County) and a considerable share of businesses receive drinking water from municipal, County, or community water systems.[2] All public water systems are supplied by groundwater wells.

Table 8-1.

Public Drinking Water System Characteristics		
Water System	**Source Aquifer (number of wells)**	**Source Concerns and System Issues**
Crisfield	Potomac, Paleocene, Piney Point (5 Total)	Fluoride
Princess Anne	Patapsco (1), Manokin (6)	Fluoride (Patapsco); Iron (Manokin)
Fairmount (Rumbley, Frenchtown)	Patapsco (2)	Fluoride, Iron
Midtown	Patapsco	Fluoride, Disinfection
Hill	Patapsco	Fluoride, Disinfection
Field	Patapsco	Fluoride, Disinfection
Ewell (Smith Island)	Patapsco (5)	Fluoride, Disinfection
Rhodes Point (Smith Island)	Patapsco (2)	Fluoride, Disinfection
Tylerton (Smith Island)	Patapsco (1)	Fluoride, Disinfection
Eastern Correctional Institution	Patapsco (2), Manokin (2)	Fluoride, Iron
Eden Mobile Home Park	Manokin	Iron

Source: 2008 Somerset County Water and Sewer Master Plan Notes 1: SCSD operates the systems in Princess Anne, Fairmount, and Rumbley/Frenchtown. The City of Crisfield operates its water system. The Maryland Environmental Service (MES) operates the ECI water system. All other public or community water systems in Somerset County are privately operated.

Groundwater is a critical natural resource for Somerset County. Groundwater serves as a source of drinking water and is also essential for the success of industry and agriculture. The capacity of the County's confined aquifers is increasingly strained by new development throughout the Delmarva Peninsula. According to the U.S. Geological Society (USGS), "withdrawals from Maryland Coastal Plain aquifers have caused ground-water levels in confined aquifers to decline by tens to hundreds of feet from their original levels. Continued water-level declines could affect the long-term sustainability of ground-water resources in agricultural areas of the Eastern Shore."[3]

The Somerset County Sanitary District (SCSD) and Somerset County Health Department administer the County's Groundwater Management program, which governs the protection of the County's aquifers. The program's regulations are based on the Groundwater Protection Report, which defines these Management Areas and associated requirements, and was adopted by reference into the County's 1996 Comprehensive Plan. The Groundwater Management program establishes criteria for septic tank location in three Management Zones, which were created based on the ability of the soil to accept and filter septic effluent without polluting the underlying aquifer.

To the north and east of Princess Anne in Management Area A, current regulations require a two-acre minimum area for a septic field and an adequate treatment zone of 2 to 4 feet between septic field and aquifer unless development is on a central sewer system. Management Area B1, surrounding Princess Anne to the west and extending towards Pocomoke City, requires soil borings and specially designed septic systems as a condition of development approval. The remainder of the County, Management Area B2, is subject to normal septic field testing.

[2] *Somerset County Water Resources Element, March 2010. https://planning.maryland.gov/Documents/OurWork/compplans/10_WRE_Somerset.pdf*
[3] *USGS. 2006. Sustainability of the Ground Water Resources in the Atlantic Coastal Plain of Maryland. USGS Fact Sheet 2006-3009*

8.1.2 Saltwater Intrusion

Saltwater intrusion is a significant environmental issue affecting Somerset County and the broader Eastern Shore region. The impacts of saltwater intrusion include:

1. Agricultural Impact:
    a. Saltwater intrusion renders productive land unsuitable for agricultural activities, leading to reduced crop yields and economic losses.
    b. In Somerset County, visible salt patches on farm fringes indicate the broader extent of at-risk farmlands. Between 2011 and 2017, visible salt patches almost doubled, and over 8,000 hectares of farmlands converted to marsh.[4]
    c. The economic losses due to saltwater intrusion were estimated between $39.4 million and $107.5 million annually, under 100% soy or corn counterfactuals, respectively.[5]
2. Environmental Changes:
    a. Coastal waters reaching farther inland cause changes in soil salinity and water quality, leading to permanent land loss and ecosystem alterations.
    b. Saltwater intrusion is leading to the formation of ghost forests and expansion of salt-tolerant invasive species.
3. Community and Livelihoods:
    a. Farmers on Maryland's Eastern Shore are rethinking their livelihoods as more saltwater seeps into their land due to rising sea levels.[6]
    b. The number of impacted plots in Somerset County has increased by 28.6% in recent years, with a total land value of more than $97 million affected.[7]
4. Drinking Water and Ecosystems:
    a. Saltwater intrusion threatens drinking water supplies and coastal ecosystems, impacting both human communities and wildlife habitats.
    b. On Maryland's rural Lower Eastern Shore, saltwater intrusion has led to invasive marsh species, undrinkable water, damaged forests, reduced agricultural crop yields, and salt-stressed soils.

Figure 8-1: Salt patches on a farm in Somerset County, MD, are visible as bare white streaks along the edges of cropland.
Photo Source: Jarrod Miller, bayjournal.com

[4] *https://www.nature.com/articles/s41893-023-01186-6*
[5] *Ibid.*
[6] *https://www.cbsnews.com/baltimore/news/saltwater-posing-threats-to-farmers-livelihoods-on-marylands-eastern-shore/*
[7] *Ibid.*

Efforts to mitigate these issues include research and adaptation strategies to manage the impact of saltwater intrusion on agriculture, water resources, and coastal ecosystems. It is a complex challenge that requires a multifaceted approach involving scientific research, community engagement, and policy development. Somerset County is particularly interested in thin layer placement (TLP) to mitigate the impacts that saltwater intrusion has had on agricultural land. According to National Oceanic and Atmospheric Administration (NOAA) National Centers for Coastal Ocean Science (NCCOS), thin layer placement involves depositing sediment on a marsh using either a high pressure hose to spray sediments, known as "rainbowing," or as low pressure slurry delivered through a pipe suspended above the sediment surface. These techniques are designed to emulate natural sediment deposition processes.[8]

8.1.3 Stormwater

Stormwater management is a critical environmental concern in Somerset County, as it is in many parts of the state. The primary issues stem from the need to mitigate the impacts of new development and redevelopment activities that introduce impervious surfaces like rooftops, paved streets, and parking lots. These surfaces prevent rainwater from soaking into the ground, leading to increased runoff volume that is funneled into storm drains and discharged into streams and rivers.

To address these challenges, Maryland has implemented stormwater best management practices (BMPs) designed to reduce the amount and velocity of runoff, control pollutants, and prevent local flooding. The state's approach has evolved over time, with the Stormwater Management Act of 2007 emphasizing Environmental Site Design (ESD). ESD aims to capture and treat runoff closer to the source to more closely mimic natural hydrology.

The Maryland Department of the Environment (MDE) is in the process of updating its stormwater management regulations, through the A-StoRM initiative, in an effort to mitigate the effects of stormwater runoff and flooding. These updated design standards and performance criteria will utilize new rainfall data, such as NOAA's Atlas 14 model, to develop effective Best Management Practices (BMPs) to address current and future stormwater management requirements. The County will utilize the new regulations and criteria to inform an updated Stormwater Management Ordinance.

Local options in stormwater management include code changes to require stormwater management reviews before obtaining building permits, maintenance agreements for stormwater solutions, and the creation of long-term plans to address stormwater issues. These measures are part of a broader strategy to ensure that stormwater management in Somerset County effectively protects the environment and the well-being of its residents. Somerset's Stormwater Management Ordinance was last updated September 15, 2020.

Somerset County's Nuisance Flooding Plan, adopted in December of 2019, addresses stormwater impacts and best management practices. The plan catalogues and maps locations of roadways and bridges that experience repetive flooding due to poor stormwater management and other issues.

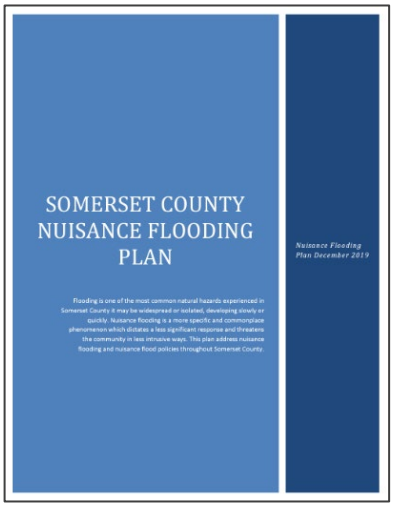

Figure 8-2: Cover of Somerset County Nuisance Flooding Plan, 2019.

[8] *Davis, J., Currin, C., and Mushegian, N. 2022. Effective use of thin layer sediment application in Spartina alterniflora marshes is guided by elevation-biomass relationship. Ecological Engineering, 177; 106566. https://doi.org/10.1016/j.ecoleng.2022.106566*

Recommendations in the nuisance flooding plan include structural and nonstructural strategies to reduce nuisance flooding associated with stormwater, including:[9]

Structural:

- Improve stormwater management infrastructure to convey water more effectively from flood-prone areas.
- Conduct regular maintenance of drainage and stormwater control systems.
- Consider green infrastructure options rather than conventional stormwater solutions.

Nonstructural:

- Improve stormwater management planning and strengthen policies to reduce runoff

8.1.4 Drainage

Somerset County is drained by streams and their tributaries that flow into Tangier Sound in the West and Pocomoke Sound to the South. Most of the county is drained by the Pocomoke, Wicomico, Manokin, and Big Annemessex Rivers and their tributaries. Most of the creeks and large rivers are tidal for several miles from their mouth. The Manokin River is tidal as far as Princess Anne.

Because the county is low-lying with fine grained soils, natural drainage is impeded. Only about 10 percent of the county has soil that drains well enough that they can be farmed without artificial drainage. Consequently, to permit human activities in the county, historically there has been much artificial drainage, including stream channelization and construction of drainage ditches. There are four public drainage associations in the county (including one public watershed association). However, most of the drainage ditches are privately owned.

In the past, some residential developments have been approved in the county without adequate drainage provisions. This may result in standing water on low lying properties and roadways.

The Department of Public Works is responsible for the County's Solid Waste & Drainage Division Strategic Plan, which was last updated in 2017. The Solid Waste & Drainage Division is responsible for improving drainage throughout the County. The division's mission as it relates to drainage is to provide a safe, efficient, and comprehensive drainage system to promote economic development while protecting Somerset County's beautiful and unique environment. The plan identifies local knowledge of environmental permitting process for drainage projects as a strength, and flat terrain and high groundwater and hydric soils as a hindrance to properly draining soils in the county. Cooperation with Mosquito Control has been identified as an opportunity to improve drainage.

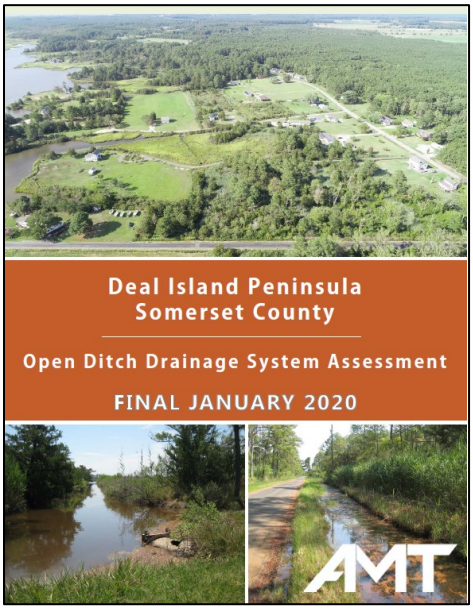

Figure 8-3: Cover of Deal Island Peninsula Open Ditch Drainage System Assessment.

The Open Ditch Drainage System Assessment[10] completed in 2020 for the Deal Island Peninsula addressed the existing conditions of the open ditch drainage system on the peninsula and provided both short and

[9] *Somerset County, Maryland. 2019. Somerset County Nuisance Flooding Plan. https://www.somersetmd.us/P&Z/Nuisance Flooding Plan %5b2019%5d.pdf*
[10] *A. Morton Thomas & Associates, Inc. 2020. Deal Island Peninsula Somerset County Open Ditch Drainage Assessment. https://www.somersetmd.us/*

long term recommendations for maintenance improvements and conceptual mitigation measures with accompanying cost evaluations to improve the drainage system conditions on the Island.

Fifteen recommendations were provided based on existing conditions for multiple study areas throughout the areas of Dames Quarter and Oriole. The assessment concluded that if the open ditch drainage system is left unattended, standing water and flooding conditions will continue to escalate within the Deal Island Peninsula communities of Dames Quarter and Oriole. This area, with the addition of Oriole, was also identified as an area of concern within the Flood Mitigation Plan. This area has been identified to be susceptible to multiple flood hazards, such as hurricane storm surge, the 1-percent-annual-chance flood, and sea level rise.

The Smith Island Vision Plan was developed to create a vision for the island that consists of goals such as (1) growing a sustainable watermen's culture, (2) creating a diverse local economy, (3) developing and maintaining infrastructure (4) providing reliable and sustainable transportation, and (5) growing year-round population.

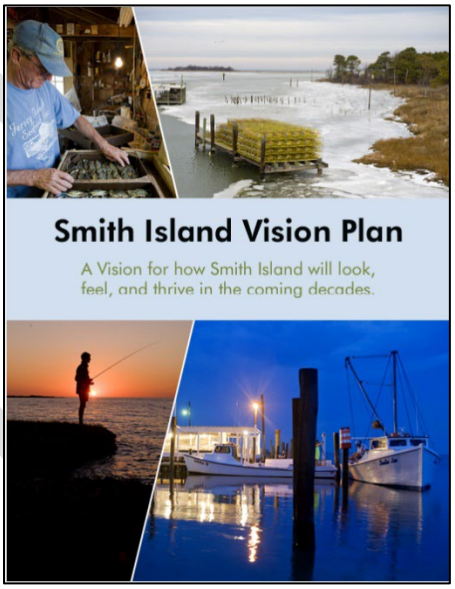

Figure 8-4: Cover of Smith Island Vision Plan.

In relation to developing and maintaining infrastructure on the island, the vision plan recommends projects related to shoreline protection, wastewater disposal, stormwater management, drainage ditch maintenance, potable water supply, increasing communication access, and mitigating repetitively flooded roadways and bridges from heavy storms. Local capabilities are established in terms of strengths and weaknesses for each of the goals outlined within the plan.

8.2 Streams and Their Buffers

Somerset County contains a variety of streams that provide support for various kinds of wildlife that rely on stream life. Streams also support commercial and recreational activities such as fishing, hunting, canoeing, and birdwatching. For long term sustainability of these streams, it is important to focus on water quality. These streams are depicted on Map 8-2.

Stream buffers are areas along the lengths of stream banks established to protect streams from man-made disturbances. Buffers are a "best management technique" that reduces sediment, nitrogen, phosphorus, and other pollutants by acting as a filter, thus minimizing damage to streams and improving water quality. Stream buffers also improve habitat for fish and other aquatic life.

Development near streams and their buffers may pose a threat to the protection of private property and the environment. In order to protect the ecological sustainability of the riparian environment it is important to emphasize mitigation strategies regarding runoff from developed areas.

The Maryland Department of the Environment (MDE) Water Quality Assessment Report[11] classifies water quality conditions in the state's watersheds as Excellent, Good, Fair, and Poor. Water quality in Somerset County's River basins is classified as generally "Good" and suited for water contact recreation and aquatic life. Seasonal elevated bacterial and nutrient levels in some locations were due to agricultural runoff. Increased bacterial levels in open tidal water areas were often found to be natural in origin due to marsh runoff.

