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8-19-2019

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Christine Tombleson
Virginia Institute of Marine Science

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Recommended Citation

Tombleson, C. (2019) Virginia Stormwater Act, Tiered Approach for Rural Tidewater Localities: Generation of Watershed Impervious Maps. Virginia Institute of Marine Science, William & Mary. <https://doi.org/10.25773/4446-4559>

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Virginia Stormwater Act, Tiered Approach for Rural Tidewater Localities: Generation of Watershed Impervious Maps

Prepared for: Middle Peninsula Planning District Commission
February 2019 - August 2019

Summary:

An amendment to Virginia's Stormwater Management Act was adopted to implement a tiered approach to stormwater management for rural Tidewater localities. To participate a locality is required to have a map showing the boundaries of the locality, with each watershed located partially or wholly within the locality, and the percentage of impervious cover (cover that impedes the natural infiltration of water into the soil) within each watershed. Center staff created maps indicating the initial percent of existing impervious cover present in each watershed for the Middle Peninsula Planning District (MPPDC) localities; Gloucester, Essex, King and Queen, King William, Mathews, Middlesex Counties and the Town of West Point. The watershed maps created illustrate the percent of impervious cover at the start of the tiered stormwater program; the localities are responsible for tracking any additional impervious area going forward.

Suggested citation: Tombleson, C. 2019. Virginia Stormwater Act, Tiered Approach for Rural Tidewater Localities: Generation of Watershed Impervious Maps. Center for Coastal Resources Management. Virginia Institute of Marine Science, William & Mary.

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Background

In March 2017, **The Rural Coastal Virginia Community Enhancement Authority** (“the Authority”) was established by the Virginia General Assembly to serve as a regional economic development body and represent a partnership between the Commonwealth; the Middle Peninsula, Northern Neck, and the Eastern Shore planning district commissions (PDCs); and the twelve rural counties of the coastal Tidewater region of Virginia that include Accomack, Essex, Gloucester, King and Queen, King William, Lancaster, Mathews, Middlesex, Northampton, Northumberland, Richmond and Westmoreland. The Authority was created to spur regional economic development. In that mission, the Authority was interested in the review of the functionality of current stormwater regulations, asserting that the State needs to look at rural and urban areas differently when it comes to establishing regulations, especially the administration of stormwater management.

What is the stormwater problem? The Virginia Department of Environmental Quality (DEQ) is the lead agency that develops and implements statewide stormwater management programs in Virginia. Under the Virginia Stormwater Management Act, DEQ administers stormwater management requirements for land disturbances of one acre or more in localities that “opt out” of becoming a Virginia Stormwater Management Program (VSMP) authority. However, in localities subject to the Chesapeake Bay Preservation Act (CBPA), the stormwater management water quantity requirements must be applied to all land disturbances in Chesapeake Bay Preservation Areas of 2,500 square feet or more. Therefore, CBPA localities that “opt out” of becoming a VSMP authority must still administer stormwater management technical criteria for these smaller projects. This requirement raised concerns from Tidewater rural localities over necessary staff and resources to implement the stormwater program requirements for these projects.

To address the concerns, the General Assembly mandated the **Commonwealth Center for Recurrent Flooding Resiliency** (CCRFR) to convene a workgroup to examine opportunities to improve stormwater management in rural localities located in Tidewater Virginia. The CCRFR was established by the General Assembly to serve, advise, and support the Commonwealth, state agencies, localities and other entities with scientific and technical assistance in support of recurrent flooding resiliency. The CCRFR is comprised of faculty, staff, and students at Old Dominion University (ODU), William & Mary, and the Virginia Institute of Marine Science (VIMS).

