No. 04-1384

IN THE

Supreme Court of the United States

JUNE CARABELL, *et al.*,

Petitioners,

v.

UNITED STATES ARMY CORPS OF ENGINEERS, *et al.*,

Respondents.

On Writ of Certiorari to the United States Court of Appeals for the Sixth Circuit

BRIEF OF ECOLOGICAL SOCIETY OF AMERICA, SOCIETY OF WETLAND SCIENTISTS, AMERICAN SOCIETY OF LIMNOLOGY AND OCEANOGRAPHY, AND ESTUARINE RESEARCH FEDERATION AS *AMICI CURIAE* IN SUPPORT OF RESPONDENTS

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The Ecological Society of America, Society of Wetland Scientists, American Society of Limnology and Oceanography, and Estuarine Research Federation, as *amici curiae*, respectfully submit this brief in support of Respondents United States Army Corps of Engineers and the United States Environmental Protection Agency.[1]

INTERESTS OF THE *AMICI CURIAE*

Amici are the leading professional associations of wetland and aquatic scientists in the United States. The Ecological Society of America (ESA) is an organization of scientists founded in 1915 to promote ecological science by improving communication among ecologists, raise the public's level of awareness of the importance of ecological science, and ensure the appropriate use of ecological science in environmental decision making by enhancing communication between the ecological community and policy-makers. Ecology is the scientific discipline that is concerned with the relationships between organisms and their past, present, and future environments. ESA has published the scientific journal *Ecology* since 1920. The Society's Aquatic Ecology Section is its largest section.

The Society of Wetland Scientists (SWS) is an international organization formed in 1980 to further scientific and educational objectives related to wetland science and to encourage and strengthen professional standards in all

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[1] All parties have consented to the filing of this brief. Pursuant to this Court's Rule 37.6, *Amici* state that no counsel for any party in this case authored this brief in whole or in part, and no person or entity other than the *Amici* and their counsel have made a monetary contribution to the preparation and submission of this brief.

activities related to wetlands science. SWS has 4200 members and publishes a quarterly journal *Wetlands* concerned with all aspects of wetlands biology, ecology, hydrology, water chemistry, soil and sediment characteristics, and management. SWS established a Professional Certification Program to serve the public's need to identify qualified individuals in the practice of wetland science.

The American Society of Limnology and Oceanography (ASLO) is a professional organization formed in 1948 for researchers and educators in the field of aquatic science. Limnology is the scientific study of the physical, chemical, hydrological, and biological aspects of inland water bodies. ASLO promotes integration and communication of knowledge across the full spectrum of aquatic science and the scientific stewardship of aquatic resources for the public interest. ASLO publishes the scientific journal *Limnology and Oceanography*.

The Estuarine Research Federation (ERF) is a professional organization founded in 1971 to promote research on estuaries and coastal waters and to provide information and advice on matters concerning estuaries and the coastal zone. ERF publishes the scientific journal *Estuaries and Coasts.*

Amici support the use of the best available scientific information in making decisions on the use and management of wetlands and aquatic resources.

INTRODUCTION AND SUMMARY OF ARGUMENT

In *United States v. Riverside Bayview Homes, Inc.,* this Court upheld Clean Water Act regulation of wetlands adjacent to open waters and other waters of the United States because such wetlands are "inseparably bound up" with those waters and Congress intended to enact a comprehensive program to control water pollution at its source. 474 U.S. 121, 134 (1985) ("*Riverside Bayview*").

The *Rapanos* petitioners challenge the essential holding of *Riverside Bayview* and contend Clean Water Act regulation is limited to wetlands that directly abut large navigable water bodies, excluding from regulation tributaries and associated wetlands. The *Carabell* petitioners contend that wetlands separated from a tributary by a narrow earthern berm are not regulated. Each of the petitioners effectively challenges the validity of federal regulations defining "adjacent" wetlands as "waters of the United States."

As developed below, the definition in question has a firm scientific foundation. Wetlands adjacent to tributaries are inseparably bound up with those and other downstream waters, and because of that connection serve functions essential to maintenance of water quality in the nation's navigable waters. Because adjacent wetlands form the primary interface between terrestrial systems and downstream waters, they exert a powerful influence on downstream water quantity and quality. For example, adjacent wetlands in the upper Mississippi River watershed remove nutrients such as nitrogen – which plays a large role in the hypoxic "dead zone" in the Gulf of Mexico – from water and prevents the pollutants from flowing downstream. It follows that the failure to protect wetlands adjacent to tributaries will have significant adverse effects on water quality and the aquatic ecosystem and will undermine achievement of the legislated goal of the Clean Water Act "to restore and maintain the chemical, physical and biological integrity of the nation's waters." 33 U.S.C.1251.