[11] *Maryland Department of the Environment. 2022. Maryland's Final Combined 2020-2022 Integrated Report of Surface Water Quality. Maryland Department of the Environment. https://mde.maryland.gov/programs/Water/TMDL/Integrated303dReports/Pages/Combined_2020_2022IR.aspx*

The Maryland Tributary Strategies initiative resulted from the 1983 Chesapeake Bay Agreement to restore the Chesapeake Bay. The Tributary Strategies describe ways in which nutrient pollution loads can be reduced by 40 percent in many sub-watersheds that drain into the Bay. Somerset County is in the Lower Eastern Shore Watershed. Sub watersheds in Somerset County include the Nanticoke and the Pocomoke. According to the 1995 Tributary Strategies, the Lower Eastern Shore Watershed has sufficient dissolved oxygen levels in most places to support fish, shellfish, and other animals, although one consistent exception is the Pocomoke Sound. In the Sound the low oxygen levels are seasonal, particularly in the summer, but rarely drop below five milligrams per liter. Pocomoke Sound, Tangier Sound, and the Big Annemessex River have among the lowest nitrogen levels of all tidal tributary streams in Maryland.

According to the Maryland Tributary Strategies, nutrient reduction goals can be achieved through the following actions: wastewater treatment plant upgrades; full implementation of erosion, sediment control, and stormwater management programs; reduction of forest loss; and implementation of other nonpoint source pollution control efforts. The Princess Anne wastewater treatment plant is seeking a Wastewater Treatment Plant Enhanced Nutrient Removal Upgrade for $6 million. Bids are expected in Spring of 2024. The City of Crisfield has the following wastewater projects underway:

- **Inflow and Infiltration (I & I).** I & I involves cleaning, televising, and lining sewer pipes as needed to repair pipes that have become porous and are allowing too much ground water to enter, impacting the processing of sewage at the City's wastewater treatment plant. The contractor Standard Pipe Services are completing this project out of Newark, Delaware. There are only a few sewer lines remaining to clean and line. It is anticipated the project will be completed by December 31, 2024. This project is funded by MDE & the United States Department of Agriculture (USDA) loans and forgivable loans for a total of $684,252.

Streams are generally adequately protected in Somerset County under the following existing programs:

- State law requires a minimum 25-foot undisturbed buffer around all non-tidal wetlands.
- Forest Conservation Ordinance requires a stream buffer 50 feet from the top of the stream bank.
- Within the Chesapeake Bay Critical Area (approximately 42 percent of the county) regulations require a 100-foot undisturbed buffer along all tidal waters, tidal wetlands and tributary streams.
- Timber harvest operations within forested areas require a sediment and erosion control plan with, typically, a 50-foot uncut buffer strip along water courses, or a buffer management plan. Logging within the buffer is permitted only in accordance with a buffer management plan.
- For agricultural land, the County's Chesapeake Bay Critical Area program requires a minimum 25-foot filter strip along streams or wetlands, or functional equivalent through best management practices. There is no required buffer for agricultural land outside the Chesapeake Bay Critical Area. However, farmers are encouraged to adopt Soil Conservation and Water Quality Plans. The Somerset Soil Conservation District estimates that adequate stream buffers are currently being provided on between 50 - 75 percent of farmland in the County. The level of participation in the voluntary program is expected to rise through other programs such as the conservation Reserve Program, and the Water Quality Incentive Program.

A 1990 Anadromous Fish Survey of Somerset County Streams recommended the following measures to encourage anadromous fish spawning: minimum 25- to 50-foot vegetated buffers along streams; limitations on concrete or riprap along stream channels; prohibition on construction or maintenance within the stream during the spawning season (March 1 through June 15); and prohibition on the blockage or diversion of streams.

According to the Somerset Soil Conservation District, buffers would be the most important of the above measures because concrete or riprap are seldom used in Somerset County in upper stream areas, and there is little or no stream blockage or diversion.

Regarding the recommendations by the Anadromous Fish Survey, the County's Zoning Ordinance requires that the stream buffer meet these recommendations in the following ways:

- The stream buffer "shall be whichever of the following is wider: a) the 25 feet minimum undisturbed buffer required around non-tidal wetlands under State regulations, or b) the 50 feet minimum buffer required from the top of the stream bank under the County Forest Conservation Ordinance."
- "The buffer shall be maintained in vegetation, and should be planted as needed to result in canopy trees and thick understory vegetation.[12]

The Zoning Ordinance does not prohibit construction or maintenance within the stream during the spawning season, nor does it prohibit the blockage or diversion of streams.

Maintenance of ditches and channelized streams is necessary to permit human activities in Somerset County. On occasion, maintenance may be necessary during the Spring, coinciding with the anadromous fish spawning season. Construction or maintenance of streams or drainage ditches during the spawning season is not allowed under the Public Drainage Association regulations without a permit. However, since many drainage ditches are privately owned and not covered by these regulations, the proposed county wide drainage ordinance should include provisions describing when and under what circumstances maintenance would be permitted.

8.3 Special Flood Hazard Area (FEMA Flood Zones)

The 1-percent annual chance flood zone, also referred to as the 100-year floodplain, is used to describe the recurrence intervals of floods. This means that a flood of similar magnitude to that of past occurrences has a one percent chance of occurring in any given year. In other words, the chances that a river will flow as high as the 100-year flood stage this year is 1 in 100.[13] FEMA flood zones are described in more detail in Table 8-2. These zones are mapped for Somerset County on Map 8-3.

Table 8-2.

FEMA Flood Zones	
Flood Zone	**Description**
SFHA - High Risk Areas	
1% Annual Chance Flood Hazard (Zones A, AE & VE)	Areas with a 1% annual chance of flooding and a 26% chance of flooding over the life of a 30-year mortgage. Because detailed analyses are not performed for such areas; no depths or base flood elevations are shown within these zones.
	Areas with a 1% annual chance of flooding and a 26% chance of flooding over the life of a 30-year mortgage. Base flood elevations derived from detailed analysis are provided. AE Zones are now used on new format FIRMs instead of A1 -A30 Zones.
	Coastal areas with a 1% or greater chance of flooding and an additional hazard associated with storm waves. These areas have a 26% chance of flooding over the life of a 30-year mortgage. Base flood elevations derived from detailed analyses are shown at selected intervals within these zones.
Moderate Risk Areas	

[12] *Jesien, Roman. 1990. Anadromous Fish Survey of Somerset County Streams : Final Report. https://repository.library.noaa.gov/view/noaa/2097*
[13] *www.usgs.gov/special-topics/water-science-school/science/100-year-flood#:~:text=The%20term%20%22100%2Dyear%20flood%22%20is%20used%20to%20describe,year%20is%201%20in%20100.*

FEMA Flood Zones	
Flood Zone	**Description**
0.2% Annual Chance Flood Hazard (Zone X shaded)	Areas outside the 1% annual chance floodplain, areas of 1% annual chance sheet flow flooding where average depths are less than 1 foot, areas of 1% annual chance stream flooding where the contributing drainage area is less than 1 square mile, or areas protected from the 1% annual chance flood by levees. No Base Flood Elevations or depths are shown within this zone. Insurance purchase is not required in these zones.
Minimal Risk Areas	
Zone X (Unshaded)	Area of minimal flood hazard, usually depicted on FIRMs as above the 500-year flood level. Zone X is the area determined to be outside the 500 -year flood and/or protected by levee from 100-year flood.

Source: FEMA – Definitions of FEMA Flood Zone Designations.

A large portion of western Somerset County lies within the 1-percent annual chance floodplain. The floodplain covers a larger land area than the Chesapeake Bay Critical Area. Most floodplain in the county is tidal. The tidal 1-percent floodplain is the land along or adjacent to tidal waters that is susceptible to inundation by the 1-percent annual chance flood generated by coastal or tidal flooding due to high tides, hurricanes, or steady on-shore winds. Less than 30 square miles of the County are within the Coastal High Hazard Area, as compared to nearly 180 square miles that are within the Special Flood Hazard Area (SFHA) There are small areas of non-tidal or riverine floodplain along streams above the head of tide. The non-tidal 1-percent annual chance floodplain is the land adjacent to non-tidal streams and bodies of water that is susceptible to inundation by flood water as a result of rainfall and runoff from upland areas.

The Coastal Barrier Resource Act of 1982 established the Coastal Barrier Resource System (CBRS). The result was to prohibit issuance of new Federal flood insurance coverage for any new construction or substantially improved structures located on undeveloped coastal barriers. The Act was expanded in 1990, with several boundary revisions adopted subsequently. Most of the CBRS in Somerset County is marsh and not inhabited. However, there are existing homes on fringe areas, notably in Dames Quarter, Deal Island, and Sound Shore on the Pocomoke Sound near Fair Island Canal. Other portions of the CBRS include St. Pierre Island on the Manokin north of Fairmount; south of Fairmount; east of Crisfield, including Lawson and Crisfield Marsh southwest of Daughtery Creek; Marsh Island, Jones Island, and Cedar Island, as well as the Martin National Wildlife Refuge on Smith Island, Little Deal Island and Hazard Point Island.

According to the U.S. Fish and Wildlife Service, a 2019 study published in the Journal of Coastal Research analyzed the economic benefits from CBRA and found that CBRA reduced federal coastal disaster expenditures by $9.5 billion between 1989 and 2013, and forecasts that additional savings will range between $11 and $108 billion by 2068.[14]

8.3.1 Floodplain Management

The County's Floodplain Management Ordinance (1084) was recently amended and made effective as of December 2023. The County's Department of Technical and Community Services is responsible for floodplain management activities in the county which includes issuing permits for proposed development in the SFHA. New development/subdivision lots are probihited within the SFHA, unless it is demonstrated that new structures cannot be located out of the floodplain. These structures shall be designed in accordance with the floodplain ordinance. Currently, the county's flood protection elevation is the base flood elevation (BFE) plus one foot of freeboard in A Zones; in Coastal Zones (V and Coastal A), the regulation is one foot above BFE.

[14] *Andrew S. Coburn and John C. Whitehead "An Analysis of Federal Expenditures Related to the Coastal Barrier Resources Act (CBRA) of 1982," Journal of Coastal Research 35(6), 1358-1361, (15 March 2019). https://doi.org/10.2112/JCOASTRES-D-18-00114.1*

Note: the Maryland Model Floodplain Management Ordinance recommends flood protection of BFE plus three feet.

8.4 Habitats of Threatened and Endangered Species

The primary Maryland law that governs the legal listing of threatened and endangered species is the Nongame and Endangered Species Conservation Act (Annotated Code of Maryland 10-2A-01), enacted in 1975. The Act is supported by regulations (Code of Maryland Regulations, COMAR 08.03.08) that define listing criteria for endangered, threatened, in need of conservation, and endangered extirpated species; lists the species included in each category; establishes the purpose and intent of research and collection permits; and lists prohibited activities. Maryland regulations may be found online.

The Maryland Natural Heritage Program tracks the status of over 1,250 native plants and animals that are among the rarest in Maryland and most in need of conservation efforts as elements of our State's natural diversity. Of these species, the Maryland Department of Natural Resources officially recognizes 566 species and subspecies as endangered, threatened, in need of conservation, or endangered extirpated. Only 39, or 7% of the total tracked species, are listed by the U.S. Fish and Wildlife Service as nationally endangered or threatened.

Federal and State laws have been put in place to protect the habitats of threatened and endangered species. Somerset County has primary regulatory authority over most development activity as it relates to potentially effected habitats. This means the County plays a key role in ensuring property owners comply with Federal and State laws.

Threatened and Endangered Species Definitions

Threatened Species: means any species of flora or fauna which appears likely, within the foreseeable future, to become endangered including any species determined to be a "threatened species" pursuant to the federal Endangered Species Act of 1973, 16 U.S.C. §§1531-1543.

Endangered Species: means any species whose continued existence as a viable component of the State's flora or fauna is determined to be in jeopardy including any species determined to be an "endangered species" pursuant to the federal Endangered Species Act of 1973, 16 U.S.C. §§1531-1543.

Source: COMAR 08.03.08

Table 8-3 lists endangered animals residing within Somerset County along with their scientific name, common name, state rank, state status, and federal status.

Table 8-3.

List of Endangered Animal Species in Somerset County, MD				
Scientific Name	**Common Name**	**State Rank**	**State Status**	**Federal Status**
Acantharchus Pomotis	Mud Sunfish	S3	-	-
Ambystoma Tigrinum	Eastern Tiger Salamander	S1	E	-
Ammospiza Caudacuta	Saltmarsh Sparrow	S2B,S1N	I	-
Botaurus Lentiginosus	American Bittern	S1B	T	-
Callophrys Hesseli	Hessel's Hairstreak	SH	X	-
Circus Hudsonius	Northern Harrier	S2B	I	-
Cistothorus Platensis	Sedge Wren	S1B	E	-

List of Endangered Animal Species in Somerset County, MD				
Scientific Name	**Common Name**	**State Rank**	**State Status**	**Federal Status**
Egretta Caerulea	Little Blue Heron	S3B	-	-
Enneacanthus Obesus	Banded Sunfish	S3,S4	-	-
Etheostoma Fusiforme	Swamp Darter	S3	-	-
Falco Peregrinus Anatum	American Peregrine Falcon	S2B	I	-
Fundulus Luciae	Spotfin Killifish	SU	-	-
Gallinula Galeata	Common Gallinule	S2,S3B	I	-
Gastrophryne Carolinensis	Eastern Narrow-Mouthed Toad	S2,S3	E	-
Habroscelimorpha Dorsalis	Eastern Beach Tiger Beetle	S1	E	LT
Haliaeetus Leucocephalus	Bald Eagle	S3,S4	-	-
Ischnura Kellicotti	Lilypad Forktail	S3,S4	-	-
Ixobrychus Exilis	Least Bittern	S2,S3B	I	-
Laterallus Jamaicensis	Black Rail	S1	E	LT
Limnothlypis Swainsonii	Swainson's Warbler	S1B	E	-
Podilymbus Podiceps	Pied-Billed Grebe	S2,S3B	-	-
Porzana Carolina	Sora	S2B	-	-
Problema Bulenta	Rare Skipper	S1	T	-
Pterourus Palamedes	Palamedes Swallowtail	S1	E	-
Rynchops Niger	Black Skimmer	S1B	E	-
Sternula Antillarum	Least Tern	S2B	T	-

Note: State Status: (E) Endangered, (I) In Need of Conservation, (T) Threatened, Federal Status: LT (Threatened)
Explanation of Rank and Status Codes

Source: https://dnr.maryland.gov/wildlife/Documents/Somerset_County_RTEs.pdf

Table 8-4 lists endangered plant species living within Somerset County along with their scientific name, common name, state rank, state status, and federal status.

Table 8-4.

