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The Impact of Redefining Navigable Waters Under the Clean Water Act

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Delaware waters vulnerable to the loss of federal protection

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For decades, the Clean Water Act has been the foundation for the comprehensive protection of our nation's waterways. Unfortunately, in the last ten years, two Supreme Court cases have undermined the ability of the EPA and the Army Corps of Engineers to protect intermittent and ephemeral streams, as well as so-called "isolated" wetlands, all of which make up a significant and vital portion of the country's hydrologic profile. This report examines the legal background of the cases and then utilizes GIS technology to demonstrate the potential ramifications for the waters in the State of Delaware, including both the physical and social consequences of a loss of federal protection. Mapping and measuring of intermittent and ephemeral streams by watershed indicates that roughly 21% of total stream miles in Delaware would lose protections. Four separate methods created to define the term "isolated" allowed for the identification (by watershed) of the State's freshwater wetlands vulnerable to a loss of protection. The mapping of these definitions shows that between 32-49% of Delaware's freshwater wetlands could be outside the realm of federal Clean Water Act jurisdiction.

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Background:

The Clean Water Act was passed by Congress in 1972 in order to protect the integrity of the nation's surface water by regulating pollution dumped into waterways. The original jurisdiction this Act afforded the Environmental Protection Agency was broad in scope. However, two Supreme Court decisions (Solid Waste Agency of Northern Cook County v. U.S. Army Corps of Engineers in 2001 and Rapanos v. United States in 2006) have curtailed this jurisdiction by limiting what can be defined as a "navigable waterway" or "adjacent to a navigable waterway," and therefore protected under the Act. Subsequent to these decisions, the EPA has backed away from regulating pollution into small streams, wetlands, and other waterways.

Justification:

This reduction in regulations is expected to have serious and far-reaching negative impacts on water quality throughout the country. Although the most painful impacts will likely be felt in the Midwest and Southwestern states, where most water bodies are intermittent or isolated, there will also be consequences for certain waters in the State of Delaware if action is not taken to ensure they are protected. Specifically, many of the State's freshwater wetlands and intermittent streams are vulnerable to losses in federal protection.

Objectives:

The goal of this report is first to understand the *SWANCC* and *Rapanos* cases in order to understand their impacts on the Clean Water Act and, furthermore, on the protection of waters in the State of Delaware. The second goal is to use GIS (Geographic Information Systems) technology to examine the watersheds of the State of Delaware in order to quantify what waters (specifically isolated wetlands and intermittent and ephemeral streams) may now fall outside the federal regulatory framework of the Clean Water Act following the *SWANCC* and *Rapanos* Supreme Court rulings. Then, the designated uses of water bodies in vulnerable areas will be assessed in order to draw conclusions about how the loss of federal protection may impact society.

Methodology:

Internet research was first conducted in order to locate essays and articles that explained in detail the nature of the two Supreme Court cases, as well as to review the case transcripts and other relevant documents, such as the Clean Water Act. Once a solid understanding of the legal background was achieved, the next step was to begin working with the GIS technology. The State's intermittent and ephemeral streams were mapped and their total mileage was calculated. Then four potential definitions for an isolated freshwater wetland were developed and input into the computer. This allowed for the creation of four separate maps documenting the locations and acreages of these potentially isolated wetlands in order to infer what water bodies might lose

their federal protection. Then, maps of cold water fisheries, areas of exceptional recreational or ecological significance (ERES), areas with and without public water supplies, and areas of excellent recharge were overlaid over the various definition maps in order to form an understanding of how a loss of protection for the State's freshwater wetlands might negatively impact drinking water supplies and other waterways.

Results and Discussion: Delaware Waters Vulnerable to the Loss of Federal Protection

For almost forty years, the Clean Water Act has protected the quality and integrity of American surface waters. However, in the past decade, two Supreme Court rulings, one in 2001 and another in 2006, have limited the scope of the Act's jurisdiction. These limitations and the ambiguous wording of the rulings themselves have the potential to negatively impact water bodies across the country, and place a greater burden on states like Delaware to maintain the integrity of waters that now fall outside the realm of Clean Water Act protection.

The years before the passage of the Clean Water Act were dark ones for the nation's surface waters. Heavy pollution in the Chesapeake Bay was costing the local fishing industry millions of dollars a year in damages. Bacteria levels were one hundred and seventy times higher in the Hudson River than the safe, acceptable limit. Record fish kills were reported across the country, and thirty percent of drinking water samples taken by the Department of Health, Education, and Welfare contained chemicals at levels above those recommended by the Public Health Service.[1]

By the time the Cuyahoga River burst into flames in 1969 for what was at least the tenth time, the public was beginning to realize the dire conditions of the nation's waters.[2] Congress responded to this major environmental crisis in 1972 with the passage what is commonly referred to today as the Clean Water Act.[3] The Act's objective was "to restore and maintain the chemical, physical, and biological integrity of the Nation's waters"[4] and "to establish a comprehensive long-range policy for the elimination of water pollution."[5] Enforcing this legislation became the job of the U.S. Army Corps of Engineers and the newly established U.S. Environmental Protection Agency.

Although far from realizing all of its goals (for example, Congress originally intended for the Act to eliminate all additional pollution into the country's waterways by 1985), the Clean Water Act has been the foundation of water pollution control for just shy of half a century. According to a report published by several environmental groups, including the National Wildlife Federation and the Natural Resources Defense Council, the Clean Water Act has literally cleaned up the nation's waters by requiring advanced pollution control technologies for industries and sewage treatment plants, demanding the acquisition of permits before wetlands and waterways can be filled or dredged, and creating "pollution budgets" in order to restore waterways that fail to meet state water quality standards.[6] This Act supplied much needed protection for the country's most polluted and beleaguered waters.

Unfortunately, two Supreme Court rulings within the last decade have challenged the scope and jurisdiction of the Clean Water Act. The first decision was issued in 2001 as a result of the *Solid Waste Agency of Northern Cook County* (SWANCC) *v. United States Army Corps of Engineers* case. In its efforts to create a new landfill, the solid waste agency had applied for and been granted a series of permits to fill in several ponds that had formed on an abandoned sand and gravel pit site.[7] According to Jon Kusler, Esq. of the Association of State Wetland Managers, Inc., "These ponds were located on a 533-acre parcel purchased by a consortium of 23 suburban cities and villages as a disposal site for non-hazardous waste….Remnant excavation ditches had evolved into a scattering of permanent and seasonal ponds varying in size from under one tenth of an acre to several acres, and from several inches to several feet deep."[8]

Because the land on the proposed site had reverted to a marshy, forested environment, the solid waste agency sought a Section 404 permit from the Army Corps of Engineers. Under Section 404 of the Clean Water Act, any party wishing to fill in or discharge into a wetland must

obtain a permit from the Corps.[9] (According to the Act, "EPA is authorized to prohibit the use of a site for disposal if discharges would have an unacceptable adverse effect on municipal water supplies, shellfish beds, fishery areas, and wildlife or recreational uses."[10]) Originally, the Corps decided that the agency did not need a permit because the area did not contain any habitats that met the Clean Water Act's definition of "wetlands." However, when the Illinois Nature Preserves Commission brought to the attention of the Corps the presence of various migratory bird species at the site, the Corps reversed their decision (and denied the agency the Section 404 permit) based on what was commonly known as the Migratory Bird Rule.[11] It was this rule that brought about the lawsuit that would eventually weaken the Clean Water Act.

In order to understand the Migratory Bird Rule, it is imperative to understand the legal foundation of the Clean Water Act. Congress's power to regulate water bodies all across the nation stems from Article I, Section 8 of the Constitution: the Commerce Clause. Traditionally, water rights belong to the States. However, the Constitution grants Congress the authority to regulate interstate and foreign commerce, which means that Congress (and EPA and the Corps, to whom it passed the authority) has the power to assert jurisdiction over any waters whose quality may impact such commerce.[12] These water bodies were known as the "navigable waters," which were vaguely and ambiguously defined as "waters of the United States." Initially, this covered only traditionally navigable waters, but in 1975 the number of protected waters expanded to include "not only actually navigable waters but also tributaries of such waters, interstate waters and their tributaries…nonnavigable intrastate waters whose use or misuse could affect interstate commerce…" and "all 'freshwater wetlands' that [are] adjacent to other covered waters."[13] The Corps' administrative interpretation of the Act also maintained that the Corps' jurisdiction included isolated waters that are intrastate and non-navigable, which served as

habitat for birds that were protected by international Migratory Bird treaties or that crossed state lines during migration.[14] The logic behind this rule was that migratory birds could affect industries (such as hunting or bird watching) in several states and were, therefore, relevant to interstate commerce.