ARGUMENT

I. BECAUSE WETLANDS ADJACENT TO TRIBUTARIES PERFORM FUNCTIONS ESSENTIAL TO MAINTENANCE OF WATER QUALITY AND THE AQUATIC ECOSYSTEM, THEY ARE "INSEPARABLY BOUND UP" WITH THE INTEGRITY OF ADJACENT AND DOWNSTREAM WATERS.

In upholding regulation of wetlands in *Riverside Bayview,* the Court relied upon Congressional findings that pollution must be controlled at the source in order to achieve the Act's goals "to restore and maintain the chemical, physical, and biological integrity of the Nation's waters." 33 U.S.C. § 1251. Congress recognized that water "moves in hydrologic cycles" such that "it is essential that discharge of pollutants be controlled at the source." S. REP. NO. 92-414, p. 77 (1972). The "integrity" sought to be restored and maintained, 33 U.S.C. § 1251, "refers to a condition in which the natural structure and function of ecosystems [are] maintained." H. REP. NO. 92-911, p. 76 (1972).

Science validates the understanding of Congress, the Corps, and this Court. It demonstrates that the failure to protect and maintain wetlands adjacent to "non navigable tributaries" will result in degradation of not only millions of miles of these important waters but also degradation of traditional navigable waters to which these tributaries contribute their flow. To date, fortunately, regulation of wetlands under the Act has done much to minimize their destruction and the attendant degradation of water quality and diminishment of aquatic integrity. The rate of loss of the nation's wetlands has declined from 458,000 acres per year during the two decades preceding enactment of the Clean Water Act to 58,500 acres per year during the most recent assessment period.[2] Most of the substantial reduction in wetland loss can only be attributed to enactment and implementation of the wetland protection provisions of the Clean Water Act.

Below, we document four related scientific points. First, adjacent wetlands are a well-defined component of the aquatic environment with highly distinctive hydrologic features. Second, these distinctive features give rise to a unique suite of functions that directly contribute to the quality of other waters. Third, and most critically, science demonstrates that these wetlands help maintain water quality not just in nearby tributaries, but in navigable waters downstream. Fourth, it is reasonable to conclude adjacent wetlands separated from other waters by a man-made berm perform functions important to maintenance of water quality in the adjacent and downstream waters.

A. Adjacent Wetlands Are Distinct Features on the Landscape With Water Quality Functions Broadly Recognized in Science.

Adjacent wetlands lie at the interface between other surface waters, such as rivers and lakes, and terrestrial or upland systems. Wetland hydrology, or patterns of inundation or saturation by water, is the driving force that defines a wetland and controls its distinctive soil characteristics and plants. Hydrology is the key factor in the federal regulatory definition of a wetland:

> The term *wetlands* means those areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to

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[2] U.S. FISH & WILDLIFE SERVICE, STATUS AND TRENDS OF WETLANDS IN THE CONTERMINOUS UNITED STATES 1986-1997, 9 (2000).

> support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions.

33 C.F.R. § 328.3(b).[3] The recurrent inundation or saturation at or near the surface creates the unique environmental conditions that result in the important functions wetlands provide in the aquatic ecosystem – functions that scientific literature has linked to maintaining water quality in adjacent and downstream waters. These are not, in other words, occasional wet spots.

As concluded by the National Research Council of the National Academy of Sciences, "[w]etlands have strong connections to adjacent uplands and deepwater environments. The interdependence between wetlands and associated aquatic ecosystems provides strong scientific justification for policies that make a connection between clean water and the protection of wetlands."[4]

B. Adjacent Wetlands Have Critical Water Quality and Ecological Functions.

Adjacent wetlands perform several functions essential to maintenance of water quality and the chemical, physical and biological integrity of the aquatic ecosystem, including water storage, nutrient transformation and removal, sediment trapping, and provision of habitat for aquatic organisms.

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[3] Hydrology is also the primary factor in the definition of "wetland" proposed by the National Research Council of the National Academy of Sciences in 1995. NAT'L RESEARCH COUNCIL, NAT'L ACADEMY OF SCIENCES, COMM. ON CHARACTERIZATION OF WETLANDS, WETLANDS: CHARACTERISTICS AND BOUNDARIES 3 (1995).