List of Endangered Plant Species in Somerset County, MD				
Scientific Name	**Common Name**	**State Rank**	**State Status**	**Federal Status**
Aeschynomene Virginica	Sensitive Joint-Vetch	S1	E	LT
Alnus Maritima	Seaside Alder	S3.1	-	-
Ammannia Latifolia	Koehne Ammannia	S2	-	-
Axonopus Furcatus	Big Carpetgrass	S2	-	-
Bidens Mitis	Small-Fruit Beggarsticks	S1	E	-
Bidens Trichosperma	Tickseed Sunflower	S3,S4	-	-
Boltonia Asteroides Var. Glastifolia	Aster-Like Boltonia	S1	E	-
Cardamine Longii	Long's Bittercress	S2	E	-
Carex Bullata	Button Sedge	S3	-	-
Carex Gigantea	Giant Sedge	S3	-	-
Carex Hyalinolepis	Shoreline Sedge	S2,S3	-	-
Carex Joorii	Joor's Sedge	S3	-	-
Carex Mitchelliana	Mitchell's Sedge	S2	-	-
Chamaecyparis Thyoides	Atlantic White Cedar	S3	-	-
Cirsium Horridulum	Yellow Thistle	S3	-	-
Desmodium Laevigatum	Smooth Tick-Trefoil	S3	-	-
Diphasiastrum Tristachyum	Deep-Root Clubmoss	S3	-	-
Dryopteris Celsa	Log Fern	S3	-	-
Dryopteris Clintoniana	Clinton's Woodfern	S1	E	-
Eleocharis Albida	White Spikerush	S2,S3	-	-

List of Endangered Plant Species in Somerset County, MD				
Scientific Name	**Common Name**	**State Rank**	**State Status**	**Federal Status**
Geranium Robertianum	Herb-Robert	S1	-	-
Hypericum Adpressum	Creeping St. John's-Wort	S1	E	-
Hypericum Gymnanthum	Clasping-Leaf St. John's-Wort	S3	-	-
Lechea Maritima	Virginian Beach Pinweed	S3	-	-
Linum Intercursum	Sandplain Flax	S2	T	-
Lobelia Elongata	Elongated Lobelia	S3	-	-
Ludwigia Glandulosa	Cylindric-Fruit Seedbox	S3	-	-
Mecardonia Acuminata	Purple Mecardonia	S2	E	-
Oldenlandia Uniflora	Clustered Bluets	S3	-	-
Paspalum Dissectum	Walter's Paspalum	S2	T	-
Persea Palustris	Red Bay	S1	E	-
Platanthera Cristata	Crested Yellow Orchid	S3	-	-
Polygala Cruciata	Crossleaf Milkwort	S2	T	-
Polygonum Glaucum	Seabeach Knotweed	S1	E	-
Potamogeton Foliosus	Leafy Pondweed	S2	-	-
Rhynchospora Glomerata	Clustered Beakrush	S3	-	-
Saccharum Contortum	Bent-Awn Plume Grass	S3,S4	-	-
Sagittaria Engelmanniana	Engelmann's Arrowhead	S2	T	-
Scleria Reticularis	Reticulated Nutrush	S2,S3	-	-
Sesuvium Maritimum	Puerto Rico Sea-Purslane	S1	E	-
Stachys Aspera	Gritty Hedge-Nettle	S1	E	-
Suaeda Linearis	Narrowleaf Seepweed	S3	-	-
Triglochin Striata	Three-Ribbed Arrow Grass	S1	E	-

Note: State Status: (E) Endangered, (I) In Need of Conservation, (T) Threatened, Federal Status: LT (Threatened)
Explanation of Rank and Status Codes

Source: https://dnr.maryland.gov/wildlife/Documents/Somerset_County_RTEs.pdf

8.4.1 Sensitive Species Project Review Areas

The Maryland Department of Natural Resources (DNR) Sensitive Species Project Review Areas (SSPRA) is a digital map layer that represent the general locations of documented rare, threatened, and endangered species. The data layer incorporates several types of regulated areas under the Critical Area Criteria and other areas of concern statewide, including Natural Heritage Areas, Listed Species Sites, Other or Locally Significant Habitat Areas, Colonial Waterbird Sites, Nontidal Wetlands of Special State Concern, and Geographic Areas of Particular Concern.

This data layer provides an overview of nearly all state-regulated and designated areas involving sensitive and listed species. However, it does not supersede, and should not be used instead of, the State's Nontidal Wetlands Guidance maps. These areas are depicted on Map 8-4.

Areas include Federal lands, State lands, and No Status lands. Federal lands make up 29,104.4 acres, State Lands make up 73,208.97 acres, and No Status lands make up 3,115.21 acres.

8.5 Steep Slopes

Steep Slopes are defined as hillsides having a 15 foot, or greater, vertical rise over 100 feet of horizontal run, or 15% slope. They are often described as undesirable areas for development due to the difficulty of building on

steep grades.[15] Overall Somerset County is very flat. Only 10% of the county's land area is higher than 20 feet above sea level. Slopes are shown on Map 8-5, including steep slopes. According to the County Soil Survey there are 204 acres of "Sandy Loam" soil units that are over 15 percent slope, mostly along streams within the Critical Area. There are 156 acres of soil units with 10 to 15 percent slopes. There are currently no protections in place for steep slopes outside of the Critical Area. The Planning Commission should consider the implications of 15 percent slopes in its review of project design. This is already required for plans requiring forest stand delineations.

8.6 Wetlands

According to the United States Fish and Wildlife Service, 81,563 acres, or 38% of Somerset County, is described as wetlands. Wetlands are areas where water covers the soil or is present either at or near the surface of the soil all year or for varying periods of time during the year, including during the growing season. Water saturation (hydrology) largely determines how the soil develops and the types of plant and animal communities living in and on the soil. Wetlands support both aquatic and terrestrial species. The prolonged presence of water creates conditions that favor the growth of specially adapted plants (hydrophytes) and promote the development of characteristic wetland (hydric) soils.[16]

Of the 81,563 acres of wetlands in Somerset County, 62,408 acres are estuarine or tidal wetlands. An estuarine or tidal wetland is a brackish habitat where freshwater meets the saltwater.[17] Wetlands of special state concern comprise 1,054.78 acres and National Wetlands Inventory (NWI) and DNR wetlands comprise 90,347.05 acres or 141.12 square miles. These wetlands are mapped on Map 8-6.

The County's zoning ordinance includes regulations that govern development on wetlands. These regulations are designed to protect these sensitive areas and ensure that any development activities comply with environmental standards. Ordinance 1193 was adopted to establish a revised Floodplain Management Program consistent with Federal and State regulatory programs concerned with the management of floodplain resources. The Forest Conservation Act (FCA) requires the identification of forested areas during the site planning process, which includes areas adjacent to wetlands. High priority is given to these areas for retention and protection. Areas adjacent to streams or wetlands, on steep slopes or erodible soils, or adjacent to large contiguous blocks of forest habitat are considered high priority.

The Maryland Nontidal Wetlands Protection Act requires a state nontidal wetlands permit or letter of authorization for activities in a nontidal wetland or within a 25-foot buffer or 100-foot expanded buffer around a nontidal wetland.

8.7 Agriculture

Agriculture is important to the aesthetic and economic value of Somerset County and is one of Maryland's largest and most important industries. However, runoff from cropland and livestock activities can carry nutrients, sediments, and pollutants from manure, fertilizers, and other sources into waterways. On Maryland's Eastern Shore as a whole, agriculture is the largest contributor of nitrogen and phosphorus to the Chesapeake Bay and its tributaries.

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[15] https://cms5.revize.com/revize/nrpc/Document_Center/Publications/iTRaC/2007/FS12_Slopes.pdf
[16] United States Environmental Protection Agency. "What is a Wetland?" May 4, 2023. https://www.epa.gov/wetlands/what-wetland
[17] https://www.filson.com/blog/field-notes/what-is-an-estuarine-wetland/#:~:text=An%20estuarine%20wetland%20is%20a,plants%2C%20animals%2C%20and%20invertebrates

Somerset County's agricultural community has always recognized the economic and historical importance of the jobs and products provided by the local seafood industry. As a result, farmers in Somerset County have historically led local efforts to restore the Bay and its tributaries—particularly Tangier Sound. Throughout the years, the agricultural community has proactively used federal, state, and local funds to implement Best Management Practices to minimize or eliminate runoff and pollution from cropland and livestock production.

Approximately 26% of the land-base in Somerset is classified as agricultural and agriculture is the largest industry in the County. Per the 2022 Census of Agriculture approximately 244 farm businesses encompass 63,019 acres of farmland with the average farm size of 258 acres. Production of corn, soybeans, broilers, vegetables, and livestock rank Somerset County 3rd in agriculture value for the State of Maryland. Somerset County ranks 1st in the state for broiler production, making it a leader in broiler poultry production.[18] Agricultural land and pasture is depicted on Map 8-7 at the end of this chapter.

Nearly one-third of the County's land is preserved and/or owned by federal and state government, and more than 80 percent of the County's cropland is dedicated to no-till or minimum-till crops—which have lower nutrient impacts than high-till crops. For several years, the County's agricultural community has taken part in research into the proper application of fertilizer, chemicals, and poultry manure handling and storage, in cooperation with the Somerset County Soil Conservation District, the University of Maryland, and the University of Delaware. Every agricultural producer in Somerset County has a nutrient management plan, monitored by Maryland Department of Agriculture (MDA). Agriculture continues to be a substantial source of nutrients throughout the Bay watershed, and Somerset County should continue to work with MDE and MDA to reduce nonpoint source nutrient loads from all sources. However, Somerset County's agricultural community has demonstrated that productive agriculture and a healthy Bay can go hand in hand.[19]

Aquaculture is also a significant part of the local economy, especially concerning shellfish farming. Aquaculture reflects a blend of tradition and modern practices, contributing to the sustainability and economic vitality of Maryland's seafood industry.

The DNR oversees shellfish aquaculture in the state, including Somerset County. Shellfish leaseholders are required to submit annual reports and invoices, and the DNR provides online tools to track shellfish aquaculture lease applications. Oyster farming is a prominent part of aquaculture with two main production methods: submerged land and water column leases. The industry has seen significant growth since 2010, contributing millions to the state's economy and utilizing thousands of acres of Maryland waters for shellfish leases. Recently, Hoopers Island Oyster Co. launched an oyster restoration project in the Bay.

Aquaculture

The Zoning Ordinance defines aquaculture as "the farming or culturing of finfish, shellfish, other aquatic plants or animals, or both, in lakes, streams, inlets, estuaries, and other natural or artificial water bodies or impoundments. Activities include the hatching, cultivating, planting, feeding, raising, and harvesting of aquatic plants and animals and the maintenance and construction of necessary equipment, buildings, and growing areas. Cultivation methods include, but are not limited to, seed or larvae development and grow-out facilities, fish pens, shellfish rafts, racks and long lines, seaweed floats and the culture of clams and oysters on tidelands and sub-tidal areas. For the purpose of this definition, related activities such as wholesale and retail sales, processing and product storage facilities are not considered aquacultural practices."

Source: Somerset County Zoning Ordinance

[18] *https://extension.umd.edu/locations/somerset-county/agriculture-and-food-systems/*
[19] *Somerset County Water Resources Element, March 2010. https://planning.maryland.gov/Documents/OurWork/compplans/10_WRE_Somerset.pdf*

The company floated 10 million spat-on-shell diploid oysters raised at Horn Point Laboratory and the Hoopers hatchery and planted them at Evans Reserve off Dames Quarter in Somerset County, Maryland. The project was for the Somerset County Watermen's Association through a contract with DNR and managed by Oyster Recovery Partnership (ORP).

8.8 Forests

Somerset County recognizes the fundamental importance of forests and aims to balance development activity with forest protection. Approximately 83,000 acres or 40% of the land in Somerset County is described as Forest. Most of this is privately owned by either farmers or industrial forest companies. As of 1990, the main recorded forest types were loblolly pine (30,000 acres), oak-pine (25,000 acres), and oak-hickory (25,500 acres). Within the Chesapeake Bay Critical Area, commercial timber harvesting programs must be conducted in accordance with a plan approved by the County Forestry Board. Outside the Critical Area, a sediment and erosion control plan are required. To protect forest resources from land development, the county adopted its forest conservation program in 1994, as required by the State. The forest conservation plan can require afforestation and/or reforestation. Afforestation is the action of planting trees where forest cover has been absent while reforestation is the replacement of existing trees, or greater, outside of the Critical Area. In certain situations, the program allows for off-site planting. Forest land within the Critical Area is protected and increased through provisions of the county's Critical Area Protection Program. The forest conservation ordinance applies to any application for site plan review, subdivision, project plan, grading, or sediment control approval on a land area of 40,000 square feet or greater outside the Chesapeake Bay Critical Area. Forested areas are shown on Map 8-8 at the end of this chapter.

Forests

The Zoning Ordinance defines forests as "a biological community where at least one-half of the land area is covered by tree crown and other woody plant cover or at least 200 trees per acre and covering a land area of one acre or more. This also includes forests that have been cut but not cleared."

Source: Somerset County Zoning Ordinance

Development within the Chesapeake Bay Critical Area must comply with guidelines administered by the State in order to protect these habitats. In 1991 the Maryland Forest Conservation Act was enacted to minimize the loss of Maryland's forest resources during land development by making the identification and protection of forests and other sensitive areas an integral part of the site planning process. Identification of priority areas prior to development makes their retention possible. Of primary interest are areas adjacent to streams or wetlands, those on steep or erodible soils or those within or adjacent to large contiguous blocks of forest or wildlife corridors.[20] In addition, most development projects require a Forest Stand Delineation (FSD).

FSD is a catalogue of a site's environmental features. Basically, it is a list of all the "green stuff" (vegetation), "wet stuff" (wetlands) or "steep stuff" (terrain) that might be disturbed during construction. The elements that determine whether an area is considered "sensitive" include specimen trees (trees larger than 30 inches in diameter), champion trees (largest individual of a species in the state); streams, steep slopes, and endangered species. If these features are impacted during development, it could have a negative effect on the surrounding ecosystem. In Maryland, the Act requires the FSD and/or the Forest Conservation Plan for "any activity requiring an application for a subdivision, grading permit, or sediment control permit on areas 40,000 square feet (approximately one acre) or greater." The county in which the delineation is being performed determines how stringent the specific requirements will be. Each delineation must be prepared by a licensed forester, licensed

[20] *https://dnr.maryland.gov/forests/Pages/programapps/newfca.aspx#:~:text=The%20main%20purpose%20of%20the,integral%20part%20of%20the%20site*

landscape architect, or a qualified professional who meets the requirements set by the DNR.[21]

8.9 Chesapeake Bay Critical Area

The Chesapeake and Atlantic Coastal Bays Critical Area Protection Program was established by the State of Maryland in 1984 to reduce environmental consequences associated with development within the fragile bay ecosystems. Creation of the State legislation focused on preservation, conscious development, and restoration within what was deemed as "critical area."

Critical Area

The Zoning Ordinance defines the critical area as “all lands and waters defined in Section 8-1807 of the Natural Resources Article, Annotated Code of Maryland. They include:

a. All waters of and lands under the Chesapeake Bay and its tributaries to the head of tide as indicated on the state wetlands maps, and all state and private wetlands designated under Title 9 of the Natural Resources Article, Annotated Code of Maryland;
b. All land and water areas within 1,000 feet beyond the landward boundaries of State or private wetlands and the heads of tides designated under Title 9 of the Natural Resources Article, Annotated Code of Maryland; and
c. Modification to these areas through inclusions or exclusions proposed by Somerset County and approved by the CBCA as specified in Section 8-1807 of the Natural Resources Article, Annotated Code of Maryland.”

Source: Somerset County Zoning Ordinance

The Critical Area is described as the land within 1,000 feet of the mean high-water line for waters under the tidal influence of the Chesapeake Bay and the Atlantic Coastal Bays. Thus, in Somerset County, the Critical Area consists of shores along the Bay and parts of its tributary rivers: Wicomico, Manokin, Big Annemessex, and Pocomoke.[22] For the State's full legal definition, see §8-1807 of the Natural Resources Article, Annotated Code of Maryland.

There are three designations within the Critical Area: IDA (Intensely Developed Area), LDA (Limited Development Area), and RCA (Resource Conservation Area). These designations stipulate the kinds and intensities of development allowed.

- IDAs are densely built areas where residential, commercial, or industrial land uses predominate. The focus here is on improving water quality through best practices in stormwater management.
- LDAs are low-to-moderately built areas that also contain natural plant and animal habitats. The focus here is on maintaining that balance – allowing certain levels of development while requiring mitigation in the form of establishing new habitat.
- RCAs are sparsely developed areas dominated by agricultural uses, wetlands, forest, barren land, surface water, or open space. The focus here is on protecting important habitats and water quality by limiting new development to residential uses and resource-utilization activities.

[21] *https://www.ecslimited.com/what-forest-stand-delineation/*
[22] *https://www.somersetmd.us/departments/departments_-_n_-_z/planning_and_zoning/critical_area/about.php*

The County's Critical Areas, including these three development designations are shown on Maps 8-9 through 8-13.

