

## Handout 1.3a Hydrologic Unit Code

### Hydrologic Unit Codes (HUCs)

Watersheds are delineated by USGS using a nationwide system based on surface hydrologic features. This system divides the country into 21 regions (2-digit), 222 subregions (4-digit), 370 basins (6-digit), 2,270 subbasins (8-digit), ~20,000 watersheds (10-digit), and ~100,000 subwatersheds (12-digit).

A hierarchical hydrologic unit code (HUC) consisting of 2 additional digits for each level in the hydrologic unit system is used to identify any hydrologic area (see [Federal Standards and Procedures for the National Watershed Boundary Dataset, 4th ed. 2013](#)). A complete list of Hydrologic Unit codes, descriptions, names, and drainage areas can be found in the [United States Geological Survey Water-Supply Paper 2294](#), entitled "Hydrologic Unit Maps".

## Hydrologic Unit Geography

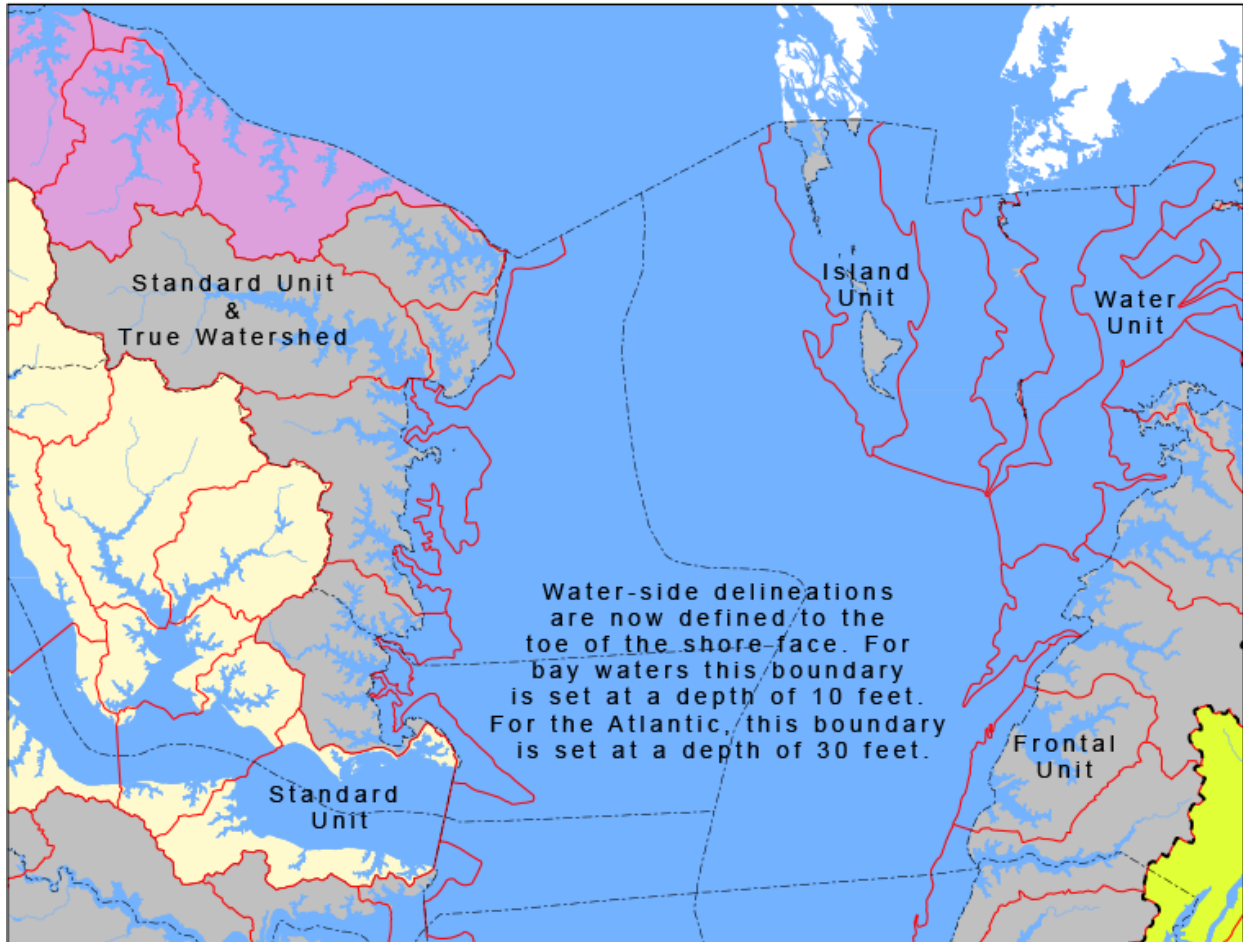
The Virginia National Watershed Boundary Dataset (VaNWBD) was completed in 2006 and has been updated several times since then, most recently in 2019. What follows explains what the VaNWBD is and how it differs from previous and coexisting hydrologic unit systems.