CCRFR Recommendation

The CCRFR workgroup recommended a tiered approach to stormwater based on watershed impervious cover thresholds to determine applicable stormwater quantity requirements in rural Tidewater localities. Stormwater requirements in each watershed would be based on the amount of impervious cover in the watershed. This approach would allow rural localities to implement less complicated water quantity requirements for projects under one acre within watersheds with smaller amounts of impervious cover. For watersheds with higher rates of impervious cover, or as impervious cover increases in a watershed, the stormwater requirements would move to the next “tier.” Determination of an initial impervious cover of each watershed in a locality would be required, and additional impervious cover tracked per watershed as development occurred. The workgroup further recommended the localities use the Virginia Geographic Information Network (VGIN) high resolution land cover dataset to establish the initial impervious cover percentages; and impervious cover maps be updated annually by localities.

Amendment to the Virginia Stormwater Management Act

In 2018, the Virginia General Assembly acted on the recommendations of the CCRFR workgroup and amended the Virginia Stormwater Management Act authorizing any rural Tidewater locality to adopt a tiered approach to manage water quantity based on the percentage of impervious cover in the watershed. In response, DEQ promulgated regulations* for a tiered approach to water quantity technical criteria compliance, as well as requirements that prior to the adoption and implementation of the tiered approach, a local governing body shall develop a watershed map that includes the following:

Item (1): The boundaries of the locality and each watershed located partially or wholly within the locality based on the most recent version of Virginia's 6th order National Watershed Boundary Dataset;

Item (2): The percentage of impervious cover within each watershed. Data provided by the Virginia Geographic Information Network (VGIN) shall be sufficient for the initial determination of impervious cover percentage at the time of the initial adoption of the map; and

Item (3): The locations at which the governing body expects or proposes that development should occur and may indicate the projected future percentage of impervious cover based on proposed development. The governing body may designate certain areas within a watershed in which it proposes that denser-than-average development shall occur and may designate environmentally sensitive areas in which the water quantity technical criteria in [9VAC25-870-66](#) shall apply.

***9VAC25-870-52. Chesapeake Bay Preservation Act Land-Disturbing Activities in Rural Tidewater Localities**

Middle Peninsula PDC Local Government Meeting

Staff from the Center for Coastal Resources Management (CCRM) at VIMS were asked to attend the February 2019 local county administrators meeting at the Middle Peninsula Planning District Commission (PDC) to discuss management of impervious area data related to the tiered approach for stormwater. At the meeting it was determined that the localities were not concerned about the ability to track new additions in impervious area moving forward, but requested technical assistance from CCRM for the determination of the initial impervious cover percentages for the watersheds in each of the seven localities of the Middle Peninsula: the counties of Essex, Gloucester, Mathews, Middlesex, King and Queen, King William and the town of West Point.

Generation of Watershed Impervious Maps

In response to the Middle Peninsula localities' request, CCRM produced maps and data to meet required items 1 and 2 for the watershed maps in the DEQ regulation. Maps were generated for each Middle Peninsula locality depicting the boundaries of a locality; the boundaries of each watershed located partially or wholly within the locality based on the most recent version of Virginia's 6th order National Watershed Boundary dataset; and the percentage of initial impervious cover using the VGIN land cover data.

The third map item required by the regulations, i.e. future changes to impervious cover, will be addressed by the localities.

CCRM staff assembled and analyzed the data using ArcMap 10.6 (ESRI's geographic information system (GIS) software). GIS allowed the storage, display, and analysis of the land cover, watershed, and county datasets.

Watershed Boundaries

Locality and watershed (6th order - WBDHUC12) boundaries for Essex, Gloucester, Mathews, Middlesex, King and Queen, King William and West Point were obtained from VGIN's website.

When the county layer and the watershed layer were displayed together, it was discovered that some of the watershed boundaries did not line up with county boundaries, resulting in small "slivers" of watershed areas on either side of a county boundary. It would be administratively difficult to implement the tiered program in these small sliver areas. Changing the county boundaries to match the watershed boundaries would require legal action. Therefore, where slivers occurred along a county boundary, the best alternative was to move the watershed boundary to match the county boundary (Figures 1 & 2). A new modified watershed boundary layer was generated reflecting the changes.