The Critical Area Program also includes special rules for the land area immediately adjacent to tidal waters, tidal wetlands, and tributary streams -- the Buffer. The Buffer has a minimum width of 100 feet and may be wider in areas with steep slopes, wetlands, or sensitive soils. This ribbon of land has been distinguished from the rest of the Critical Area due to its importance in acting as a buffer between developed areas and sensitive aquatic resources and shoreline habitat. Proper establishment and maintenance of the Buffer may help decrease shoreline erosion, slow runoff, and absorb excess water -- potentially decreasing the severity of flooding.

8.10 Sea Level Rise

As the climate continues to warm, global sea levels rise as a result. Increasing temperatures cause the melting of ice on land, such as mountain glaciers and polar ice sheets, and thermal expansion as the ocean water takes up more space. As a whole Maryland experiences higher rates of relative sea level rise than the global average due to several factors including Maryland's geographic position in relation to melting polar ice sheets and land subsidence.[23]

Land subsidence is defined as a gradual settling or sudden sinking of the Earth's surface owing to subsurface movement of earth materials. The principal causes of land subsidence are aquifer-system compaction, drainage of organic soils, underground mining, hydro compaction, natural compaction, sinkholes, and thawing permafrost.[24]

According to the sea level measurement from the Annapolis area tide gauge, sea levels in Maryland have risen 10 inches since 1950. Sea levels are projected to rise another 1-2 feet by 2050. According to the 2008 Rising Sea Level Guidance for Somerset County – the most recent County-level report of its kind – Dames Quarters, Janes Island State Park, and Smith Island are predicted to be almost completely underwater by 2100 as the Bay's average surface elevation increases nearly one-foot.[25]

Furthermore, groundwater is Somerset County's sole source for drinking water. Two primary aquifers are utilized for public water and private wells: Manokin Aquifer and Patapsco Aquifer. Increasing sea level rise and shoreline erosion could affect these aquifers by causing intrusion of salt water, therefore limiting the water that can be utilized.

Map 8-14 shows how sea level rise is expected to impact Somerset County by the end of the century. Areas highlighted in red are expected to be almost completely underwater by 2100.

8.11 Shoreline Erosion

According to Somerset County's Multi-Hazard Mitigation Plan, characteristics of shoreline erosion in Maryland reflect a unique combination of natural and man-made conditions affecting the State's shorelines. The natural factors influencing erosion rates include soil composition, weather, topography, water depth, fetch and surface and groundwater conditions. Regarding man-made structures, over 1,000 miles of man-made structures have

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[23] https://extension.umd.edu/programs/environment-natural-resources/program-areas/coastal-climate-program/sea-level-rise/
[24] https://www.usgs.gov/mission-areas/water-resources/science/land-subsidence#:~:text=collapse%2C%20or%20subsidence.-Land%20subsidence%20is%20a%20gradual%20settling%20or%20sudden%20sinking%20of,%2C%20sinkholes%2C%20and%20thawing%20permafrost
[25] Somerset County, Maryland. September 2008. Somerset County, Maryland Rising Sea Level Guidance. https://dnr.maryland.gov/ccs/Publication/SeaLevel_Somerset.pdf

been incorporated into Maryland's shorelines. Currently, the preferred method for erosion control is Living Shorelines; this is a method that provides habitat while offering shoreline protection. However, when necessary other man-made methods are utilized, such as: wooden or concrete bulkheads, stone revetment, beach replenishment and segmented breakwaters.

Approximately 260 acres of tidal shoreline are lost each year to shoreline erosion. This degrades water quality in the Bay by adding approximately 5.7 million pounds of nitrogen and 4.2 million pounds of phosphorus, as well as sediment, into Bay waters. Shoreline erosion rate information was requested from the U.S. Army Corps of Engineers (USACE), Baltimore District; shoreline erosion rates for Somerset County are presented in Table 8-5, following.

Living Shorelines

"Living shorelines are the result of applying erosion control measures that include a suite of techniques which can be used to minimize coastal erosion and maintain coastal process. Techniques may include the use of fiber coir logs, sills, groins, breakwaters or other natural components used in combination with sand, other natural materials and/or marsh plantings. These techniques are used to protect, restore, enhance or create natural shoreline habitat."

Source: Maryland Department of Natural Resources

Table 8-5.

Rates of Shoreline Erosion in Somerset County					
Somerset County			**Maryland***		
Erosion Category	**Average Erosion Rate (ft/yr)**	**Shoreline Length (Miles)**	**Erosion Category**	**Average Erosion Rate (ft/yr)**	**Shoreline Length (Miles)**
Accretion	+0.5	18.33798	Accretion	+0.5	294
Protected	0	21.4271	Protected	0	978
No Change	0	646.4702	No Change	0	3,851
Slight	-1	93.14462	Slight	-1	1,157
Low	-3	26.24806	Low	-3	182
Moderate	-6	7.275717	Moderate	-6	59
High	-11	0.356062	High	-11	11
Unknown	0 or -1	0	Unknown	0 or -1	65
Total	-	**813.2595**	**Total**	-	**6,597**

** Note: Includes the 16 coastal counties and Baltimore City, excluding Smith Island, South Marsh Island, Poplar Island, Bloodsworth Island, and several other large Bay Islands).*
Source: U.S. Army Corps of Engineers, 2016.

According to the U.S. Army Corp of Engineers Planning Division, the erosion categories have been changed, and due to different mapping techniques, the measured shoreline has changed. The Virginia Institute of Marine Science (VIMS) produced the updated shoreline and erosion rates based on Maryland Geological Survey (MGS) data.

In addition, approximately 67% of the houses in Somerset County were constructed prior to 1981 which is the date when the County adopted floodplain maps and began administering the floodplain ordinance. A high percentage of those homes were constructed near the water. Therefore, those structures could be more susceptible to the effects of shoreline erosion. Moreover, within the low-lying areas closer to the shores, the infrastructure located in these areas could be significantly damaged. With shorelines eroding further inland,

flooding could also extend further inland and cause damage to roads, bridges, railroads, septic systems, water distribution systems and electric, cable and telephone distribution systems.[26]

Finally, the County Health Department estimates that over 5,072 homes utilize septic tanks, with 1.5% of these residents requesting replacement systems annually. As shoreline erosion increases causing above average high tides, the number of septic tanks failing will increase.

Map 8-15 shows areas of shoreline erosion from low to high risk. Areas of particularly high erosion rates include Smith Island, Janes Island, and Cedar Island. These areas are circled in red on the map.

8.12 Green Infrastructure (Protected Lands and Targeted Ecological Areas)

Green infrastructure refers to systems, both natural and engineered, that function as living infrastructure. Per Maryland's DNR Green Infrastructure Assessment (GreenPrint), green infrastructure includes targeted ecological areas, DNR owned properties, conservation reserve enhancement programs, forest legacy, rural legacy properties, land easements, local protected lands, coastal and estuarine land conservation programs, private conservation lands, protected federal lands, and transfer development rights and purchase development rights.

Green infrastructure delivers environmental, social, and economic benefits, improves water and air quality, reduces stormwater, and provides necessary habitat for wildlife. Green infrastructure can also include local and small-scale solutions, such as rain gardens, bioswales, planter boxes, and permeable pavement. These neighborhood-level options primarily help manage stormwater runoff.
Per the County's 2022 Land Preservation, Parks and Recreation Plan (LPPRP), the State's goals for natural resources land conservation specific to green infrastructure includes:

- *Conserve and restore species of concern and important habitat types that fall outside the green infrastructure: rock outcrops, karst systems, caves, shale barren communities, grasslands, shoreline beach and dune systems, mud flats, non-forested islands, etc.*
- *Assess the combined ability of State and local programs to expand and connect forests, farmlands, and other natural lands as a network of contiguous green infrastructure.*

In previous years, the County's goal for green infrastructure was to work with the State to complete protection of green infrastructure in the northeast area of the county. As of 2022, progress towards this goal is as follows:

- The County's protected lands and designated conservation areas closely correlate with the Targeted Ecological Areas in GreenPrint. The State can assist the County by identifying specific priority lands that should be considered for protection. Once priority areas are identified, the County can consider options for protection which might include:
    - Incorporating protection criteria into the zoning and subdivision regulations.
    - Working with private land trusts and others in protecting such areas.

[26] *Somerset County, Maryland. 2022. Somerset County Multi-Hazard Mitigation Plan.*

8.13 Fisheries

Counties located on tidal waters must include a fisheries element, which focuses on the designation of areas for loading, unloading, and processing finfish and shellfish, and for docking and mooring commercial fishing boats and vessels. The following commercial fisheries are in the county: MeTompkin Bay Oyster Company, Southern Connection Seafood, Handy Seafood, Somerset Seafood Company, and Marshall's Seafood & Farming.

In Somerset County, commercial fisheries play a role in the local economy and culture in the following significant ways:

1. Blue Crabs and Oysters
   - Somerset County is known for its Chesapeake Bay blue crabs. Crabbing is a vital part of the local seafood industry. The City of Crisfield is known as the "Crab Capital of the World."[27]
   - Oysters are another essential resource. The MeTompkin Bay Oyster Company and Marshall's Seafood & Farming, Inc. participate in oyster harvesting and processing.[28]
2. Fishing and Watermen
   - The county has a rich tradition of fishing and watermen's activities. Water activities in the County include watersports, crabbing and fishing, boating, and scenic cruises.
3. Commercial Reporting:
   - The Maryland Department of Natural Resources oversees commercial fisheries. Fishermen are required to submit regular reports on their catches.[29]
   - The DNR also maintains a Commercial Reporting Hotline for inquiries and assistance.
4. Economic Impact:
   - Somerset County's seafood industry contributes to the local economy, providing jobs and supporting businesses.
   - The county's focus on commercial/industrial development includes efforts to enhance the seafood sector.

Fisheries Activities

The Zoning Ordinance defines fisheries activities as "commercial water dependent fisheries facilities including structures for the packing, processing, canning, or freezing of finfish, crustaceans, mollusks, and amphibians and reptiles and also including related activities such as wholesale and retail sales, product storage facilities, crab shedding, off-loading docks, shellfish culture operations, and shore based facilities necessary for aquaculture operations."

Source: Somerset County Zoning Ordinance

Commercial coastal regulations are included in the Code of Maryland Regulations (COMAR) and Natural Resources Article of the Annotated Code of Maryland. The Exclusive Economic Zone (EEZ) is all waters from the seaward boundary of coastal states (3 miles from shore) out to 200 nautical miles. Maryland waters are from the shore to 3 miles.

County Roads & Waterways maintains 14 marine facilities, which includes the following locations:

- Coulbourn Creek
- Crisfield County Dock
- Dames Quarter
- Deal Island
- Ewell
- Janes Island State Park

[27] *https://fishandhuntmaryland.com/species/crabs#:~:text=Maryland%20and%20the%20Chesapeake%20Bay,Crab%20Capital%20of%20the%20World.*
[28] *Fresh Seafood | Somerset County, MD | Eastern Shore Crabs (visitsomerset.com)*
[29] *Commercial Fisheries (maryland.gov)*

- Jenkins Creek
- Rehobeth
- Rhodes Point
- Rumbley
- Shelltown
- Tylerton
- Websters Cove
- Wenona Harbor

Boat slips are available at the following 6 marinas:

- Deal Island
- Webster's Cove
- St. Peter's
- Wenona Harbor
- Tylerton
- Jenkins Creek Doc

8.14 Hazard Mitigation Planning

Hazard Mitigation is sustained action taken to reduce or eliminate the long-term risk to life and property from hazards. Resilience is the capacity of individuals, communities, businesses, institutions, environmental systems, and governments to adapt to changing conditions and to prepare for, withstand, and rapidly recover from disruptions to everyday life, such as hazard events. Hazard Mitigation Plans are required to be updated every five years, must be approved by FEMA, and adopted by local officials.

Figure 8-5: Cover of Somerset County Multi-Hazard Mitigation Plan, 2022.

Somerset County's Multi-Hazard Mitigation Plan (2022) assesses the risk and vulnerability of people, infrastructure, and critical facilities to natural hazards such as flooding, shoreline erosion, and sea level rise. The plan determines risk for each identified hazard based upon the following factors:

- Historical impacts, in terms of human lives and property;
- Geographic extent
- Historical occurrence
- Future probability
- Community perspective

Natural hazards ranked as "**high**" risk within the multi-hazard mitigation plan include Coastal Hazards, Flood, Shoreline Erosion, and Sea Level Rise.

The Plan includes recommendations in the form of mitigation strategies to reduce hazard risk and vulnerability. Ideally, the County will strive to prevent new development in known hazard areas, as identified by the hazard mitigation plan. Mapping products and some information from this plan has been integrated into Chapter 8. Mitigation strategies related to protecting sensitive areas from hazards include:

- Project D Natural Resources Planning: implement measures that protect people, property, and natural resources including planting native vegetation, vegetated swales, and buffer strips on parcels within

critical areas that presently lack vegetation. Prioritize parcels that are also experiencing high rates of shoreline erosion[30].

It is an overall goal of the multi-hazard mitigation plan to integrate hazard mitigation into the County's comprehensive plan. More information on this planning document can be found at www.somersetmdhazardplan.org.

In addition to the multi-hazard mitigation plan, The County has developed and adopted a Flood Mitigation Plan (2021). The purpose of the flood mitigation plan is to frame flood risk and vulnerability within the County, evaluate areas of concern, and develop strategies to lessen risk and vulnerability to flooding. Flood hazards evaluated in the plan include hurricane storm surge, 1% annual chance flood, projected sea level rise, nuisance flooding, and flash flooding.

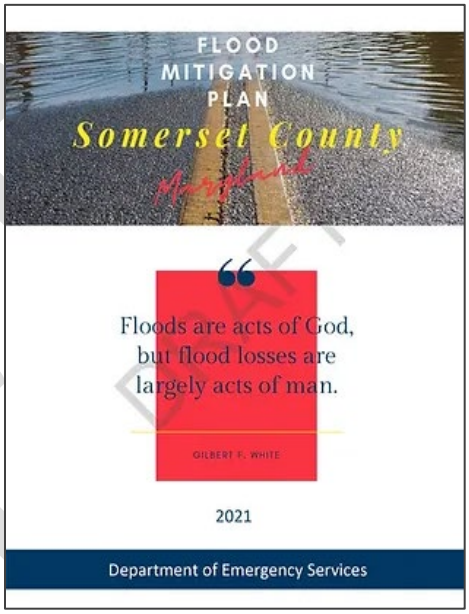


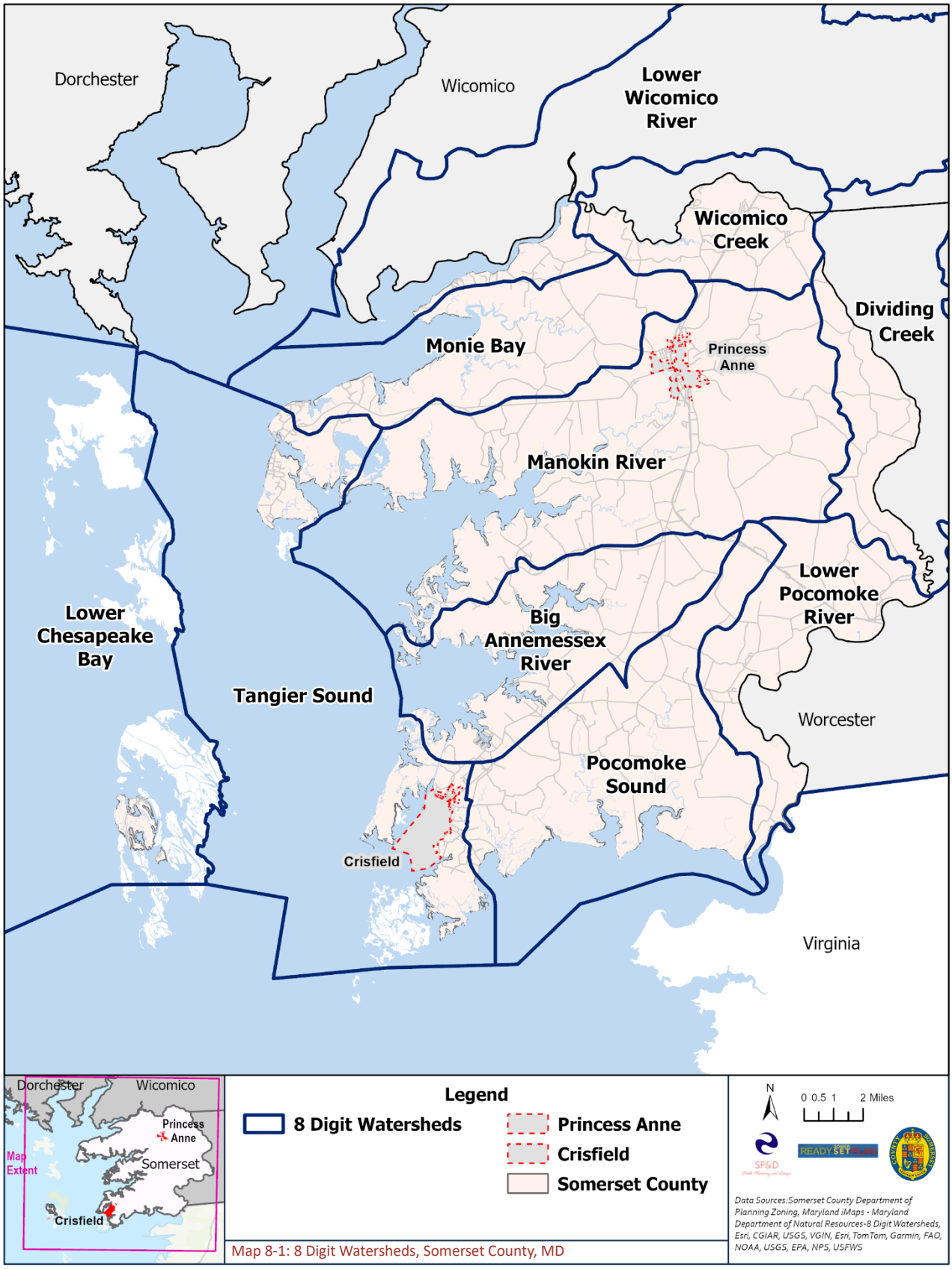
Figure 8-6: Cover of Somerset County Flood Mitigation Plan, 2021.