[4] *Id.* at 34.

1. Water Storage and Flow Moderation.

Wetlands store surface water following precipitation events and moderate the flow of adjacent and downstream waters. Short-term surface water storage in wetlands reduces downstream flood peaks following precipitation events. Excessive flood peaks result in destructive scouring of stream beds and channels which can harm aquatic life. In the northeastern United States, watersheds with 4% or greater wetlands had peak flows that were 50% lower than watersheds with no remaining wetlands.[5] Long-term surface water storage in wetlands maintains the base flow and seasonal flow distribution in adjacent streams. Wetlands in the adjacent landscape slowly release stored water through surface and sub-surface connections and "recharge" the streams maintaining flow during periods of low precipitation.[6]

2. Nutrient Transformation and Removal.

Wetlands play a critical role in limiting excessive nutrients in water because they intercept, transform, and accumulate nutrients (nitrogen and phosphorus) that would otherwise be delivered directly to streams or other waters by precipitation and runoff. All scientific studies conclude that wetlands are a major sink of pollutant nitrogen in the landscape, and some recent studies suggest that wetlands may be the most important sink.[7]

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[5] NAT'L RESEARCH COUNCIL, NAT'L ACADEMY OF SCIENCES, COMPENSATING FOR WETLAND LOSSES UNDER THE CLEAN WATER ACT 48 (2001).

[6] T.C. WINTER, U.S. GEOLOGICAL SURVEY CIRCULAR, GROUNDWATER AND SURFACE WATER: A SINGLE RESOURCE, 1139 (1999).

[7] NAT'L RESEARCH COUNCIL, NAT'L ACADEMY OF SCIENCES, CLEAN COASTAL WATERS: UNDERSTANDING AND REDUCING

A recent study of five wetlands (size 0.4-3.1 hectares) in southwestern Michigan found even these relatively small wetlands removed nitrate and sulfate from introduced water containing those pollutants at a rapid rate: "The rapid rates of [nitrate and sulfate] removal demonstrate how very small areas of wetland sediment are capable of improving water quality, and such areas often occur at critical points of water flow between surface and groundwater reservoirs."[8]

Wetlands reduce nitrogen pollution in surface waters by converting polluting forms of nitrogen into harmless gaseous form in a process called denitrification. It is the hydrology, or recurrent saturation or inundation, of a wetland that creates the conditions that make wetlands ideal for denitrification. Denitrification occurs under anoxic (without oxygen) soil conditions, but oxic (with oxygen) soils may be important in processing nitrogen first! Inundation or saturation of the soil with water limits oxygen except in the upper level of the soil and along some plant roots, creating an interface of oxic and anoxic soil conditions ideal for denitrification. Since some forms of nitrogen are highly mobile in groundwater, wetlands that do not have a surface hydrologic connectivity but have a subsurface groundwater connection can be important to reducing nitrogen pollution to nearby surface waters.[9] While other ecosystems provide some denitrification, only wetlands

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THE EFFECTS OF NUTRIENT POLLUTION (2000); R.W. Howarth, et al., *Sources of Nitrogen Pollution to Coastal Waters of the United States*, 25 ESTUARIES 656-676 (2002); Van Breemen, et al., *Where Did All the Nitrogen Go? Fate of Nitrogen Inputs to Large Watersheds in the Northeastern USA*, 57&58 BIOGEOCHEMISTRY 267-293 (2002).

[8] S.L. Whitmire & S.K. Hamilton, *Rapid Removal of Nitrate and Sulfate in Freshwater Wetland Sediments*, 34 J. ENVIRON. QUALITY 2062, 2070 (2005).

[9] NAT'L RESEARCH COUNCIL, *supra* note 7.

have this tremendous capacity to intercept and remove nitrogen, thus maintaining the water quality of adjacent and downstream waters.

In fact, scientists believe that wetlands adjacent to smaller tributaries in the upper reaches of watersheds "may be the most important regulating water chemistry in large drainages because their large surface-to-volume ratios favor rapid nitrogen uptake and processing."[10] Once water reaches larger rivers, the nitrogen in the water is less likely to come into contact with soils and vegetation, so it is critical to water quality that excessive nitrogen be filtered in wetlands adjacent to smaller tributaries.[11] In a given watershed, smaller tributaries and associated wetlands may process more nitrogen and retain more large sediment particles while wetland floodplains associated with larger downstream rivers retain phosphorous and trap fine particles. Wetlands thus may be needed both upstream and downstream to fully address problems of nitrogen and phosphorus in surface waters.