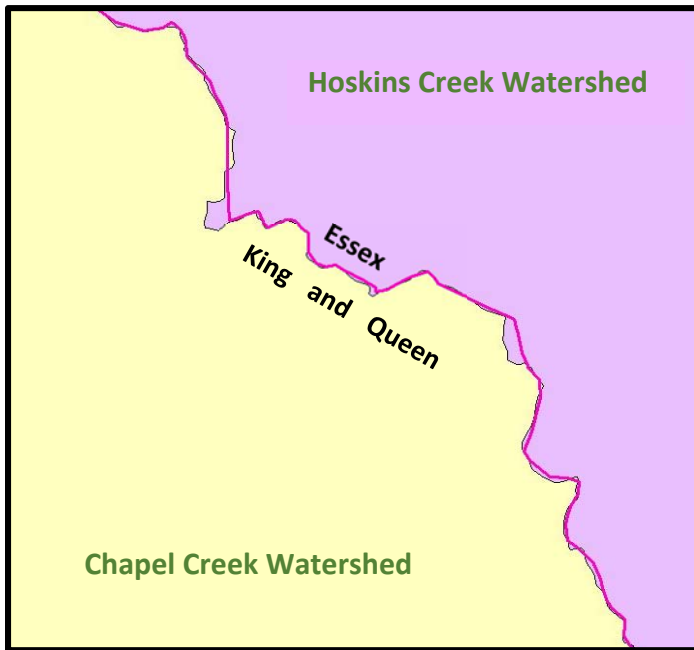


Figure 1. Section of county and watershed boundaries that do not match. The purple represents the Hoskins Creek Watershed and the yellow represents the Chapel Creek Watershed. The pink line is the county line between Essex and King and Queen Counties.

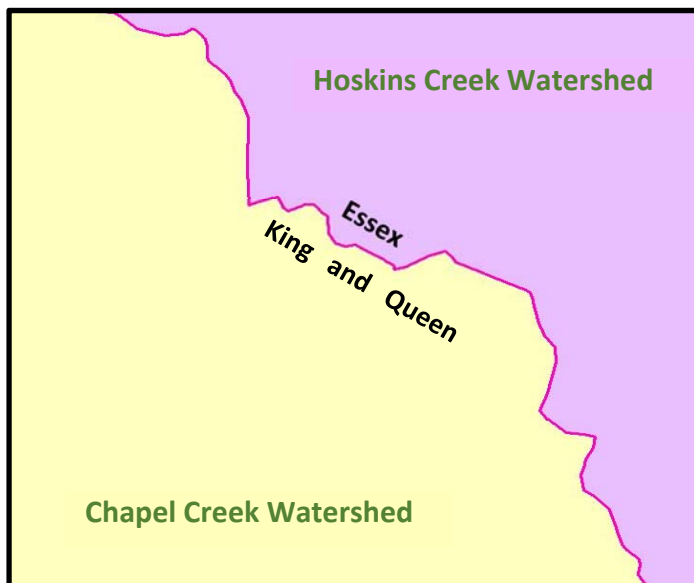


Figure 2. Watershed boundaries moved to match county boundary.

Impervious Cover

The Virginia Stormwater Management regulations define **impervious cover** as “a surface composed of material that significantly impedes or prevents natural infiltration of water into soil.”

Table 1 VGIN Land Cover Categories

VGIN Land Cover Dataset		
Land Cover Description	Category	Impervious
Open Water	11	?
Impervious Extracted	21	Yes
Impervious Local Datasets	22	Yes
Barren	31	No
Forest	41	No
Tree	42	No
Shrub/Scrub	51	No
Harvested/Disturbed Forest	61	No
Turf Grass	72	No
Pasture	81	No
Cropland	82	No
NWI_Other	91	No

The regulations state the initial impervious cover percentage shall be determined from the VGIN land cover data. The Virginia High Resolution Land Cover Dataset classifies categories 21 and 22 as impervious and the rest of the categories are considered pervious (Table 1.)

However, the workgroup recommendation and regulations did not take into account that DEQ considers some water features to be impervious. Therefore, an issue arose of how to designate the open water land cover category 11 (Table 1).