Strategies proposed in the flood mitigation plan relating to sensitive areas include:

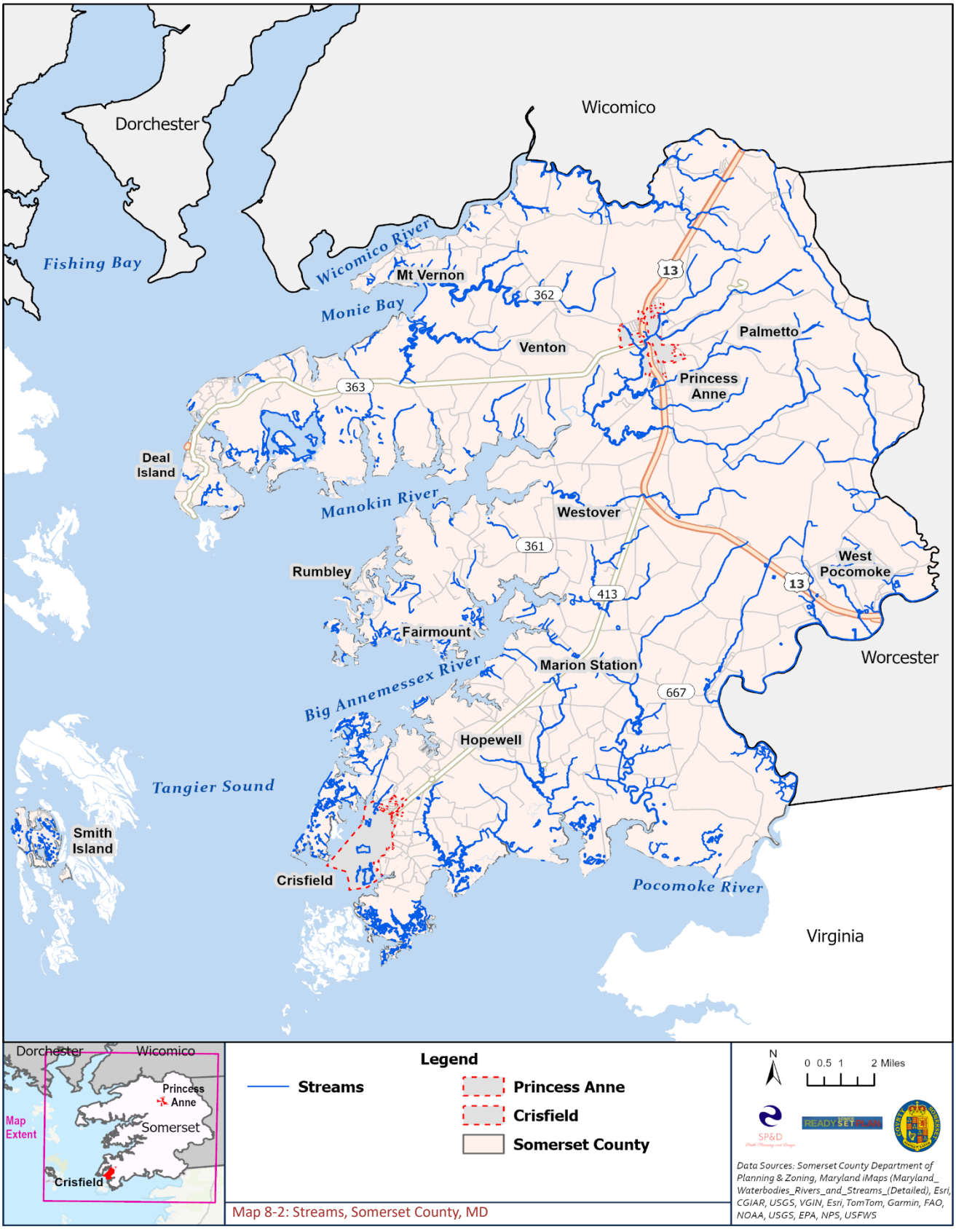
- Action Item #10: Identify stormwater management issues and the most vulnerable properties affected in the county. Review area(s) to determine cause of issues, specifically lack of natural vegetation, if applicable. Adopt similar building regulations (such as those in the Chesapeake Bay critical area) to these properties. This would include a buffer zone with natural vegetation.
- Objective 2.2: Enact and enforce regulatory measures to ensure that new development will not increase hazard threats from coastal and riverine flooding, storm surge or the threat of sea level rise.
- Objective 3.1: Establish open space parks and recreational areas in flood hazard areas.
- Objective 3.2: Provide for the conservation and preservation of natural resources.
- Objective 3.3: Limit additional housing (especially elderly and high density) in areas of high hazard risk.

Note: due to the abundance of maps included in this chapter, mapping products are included at the end of the chapter and are followed by goals and strategies.

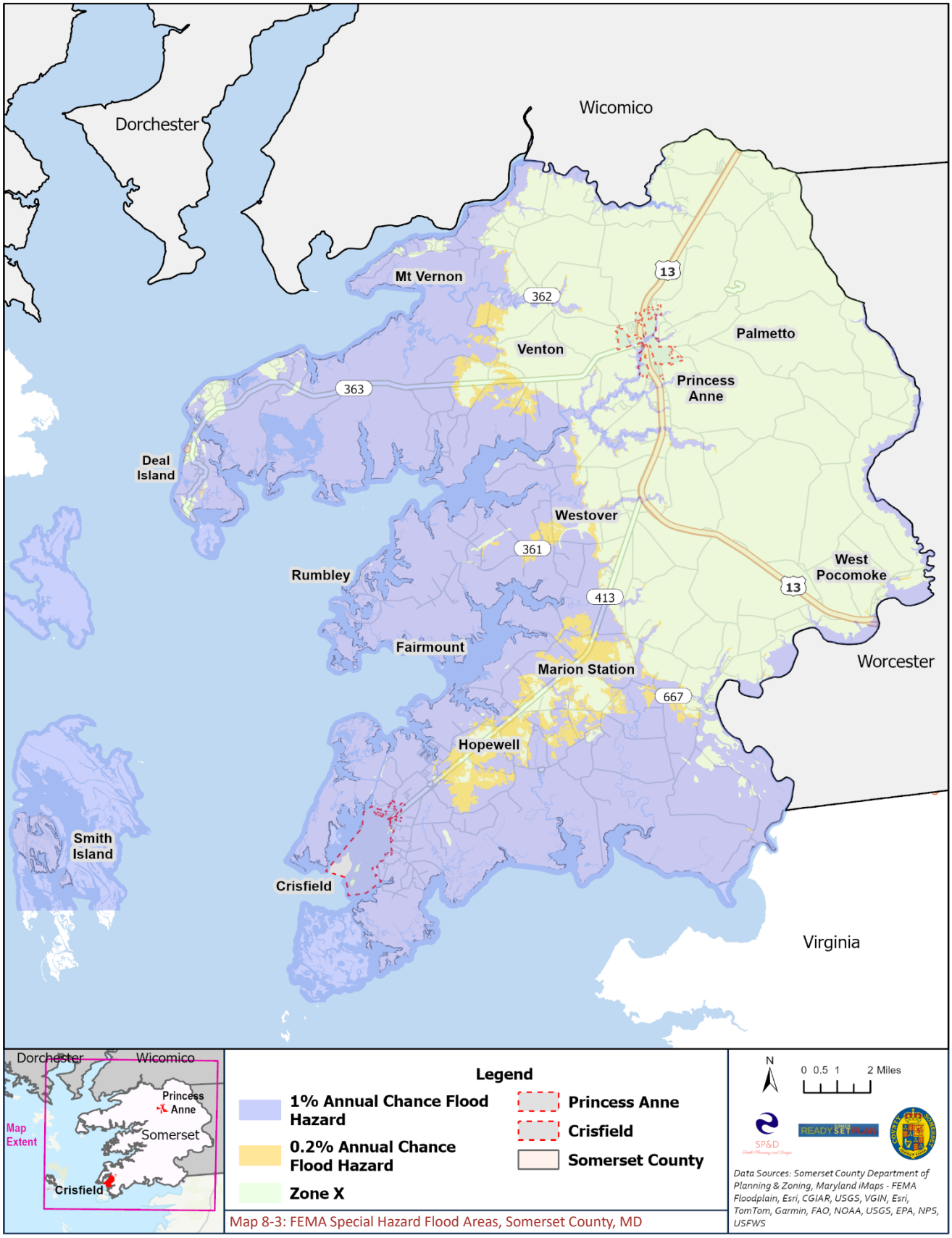
[30] *Somerset County, Maryland. 2022. Somerset County Multi-Hazard Mitigation Plan.*



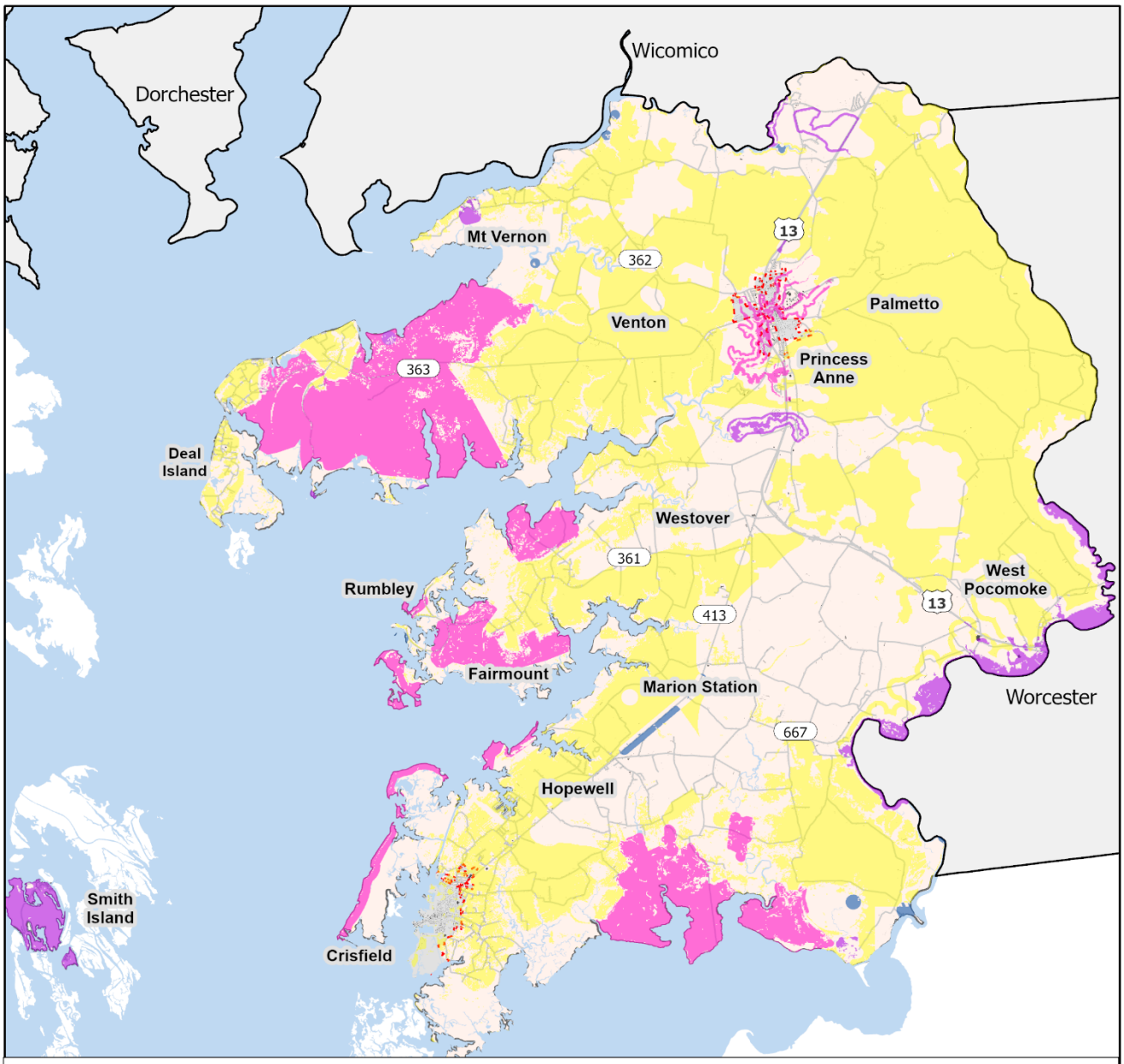
Map 8-1: 8 Digit Watersheds, Somerset County, MD



Map 8-2: Streams, Somerset County, MD



Map 8-3: FEMA Special Hazard Flood Areas, Somerset County, MD

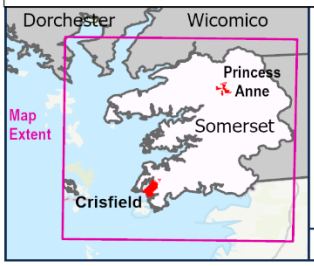


Targeted Ecological Areas

Lands and watersheds of high ecological value, identified as conservation priorities by DNR. These lands include large blocks of forests and wetlands, rare species habitats, aquatic biodiversity hotspots, and areas important for protecting water quality.

Sensitive Species Review Areas

Primarily represents the general locations of documented rare, threatened, and endangered species per the Wildlife & Heritage.



