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American Shad Habitat Plan for the Commonwealth of Virginia

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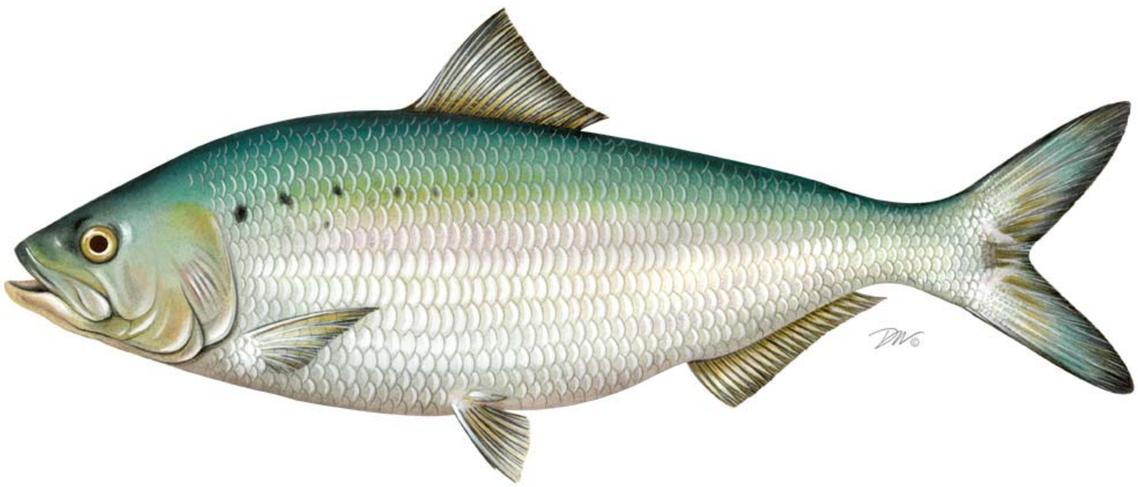

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Approved February 6, 2014

Commonwealth of Virginia
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Agencies within the Commonwealth of Virginia with Regulatory Ability Related to American Shad or American Shad Habitat Management

Virginia Marine Resources Commission (VMRC). The VMRC is divided into three divisions: 1) Fisheries Management, which is charged with regulation of fisheries resources in tidal and marine environments, including collection of fisheries statistics, development of management plans, and promotion and development of recreational fishing activities; 2) Habitat Management, which manages and regulates the submerged bottom lands, tidal wetlands, sand dunes, and beaches; and 3) Law Enforcement, which enforces state and federal fisheries laws and regulations.

Virginia Department of Game and Inland Fisheries (VDGIF). The VDGIF manages and regulates inland fisheries, wildlife, and recreational boating for the Commonwealth of Virginia, and is responsible for enforcement of laws pertaining to wildlife and inland fisheries management.

Virginia Department of Environmental Quality (DEQ). The DEQ is charged with monitoring and regulating the quality of air and water resources in Virginia. DEQ is organized into many programs, including Air, Water, Land Protection and Revitalization, Renewable Energy, Coastal Zone Management, Enforcement, Environmental Impact Review, Environmental Information, and Pollution Prevention.

Habitat Assessment

In Virginia, American shad are found in the Chesapeake Bay and its major tributaries, including the Potomac, Rappahannock, York, and James rivers, as well as smaller tributaries and other coastal habitats (e.g., along the Delmarva peninsula) (Fig. 1). Additionally, American shad are found in certain rivers in Virginia that drain to North Carolina (Desfosse et al., 1994). Here we focus on the major western tributaries of the Chesapeake Bay as these areas have come to define the primary stocks in Virginia waters (the James, York, and Rappahannock stockes). Although certain spawning/rearing reaches are known for American shad for individual rivers (Bilcovic et al. 2002), the amount of habitat used by American shad for these life history stages at a river-wide scale is unknown for Virginia tributaries of the Chesapeake Bay. Several tidal portions of the three major Virginia tributaries of the Chesapeake Bay have been designated as high priority areas for living resources, and migratory fishes in particular (Figs. 2, 3).

James River System

The James River forms at the junction of Cowpasture and Jackson rivers (rkm 580), and its drainage is the largest watershed in Virginia, totaling 26,164 km^2 (Jenkins and Burkhead, 1994). Average annual spring discharge on the James River is 294.2 m^3/s (Tuckey 2009). Prior to damming, which began in the colonial period, shad and river herring were reported to reach these headwaters and far into the major tributaries of the James River (Loesch and Atran, 1994). The two primary tributaries of the James River below the fall line at Richmond are the Appomattox River, which joins at the city of Hopewell (rkm 112), and the Chickahominy River, which joins at rkm 65. The extent of salt water is variable, but brackish conditions are observed as far up as the mouth of the Chickahominy River on a seasonal basis. Tidal water reaches Boshers Dam in Richmond (rkm 182).

York River System

The York River system includes the Mattaponi and Pamunkey rivers, which merge at West Point, VA, to form the York River (53 rkm). This is the smallest of the three western tributary systems, with a watershed of 6,892 km^2 (Jenkins and Burkhead, 1994); the Pamunkey drainage is larger and has greater average spring discharge than that of the Mattaponi (3,768 km^2 and 47.5 m^3/s vs. 2,274 km^2; 27.2 m^3/s, Bilcovic 2000). Tidal propogation extends to approximately 67 rkm in the Mattaponi and 97 rkm in the Pamunkey (i.e., approximately 120 km and 150 km, respectively, from the mouth of the York River; Lin and Kuo, 2001). The extent of the salt intrusion varies by season, but moderate salinity values (>2 ppt) are often observed in lower portions of these rivers.

Rappahannock River System

The Rappahannock River, which is approximately 195 km in length (172 km is tidal; 118 is salt water), has its headwaters in the piedmont and is fed by the Rapidan River. The Rappahannock watershed encompasses a total of 7,032 km^2 (Jenkins and Burkhead, 1994), and the average annual discharge at the fall line is 45 m^3/s (O'Connell and Angermeier 1997). An estimated 125 tributaries of the Rappahannock River are potentially used by alosines (O'Connell and Angermeier 1997).

Threats Assessment and Habitat Restoration Programs

Rulifson (1994) identified the following river specific factors potentially involved in the decline of migratory alosines in Virginia, including American shad:

Rappahannock River System:
- System wide: dams, overfishing, turbidity, low oxygen

York River System:
- York River: industrial water intakes, industrial discharge locations, overfishing, chemical pollution, thermal effluents, low oxygen, sewage outfalls
- Mattaponi River: industrial discharge locations, overfishing, thermal effluents
- Pamunkey River: industrial discharge locations, overfishing, thermal effluents

James River System:
- James River: channelization, dredge and fill, dams, industrial water intakes, industrial discharge locations, overfishing, chemical pollution, thermal effluents, turbidity, sewage outfalls
- Nansemond River: dams
- Chickahominy River: dams, industrial discharge locations, overfishing.
- Appamattox River: dams
- Pagan River: turbidity, sewage outfalls

Further Rulifson (1994) identified the potential habitat management practices, or rather their effects, involved in the decline of migratory alosines in Virginia, including American shad:

Rappahannock River: inadequate fishways, reduced spawning habitat

York River System:
- York River: poor water quality
- Mattaponi River: poor water quality
- Pamunkey River: poor water quality

James River System:
- James River: inadequate fishways, reduced freshwater input to estuaries, reduced spawning habitat, poor water quality, water withdrawal
- Nansemond River: inadequate fishways, reduced freshwater input to estuaries, reduced spawning habitat, water withdrawal
- Chickahominy River: reduced freshwater input to estuaries, reduced spawning habitat, fishing on spawning area, water withdrawal
- Appomattox River: inadequate fishways, water releases from dams, reduced spawning habitat, water withdrawal
- Pagan River: turbidity, poor water quality

From the above threats assessment, two primary classes of threats and their associated repercussions are identified here in relation to American shad habitat needs and restoration in Virginia. These are discussed below. The threat of overfishing was addressed in 1994, when a harvest moratorium was put in place for all Virginia waters (a small bycatch fishery has been allowed in each river system since 2006).