Per discussions with DEQ staff, natural water features such as rivers and streams were considered *pervious*. Inland water features that appeared to be artificially impounded were to be classified as *impervious*.

Raster land cover data were converted to polygons (Figure 3). The polygons representing open water in the land cover data were compared to aerial imagery

(Figure 4) and a determination was based on observation of the imagery.

Figure 3. VGIN Land Cover Data

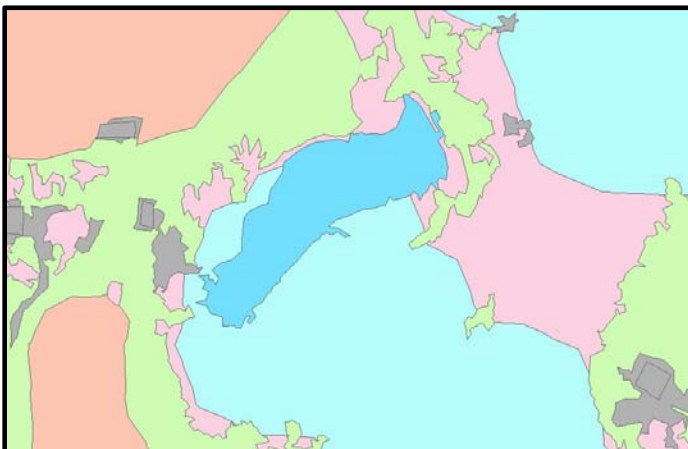


Figure 4. 2017 Aerial Imagery



Open water polygons in each watershed of all seven localities were reviewed. Water features that appeared to be artificially impounded were designated impervious. Water features that were natural marsh areas, not artificially impounded, or oxbows were designated pervious.

Figure 5 illustrates the distribution of impervious, pervious, and open water cover according to VGIN land cover categories in an area of Gloucester County, near Beaverdam Reservoir. Figure 6 illustrates the distribution of impervious and pervious cover in this same area with the change in open water classification based on the DEQ definition for the impervious designation of water bodies.