3. Sediment Trapping.

Wetlands adjacent to streams and other waters are generally depositional areas on the landscape. Soil erodes from the adjacent upland areas "downhill" into the wetland. Adjacent wetlands intercept and trap eroding soil and sediment from uplands preventing delivery to the stream or other water body. Sediment adversely affects water quality by smothering

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[10] Peterson, et al., *Control of Nitrogen Export From Watersheds by Headwater Streams*, 292 SCIENCE 86-90 (2001).

[11] D.F. Whigham, et al., *Impacts of Freshwater Wetlands on Water Quality: A Landscape Perspective*, ENVIRONMENTAL MANAGEMENT, 663-671 (1988).

streambeds and destroying or degrading aquatic habitat.[12] In addition, toxic materials including pesticides, industrial wastes, and metals can be bound to sediment and carried into water bodies.[13] States report that sedimentation is one of the most widespread pollutants of streams and rivers and impairs 12% of assessed stream miles and 31% of the impaired stream miles.[14]

4. Habitat for Aquatic Organisms.

Wetlands provide the only habitat for numerous organisms and are important to the overall maintenance of biodiversity and the aquatic ecosystem. Similarly, tributaries provide different physical habitat for different kinds of aquatic species and different lifestages of certain fish species. Most fish require different physical habitats for each life stage, so that connectivity of diverse habitats including perennial, intermittent, ephemeral, and headwater streams is important to the fish finding suitable habitats during reproduction and each critical life stage.[15, 16, 17]

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[12] U.S. ENVT'L PROTECTION AGENCY, NATIONAL WATER INVENTORY REPORT 13 (2000) (Report to Congress).

[13] W.R. Osterkamp, et al., *Economic Considerations of a Continental Sediment-Monitoring Program*, 13 INTERNATIONAL JOURNAL OF SEDIMENT RESEARCH No. 4: 12-24 (1998).

[14] U.S. ENVT'L PROTECTION AGENCY, *supra* note 12, at 12.

[15] T.R. Labbe & K.D. Fausch, *Dynamics of Intermittent Stream Habitat Regulate Persistence of a Threatened Fish at Multiple Scales*, 10(6) ECOLOGICAL APPLICATIONS 1774-1791 (2000).

[16] M.N. Paller, *Relationships Between Fish Assemblage Structure and Stream Order in South Carolina Coastal Plain Streams*, 123 TRANSACTIONS OF THE AMERICAN FISHERIES SOCIETY 150-161 (1994).

Headwaters are essential breeding habitat for some species of fish.[18]

C. Wetlands Adjacent to Tributaries Have Functions Important to Maintaining Water Quality in Traditionally Navigable Water Bodies.

Numerous scientific studies have documented and described the functions of wetlands in relation to adjacent waters and downstream waters. Functions of a wetland are associated with its landscape position.[19] Most of a surface water drainage network's interface with the land occurs in streams and associated wetlands at the most upper or "headwater" extent of the watershed. In most landscapes, approximately 75% percent of the stream length of a surface water drainage network consists of first order streams (no tributaries) and second order streams (where two first order streams join). These headwater tributaries and adjacent wetlands are "first responders" to the discharge of pollutants generated by activities in uplands. The most obvious reason even small tributaries and adjacent wetlands play a critical water quality function is that the great majority of water passes through them on the way downstream.

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[17] I.J. Schlosser, *Critical Landscape Attributes That Influence Fish Population Dynamics in Headwater Streams,* 303 HYDROBIOLOGIA 71-81 (1995).

[18] J.L. Meyer & J.B. Wallace, *Lost Linkages and Lotic Ecology: Rediscovering Small Streams*, ECOLOGY: ACHIEVEMENT AND CHALLENGE 302 (M.C. Press et al. eds., 2001).

[19] See M.M. BRINSON, A HYDROGEOMORPHIC CLASSIFICATION FOR WETLANDS, Technical Report WRP-DE-4, (U.S. Army Engineer Waterways Experiment Station, Vicksburg, MS, 1993).