After the Corps reversed its decision and denied permitting for the site, the solid waste agency filed suit. It was the agency's belief that the Corps had no jurisdiction over the land in question, as had originally been determined, and it took this belief to the federal District Court. When the District Court ruled in favor of the Corps, the agency appealed to the U.S. Court of Appeals for the Seventh Circuit. The Court of Appeals also ruled in favor of the Corps, finding that the Clean Water Act did in fact grant them the authority to regulate waters like those on the solid waste facility's proposed site.[15] Finally, the agency appealed its case to the Supreme Court.

In a strongly divided decision issued in January of 2001, the Supreme Court overturned the rulings of both the District Court and the Court of Appeals. The Court held, five votes to four, that the Corps had no jurisdiction over the waters in question, and furthermore revoked the Corps' jurisdictional power over any waters protected solely by the Migratory Bird Rule. In creating the Clean Water Act, the Court argued, Congress had not shown clear intent to protect waters based on whether or not they provided habitat for migratory birds. Because such a rule would have pushed the boundaries of Congress' power, clear indication of Congress' intent was necessary for it to be a valid practice.[16] Since such an intent was not obvious, the Migratory Bird Rule became invalid altogether.

This decision not only eliminated jurisdiction over waters whose protection was based solely on the Migratory Bird Rule, it also created uncertainty about "whether or not there

remains any basis for jurisdiction…over isolated, non-navigable, intrastate waters…[for uses such as:] interstate or foreign travelers for recreational or other purposes; the presence of fish or shellfish that could be taken and sold in interstate commerce; [or] use of water for industrial purposes by industries in interstate commerce."[17] Even though a previous Supreme Court decision (United States v. Riverside Bayview Homes Inc.) had ruled that the Clean Water Act's use of the term "navigable" was of "limited import," Chief Justice William Rehnquist, the author of the majority opinion in the *SWANCC* decision, wrote that the term itself could not wholly be ignored, and that it must be considered when attempting to discern Congress' intended scope for the Act.[17] Justice Rehnquist did not go so far, however, as to answer how exactly EPA and the Corps should interpret the term "navigable," leaving a regulatory gray area between "limited import" and no importance at all.

The second blow to the Clean Water Act's scope came in 2006 when the Supreme Court issued its *Rapanos v. United States* decision. This case was actually two combined suits (*Rapanos v. United States* and *Carabell v. United States Army Corps of Engineers*) that had been through District Court and the Sixth Circuit Court of Appeals.[18] In the *Rapanos* case, the government brought a civil suit against John Rapanos, a property owner who was ignoring Clean Water Act Section 404 regulations and illegally filling in wetlands on his land for the purpose of building a shopping mall. In court, Mr. Rapanos argued that the Clean Water Act only gave EPA and the Corps jurisdiction over navigable-in-fact waters, and that his wetlands were outside of such regulation. The district court disagreed, citing that because these wetlands drained into ditches which in turn drained into streams and eventually into navigable waters, EPA and the Corps had the right to regulate them under the "adjacent wetlands" clause. When the case was appealed, the Sixth Circuit court upheld the lower court's decision, maintaining "that the

'hydrological connection' of the wetlands to the navigable waters qualifies them as 'waters of the United States' under the Act."[19]

In the *Carabell* case, the June and Keith Carabell and Frances and Harvey Gordenker (who are collectively referred to as "Carabells") sought to obtain a permit to fill in wetlands on their property for the purpose of building a condominium. Their request was also denied based on the "adjacent wetlands" clause, because according to the Corps, although there was a four foot earthen barrier between the wetlands and a series of ditches that drained into a navigable lake a mile away, the wetlands where nevertheless adjacent to navigable waters. The Carabells disagreed, claiming that the wetlands in question were too isolated to be qualified "adjacent." Both the district and the Sixth Circuit courts sided with the Corps, finding that the wetlands were adjacent and had a "significant nexus" to traditionally navigable waters.[20]

In both cases, the lower courts confirmed that federal jurisdiction existed over the proposed sites. When these cases appealed the Sixth Circuit decisions, the Supreme Court consolidated them in order to answer the overarching question of how far the Clean Water Act's authority extends over non-navigable, isolated, and intrastate wetlands.[21] Ultimately, they did repeal the Sixth Circuit decisions and found in favor of Rapanos and the Carabells. However, answering the real question in the matter was much less cut and dry.

In this case, the justices were just as divided as they had been over the *SWANCC* decision, with none of the issued opinions commanding a majority. The plurality opinion (which represented the opinions of four of the justices) concluded that the statutory language of the Act implies that jurisdiction "should extend only to 'relatively permanent, standing or continuously flowing bodies of water' connected to traditional navigable waters, and to 'wetlands with a

continuous connection to' such relatively permanent waters."[22] This would exclude most, if not all intermittent (flowing during only part of the year) and ephemeral (flowing only during and immediately after precipitation) streams as well as geographically isolated wetlands from federal regulation, regardless of the hydrologic impact they may have on downstream waters. The plurality also argued that too broad of an interpretation of the Clean Water Act would upset the state-federal balance of power, and therefore such an interpretation must be avoided.[23]

The four dissenting justices argued that EPA and the Corps should have the authority to regulate any waters they felt promoted the Clean Water Act's goal of maintaining the health and integrity of the nation's waters. In their collective opinion, they dismissed the plurality's concerns over the balance of power between the federal government and the states, and found that the importance of wetlands in maintaining water quality justified the Corps' interpretation of the Act and their jurisdictional right to protect them.[24]

The final opinion, authored by Justice Kennedy (who in part concurred with the plurality), proposed that a new system be established for determining whether or not a wetland should be protected under the Clean Water Act. He dubbed it the "significant nexus" test, which would serve a case-by-case testing method to determine whether or not the water body in question has a considerable impact on any navigable "waters of the United States." If it is determined to have a significant impact, it is to be protected. Otherwise, it is outside of federal jurisdiction.[25] (In order to prevent some of the enforcement headaches that would result from needing to assess every wetland individually, it was also implied in Justice Kennedy's opinion that the Corps could identify whole classes of wetlands that generally achieve a significant nexus.[26])

Overall, not only did the Supreme Court fail to nail down any true definitions for some of the core issues in this case (i.e.: "isolated" and "significant impact"), it also resulted in ambiguity over which opinion should be adhered to by the lower courts and federal agencies. Generally, when faced with the lack of a majority opinion, the opinion of the judge "concurring in the decision on the narrowest grounds" becomes the standard.[27] However, it is far from obvious which decision stands on this "narrowest ground," because one can interpret such standing in several different ways. While Kennedy's opinion may seem the most practical for the lower courts to follow, the dissenting judges have acknowledged that there are situations that may arise in which the "significant nexus" test might be more stringent than both the plurality and the dissent. In fact, in the time since the decision, there is already inconsistency among the lower courts over which methodology to follow.[28] According to Jay E. Austin and D. Bruce Myers Jr. of the Environmental Law Institute, "To date, the main impact of the *Rapanos* Court's 'clarification' of the statute has been to leave Clean Water Act jurisdiction in disarray, with the implementing agencies, legal scholars, and the regulated community struggling to sort it all out."[29]

There is little doubt that these two Supreme Court decisions have created an atmosphere of confusion around the enforcement of the Clean Water Act, since the Court did not specifically define which waters are to be federally protected. It left much of that burden to the lower courts, which use different methods for determining jurisdiction depending on where the water body in question is located and the personal opinions of the judges involved. According to Charles A. Rhodes Jr. of EPA's Region III, the *SWANCC* decision alone has significant impacts on Sections 404 (dredge and fill policies); 303 (water quality standards); 311 (the spill program and the Oil

Pollution Act); 401 (the State water quality certification program); and 402 (NPDES) of the Clean Water Act, and also complicates enforcement of the Safe Drinking Water Act of 1974.[30]

The *Rapanos* ruling also decreased the effectiveness of these programs, with nearly five hundred cases where "formal enforcement was not pursued as a result of jurisdictional uncertainty, case priority was lowered as a result of jurisdictional uncertainty, or lack of jurisdiction was asserted as an affirmative defense to an enforcement action."[31] However, many consider this to be a lowball estimate, with some EPA regulators claiming that as many as 1500 investigations into major water pollution have been let go since the *Rapanos* ruling was issued.[32] As Professor David M. Uhlmann from the University of Michigan put it, "Cases are now lost [or not fought at all] because the company is discharging into a stream that flows into a river, rather than into the river itself," which can exempt it from federal regulation.[33]This lack of strict enforcement is a dangerously growing problem because even though EPA and the Corps may in fact have jurisdiction over a certain water body, they now generally avoid putting forth the effort if they perceive that the legal battle to prove it will be too difficult or too costly.