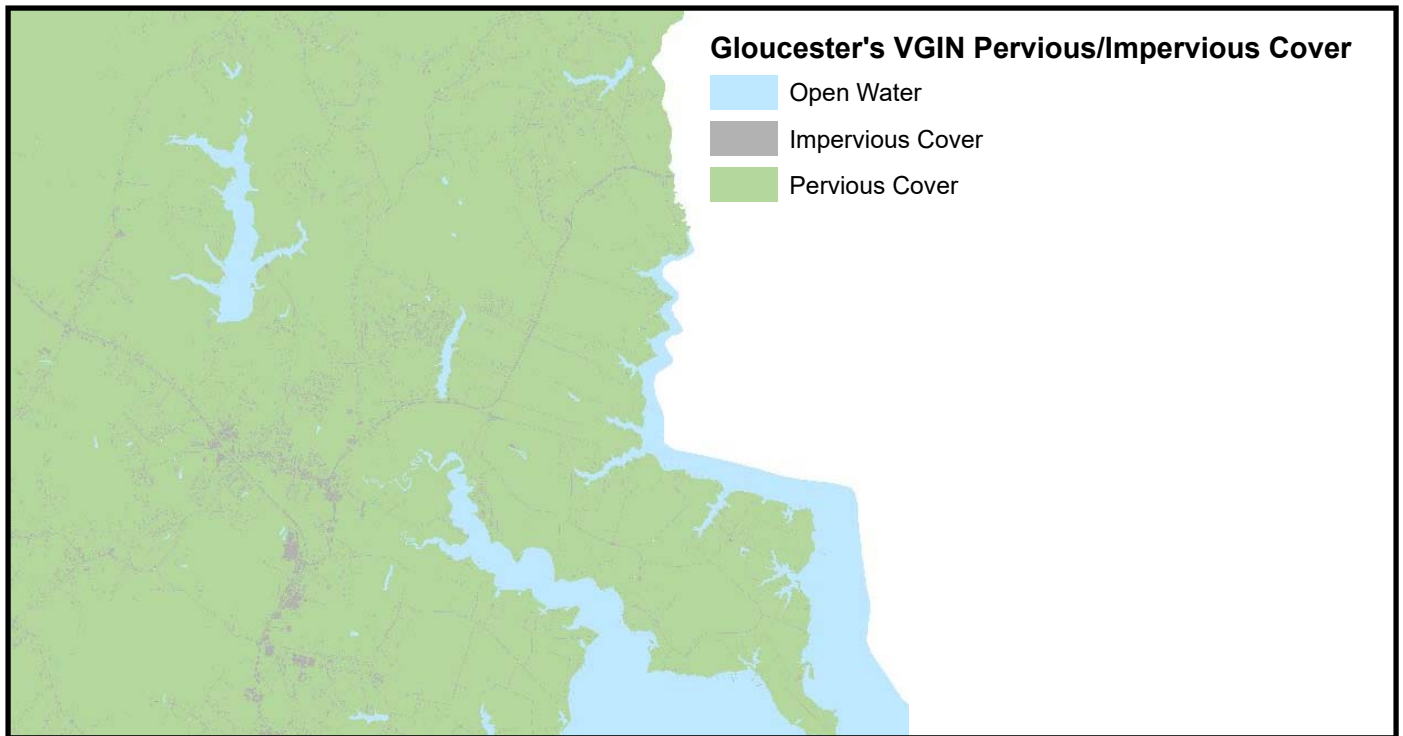


Figure 5. Original VGIN pervious/impervious and open water land cover classifications. Area of Gloucester County, near Beaverdam Reservoir