While first and second order tributaries constitute most of a surface drainage system, no generalizations can be made about proximity of first or second order tributaries to navigable waters. In some cases, first order tributaries may be many miles from the nearest navigable water. In other cases, first order tributaries may empty directly into navigable waters. Consequently, no generalizations can be made about the relative function of first or second order tributaries and associated wetlands with respect to downstream water quality based on their proximity to the downstream waters.

The Carabell wetlands are adjacent to a ditch excavated in wetlands. Ditches are typically excavated to modify the natural drainage characteristics of a site to increase the rate of flow from the site by decreasing surface and subsurface water retention. A large percentage of the nation's streams and wetlands have been channelized or ditched. Ditches connected to other waters function as tributaries by conveying water, and any pollutants contained in that water, to downstream water bodies.

The water quality maintenance functions of wetlands adjacent to tributaries extend hundreds of miles downstream to the larger waters to which the tributaries contribute flow. Nutrient control provides a paradigmatic example. Pollution from excessive nutrients is a significant problem in coastal waters including Chesapeake Bay, Albemarle and Pamlico Sounds in North Carolina, and the Gulf of Mexico.[20] Large additions of nutrients, including nitrogen, into such waters causes an overgrowth of algae and subsequent depletion of oxygen in the water, a process called eutrophication.

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[20] The degradation of coastal estuaries prompted Congress to amend the Clean Water Act to establish a national estuary program to develop comprehensive conservation and management plans to implement corrective actions to address pollution of estuaries. *See* 33 U.S.C. 1330.

"Eutrophication accounts for about half of the impaired lake area and 60% of the impaired river reaches in the U.S. and is also the most widespread pollution problem of U.S. estuaries."[21] Much of the excessive nutrient loading of coastal waters and estuaries is delivered by upstream tributaries from sources in watersheds that can be long distances from the coastal zone.[22]

The notorious "dead zone" in the Gulf of Mexico illustrates just how serious the problem can become, and how wetlands are integral to solving it. Nutrient laden waters from the Mississippi River seasonally create a large area of oxygen-depleted water, referred to as hypoxia, in the Gulf of Mexico on the Louisiana continental shelf. Excessive nutrients contribute to algal production which in turn leads to increased availability of organic carbon and depletion of oxygen in the water column. Most aquatic species cannot survive in oxygen depleted water – yet this hypoxia occurs in the middle of the most important commercial and recreational fisheries in the conterminous United States.[23] Significantly for present purposes, some *eighty-six percent* of nitrogen arriving at the hypoxic zone originates in the upper Mississippi River basin above the confluence with the Ohio

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[21] Carpenter, et al., *Nonpoint Pollution of Surface Water with Phosphorus and Nitrogen*, 3 ISSUES IN ECOLOGY 1-12 (1998).
[22] NAT'L RESEARCH COUNCIL, *supra* note 7; R. Howarth, et al., *Nutrient Pollution of Coastal Rivers, Bays, and Seas*, 7 ISSUES IN ECOLOGY 1-15 (2000).
[23] See N.N. Rabalais, et al., *Characterization of Hypoxia, Topic 1 Report for the Integrated Assessment of Hypoxia in the Gulf of Mexico* (U.S. Dep't. of Commerce, Nat'l Oceanic and Atmospheric Admin. (1999)), http://oceanservice.noaa.gov/products/pubs_hypox_t1final.pdf

River.[24] The National Oceanic and Atmospheric Administration has identified restoration of wetlands in the Mississippi River watershed as a strategy to address hypoxia in the Gulf based on the nutrient removal functions wetlands provide in the upper Mississippi River tributaries.[25] Although its watershed is located hundreds of miles from the Gulf, "the Illinois River basin, with 7% of its watershed converted to wetland, could reduce about 50% of the 144,000 metric tons/yr of nutrients it generates, or about 5% of the entire nitrogen load to the gulf of Mexico."[26]

D. Wetlands Neighboring, Bordering, or Contiguous to Other Waters Usually Have Significant Functional Relationships to the Adjacent Waters Notwithstanding Natural or Man-Made Berms or Similar Barriers.

The water quality and other functions of adjacent wetlands for downstream water bodies are only partially removed, if removed at all, by construction of levees or berms. Natural river levees are formed on most large meandering rivers and consist of linear elevated lands along the river bank often separating the river from wetland areas or "backswamps."