### Definitions

The terms *watershed* and *hydrologic unit* are used throughout DCR's website. Do both terms refer to the same thing? Almost. A true watershed is an area of land and water defined by a boundary such that all surface drainage within the boundary converges to a single point. This point of convergence is usually the exit point or outlet, where the collected waters leave the watershed. There are, however, watersheds out of which no water flows.

In contrast, hydrologic units are drainage areas that are delineated so as to nest into a multi-level hierarchical drainage system. Aside from the surface waters that are collected within the boundary of a hydrologic unit, it may also accept water from one or more points outside of the unit's boundary. The tidal portion of the James River is a good example. It can be a hydrologic unit but not a watershed because water enters this unit from both the non-tidal (Piedmont) James River at Richmond and the Appomattox River at Hopewell. Additionally, hydrologic units may include associated surface areas whose drainages do not connect, thus resulting in multiple outlet points. This is usually the case with coastal frontage units such as those containing multiple outlets to the Chesapeake Bay or Atlantic Ocean.

Click the map below to view the main types of hydrologic units in the VaNWBD.



According to the classic definitions, all watersheds are hydrologic units but not all hydrologic units are watersheds. In the development of hydrologic units, watersheds are inherently preferred: They are the perfect hydrologic unit.

You may notice that there is no mention of size in the above definitions of watersheds and hydrologic units. How big or small may they be? Watersheds may be as big or as small as they need to be to correctly be referred to as a watershed. A hierarchical hydrologic unit system, on the other hand, has levels that are based on the size of the area within the boundaries of the units.

A hierarchical hydrologic unit system for the US started in the 1970s and has been modified several times since. Our [HU origins page](#) describes the original form and subsequent changes to those units in Virginia prior to the development of the national Watershed Boundary Dataset.

### **Watershed Boundary Dataset**

In 2001 the NRCS, USGS, EPA and other federal agencies teamed with the Subcommittee on Spatial Water Data — part of the Advisory Committee on Water Information (ACWI) — and the Federal Geographic Data Committee (FGDC) to develop a new hydrologic unit delineation standard. With state input, the new Federal Standards for Delineation of Hydrologic Unit Boundaries was created. The new standards establish a new set of seamless 5th and 6th level hydrologic units for the entire U.S. The digital products resulting

from the delineation and capture of these new units is the Watershed Boundary Dataset (WBD). The WBD became the country's official hydrologic unit system at that time, although WBD standards continue to evolve.