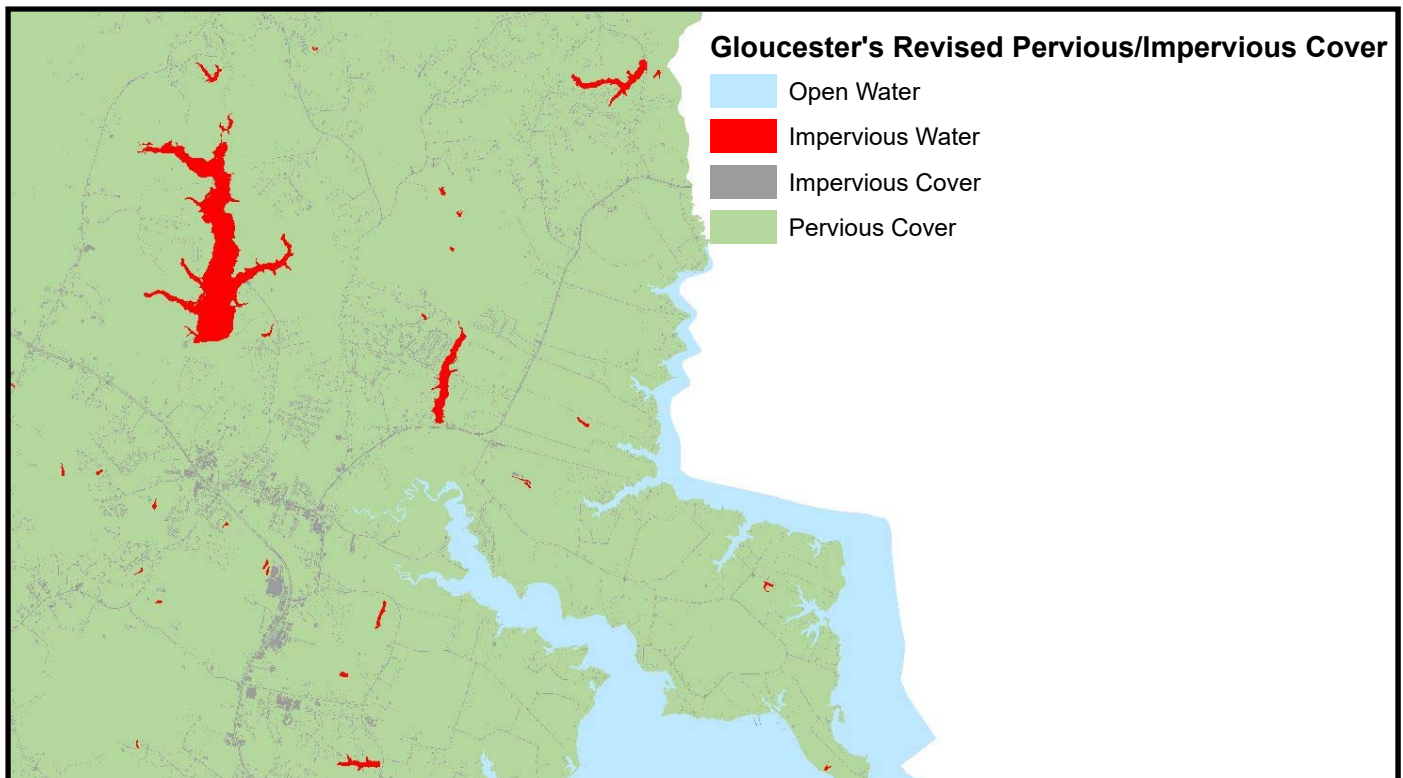


Figure 6. Revised open water land cover classifications. Area of Gloucester County, near Beaverdam Reservoir

Additionally, the land cover data contained very small category 11 polygons (arguably land cover misclassifications) scattered throughout each locality. These polygons were located in areas other than water, impounded areas, or marshes. Based on the surrounding land cover data and aerial imagery, these polygons were recoded as impervious or pervious.

The revised **impervious cover** for each land cover polygon in a watershed was summed in the GIS software.

The **percent of impervious cover** present in each watershed (in each Middle Peninsula locality) was then calculated. The watershed boundaries used were the modified watershed boundaries created to match county boundaries where necessary.

Final watershed maps were generated for each Middle Peninsula locality. The maps depict the boundaries of a locality; the boundaries of each watershed, based on the most recent version of Virginia's 6th order National Watershed Boundary dataset, modified where necessary to match the county boundary; and the percentage of initial impervious cover derived from the VGIN land cover data using a revised open water (category 11) based on DEQ guidelines and as observed via aerial imagery (Figure 7, Gloucester County).