These complications and restrictions have far-reaching consequences for American waters, and for American citizens. The EPA estimates waters vulnerable to exclusion from the Clean Water Act supply as many as 117 million people with drinking water, and "internal studies indicate that as many as 45 percent of major polluters might be either outside regulatory reach or in areas where proving jurisdiction is overwhelmingly difficult."[34] By removing categorical protections from tributaries and eliminating protection altogether for "isolated" wetlands and some intermittent and ephemeral streams, these decisions have made some of the nation's most vital waters vulnerable to pollution. More than half of the stream miles in this country are intermittent or ephemeral (especially out west in states like Arizona, Nevada, and New Mexico

where they make up over three quarters of the total stream miles).[35] These streams are more often than not the crucial headwaters for downstream perennial water bodies. They also provide a host of ecosystem services that promote a healthy watershed, including sediment control, surface water filtration, stream energy dissipation, and support for native vegetation.[36]

According to a report published by the U.S. Fish and Wildlife Service in reference to the nation's wetlands, "'isolated' is a temperamental, relative term. There is no single ecologically or scientifically accepted definition of isolated wetland because this issue is more a matter of perspective than scientific fact."[37] Bearing this in mind, even those wetlands considered to be "isolated" provide a multitude of services that are often highly undervalued. In addition to providing ideal habitat for countless plant and animal species, they also cycle and retain nutrients and sediments, control and store flood and storm water, and act as filters to protect the integrity of ground and surface water supplies.[38]

Obviously, intermittent and ephemeral streams and so-called isolated wetlands are far from being trivial water bodies with insignificant impacts on downstream, navigable waters. They are integral to the health and wellbeing of the watershed and contaminating or destroying them could have significant consequences for both the environment and public health.

While *SWANCC* and *Rapanos* are causing chaos for water bodies in the arid and semi-arid western states, their implications also have a significant impact here on the East Coast. Over this past summer I studied the implications of these rulings as they pertain to the State of Delaware using ArcMap, a geographic information systems (GIS) technology at the University of Delaware's Water Resources Agency. This program is "an integrated collection of computer software and data used to view and manage information about geographic places, analyze spatial relationships, and model spatial processes."[39] With its detailed maps and data sets on various

land surface features, I was able to identify the various features of water bodies in Delaware including their location, classification, length and area, and distance from other waters.

First, I examined the total stream length in the State to determine what proportion of stream length was vulnerable to losing protection. According to current ArcGIS[40] models when I input for stream length and classification, there are roughly 7,300 kilometers of total stream length in Delaware, and about 1,793 kilometers are either intermittent or ephemeral. This means that, depending on how the court system and EPA choose to interpret the two rulings, as much as 24.56% of the State's total stream length could lose protection under the Clean Water Act (if canals and ditches are factored into total stream length, the percentage drops to 20.1%). In addition to computing the total length for the whole State, I also calculated the length of vulnerable stream kilometers by watershed by isolating each individual watershed and selecting for its vulnerable streams. Some of the watersheds with the most intermittent and ephemeral streams include the Bohemia Creek watershed, with 50.2%, the Chester River watershed with 54.8%, the Sassafras River watershed with 58.6%, and the Choptank River watershed with a whopping 65.8% of its total stream length currently vulnerable.

Wetlands are also an incredibly important feature of the Delaware landscape. The State is home to 193,400 acres of palustrine (fresh water, non-tidal wetlands), a significant portion of which could be labeled "isolated." Identifying and measuring isolated wetlands is no exact science because, as was previously noted, there is no widely accepted definition for the term "isolated." In order to calculate what wetlands might be vulnerable, I developed four separate options that EPA or the courts system may use to define the term. It is important to note that for these definitions, it is assumed (as it is implied in the *SWANCC* and *Rapanos* case literature) that significant nexus or adjacency of a wetland to an intermittent or ephemeral stream does not

afford the wetland protection under the Clean Water Act, because these streams do not meet the "navigable waters" standard under either decision.

In my first definition, labeled Method 1, I measured isolated wetlands with a ten meter buffer for perennial streams, ditches, and canals by selecting for those attributes (meaning that if a wetland comes within ten meters of any of the aforementioned water bodies, it is not considered to be isolated). Overall, the data shows that under this definition, which is the most generous in terms of avoiding the "isolated" label, 32.46% of total wetland acreage in Delaware would be considered "isolated." As with the stream data, I also selected for these attributes watershed by watershed and found that the most at-risk areas were Shellpot Creek watershed, with 72% of its wetlands considered isolated under this definition, Naamans Creek watershed, with 74.3%, the Delaware Bay watershed, with 88.3%, the Delaware River watershed, with 91.4%, and finally the tiny Elk Creek watershed, where 100% of wetlands would be labeled "isolated" and lose their protection under the Clean Water Act as a result of *SWANCC* and *Rapanos*.

In Method 2, I altered the definition of "isolated" by removing the buffer clause. This means that for this definition, any wetland not directly adjacent to a perennial stream, ditch, or canal is considered to be isolated. When I selected for these attributes, the percentage of total isolated wetland acreage jumped to 41.87%, with most individual watersheds climbing by an average of 4%. The four most vulnerable watersheds specified in Method 1 were joined by the Army Creek watershed, with 69.1% of its wetlands considered isolated, and the C & D Canal East watershed, with 74.1%.

In Method 3, the buffer clause was reinstated, but the type of adjacent water body was redefined. In this definition, isolated wetlands were measured with a ten meter buffer for

perennial streams and named ditches and canals. (In this case, unnamed ditches and canals have been grouped in with intermittent and ephemeral streams.) This means that any wetland within ten meters of a perennial stream or a canal or ditch with a name recognized by the GIS data collection is not considered to be isolated. The logic behind this definition is to attempt to close even further around the idea of "navigable waters," because throughout Delaware and especially in the southern part of the State, there are many tiny agricultural runoff ditches that do not hold water year round and therefore may not afford a wetland "significant nexus." By selecting for these attributes, I was able to determine that 41.75% of total wetland acreage in the State would be vulnerable to being labeled "isolated." This total is very close to the total from Method 2, but individual watershed totals varied greatly, with some exhibiting minimal change from the previous method and others fluctuating as much as 10% up or down.

In the final definition, Method 4, the buffer clause was removed once again to measure for isolated wetlands as those wetlands which are not directly adjacent to a perennial stream or a named ditch or canal. Again, unnamed ditches and canals were grouped in with intermittent and ephemeral streams. When I input for this definition, the total acreage of isolated wetlands in the State rose to a staggering 49.79%. Of the forty five watersheds in the state, nineteen of them had more than half of their wetlands defined as isolated. While this is a narrow definition and is not very likely to be used by EPA or the courts, it still demonstrates the significance of defining "isolated" and how it may drastically affect protection for the State's wetlands.

In addition to studying which waters in Delaware may lose their Clean Water Act protections, I also wanted to understand how such a loss in federal regulation might impact local communities and economies here in the State. In order to do so, I examined three specific types

of water related uses by watershed: cold water fisheries (CWF); waters of exceptional recreational or ecological significance (ERES); and finally areas of public water supply (PWS).[41]

Cold water fisheries were present in four watersheds, including the Brandywine Creek watershed (where 24% of streams and 21-23% of wetlands are vulnerable), the Christiana River watershed (10% of streams and 45-50% of wetlands vulnerable), the Red Clay Creek watershed (21% of streams and 5-7% of wetlands vulnerable), and the White Clay Creek watershed (21% of streams and 33-41% of wetlands vulnerable). Cold water fisheries are relatively fragile environments, and pollution, filling, or development of the waters in these areas could degrade or destroy the fisheries altogether.

Waters of exceptional recreational or ecological significance are present in fifteen of the State's watersheds. The most vulnerable watersheds where ERES's are present are the White Clay Creek watershed (with 21% of streams and 33-41% of its wetlands vulnerable), the Nanticoke River watershed (35% of streams and 39-54% of wetlands vulnerable), Cedar Creek watershed (15% of streams and 48-52% of wetlands vulnerable) and the Rehoboth Bay watershed (19% of streams and 59% of wetlands vulnerable to a loss of protection). As the label implies, these waters are of high value, both environmentally and socially. Something about their outstanding quality or desirable features has obviously caused both scientists and local officials to declare them as important waters. However, as with the cold water fisheries, the pollution or degradation is possible without Clean Water Act protections could destroy the very attributes that make these waters so unique and important.