Threat: Barrier to Migration (Dams). As an anadromous fish, American shad are negatively impacted by obstructions to migration from marine and estuarine habitats to the upstream freshwater spawning and rearing habitats. Here we provide a review of the primary obstructions found on the three Virginia tributaries of the Chesapeake Bay.

Rappahannock River: The main stem of the Rappahannock River was dammed until 2004-2005 when the Crib Dam (built in 1854) and the Embrey Dam (built in 1910) at Fredericksburg (rkm 250) were removed. Removal of the dam opened 170 km of potential habitat for migratory fishes, such as American shad and river herring (American shad and blueback herring have been collected 28 miles upstream of dam). The Embrey Dam was the last remaining dam on the Rappahannock main stem. There are dams in place on tributaries of the Rappahannock (e.g., the Rapidan River) that may impeded migration of American shad (although it is unknown if American shad used these reaches prior to dam installation). A fish passage was installed on the Orange Dam on the Rapidan River, a tributary of the Rappahannock (http://www.dgif.virginia.gov/fishing/fish-passage/) 10 miles upstream of Rapidan Mill Dam, which remains as a migration barrier.

York River System: The Mattaponi, Pamunkey, and York rivers are all completely undammed. There are few dams in place on some tributaries of these rivers (e.g., the Ashland Mill Dam on the South Anna River, a tributary of the Pamunkey).

James River: Numerous dams on the James River and its tributaries have historically blocked migration of fishes. Between 1989 and 1993 three dams in the fall zone were breached or notched, extending available habitat to the base of Boshers Dam. A fish passage was installed in Boshers Dam(built in 1823) in 1999, reopening 221 km of the upper James River and 322 km of its tributaries to American shad and other anadromous fishes; the next dam of the mainstem is at Lynchburg, VA (Weaver et al., 2003). The main stem of the Appomattox River is accessible to American shad (127 miles), with a fishway at Harvell Dam in Petersburg, VA (rkm 17; scheduled for removal in 2014; see below), and a fish lift on Brasfield Dam (Lake Chesdin), near Matoaca, VA. The first existing dam on the Chickahominy is Walkers Dam at rkm 35 (with a fish passage rebuilt in 1989, and replaced in 2013). A number of additional dam removal and fishway construction projects have occurred in the past on several smaller creeks and streams in the James River drainage as well (http://www.dgif.virginia.gov/fishing/fish-passage/).

Recommended Actions: Installation of fish passage systems, breaching and removal of dams as appropriate (see Fig. 4 for recent activities in Virginia and the Chesapeake Bay watershed generally). Continued monitoring of fish passage systems currently in place for effectiveness for American shad passage.

The remaining significant American shad habitat that is yet to be reopened in Virginia includes the South Anna River, a tributary of the Pamunkey River, upstream of the Ashland Mill Dam (this would open 37 miles of shad habitat). American shad are routinely collected during sampling below Ashland Mill Dam at Rt. 1. Removal of this dam was discussed as mitigation for the King William Reservoir, but it is still in place. This remains a high priority fish passage project site in Virginia, although no timeframe or immediate plans for its removal are set. In the James River, there remain seven dams spaced over 21 miles upstream of Lynchburg, VA, starting with Scott's Mill Dam (removal of these barriers or installation of adequate fish passage facilities would open a significant amount of additional habitat). Within the Rappahannock River system, removal or fish passage at the Rapidan Mills Dam (on the Rapidan River, a tributary of the Rappahannock) would open 33 miles of habitat because there is a Denil fishway on a water supply dam (Orange, VA) 10 miles upstream of Rapidan Mill Dam.

The Harvell Dam (Appomattox River) is scheduled to be removed in 2014. Although this dam has a fishway on it, this removal would provide American shad full access to upstream habitats of the Appomattox until they encounter the Brasfield Dam fishlift. An additional 121 miles of potential American shad habitat is available upstream of the Brasfield lift should that lift prove to be successful at passing American shad.

Agency or Agencies with Regulatory Authority: Licensing and relicensing of dams is regulated by FERC. Within Virginia, VDGIF oversees the Fish Passage Program. VMRC, VDGIF, and DEQ all may be involved with the permitting process, regulations and monitoring of aspects of fish passage systems, dam removals, and other environmental factors associated with these activities depending on position of the dam.

Goal: "The importance of migratory fish species was recognized in the 1987 Chesapeake Bay Agreement and re-affirmed in Chesapeake 2000. A commitment was endorsed to 'provide for fish passage at dams and remove stream blockages whenever necessary to restore natural passage for migratory and resident fish.' The Fish Passage Work Group of the Bay Program's Living Resource Subcommittee developed strategies (1988) and implemented plans (1989) to fulfill this commitment. In 2004, the original Fish Passage Goal of 1,357 miles (established in 1987) was exceeded. Chesapeake 2000 led to the establishment of a new Fish Passage Goal, set in 2004, committing signatory jurisdictions to the completion of 100 fish passage/dam removal projects," to re-open an additional 1,000 miles of high-quality habitat to migratory and resident fishes. [from VDGIF (http://www.dgif.virginia.gov/fishing/fish-passage/#background; accessed January

8, 2014)]. This increased the over all goal to 2,807 total miles for which Virginia is responsible for roughly one-third of the miles to be reopened. To date, the partners have reopened a grand total of 2,574.5 miles, which is 92% of the 2,807 mile goal. The proposed new fish passage goal in the new Chesapeake Bay Agreement will be to reopen an additional 1,000 miles by 2025 (this will include miles starting from 2011, which is about 200 to date).

Cost: N/A

Timeline: N/A. While there is no timeline set for dam removal and fish passage in Virginia, there is a meeting of the ASMFC Fish Passage Work Group scheduled for February 2014, during which a prioritization of projects, including those in Virginia, will be discussed. While not set for individual species (i.e., specific to American shad), this next phase in prioritizing will use the prioritization tools and other existing information to create a Virginia plan that could include breaking down habitat total goals and accomplishments per anadromous species.

Threat: Pressures from Land Use associated with Population Growth

Many of the non-barrier threats identified by Rulifson (1994) can be collectively viewed as the results of changes in land use associated with population growth. The population surrounding the three primary Virginia barriers is centered in Richmond (James River), with a significant population center in Fredericksburg (Rappahannock River); the remaining areas are rural (Fig. 5). According to the Chesapeake Bay Program, within Virginia land use pressure is highest along the James River at Richmond, with other significantly high vulnerability levels at the James River near the confluence of the Chickahominy River, and the peninsula separating the James River from the York River (Fig. 6). Land use surrounding rivers within the Chesapeake Bay watershed in Virginia likely is associated with contamination (significant levels throughout, principally PCBs, but also metals within the York River system; Fig. 7), sediment load (High in the Rappahannock, Low in the York River system, Chickahominy and Appomattox rivers, and Medium in the Upper James River; Fig. 8), and phosphorus yields (High in the Rappahannock, Medium in the Upper James River, and Low in the other rivers; Fig. 9); nitrogen yields are low in all three river systems (Fig. 10). Low summertime dissolved oxygen levels remains a threat in all portions of three rivers, except the upper Mattaponi and upper Pamunkey rivers (York River System), and the upper James River (Fig. 11).