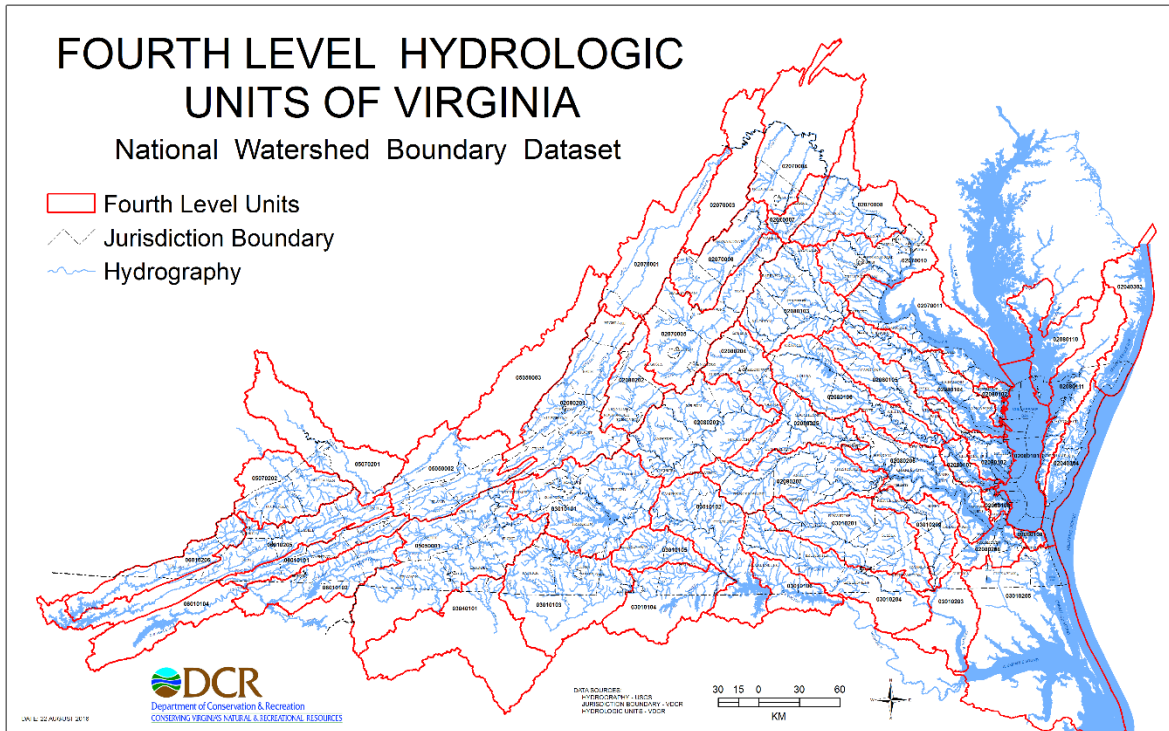
As part of the WBD development process in Virginia, 6th level units were delineated by DCR so as to preserve as much of the intent of the 1995 Virginia Hydrologic Unit boundaries as possible in order to make the transition between the two systems less complicated.

There are several major differences between the new standards and those used to develop the pre-NWBD Virginia Hydrologic Unit system:

- Both 5th and 6th level units are smaller in the WBD. Sixth level units of the 1995 product for Virginia averaged 54,000+ acres in size. The WBD size requirements by level are in Table 3.
- Additional specific attributes to polygons and arcs include unit modifiers (dam, karst, drainage ditches, etc.) and types (standard, frontal, water, etc.), unit names, line source, official unit codes up to the 6th level, and codes for 5th and 6th level units downstream.
- Water-side delineations of frontal units extend to the toe of the shore face. In Virginia, this boundary has been set at a depth of 10 feet for the Chesapeake Bay and 30 feet for Atlantic waters. Both depths are based on research regarding where wave action first affects the shoreline.
- Unit coding for 5th and 6th level units has changed from requiring 11 and 14 digits to requiring 10 and 12 digits, respectively as shown in Table 3.
- Level names changed, as shown in Table 3.
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Click the map below to view WBD Subbasin Units that cover Virginia. They replace the previous Cataloging Units.



**Table 3. New versus old hydrologic unit system references**

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LEVEL	WBD DIGITS	OLD DIGITS	WBD NAME	OLD NAME	UNIT SIZE
1	2	2	Region	Region	Avg. 177,580 sq. miles
2	4	4	Subregion	Sub-Region	Avg. 16,800 sq. miles
3	6	6	Basin	Accounting Unit	Avg. 10,598 sq. miles
4	8	8	Subbasin	Cataloging Unit	Avg. 703 sq. miles
5	10	11	Watershed		Range: 40,000 to 250,000 acres
6	12	14	Subwatershed		Range: 10,000 to 40,000 acres

The new unit name reference “Watershed” above may refer to hydrologic units that are not actually watersheds as correctly defined at the top of this page. Therefore, to

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avoid the unfortunate confusion these references create, DCR refers to the various orders of hydrologic units by their level instead of their name.