Finally, and perhaps most importantly, I examined the overlap between potentially unprotected waters and public versus private water supplies. The potential consequences of

increased pollution into unprotected water bodies varies depending upon location, but no matter where this pollution occurs, there will be negative impacts. While most of the wetlands and streams in this State that could lose Clean Water Act protections are not direct PWS sources, they feed into groundwater, larger streams, rivers, and reservoirs that do supply drinking water, and anything dumped into an unprotected stream or wetland will most likely find its way downstream into such a waterway eventually. What I found while analyzing the GIS maps is that there is overlap between vulnerable stream/wetland acreage and areas of groundwater recharge, meaning that should these waters lose protection, it is entirely possible that any pollutants dumped into them in the future could easily enter groundwater supplies.

In northern and the more urban areas of Delaware, where most people receive public water, this increased pollution could mean higher water costs, as it would cost public suppliers more to filter out the harmful pollutants in order to meet Safe Drinking Water Act standards. In the southern, more rural areas, it is possible that such pollution might have a more direct effect on drinking water. In these areas, most people draw water from private wells, which are less likely than public suppliers to have the filtration systems necessary to remove dangerous or persistent pollutants. This could not only degrade the overall quality of water being pumped into homes, it is also a potential health risk.

Tables and Maps:

With regard to the Isolated Wetland* Acreage analysis:

Method 1- Measures isolated wetlands with a ten meter buffer for perennial streams, ditches, and canals. This means that if a wetland is within ten meters of a perennial stream, ditch, or canal, according to this definition it is considered to be connected, and therefore not isolated.

Method 2- Measures isolated wetlands with no buffer. This means that if a wetland is not directly adjacent to a perennial stream, ditch, or canal, according to this definition it is considered to be isolated.

Method 3- Measures isolated wetlands with a ten meter buffer for perennial streams and NAMED ditches and canals. (In this case, unnamed ditches have been grouped together with intermittent and ephemeral streams.) This means that if a stream is within ten meters of a perennial stream or NAMED ditch or canal, according to this definition it is considered to be connected, and therefore not isolated.

Method 4- Measures isolated wetlands with no buffer. (In this case, unnamed ditches have been grouped together with intermittent and ephemeral streams.) This means that if a stream is not directly adjacent to a perennial stream or NAMED ditch or canal, according to this definition it is considered to be isolated.

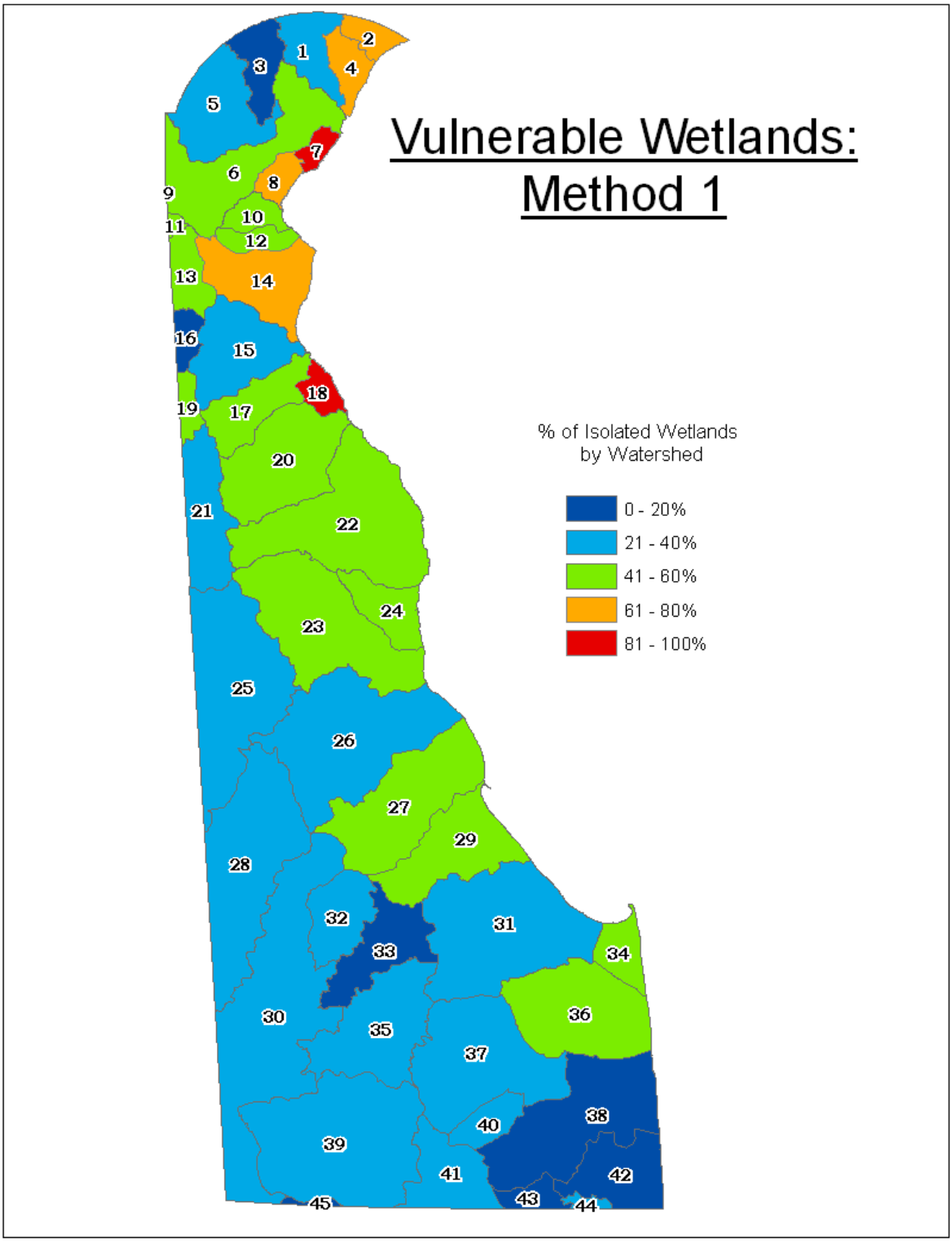
*All wetlands data refers only to the State's freshwater wetlands, as tidal wetlands are federally protected.

Delaware Watersheds by numbers:

1. Brandywine Creek
2. Naamans Creek
3. Red Clay Creek
4. Shellpot Creek
5. White Clay Creek
6. Christina River
7. Delaware River
8. Army Creek
9. Elk Creek
10. Red Lion Creek
11. Perch Creek
12. Dragon Run Creek
13. C & D Canal West
14. C & D Canal East
15. Appoquinimink River
16. Bohemia Creek
17. Blackbird Creek
18. Delaware Bay
19. Sassafras River
20. Smyrna River
21. Chester River
22. Leipsic River
23. St. Jones River
24. Little Creek
25. Choptank River
26. Murderkill River
27. Mispillion River
28. Marshyhope Creek
29. Cedar Creek
30. Nanticoke River
31. Broadkill River
32. Gum Branch
33. Gravelly Branch
34. Lewes-Rehoboth Canal
35. Deep Creek
36. Rehoboth Bay
37. Indian River
38. Indian River Bay
39. Broad Creek
40. Iron Branch
41. Pocomoke River
42. Little Assawoman
43. Buntings Branch
44. Assawoman
45. Wicomico