Recommended Action: No specific actions can be identified related to mitigation against land use in Virginia as it relates to American shad habitat use. Indeed, it is difficult to identify specific actions to be taken in land use management that will affect American shad population status (Waldman and Gephard, 2011). However, further study of freshwater habitat use by American shad in Virginia is needed. Specifically, quantification and analysis of specific reaches of riverine habitats used by American shad during residency (adults during the spawning run, larvae, and juveniles) is needed to better manage and address habitat concerns of the species.

Agency or Agencies with Regulatory Authority: Land use regulations associated with water quality primarily are under the authority of DEQ, although both VMRC and VDGIF may be involved in the permitting process and other aspects of regulation for certain activities that will affect water quality.

Goal: No specific goal(s) are identified for protecting American shad from pressures associated with habitat alteration and other land use changes. Stocking of hatchery fishes (VDGIF) and enforcement of a moratorium on fisheries of American shad (VMRC; VDGIF) are aimed at curbing further declines.

Progress: The moratorium for American shad has been in place in Virginia since 1994. Stocking efforts are focused on the James River (since 1994) and more recently (since 2003) on the Rappahannock River. Significant levels of hatchery returns are seen on the James River (34% in 2012) and increasing levels on the Rappahannock (from 0% in 2007 and years before, to 6.8% in 2012). Although it is suspected that the James River stock is dependent on hatchery inputs (Hilton et al. 2013), the stocking program has decreased in recent years due to decreasing funds.

Cost: N/A

Timeline: N/A

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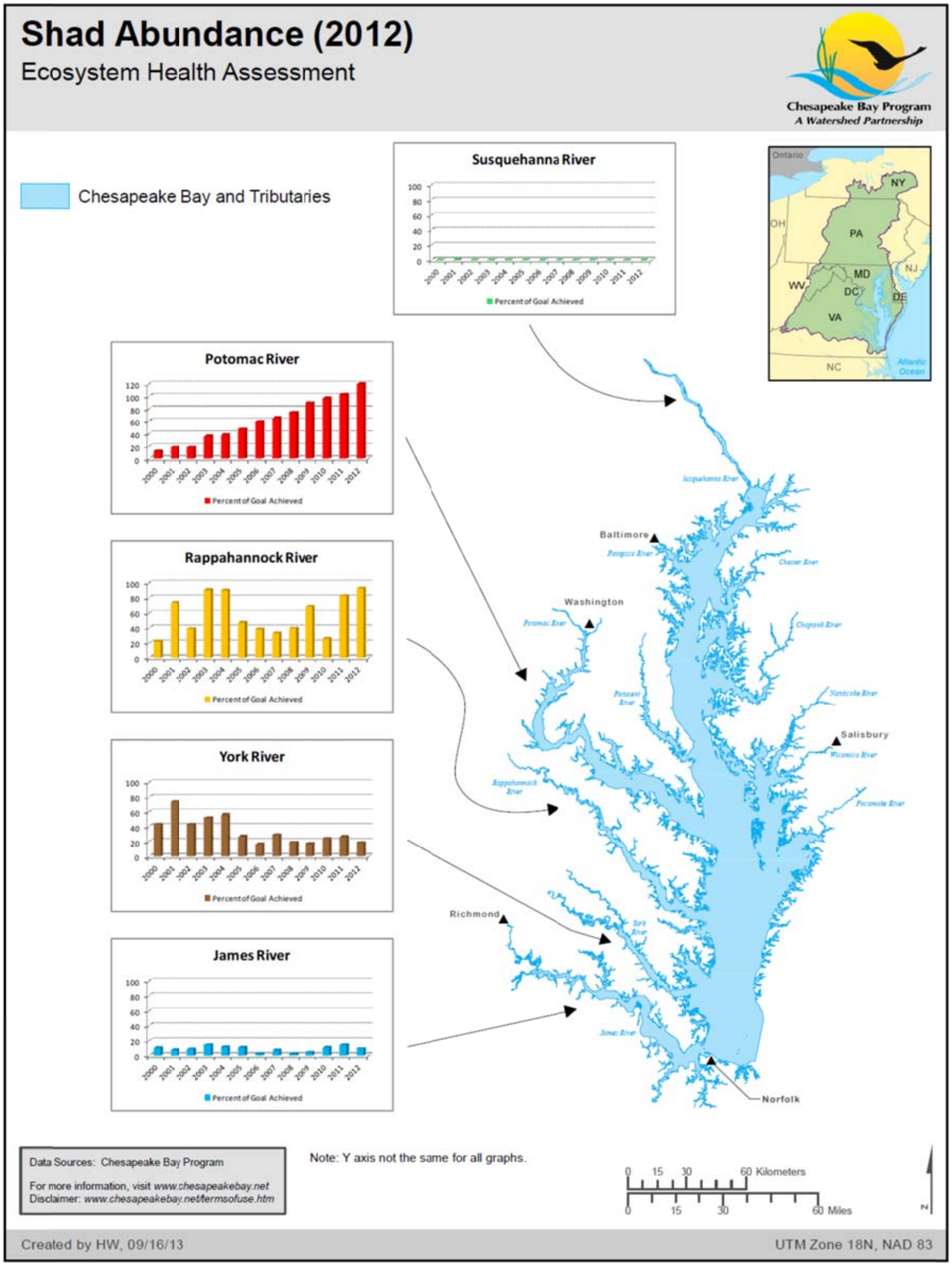

Figure 1. Shad distribution and abundance in the Chesapeake Bay. (Source: Chesapeake Bay Program)