Watershed Maps

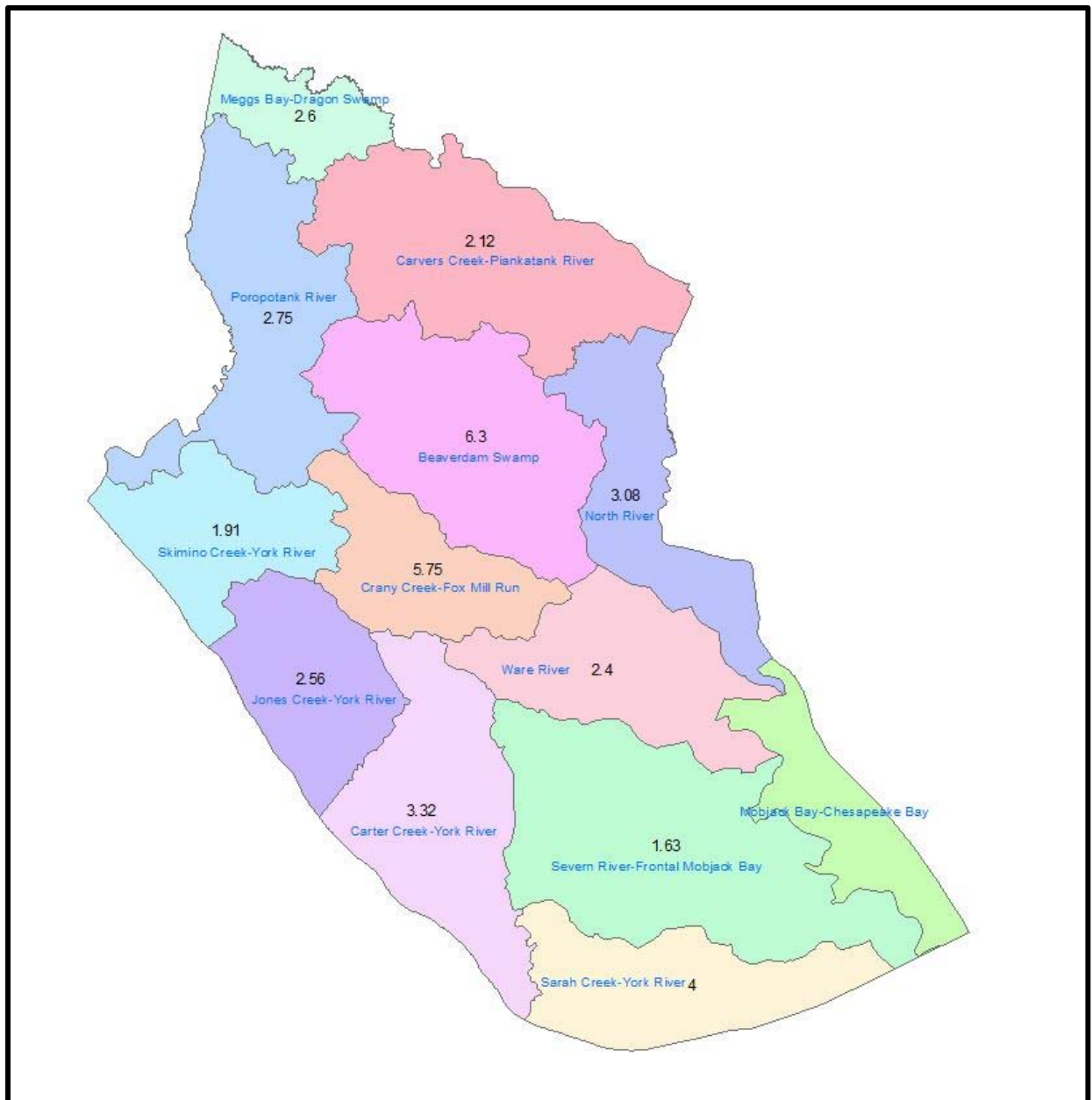


Figure 7. Watershed Impervious Percentage Map for Gloucester County, Virginia.

DEQ Review and Approval

Completed watershed maps and datasets were sent to DEQ Office of Stormwater Management for review on April 23, 2019.

On June 26, 2019, DEQ found *“that it appeared the following preliminary watershed GIS map/files met the requirements outlined within the code § 62.1-44.15:27.2.B.1 and the following files [datasets] can be used to fulfill the process outlined in § 62.1-44.15:27.2.B. Rural Tidewater localities; water quantity technical criteria; tiered approach.”*

CCRM staff provided the watershed maps and datasets to the Middle Peninsula PDC for distribution to localities.

Data Reference

- 1) **Virginia_Administrative_Boundary_Dataset_2018** – County/Town Boundaries
<https://vgin.maps.arcgis.com/home/item.html?id=777890ecdb634d18a02eec604db522c6>
Created March 29, 2016, Updated Jan 22, 2019
Counties – Gloucester, Mathews, Middlesex, Essex, King and Queen, King William
Towns- Town of West Point
Projection: UTM
Note: Cut out West Point area from King William
- 2) **VGIN - Virginia National Hydrography Dataset** – Watershed Areas
<https://vgin.maps.arcgis.com/home/item.html?id=6a310e46199645dd9cb45c2fda54bdc6>
Created: March 22, 2017, Updated, Jan 22, 2019
WBDHUC12 – 6th order watershed required
- 3) **2016 VGIN Virginia Land Cover Dataset** - Latest VGIN land use cover data –
<https://vgin.maps.arcgis.com/home/item.html?id=d3d51bb5431a4d26a313f586c7c2c848>
Created: Jan. 18, 2017, Updated: Feb 21, 2019