Wetland Acreage Summary

Watershed	Total Wetland Acreage	Method 1			Method 2			Method 3			Method 4		
		# Isolated	Acres_Iso	% Iso_Acreage	# Isolated	Acres_Iso	% Iso_Acreage	# Isolated	Acres_Iso	% Iso_Acreage	# Isolated	Acres_Iso	% Iso_Acreage
Appoquinimink River	1594.33	207	476.8141	29.9%	210	480.6469	30.1%	207	476.8141	29.9%	210	480.6469	30.1%
Army Creek	126.50	76	86.4961	68.4%	78	87.4417	69.1%	76	86.4961	68.4%	78	87.4417	69.1%
Assawoman	382.00	36	78.8452	20.6%	45	104.8458	27.4%	55	190.4098	49.8%	59	204.1701	53.4%
Blackbird Creek	2763.74	682	1464.3892	53.0%	688	1481.2075	53.6%	682	1464.3892	53.0%	688	1481.2075	53.6%
Bohemia Creek	301.09	22	58.3126	19.4%	22	58.3126	19.4%	22	58.3126	19.4%	22	58.3126	19.4%
Brandywine Creek	288.67	67	63.2765	21.9%	80	66.5060	23.0%	67	63.2765	21.9%	80	66.5060	23.0%
Broad Creek	13217.19	840	3487.8408	26.4%	892	4102.4830	31.0%	908	4651.9054	35.2%	939	5136.4437	38.9%
Broadkill River	5671.91	706	2153.7365	38.0%	723	2671.5483	47.1%	719	2720.4532	48.0%	730	2840.0477	50.1%
Buntings Branch	2547.51	95	167.5301	6.6%	110	235.6144	9.2%	148	895.4669	35.2%	154	973.8523	38.2%
C & D Canal East	1410.58	294	948.8493	67.3%	303	1007.6072	71.4%	297	991.3645	70.3%	305	1045.1374	74.1%
C & D Canal West	1175.54	150	546.3781	46.5%	154	552.2814	47.0%	150	546.3781	46.5%	154	552.2814	47.0%
Cedar Creek	2307.69	269	1100.8891	47.7%	274	1121.0621	48.6%	273	1186.9166	51.4%	276	1198.5573	51.9%
Chester River	9955.66	595	3028.0673	30.4%	628	3751.3014	37.7%	599	3301.1771	33.2%	630	3759.8335	37.8%
Choptank River	20923.63	1701	8367.7812	40.0%	1929	13608.7668	65.0%	1878	12588.5061	60.2%	1967	16779.5097	80.2%
Christina River	1535.11	503	690.2519	45.0%	513	758.2145	49.4%	507	718.2665	46.8%	514	761.6212	49.6%
Deep Creek	12032.80	402	2504.1050	20.8%	460	3223.4132	26.8%	427	2877.9754	23.9%	472	3614.5120	30.0%
Delaware Bay	296.32	154	261.5839	88.3%	154	261.5839	88.3%	154	261.5839	88.3%	154	261.5839	88.3%
Delaware River	29.77	26	27.2210	91.4%	28	28.0460	94.2%	27	28.2564	94.9%	29	29.0813	97.7%
Dragon Run Creek	238.94	69	141.3291	59.1%	72	143.9079	60.2%	74	146.9542	61.5%	75	147.4142	61.7%
Elk Creek	30.62	4	30.6186	100.0%	4	30.6186	100.0%	4	30.6186	100.0%	4	30.6186	100.0%
Gravelly Branch	9014.74	233	1384.9337	15.4%	281	2608.9168	28.9%	267	2250.3580	25.0%	301	3470.2327	38.5%
Gum Branch	4059.86	175	1408.8029	34.7%	205	1897.5618	46.7%	193	1644.6697	40.5%	215	1988.8965	49.0%
Indian River	6640.00	452	1422.7665	21.4%	479	1735.5330	26.1%	468	1605.2170	24.2%	485	1790.2464	27.0%
Indian River Bay	9692.57	578	1219.5756	12.6%	655	1916.4433	19.8%	739	2931.3118	30.2%	779	3316.4665	34.2%
Iron Branch	3246.80	132	665.4685	20.5%	151	919.5794	28.3%	147	1052.7388	32.4%	156	1144.7259	35.3%
Leipsic River	6273.40	800	2622.2398	41.8%	833	2972.9124	47.4%	823	2840.8104	45.3%	842	3078.5667	49.1%
Lewes-Rehoboth Canal	874.36	154	367.1372	42.0%	156	379.6314	43.4%	158	380.6991	43.5%	159	391.3481	44.8%
Little Assawoman	4648.93	330	735.8221	15.8%	408	1002.6464	21.6%	480	2018.1611	43.4%	515	2210.5126	47.5%
Little Creek	1908.59	243	1041.6382	54.6%	246	1061.9141	55.6%	253	1214.9187	63.7%	254	1220.7855	64.0%
Marshyhope Creek	17468.13	742	5559.6892	31.8%	940	9835.4454	56.3%	824	7725.8600	44.2%	968	12413.1883	71.1%
Mispillion River	4691.82	437	2235.2464	47.6%	451	2423.9119	51.7%	445	2693.4858	57.4%	456	2788.2922	59.4%
Murderkill River	7796.07	662	2075.8778	26.6%	688	2498.4579	32.0%	679	2335.5592	30.0%	696	2693.3385	34.5%
Naamans Creek	26.26	11	19.5100	74.3%	12	19.6919	75.0%	11	19.5100	74.3%	12	19.6919	75.0%
Nanticoke River	14662.64	1122	5705.9945	38.9%	1214	6650.3759	45.4%	1165	6909.8704	47.1%	1237	7946.7589	54.2%
Perch Creek	222.66	30	104.3855	46.9%	32	104.6449	47.0%	30	104.3855	46.9%	32	104.6449	47.0%
Pocomoke River	9485.70	346	3341.3325	35.2%	382	3812.3146	40.2%	394	4321.9089	45.6%	411	4636.8675	48.9%
Red Clay Creek	256.78	49	15.1322	5.9%	55	18.2051	7.1%	49	15.1322	5.9%	55	18.2051	7.1%
Red Lion Creek	305.70	76	142.2762	46.5%	79	142.8083	46.7%	77	149.3628	48.9%	80	149.8948	49.0%
Rehoboth Bay	1923.45	458	1142.6940	59.4%	458	1142.6940	59.4%	459	1143.8722	59.5%	459	1143.8722	59.5%
Sassafras River	1045.30	113	441.4707	42.2%	113	441.4707	42.2%	113	441.4707	42.2%	113	441.4707	42.2%
Shellpot Creek	214.25	48	154.2246	72.0%	48	154.2246	72.0%	48	154.2246	72.0%	48	154.2246	72.0%
Smyrna River	5012.46	826	2425.0137	48.4%	849	2508.2483	50.0%	841	2535.0244	50.6%	859	2593.4820	51.7%
St. Jones River	6296.87	774	2660.8210	42.3%	785	2715.1558	43.1%	780	2736.2428	43.9%	791	2820.5776	44.8%
White Clay Creek	423.76	181	142.0725	33.5%	197	175.7974	41.5%	181	142.0725	33.5%	197	175.7974	41.5%
Wicomico	378.69	25	65.7104	17.4%	25	65.7104	17.4%	25	65.7104	17.4%	25	65.7104	17.4%
	193399.36	*15895*	**62785.1513**	**32.46%**	*17109*	**80979.7049**	**41.87%**	*16923*	**80748.0980**	**41.75%**	*17715*	**96286.5769**	**49.79%**