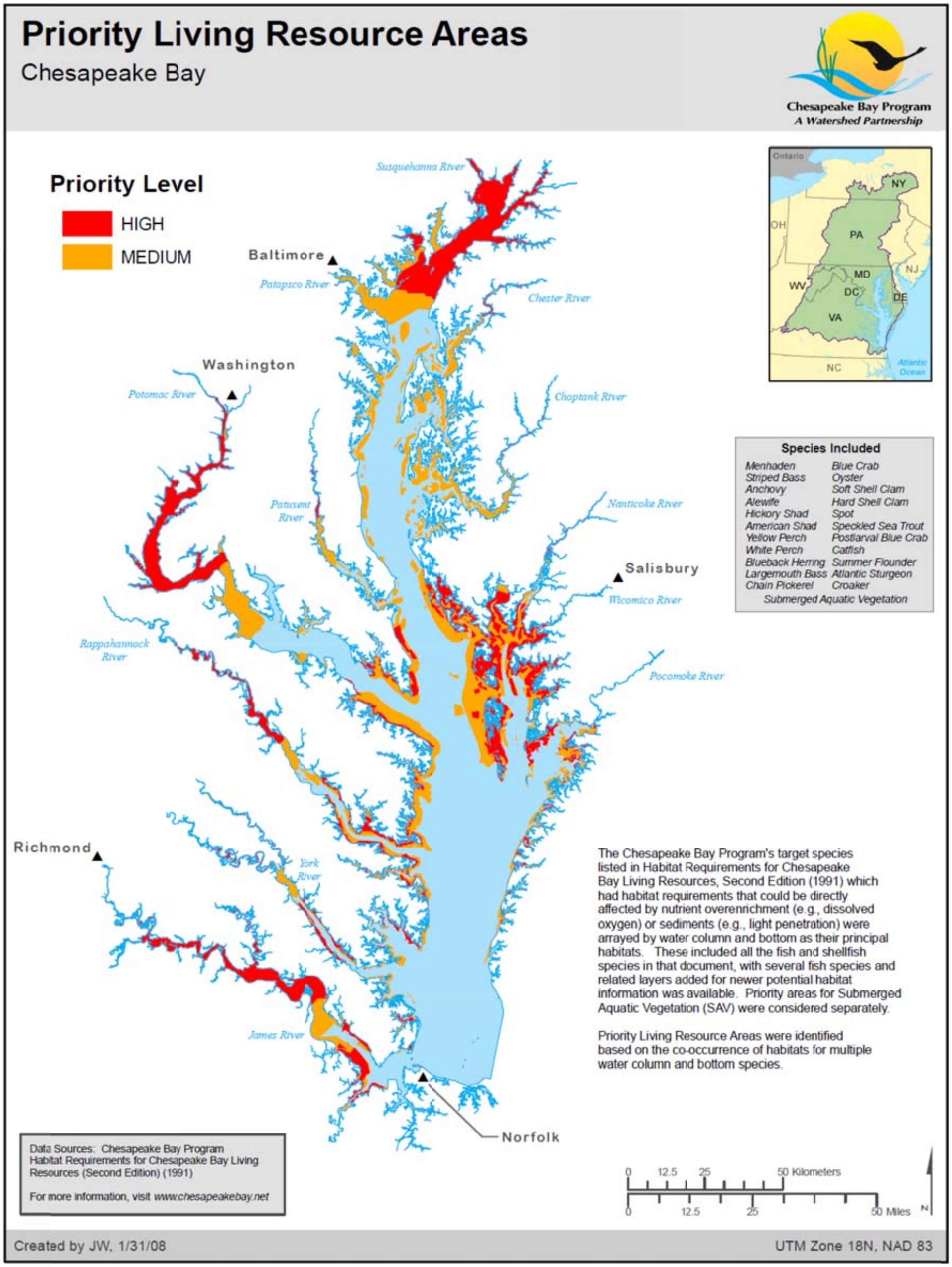

Figure 2. Priority living resource areas of the Chesapeake Bay watershed. (Source: Chesapeake Bay Program)

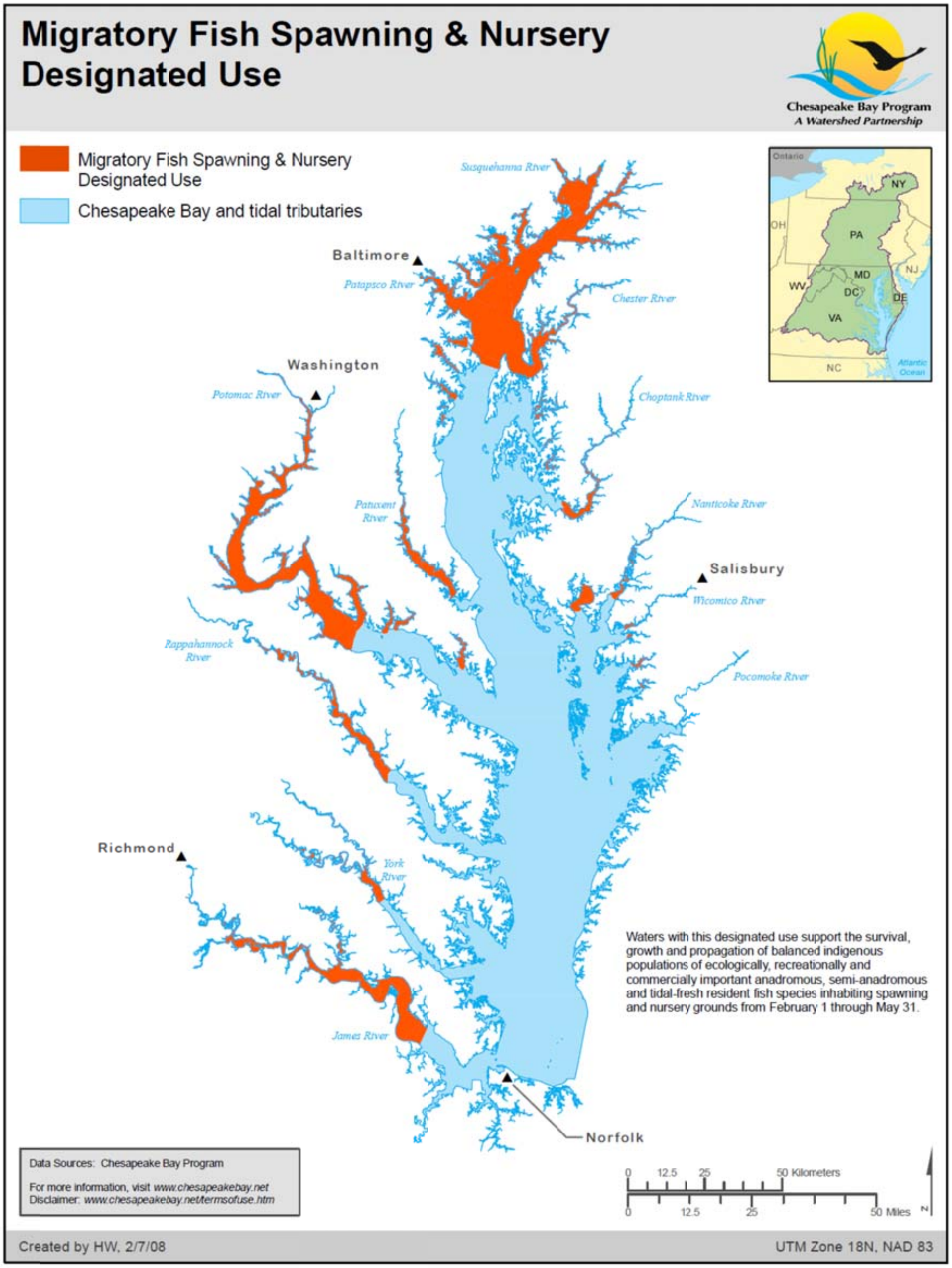

Figure 3. Migratory fish use of the Chesapeake Bay watershed (Source: Chesapeake Bay Program)