Legend

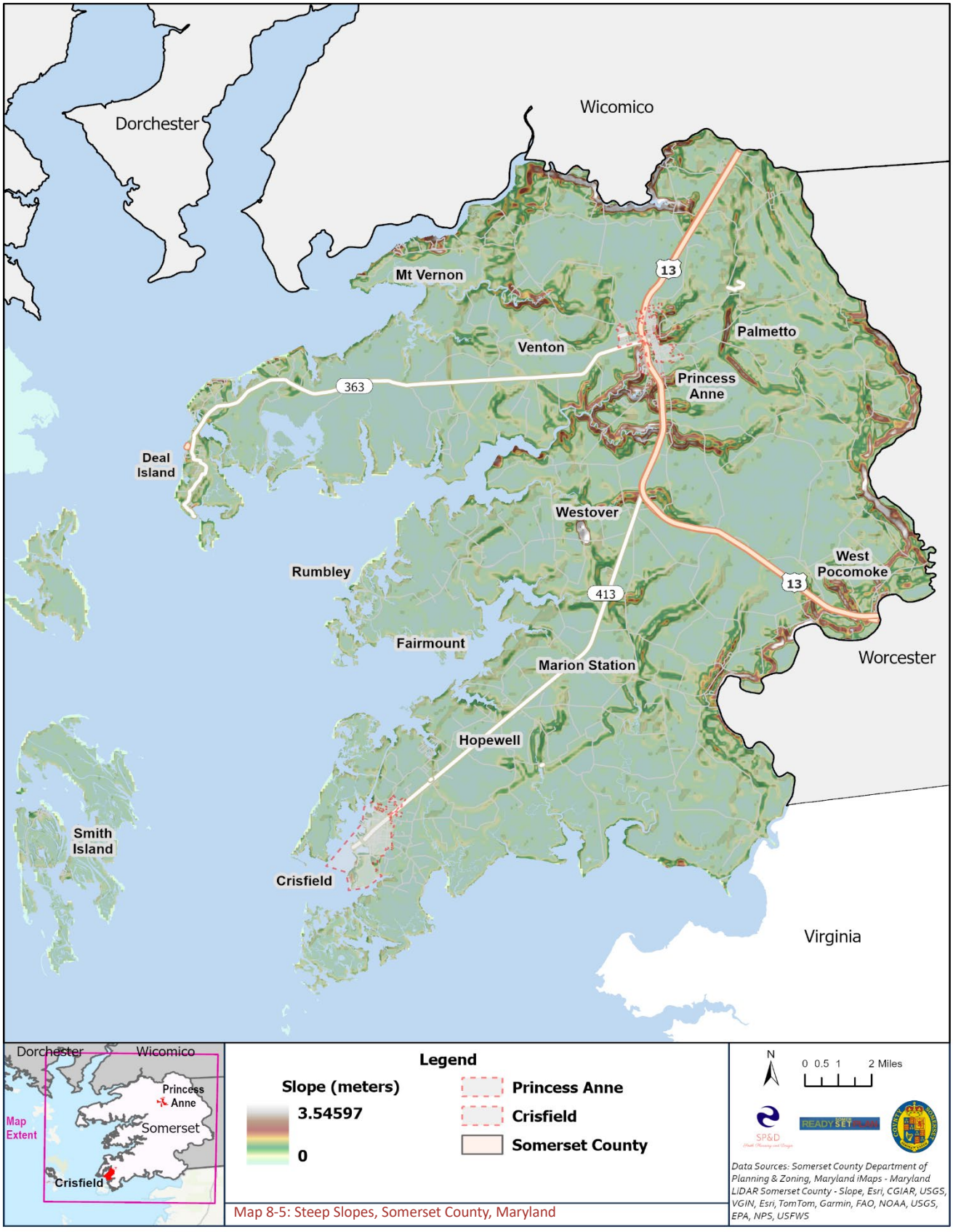
- Targeted Ecolocial Areas
- Sensitive Species Review Areas
- Group 1 Federally Listed Species
- Group 2 State Listed Species
- Group 3 Species of Concern but No Listed Status
- Princess Anne
- Crisfield
- Somerset County

N

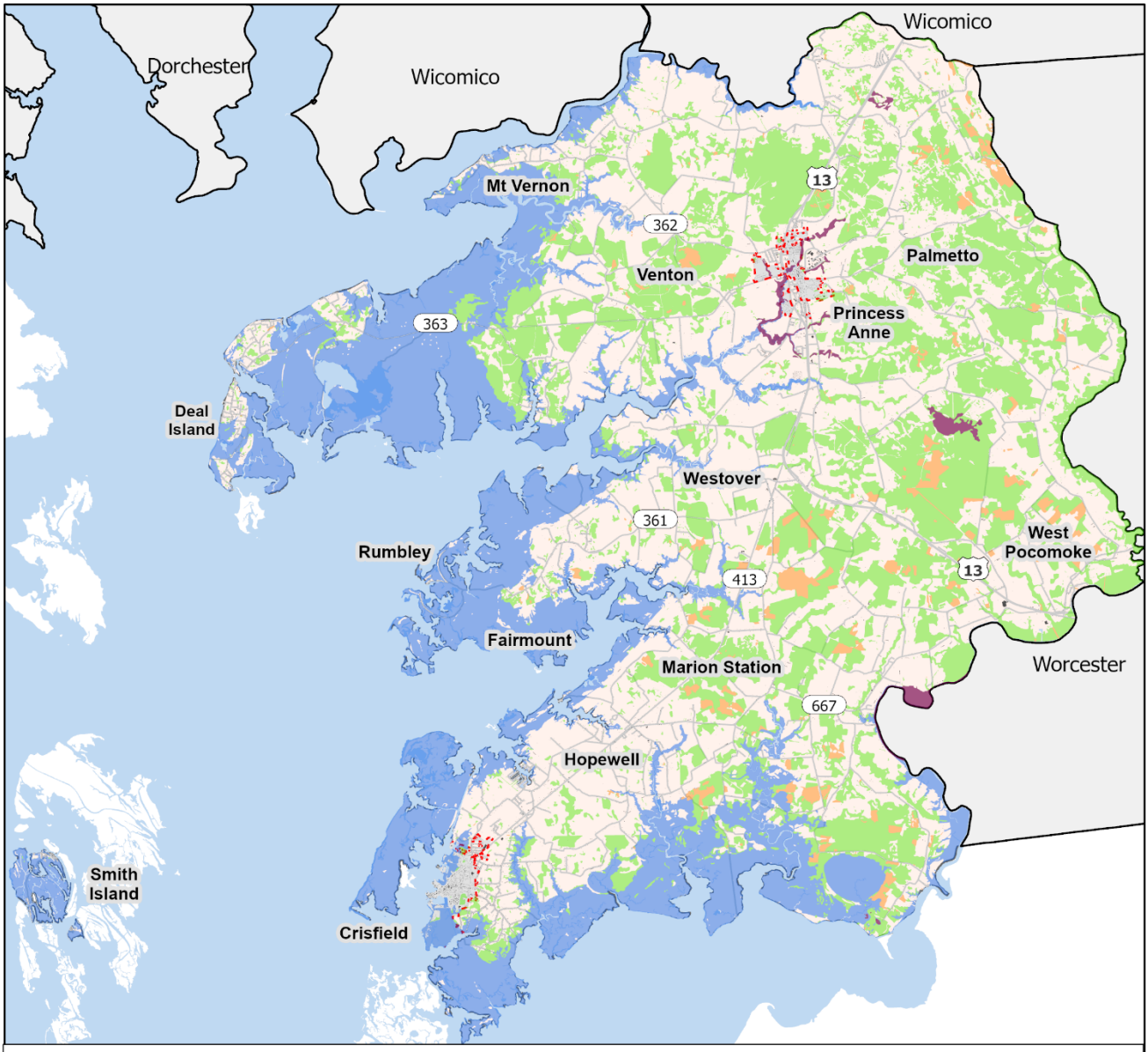
0 0.5 1 2 Miles

Data Sources:Somerset County Department of Planning & Zoning, Maryland iMap (Targeted Ecological Areas and Sensitive Species Review Areas), Esri, CGIAR, USGS, VGIN, Esri, TomTom, Garmin, FAO, NOAA, USGS, EPA, NPS, USFWS

Map 8-4: Targeted Ecological Areas & Sensitive Species Review Areas



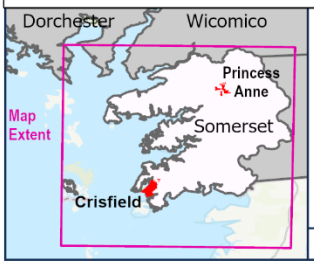
Map 8-5: Steep Slopes, Somerset County, Maryland



Special State Concern Wetlands - Identified by MDE based on the "Prioritizing Sites for Wetland Restoration, Mitigation & Preservation in Maryland" Report.

National Wetlands Inventory (NWI) - Includes wetlands identified by the US Fish & Wildlife Service. Typically, these include wetlands 5+ acres in size. Additional wetlands may exist.

DNR Wetlands - Wetlands identified by the Maryland Department of Natural Resources, which supplement NWI datasets.



Legend

Special State Concern Wetlands

NWI & DNR Wetlands

Estuarine and Marine Wetland

Freshwater Emergent Wetland

Freshwater Forested/Shrub Wetland

Princess Anne

Crisfield

Somerset County

N

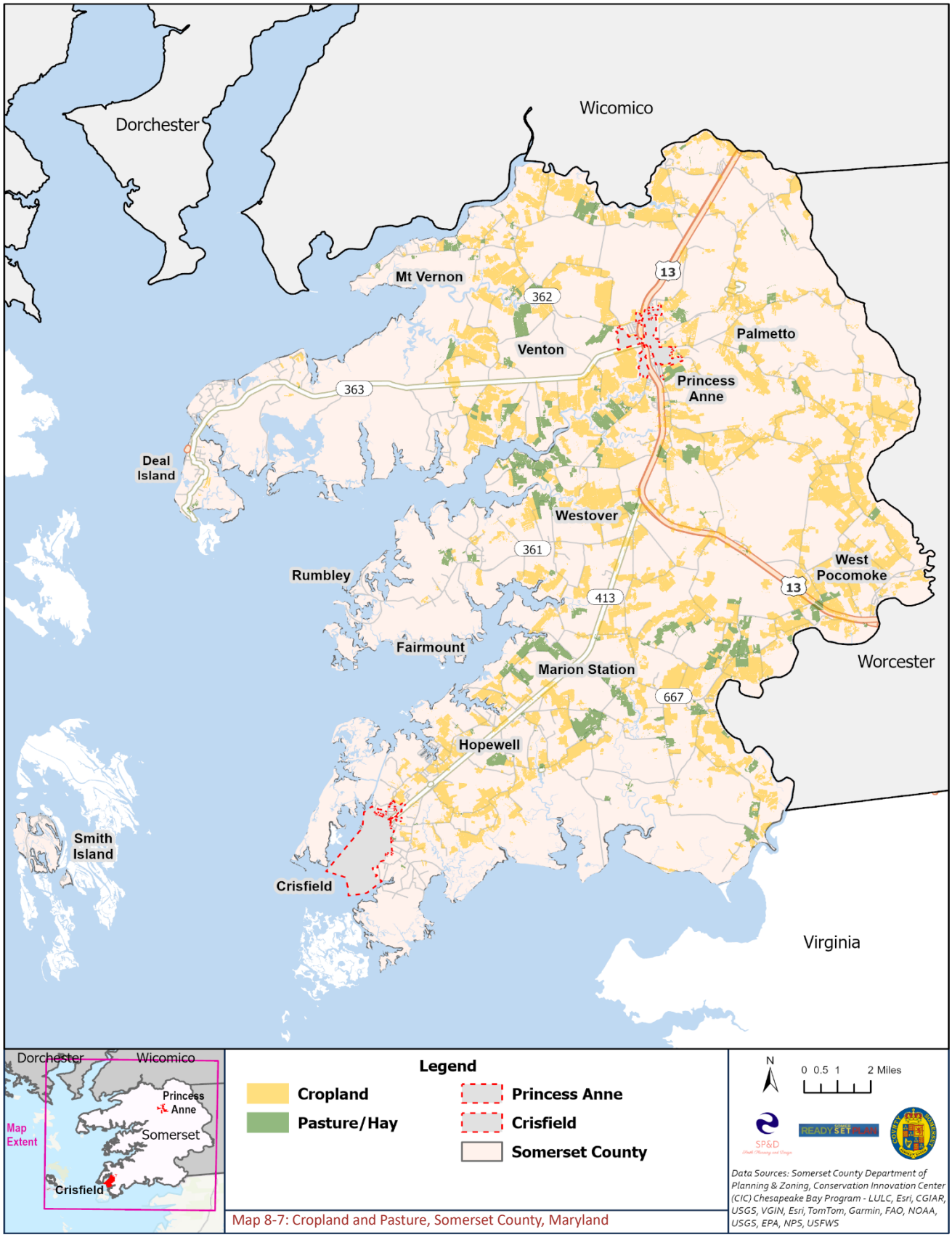
0 0.5 1 2 Miles

SP&D

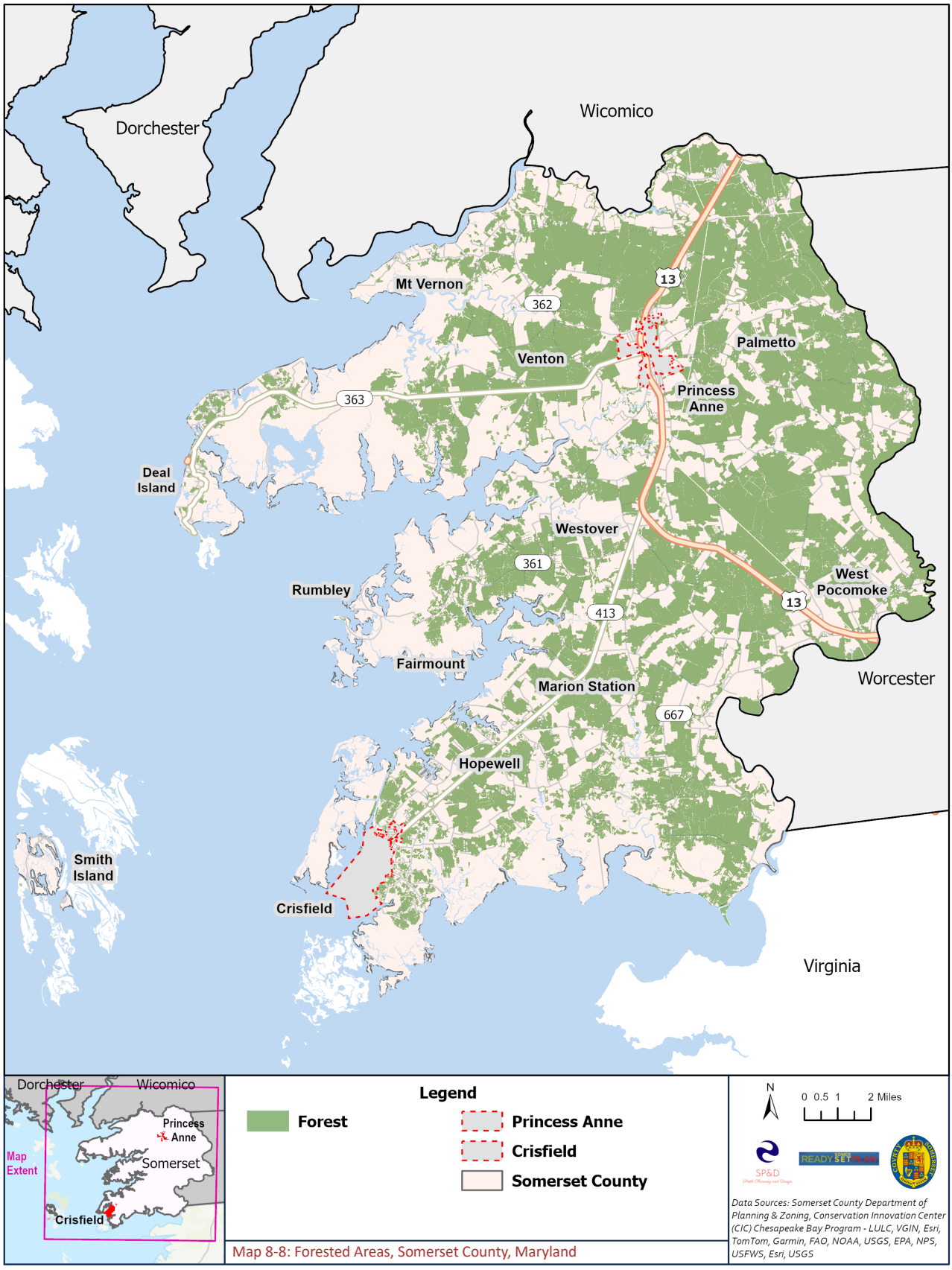
READY SET PLAN

Data Sources: Somerset County Department of Planning & Zoning, Maryland iMap (Wetlands of Special State Concern, U.S. Fish & Wildlife Service - National Wetlands Inventory, Maryland Department of Natural Resources Wetlands), Esri, CGIAR, USGS, VGIN, Esri, TomTom, Garmin, FAO, NOAA, USGS, EPA, NPS, USFWS