Vulnerable Wetlands:
Method 1
% of Isolated Wetlands
by Watershed
0 - 20%
21 - 40%
41 - 60%
61 - 80%
81 - 100%
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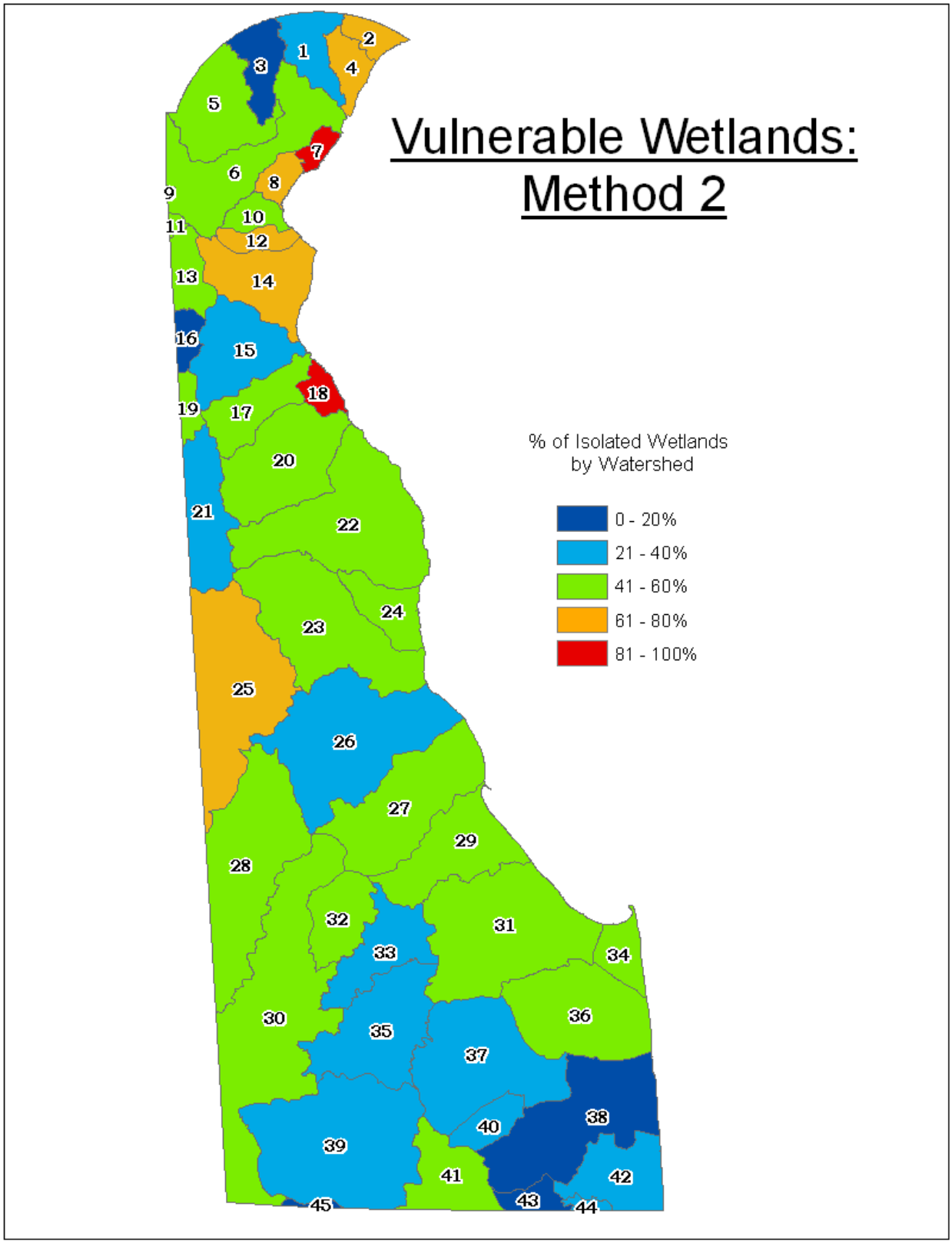
Vulnerable Wetlands:
Method 2
% of Isolated Wetlands
by Watershed
0 - 20%
21 - 40%
41 - 60%
61 - 80%
81 - 100%
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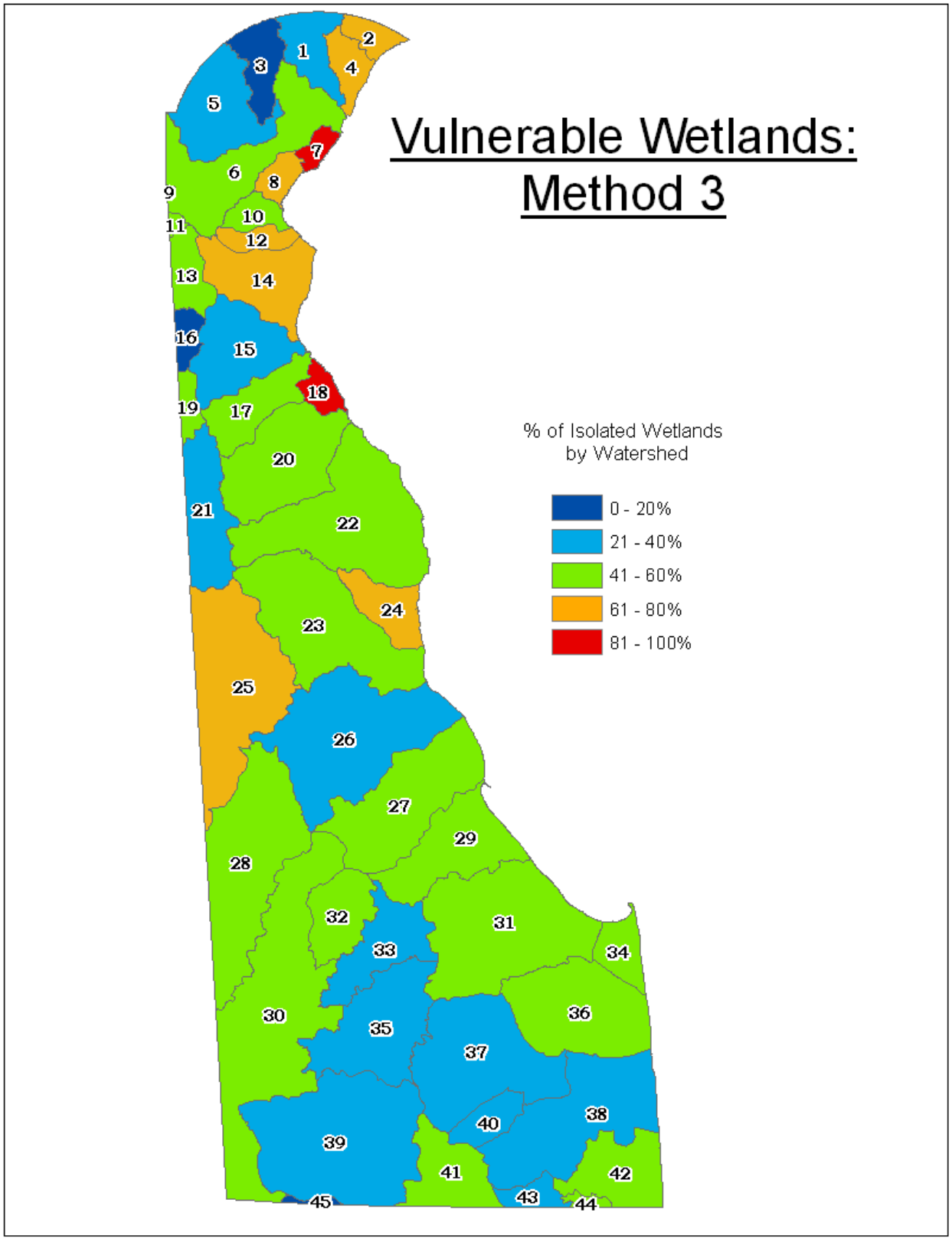
Vulnerable Wetlands:
Method 3
% of Isolated Wetlands
by Watershed
0 - 20%
21 - 40%
41 - 60%
61 - 80%
81 - 100%
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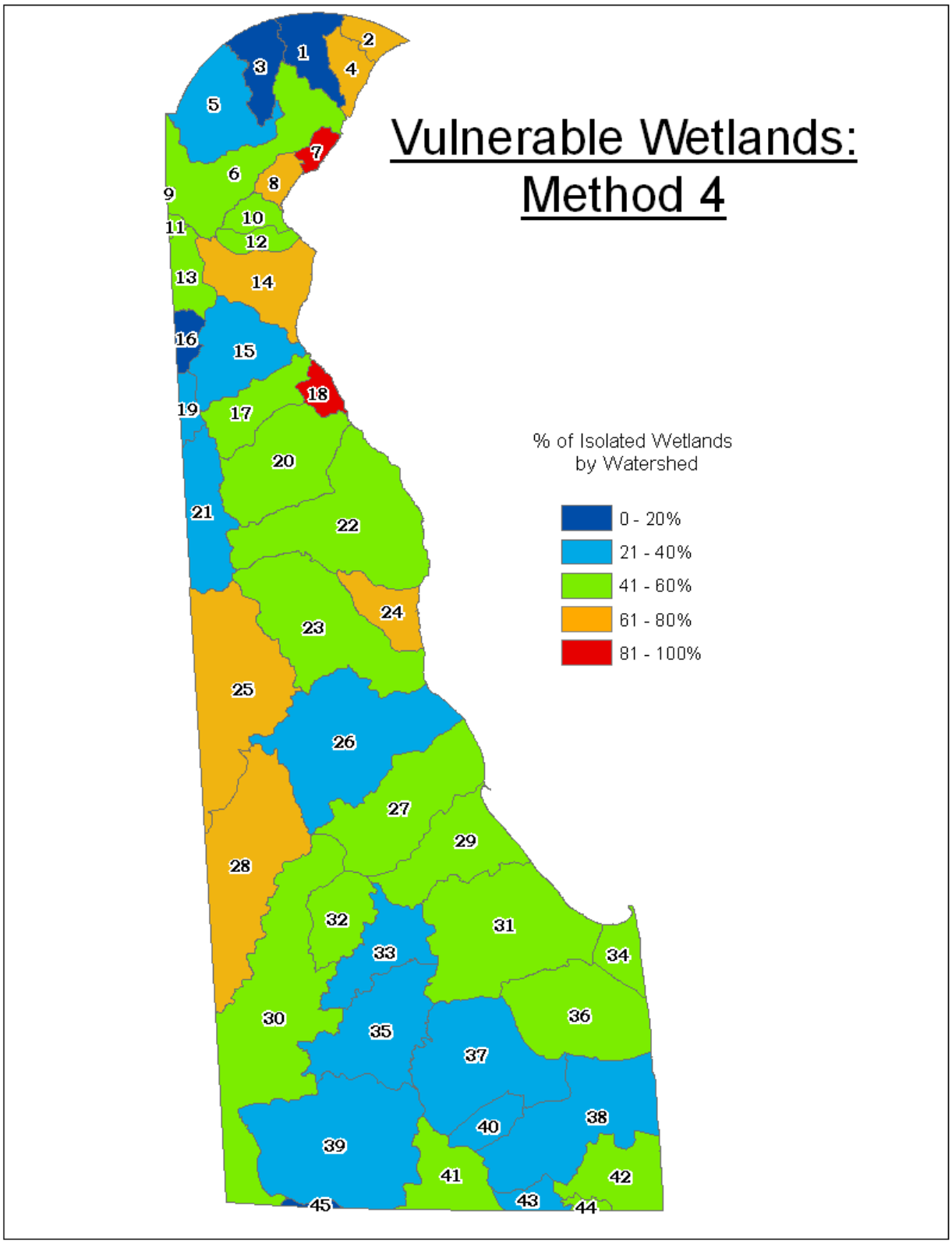
Vulnerable Wetlands:
Method 4
% of Isolated Wetlands
by Watershed
0 - 20%
21 - 40%
41 - 60%
61 - 80%
81 - 100%
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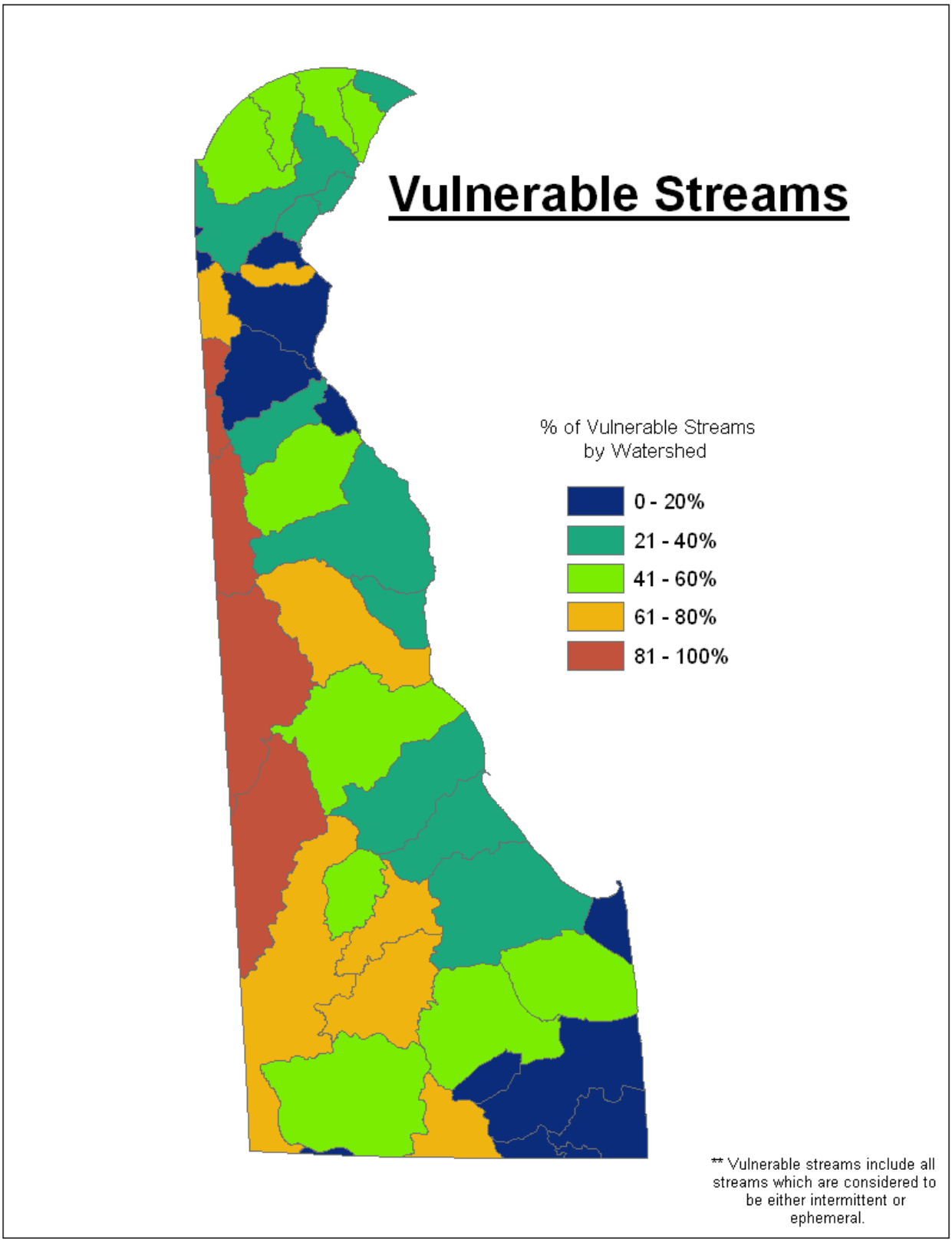
Vulnerable Stream Mileage in Delaware