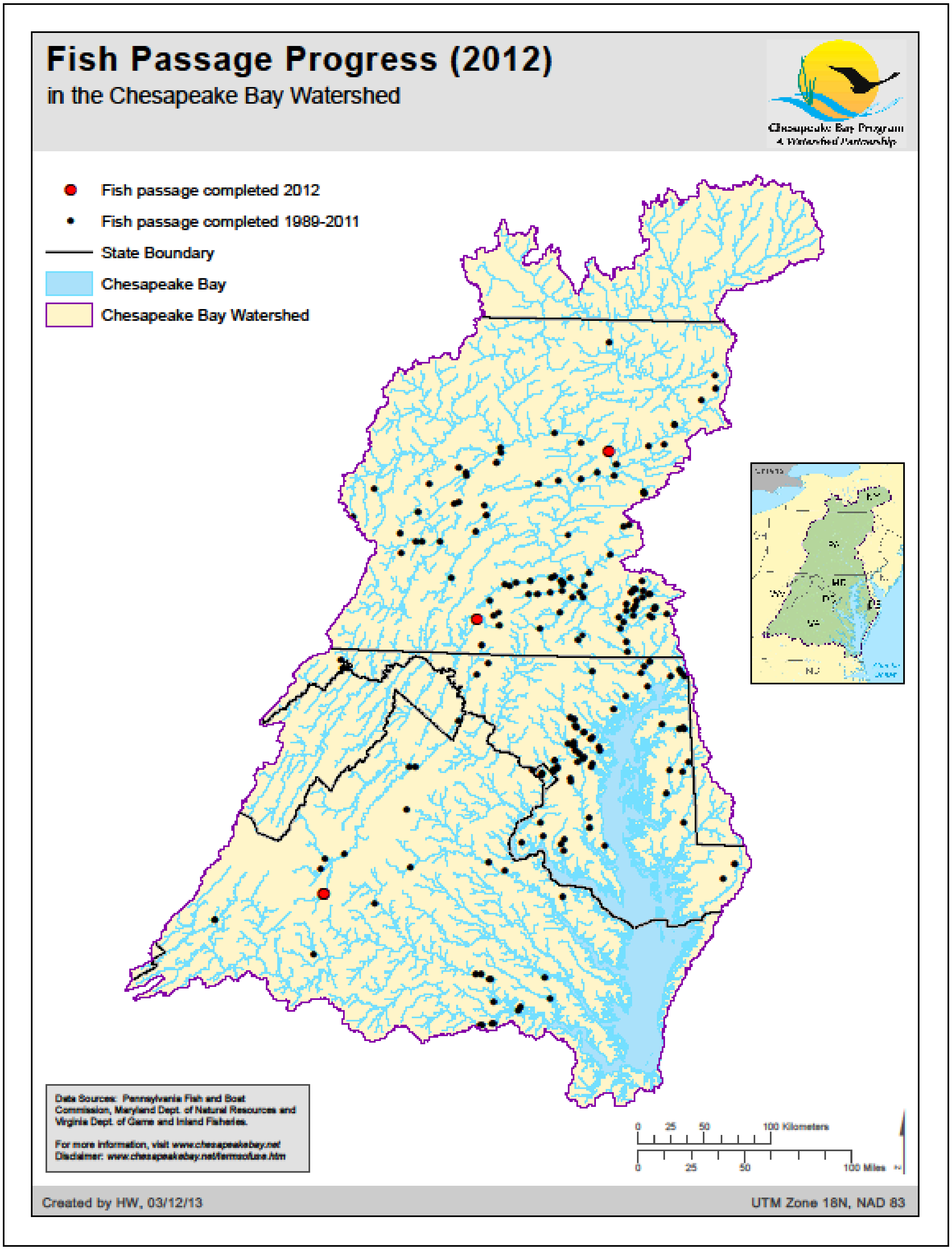

Figure 4. Fish passage projects in the Chesapeake Bay watershed. (Source: Chesapeake Bay Program)

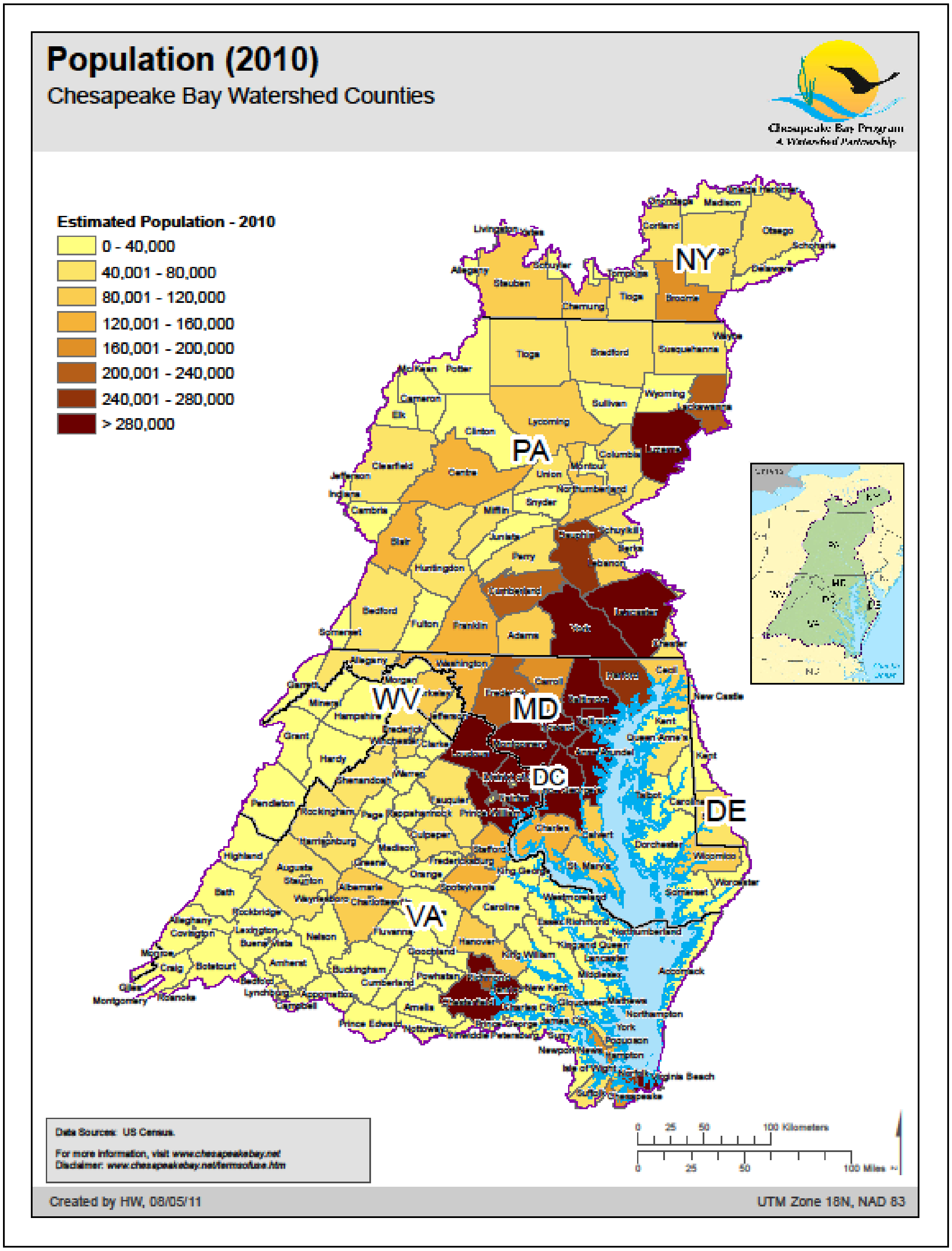

Figure 5. Population levels of the Chesapeake Bay region. (Source: Chesapeake Bay Program)