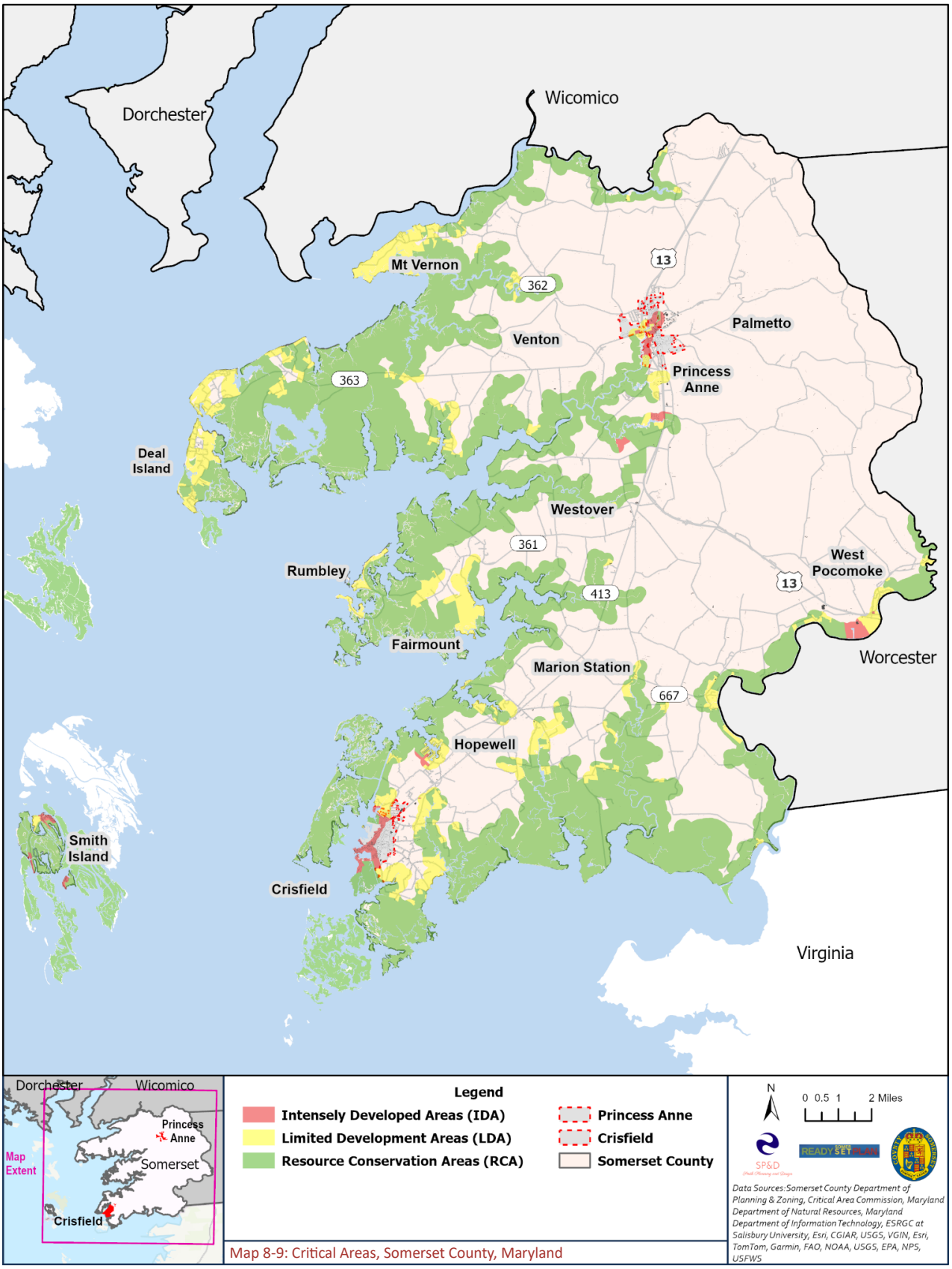
Map 8-6: Wetland Areas, Somerset County, Maryland



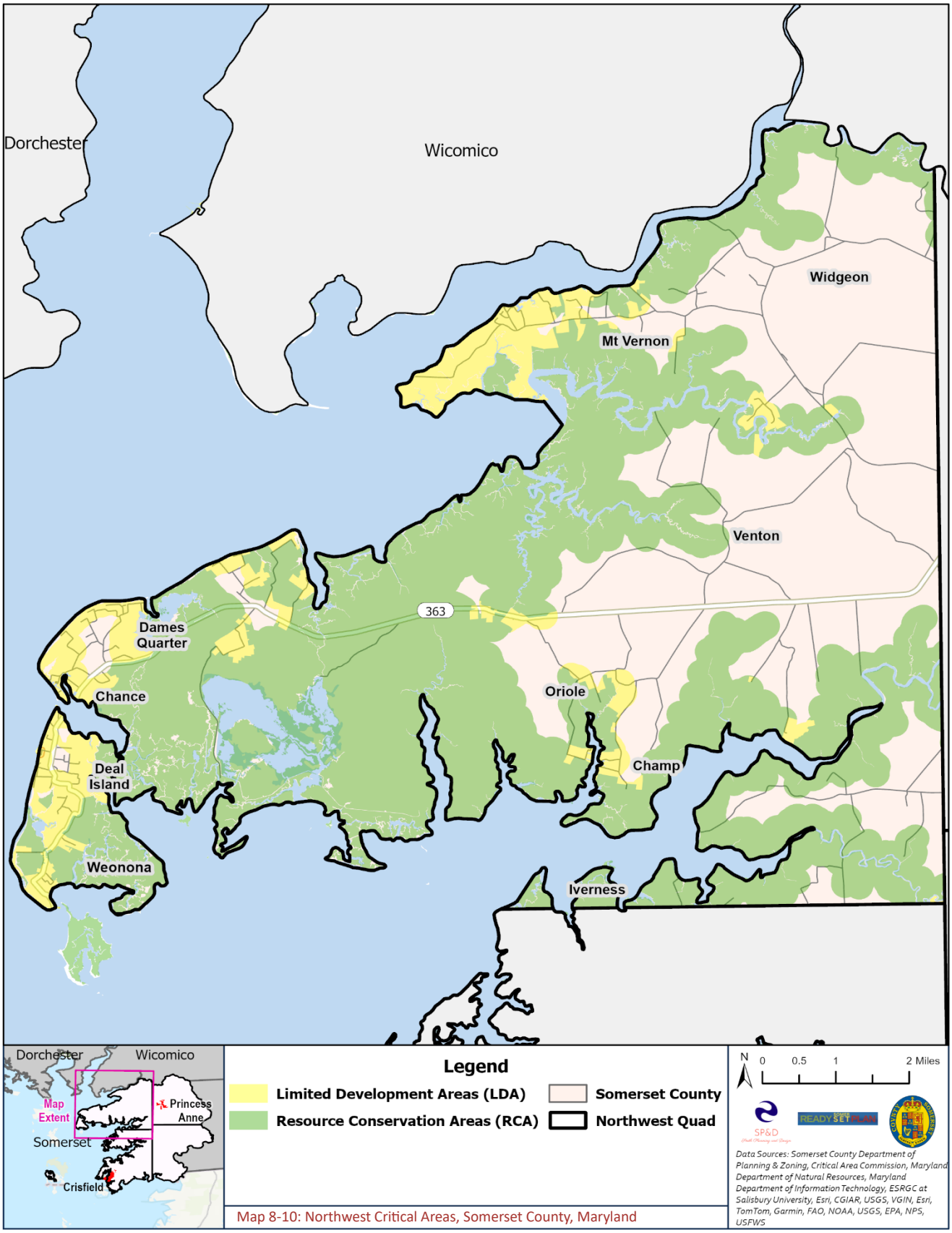
Map 8-7: Cropland and Pasture, Somerset County, Maryland



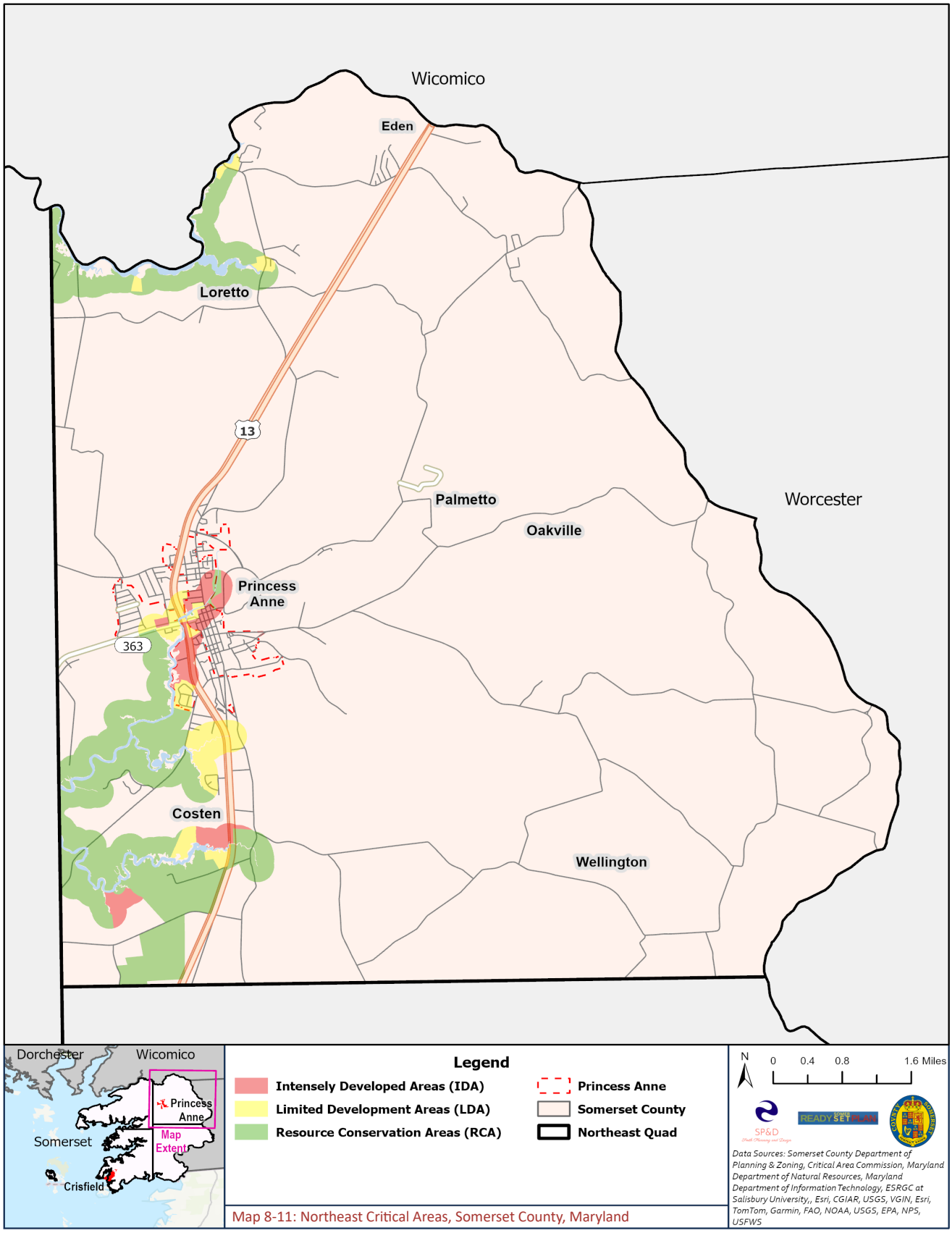
Map 8-8: Forested Areas, Somerset County, Maryland



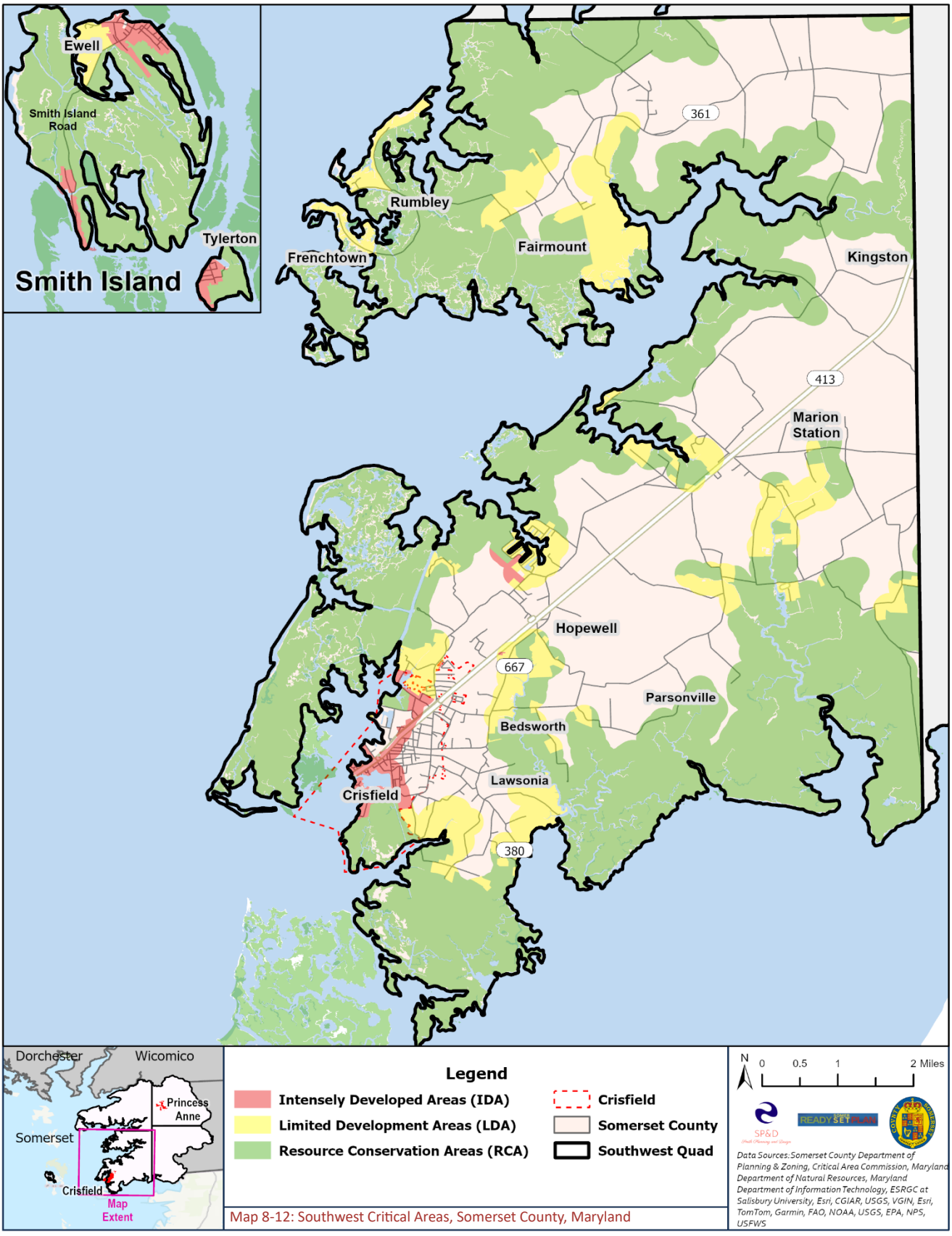
Map 8-9: Critical Areas, Somerset County, Maryland