WATERSHED	km_Total Stream Length	km_Threatened Stream Length	% Threatened Stream km	km_Total_Length (with canals/ditches)	% Threatened (with canals/ditches)	Basin
Appoquinimink River	163.018	2.689	1.6%	163.370	1.6%	Delaware Bay
Army Creek	32.352	2.498	7.7%	33.663	7.4%	Delaware Bay
Assawoman	12.808	0.000	0.0%	41.432	0.0%	Inland Bays/Atlantic Ocean
Blackbird Creek	149.908	12.000	8.0%	149.908	8.0%	Delaware Bay
Bohemia Creek	26.007	13.067	50.2%	26.007	50.2%	Chesapeake Bay
Brandywine Creek	86.098	20.713	24.1%	88.007	23.5%	Piedmont
Broad Creek	327.831	84.127	25.7%	453.642	18.5%	Chesapeake Bay
Broadkill River	291.471	40.158	13.8%	334.865	12.0%	Delaware Bay
Buntings Branch	22.131	0.447	2.0%	92.766	0.5%	Inland Bays/Atlantic Ocean
C & D Canal East	191.479	8.815	4.6%	198.124	4.5%	Delaware Bay
C & D Canal West	52.022	18.728	36.0%	52.022	36.0%	Chesapeake Bay
Cedar Creek	169.456	25.307	14.9%	180.531	14.0%	Delaware Bay
Chester River	170.259	93.285	54.8%	171.171	54.5%	Chesapeake Bay
Choptank River	454.355	298.834	65.8%	572.649	52.2%	Chesapeake Bay
Christina River	180.197	17.302	9.6%	186.863	9.3%	Piedmont
Deep Creek	233.521	85.493	36.6%	277.017	30.9%	Chesapeake Bay
Delaware Bay	172.760	2.181	1.3%	172.760	1.3%	Delaware Bay
Delaware River	17.497	1.980	11.3%	19.437	10.2%	Delaware Bay
Dragon Run Creek	24.379	8.374	34.3%	28.362	29.5%	Delaware Bay
Elk Creek	0.000	0.000	0.0%	0.000	0.0%	Chesapeake Bay
Gravelly Branch	110.011	41.430	37.7%	144.157	28.7%	Chesapeake Bay
Gum Branch	73.607	18.655	25.3%	107.009	17.4%	Chesapeake Bay
Indian River	218.126	42.945	19.7%	242.223	17.7%	Inland Bays/Atlantic Ocean
Indian River Bay	187.606	2.873	1.5%	557.276	0.5%	Inland Bays/Atlantic Ocean
Iron Branch	36.235	1.638	4.5%	58.061	2.9%	Inland Bays/Atlantic Ocean
Leipsic River	852.631	114.453	13.4%	887.951	12.9%	Delaware Bay
Lewes-Rehoboth Canal	55.133	0.325	0.6%	64.392	0.5%	Inland Bays/Atlantic Ocean
Little Assawoman	130.406	0.000	0.0%	375.350	0.0%	Inland Bays/Atlantic Ocean
Little Creek	118.022	14.834	12.6%	143.927	10.3%	Delaware Bay
Marshyhope Creek	382.304	184.184	48.2%	480.309	38.3%	Chesapeake Bay
Mispillion River	223.181	30.633	13.7%	250.142	12.2%	Delaware Bay
Murderkill River	369.116	107.824	29.2%	399.528	27.0%	Delaware Bay
Naamans Creek	34.533	4.366	12.6%	34.809	12.5%	Piedmont
Nanticoke River	400.836	139.209	34.7%	485.761	28.7%	Chesapeake Bay
Perch Creek	6.823	0.000	0.0%	6.823	0.0%	Chesapeake Bay
Pocomoke River	70.208	28.039	39.9%	148.575	18.9%	Chesapeake Bay
Red Clay Creek	95.123	20.324	21.4%	95.123	21.4%	Piedmont
Red Lion Creek	28.741	1.155	4.0%	29.323	3.9%	Delaware Bay
Rehoboth Bay	139.044	26.846	19.3%	143.171	18.8%	Inland Bays/Atlantic Ocean
Sassafras River	34.497	20.201	58.6%	34.497	58.6%	Chesapeake Bay
Shellpot Creek	34.668	7.708	22.2%	34.668	22.2%	Piedmont
Smyrna River	327.660	86.836	26.5%	352.268	24.7%	Delaware Bay
St. Jones River	404.712	123.039	30.4%	414.444	29.7%	Delaware Bay
White Clay Creek	183.852	39.469	21.5%	183.852	21.5%	Piedmont
Wicomico	4.800	0.000	0.0%	4.800	0.0%	Chesapeake Bay
TOTAL:	7299.424	1792.984	24.56%	8917.035	20.1%	