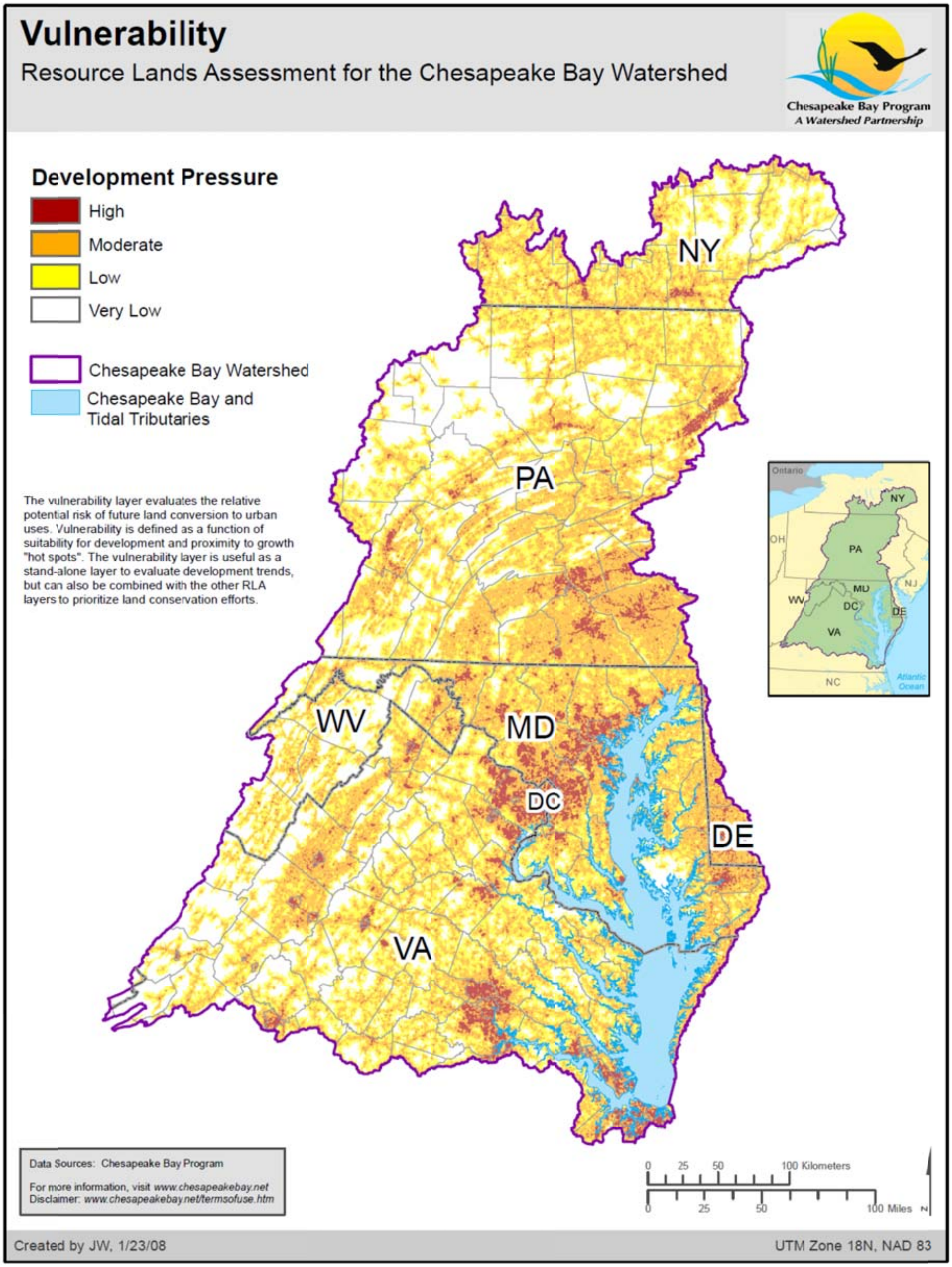

Figure 6. Potential for lands to become urban, representing significant land use changes and impacts. (Source: Chesapeake Bay Program)

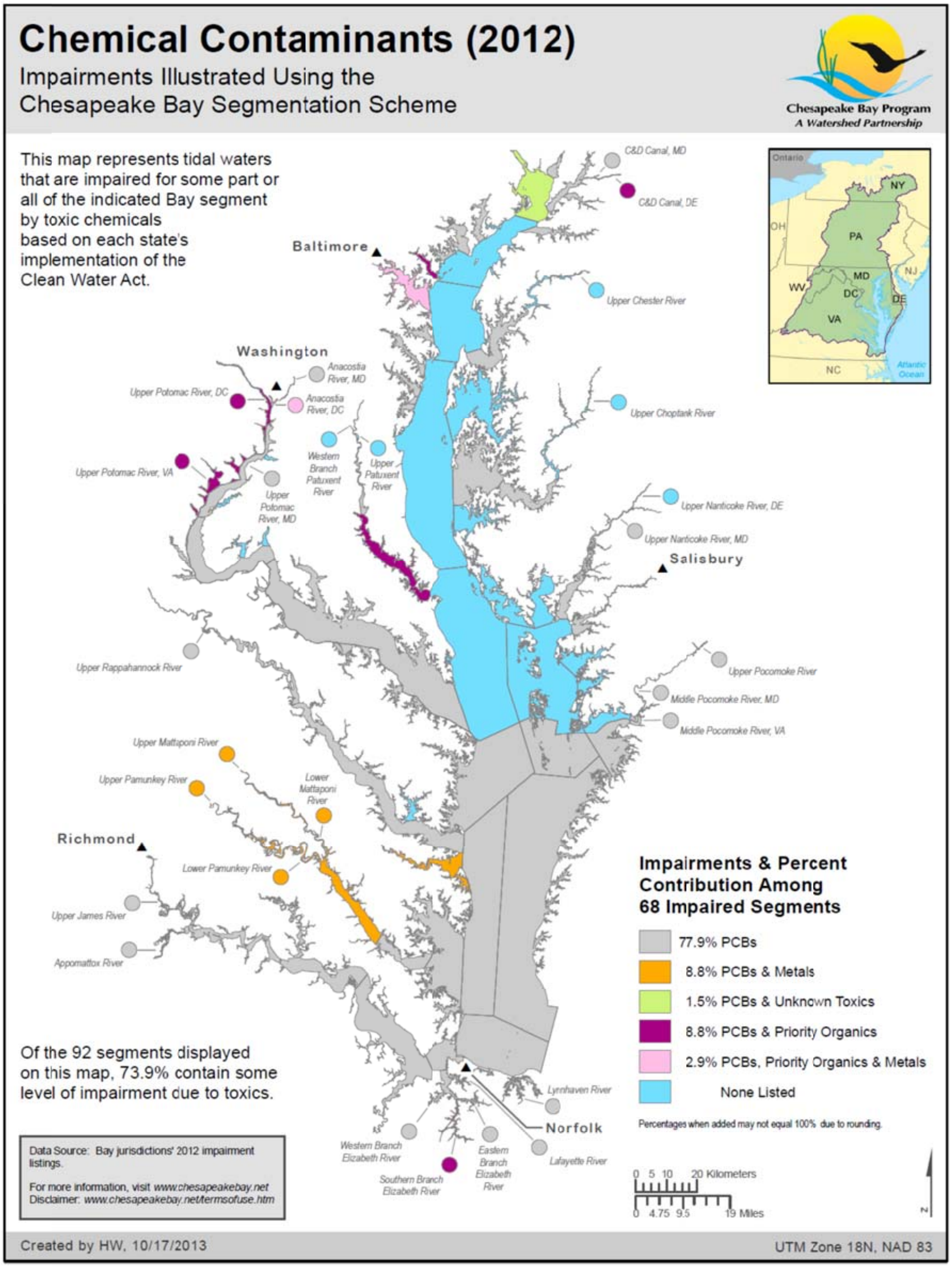

Figure 7. Chemical contaminants in the Chesapeake Bay watershed. (Source: Chesapeake Bay Program)