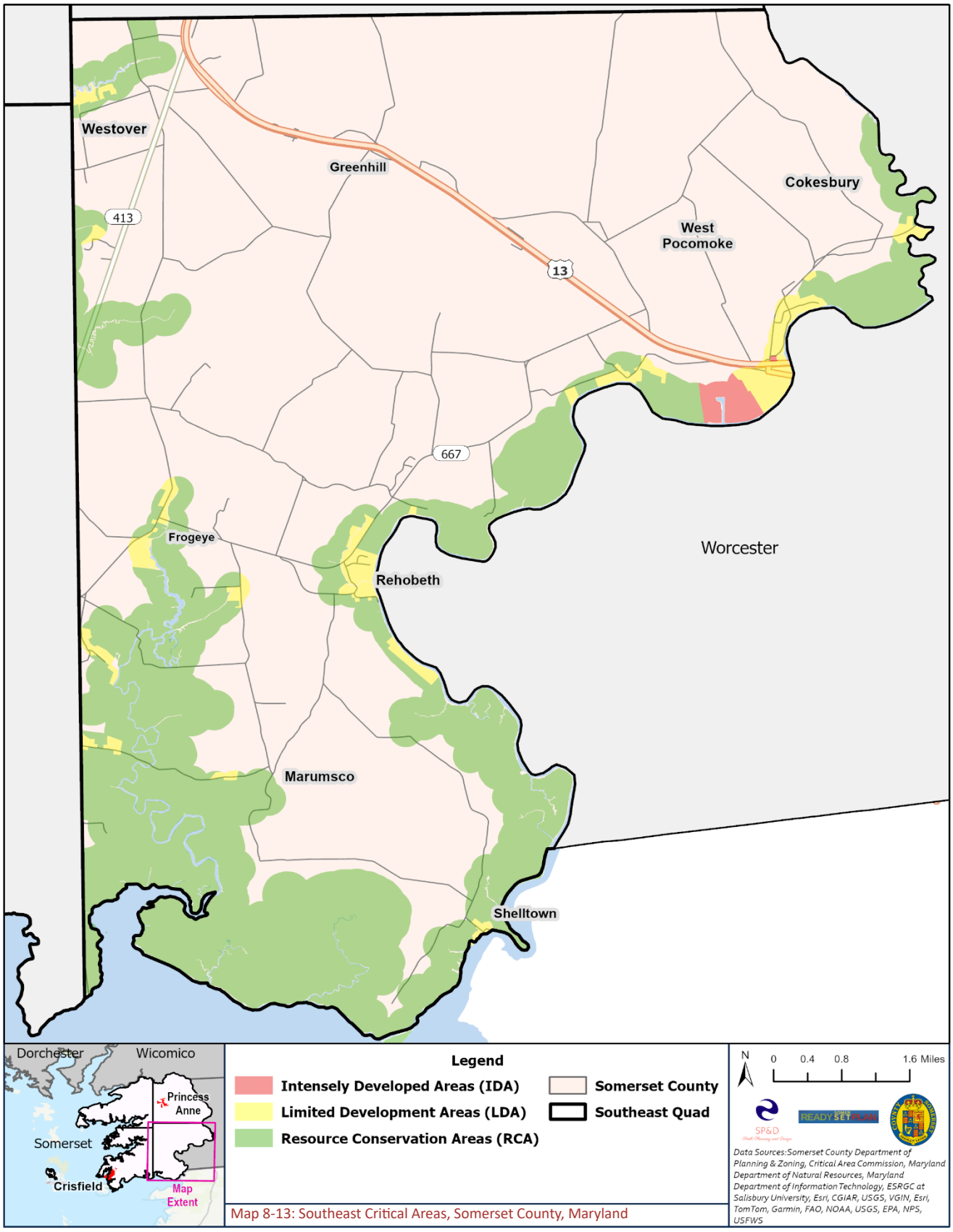
Map 8-10: Northwest Critical Areas, Somerset County, Maryland



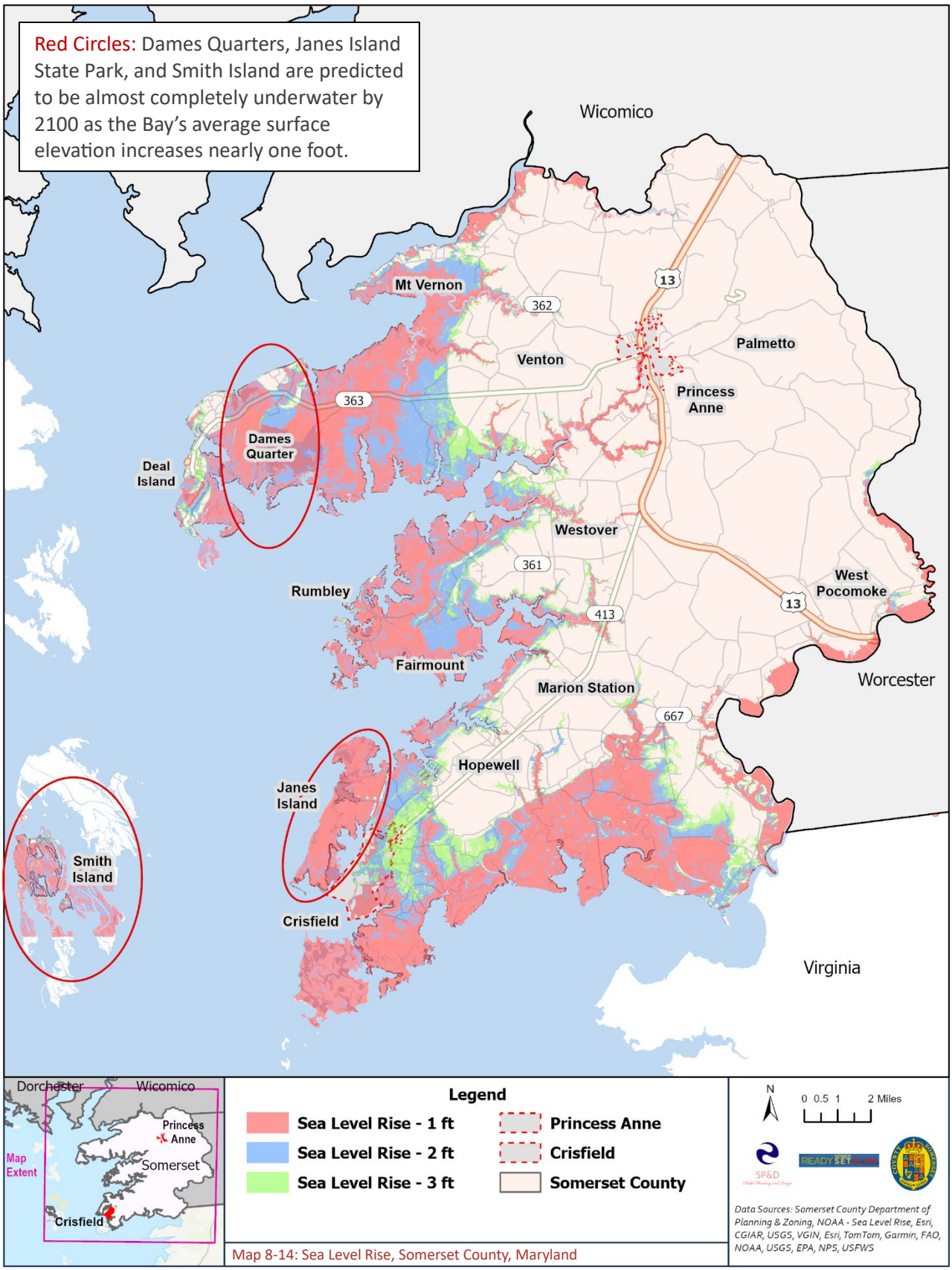
Map 8-11: Northeast Critical Areas, Somerset County, Maryland



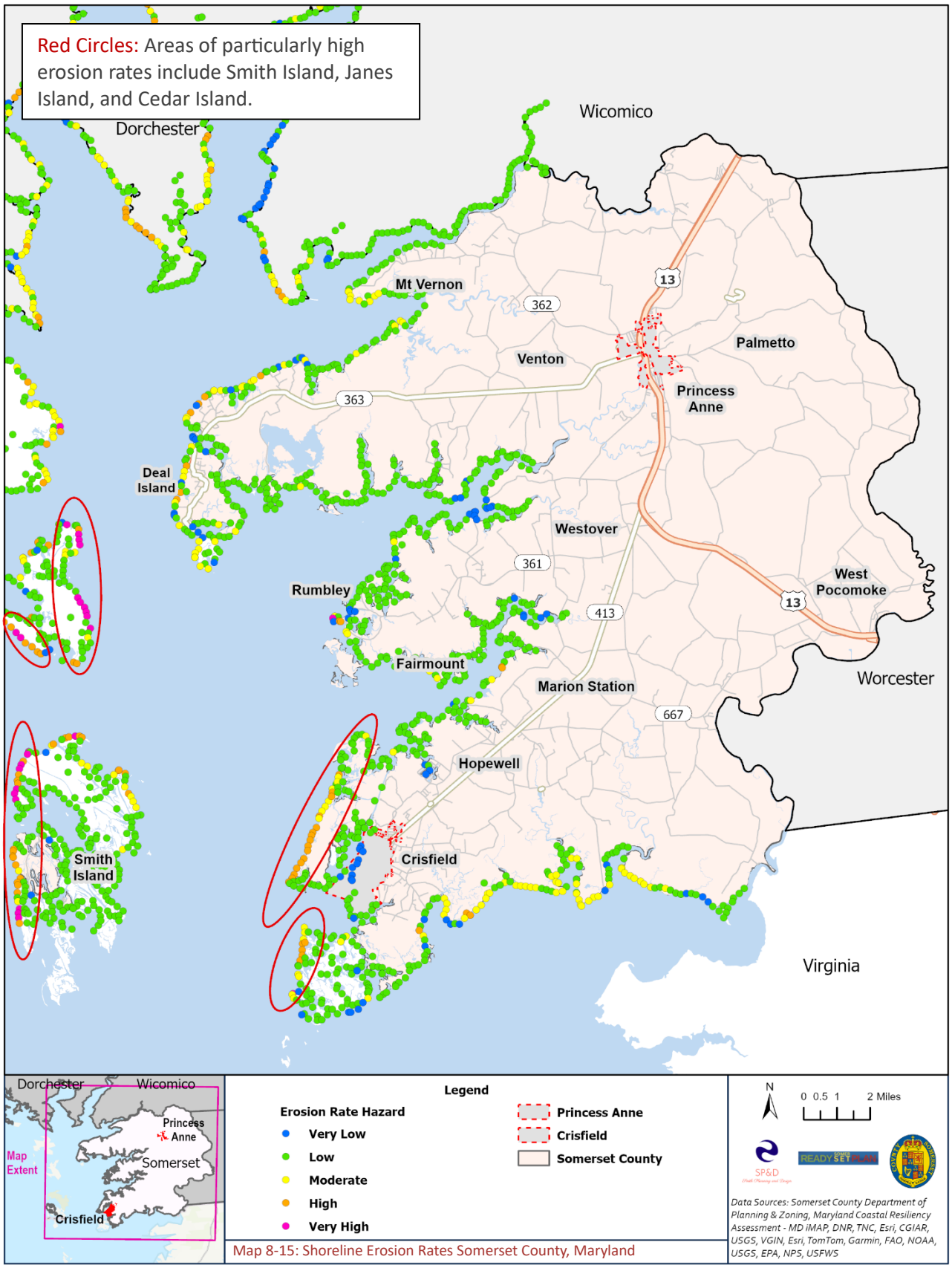
Map 8-12: Southwest Critical Areas, Somerset County, Maryland



Map 8-13: Southeast Critical Areas, Somerset County, Maryland



Map 8-14: Sea Level Rise, Somerset County, Maryland



Map 8-15: Shoreline Erosion Rates Somerset County, Maryland

Chapter 8: Sensitive Areas Goals & Strategies

Goal 8.1

Work with the State to complete protection of green infrastructure primarily in the northeast area of the county.

Strategies

A. The State can assist the County by identifying specific priority lands that should be considered for protection. Once priority areas are identified, the County can consider options for protection which might include:
    a. Incorporating protection criteria into the zoning and subdivision regulations
    b. Working with private land trusts and others in protecting such areas.

Goal 8.2

Implement water quality improvement projects and initiatives and protect aquatic life.

Strategies

A. Collaborate with government and non-profit partners to identify opportunities for water quality improvement projects and initiatives.
B. Develop and implement strategies to reduce pollutant loads on a watershed basis in accordance with Watershed Improvement Plans (WIP). Update impervious surface analyses Countywide. Explore areas for opportunities to replace with pervious materials and possibly combine with bioretention areas.

Goal 8.3

Protect sensitive areas by implementing conservation, preservation, and regulation strategies.

Strategies

A. Continue to implement the County's wetland and stream buffer protection within existing ordinances.
B. Consider revising the zoning ordinance to prohibit construction or maintenance within the stream during the spawning season and to prohibit the blockage or diversion of streams.
C. Continue to implement the Chesapeake Bay Critical Area Program to minimize adverse effects of human activities on water quality and natural habitat and allow for development in a sensitive manner.
D. Investigate utilizing shoreline restoration as a future way to achieve restoration and address sea level rise vulnerability, particularly if dedicated funding sources become available.
E. Continue to regulate development in mapped flood zones and evaluate the appropriateness of going beyond FEMA requirements to consider additional restrictions based on projected sea level rise.
F. Support the goals and action items identified in both the Somerset County Hazard Mitigation and Flood Mitigation Plans.
G. Encourage future development where infrastructure exists. Discourage development near sensitive areas and other environmental resources protection areas.
H. Update the County's Critical Area Ordinance based on the 2024 adopted Critical Area maps.
I. Through outreach and education efforts, promote land and water stewardship to guide individual and group actions.
J. Encourage replacement of engineered shoreline structures with adaptive, resilient shoreline stabilization measures such as living shorelines, marsh edging and living breakwaters, where feasible.
K. Continue to support the efforts of State, Federal and non-profit organizations to preserve natural resources, including productive agricultural land.
L. Collaborate with Economic Development Department and leaders to develop assistance programs for the agricultural and forest product industries.

M. Explore the possibility of making the County Maryland Agricultural Land Preservation Foundation (MALPF) Certified to maximize funding.
N. Continue to promote the Transfer of Development Rights (TDR) program.
O. Prioritize and support preservation efforts in Rural Legacy Areas.
P. Promote the natural recolonization or reestablishment of habitat and benthic species using thin layer placement (beneficial use of dredge material).
Q. Review for those areas outside of the Critical Area, which are not protected, the Planning Commission should consider the implications of 15 percent slopes in its review of project design. This is already required for plans requiring forest stand delineations.
R. Partner with Mosquito Control on beneficial drainage projects in order to improve drainage systems throughout the County.

Goal 8.4

Limit development in high hazard areas as identified in the Multi-Hazard Mitigation Plan and the Flood Mitigation Plan.

Strategies

A. Enact and enforce regulatory measures to ensure that new development will not increase hazard threats from coastal and riverine flooding, storm surge or the threat of sea level rise.
B. Establish open space parks and recreational areas in flood hazard areas.
C. Provide for the conservation and preservation of natural resources.
D. Limit additional housing (especially elderly and high density) in areas of high hazard risk.