Vulnerable Streams
% of Vulnerable Streams
by Watershed
0 - 20%
21 - 40%
41 - 60%
61 - 80%
81 - 100%
** Vulnerable streams include all streams which are considered to be either intermittent or ephemeral.

WATERSHED	Watershed Area (m sq.)	Designated Uses Present Designated Uses (CWF)	(ERES)	PWS Area (m sq.)	% Area With PWS	% Area without PWS
Appoquinimink River	120100000.0	No	No	68399746.026	57.0%	43.0%
Army Creek	25990976.0	No	No	25714678.953	98.9%	1.1%
Assawoman	8671558.0	No	YES	6337906.906	73.1%	26.9%
Blackbird Creek	80231624.0	No	No	11669331.762	14.5%	85.5%
Bohemia Creek	22734446.0	No	No	7383738.288	32.5%	67.5%
Brandywine Creek	59527492.0	YES	YES	38613445.587	64.9%	35.1%
Broad Creek	309910000.0	No	YES	28738973.504	9.3%	90.7%
Broadkill River	277710000.0	No	No	71630026.078	25.8%	74.2%
Buntings Branch	25571248.0	No	No	17124405.390	67.0%	33.0%
C & D Canal East	114150000.0	No	No	61039573.185	53.5%	46.5%
C & D Canal West	45015112.0	No	No	33928139.521	75.4%	24.6%
Cedar Creek	135330000.0	No	YES	7200485.679	5.3%	94.7%
Chester River	102620000.0	No	No	5924423.216	5.8%	94.2%
Choptank River	251690000.0	No	No	9832107.087	3.9%	96.1%
Christina River	174050000.0	YES	No	172977611.145	99.4%	0.6%
Deep Creek	164380000.0	No	YES	7445918.145	4.5%	95.5%
Delaware Bay	24914828.0	No	No	965574.472	3.9%	96.1%
Delaware River	16856558.0	No	No	15904384.751	94.4%	5.6%
Dragon Run Creek	26884438.0	No	No	26884438.000	100.0%	0.0%
Elk Creek	1111555.0	No	No	1110223.406	99.9%	0.1%
Gravelly Branch	99248056.0	No	YES	3146526.967	3.2%	96.8%
Gum Branch	78246576.0	No	YES	491074.708	0.6%	99.4%
Indian River	222950000.0	No	YES	33960811.873	15.2%	84.8%
Indian River Bay	223430000.0	No	YES	89136741.841	39.9%	60.1%
Iron Branch	39961620.0	No	YES	3387632.400	8.5%	91.5%
Leipsic River	271390000.0	No	No	55516795.121	20.5%	79.5%
Lewes-Rehoboth Canal	43415116.0	No	No	35799463.764	82.5%	17.5%
Little Assawoman	96211208.0	No	YES	51749418.564	53.8%	46.2%
Little Creek	60248724.0	No	No	19136946.778	31.8%	68.2%
Marshyhope Creek	249590000.0	No	No	6362762.363	2.5%	97.5%
Mispillion River	197940000.0	No	No	29390559.289	14.8%	85.2%
Murderkill River	276640000.0	No	No	90397738.717	32.7%	67.3%
Naamans Creek	26409434.0	No	No	26405549.092	100.0%	0.0%
Nanticoke River	373780000.0	No	YES	40390054.766	10.8%	89.2%
Perch Creek	5240404.5	No	No	5240404.601	100.0%	0.0%
Red Clay Creek	54674976.0	YES	No	33513303.463	61.3%	38.7%
Red Lion Creek	28379484.0	No	No	28379484.000	100.0%	0.0%
Rehoboth Bay	186240000.0	No	YES	109397630.238	58.7%	41.3%
Sassafras River	20853142.0	No	No	1581496.884	7.6%	92.4%
Shellpot Creek	37216244.0	No	No	37032968.938	99.5%	0.5%
Smyrna River	165690000.0	No	No	43156280.171	26.0%	74.0%
St. Jones River	233270000.0	No	No	126406756.492	54.2%	45.8%
White Clay Creek	119670000.0	YES	YES	119670000.000	100.0%	0.0%
Wicomico	5281164.5	No	YES	2492589.414	47.2%	52.8%
	5103425984			1610968121.545	31.6%	68.4%

CWF: Cold water fishery

ERES: Exceptional Recreational or Ecological Significance

PWS: Public Water Supply

*Margin of error for the area data in this table is about 1%

Conclusions:

With all of the regulatory chaos and harmful implications of the *SWANCC* and *Rapanos* decisions, it is clear that something must be done to remedy the situation, both for Delaware and the nation as a whole. Congress took a step forward in April of 2009 with the introduction of the Clean Water Restoration Act to amend the Clean Water Act. The purpose of these amendments was to restore the scope of the Clean Water Act to what it was prior to the *SWANCC* and *Rapanos* cases. It is a chance for Congress to express the "intent" that the Supreme Court found lacking during the two cases in question. The Act expanded the definition of "waters of the United States" to include intermittent and ephemeral streams as well as essentially all wetlands that are not completely hydrologically isolated. In doing so, this Act recognized that such waters are incredibly valuable to the health and integrity of the nation's water supply, and should be treated accordingly.[42] Unfortunately, even with all of the support it originally garnered in the Senate, the momentum behind this bill has begun to wane, and it is possible that it will disappear if swift action is not taken to revive it.

There is an alternative course of action for the State of Delaware. Instead of waiting for a polarized Congress to pass the Clean Water Restoration Act, this State can follow the lead of others, like New Jersey, Pennsylvania, and Maryland by drawing up its own vulnerable waters plan. In New Jersey, for example, a Freshwater Wetlands Protection Act was passed in 1998, and it fills in most of the gaps where the Clean Water Act is currently lacking. This Act requires that policy makers take "vigorous action to protect the State's inland waterways and freshwater wetlands…" and recognizes that "the public health benefits arising from the natural functions of freshwater wetlands, and the public harm from freshwater wetland losses, are distinct from and may exceed the private value of wetlands."[43] With this legislation, New Jersey was able to

assume wetland permitting jurisdiction from EPA and the Corps and because of this has managed to avoid many of the problems created by *SWANCC* and *Rapanos*. There is no reason why Delaware could not put into place such legislation (in fact, versions of such an act have been drafted for this State), rather than doing nothing while Congress argues about how to fix the Clean Water Act.

No matter how one approaches the subject, the Clean Water Act is broken. Its ultimate objective is to protect the health and integrity of our nation's waters and, in doing so, protect the health of the environment and the people of this nation. Because of the *SWANCC* and *Rapanos* decisions, it is unable to do so. Over half of the country's stream miles and thousands of acres of wetlands are at risk, and if parts of the system are threatened, the system as a whole is vulnerable. Water is our most precious and life-giving resource. Evidence of the potential negative impacts exists, and the consequences are serious. Even states on the East Coast, where clean freshwater is seemingly abundant, are not immune. Actions must be taken in Delaware and across the country to protect the nation's waters before they are degraded or destroyed beyond repair. The time to act for the Clean Water Act is now.

Endnotes

1. PBS Online. “A Brief History of the Clean Water Act.” *NOW with Bill Moyers: Troubled Waters*. www.pbs.org/now/science/cleanwater.html

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