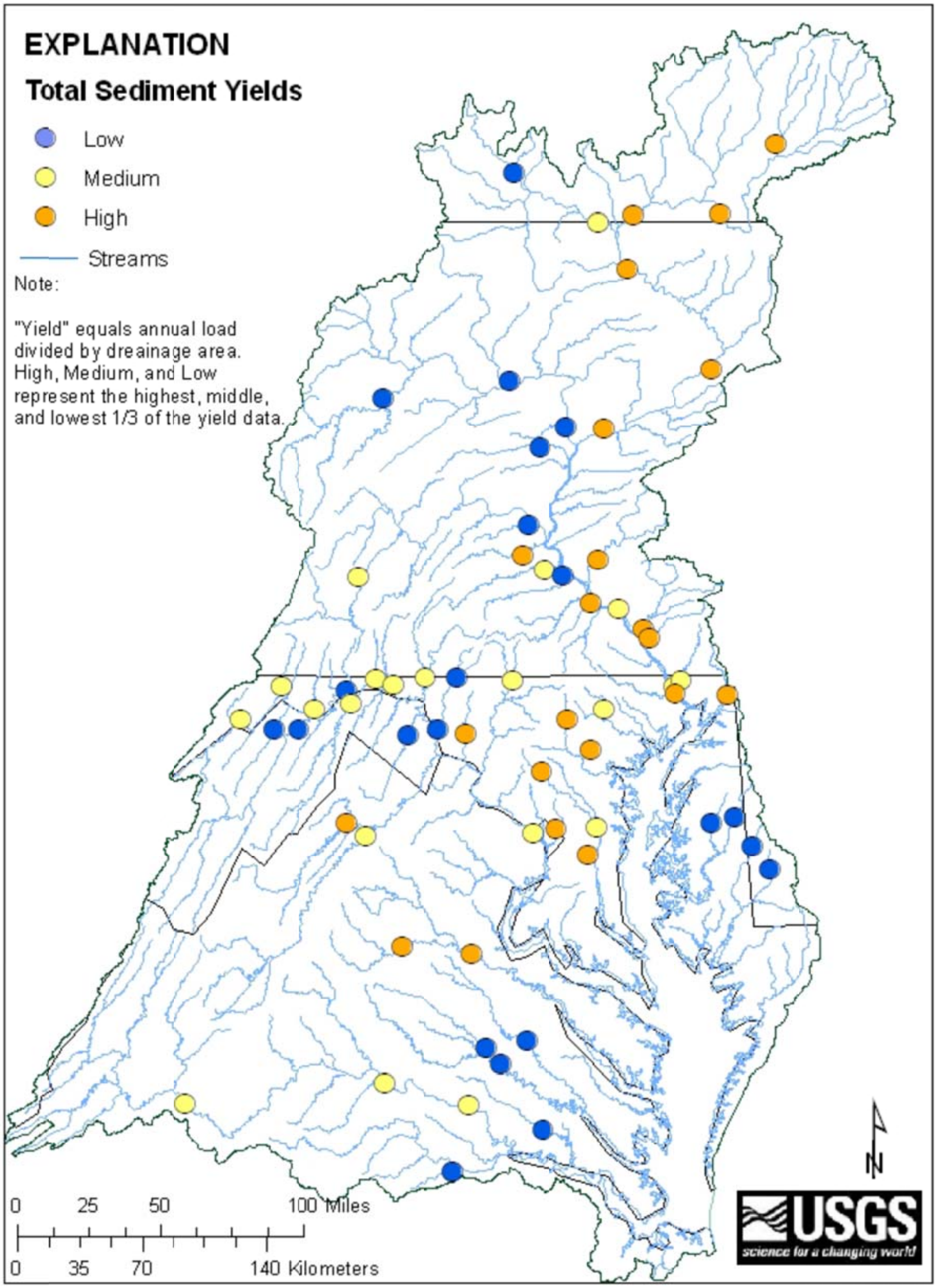

Figure 8. Sedimentation yields in the Chesapeake Bay watershed. (Source: Chesapeake Bay Program)

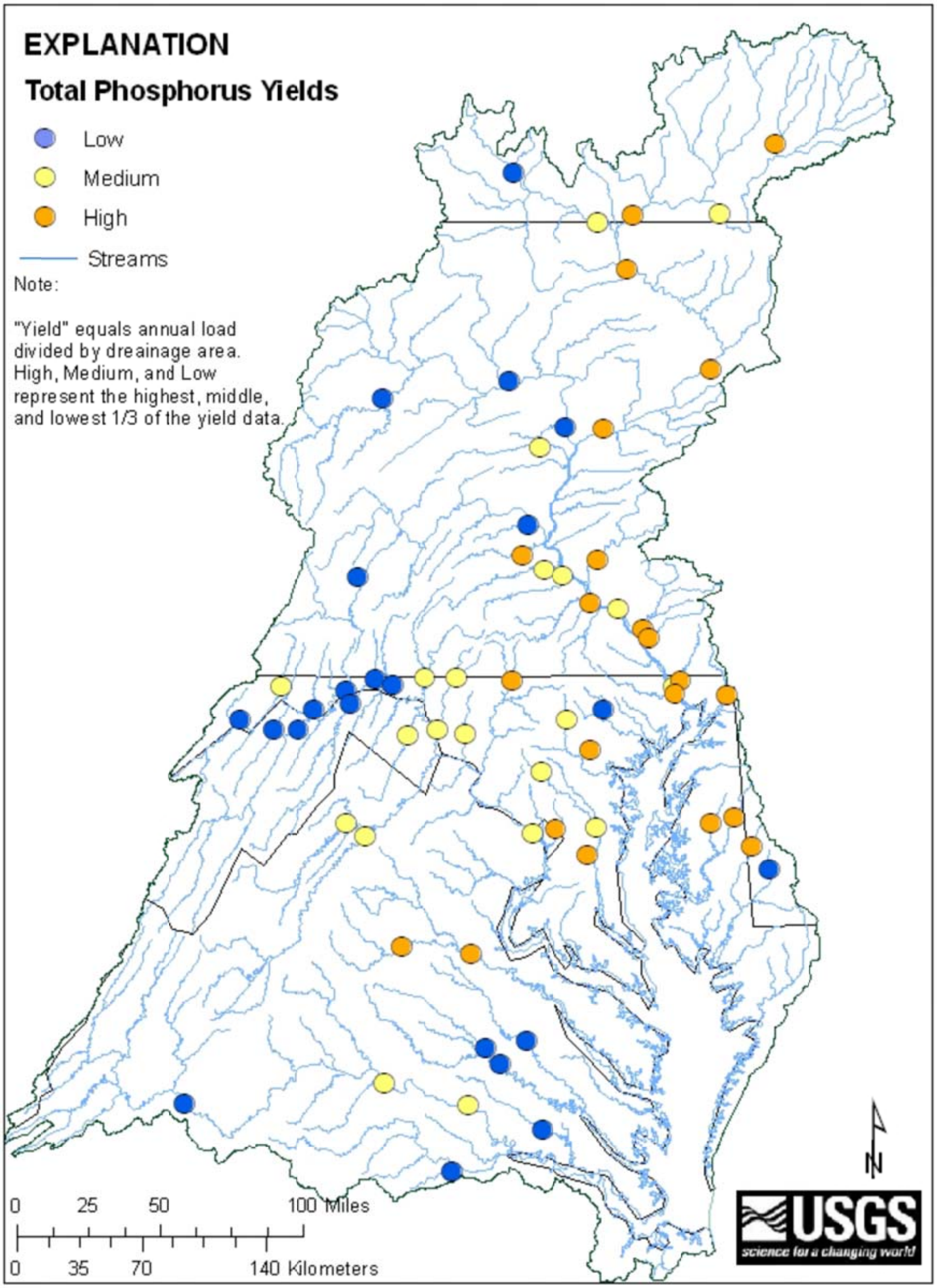

Figure 9. Total phosphorus yields in the Chesapeake Bay watershed. (Source: Chesapeake Bay Program)

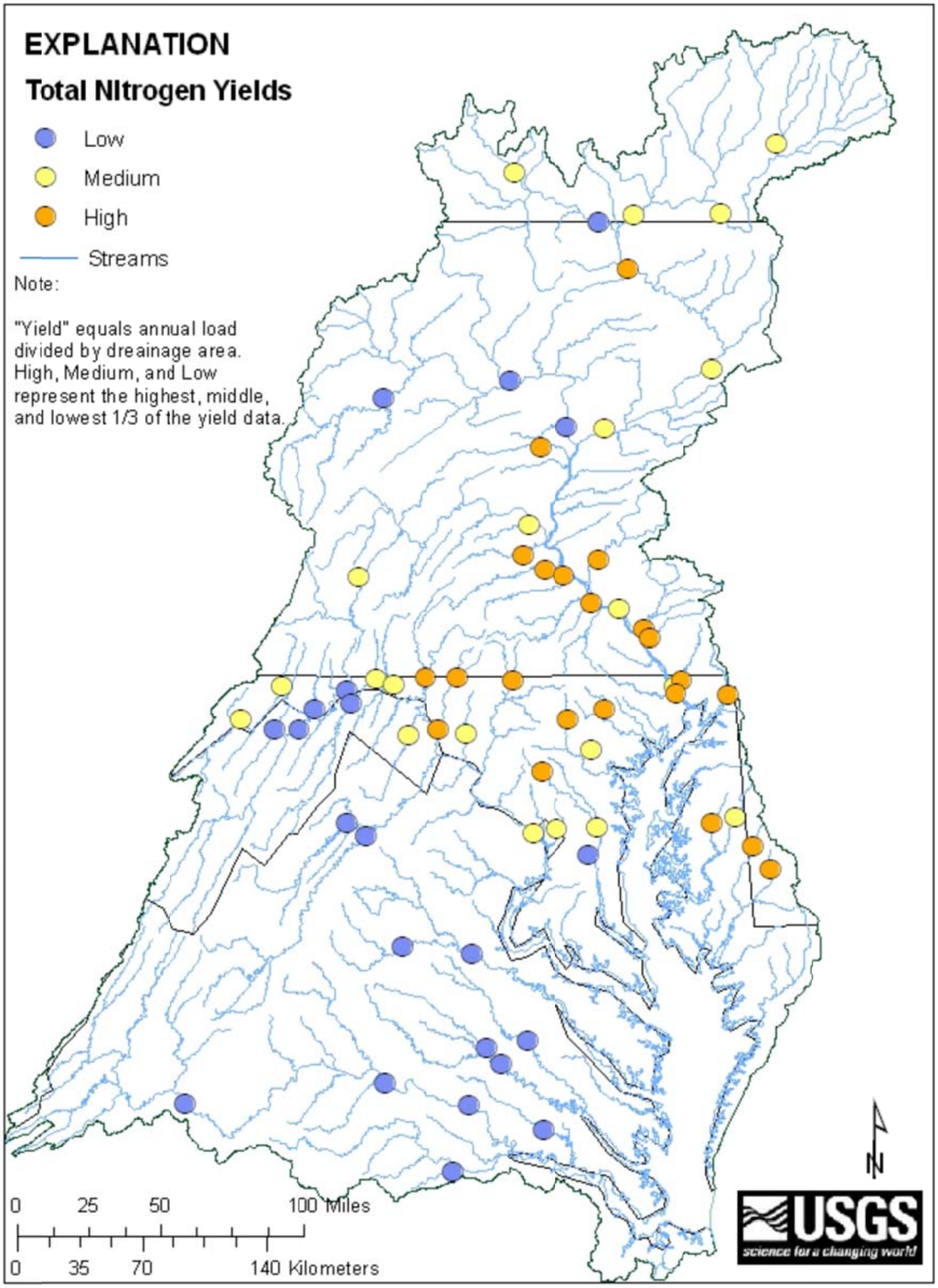

Figure 10. Total nitrogen yields in the Chesapeake Bay watershed (Source: Chesapeake Bay Program)

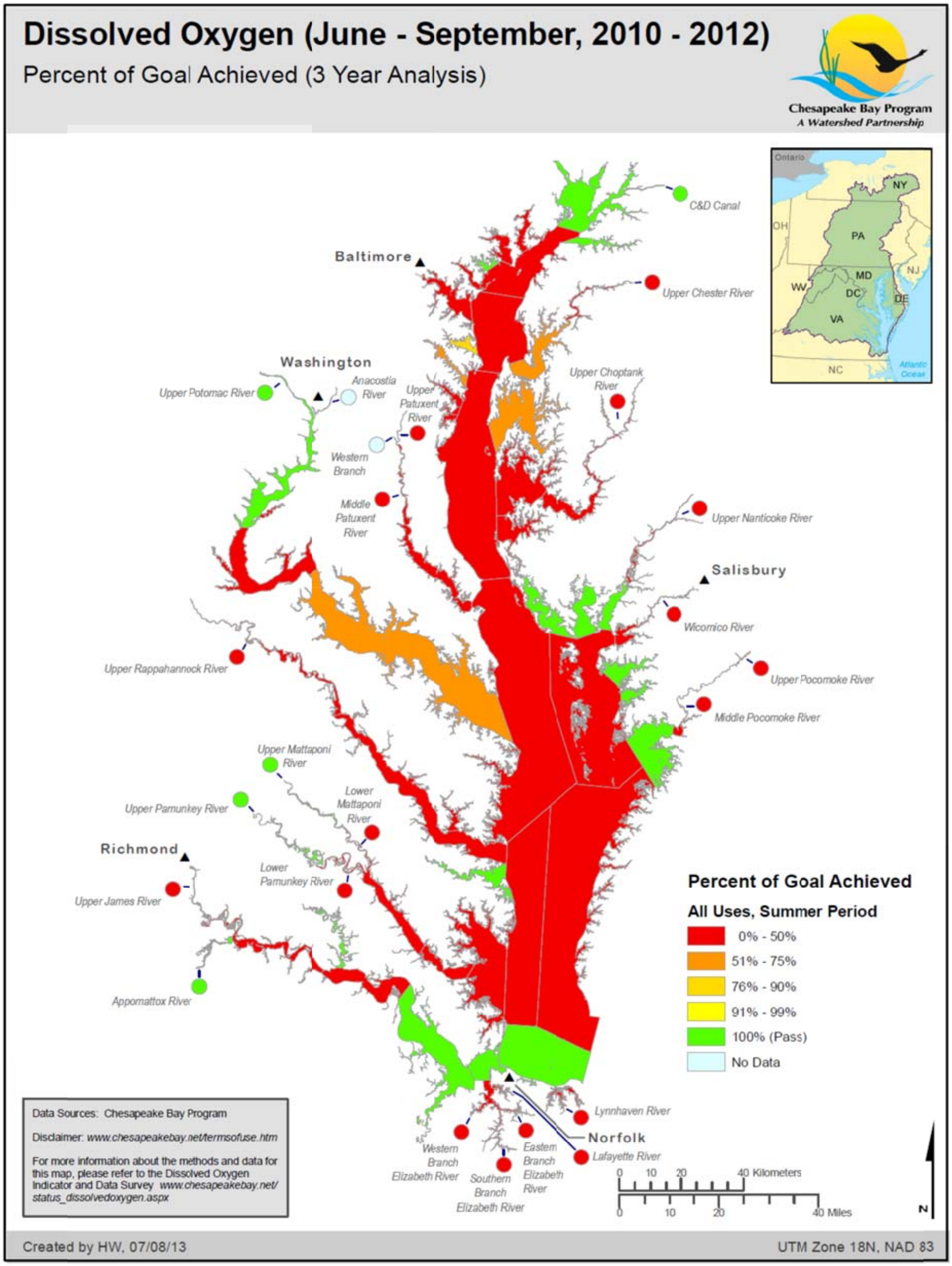

Figure 11. Dissolved oxygen in the Chesapeake Bay watershed. (Source: Chesapeake Bay Program)