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[24] D.A. Goolsby, et al., *Flux and Sources of Nutrients in the Mississippi – Atchafalaga River Basin: Topic 3 Report for the Integrated Assessment on Hypoxia in the Gulf of Mexico*, (U.S. Dep't of Commerce, Nat'l Oceanic and Atmospheric Admin.(1999)), http://www.nos.noaa.gov/Products/hypox_t3final.pdf.

[25] W.J. Mitsch, et al., R*educing Nutrient Loads, Especially Nitrate-Nitrogen, to Surface Water, Ground Water, and the Gulf of Mexico, Topic 5 Report for the Integrated Assessment on Hypoxia in the Gulf of Mexico* 84 (U.S. Dep't of Commerce, Nat'l Oceanic and Atmospheric Admin. (1999), http://oceanservice.noaa.gov/products/pubs_hypox.t5final.pdf

[26] *Id.*

These levees are formed by the deposition of sediment during flood stage as sediment laden water leaves the river channel, slows and spreads out, and drops its sediment load along the immediate river shoreline. The levee does not isolate the backswamp from the river as the levee is periodically overtopped by the river during flood stage such that backswamp wetland absorbs floodwaters, attenuates flows and receives pollutants such as sediment that would otherwise travel immediately downstream.[27] Similar man-made dikes or barriers usually do not isolate a wetland from all surface connection with adjacent waters. If water levels rise and overtop the dike or barrier, it results in a direct surface connection with the adjacent wetland.

Subsurface connections also can exist between wetlands and adjacent waters even where "separated" by surface features such as berms, dikes, or dunes. For example, studies show that beach dunes do not completely isolate a wetland from adjacent waters. Wetland dune swales along the immediate shoreline of the Great Lakes have direct subsurface hydrological connectivity to the adjacent lake and water tables in the wetland are controlled by lake levels.[28] Exchange of water between adjacent wetlands and a river is often through shallow groundwater, in both directions.[29]

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[27] W.J. Mitsch & J.G. Gosselink, 317-351 WETLANDS (1986).

[28] D. Albert, *Borne of the Wind: An Introduction to the Ecology of Michigan's Sand Dunes* (Michigan Natural Features Inventory 2000).

[29] See NAT'L RESEARCH COUNCIL, NAT'L ACADEMY OF SCIENCES, RIPARIAN AREAS, FUNCTIONS AND STRATEGIES FOR MANAGEMENT 33 (2002) ("Because floodplains are porous and contain aquifers that are closely linked to and controlled by the channel system, waterbodies and their riparian areas are linked longitudinally, vertically and horizontally); *id.* at 34 (Figure 1-4 and legend describing how in most "alluvial river corridors" river water moves rapidly through surficial

Indeed, even where man-made levees are in place, hydrologic connectivity between wetlands and adjacent waterways persists.[30]

The direct subsurface connections between wetlands and adjacent waters can affect water quality despite surface features. As discussed above in I.B.2., excessive nitrogen is a major pollutant of surface waters. Because nitrogen is mobile in groundwater, wetlands separated from waters by dikes or berms may still perform important functions by reducing nitrogen conveyed to the adjacent water by subsurface connections.[31]

Failure to include wetlands as "adjacent" where immediate at-grade abutment is interrupted by natural or man-made landforms will eliminate federal protection over large expanses of wetland function. The U.S. Geological Survey has calculated that over ninety-percent (93%) of the lower Mississippi River floodplain has been modified by the

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alluvia in a hyporheic zone immediately underlying the stream bed and adjacent areas). http://www.nap.edu/books/0309082951/html/33.html; Gerald J. Gonthier, *Ground-water-flow Conditions Within a Bottomland Hardwood Wetland, Eastern Arkansas*, 16 WETLANDS 334-46 (1996) (describing groundwater flow from wetland adjacent to Cache River in Arkansas to and from river).

[30] *See, e.g.*, Kelley, *Relations Among River Stage, Rainfall, Ground Water Levels, and Stage at Two Missouri River Flood-Plain Wetlands* (U.S. Geological Survey 2001) (describing water levels in floodplain wetlands separated from Missouri River by levees rising and falling as river heights (stages) varied).

[31] NAT'L RESEARCH COUNCIL, *supra* note 7.

presence of levees.[32] Many of the remaining wetlands are landward of those levees.

II. THE FEDERAL DEFINITION OF "ADJACENT" WETLANDS ACCURATELY REFLECTS THE CONNECTION TO ADJACENT AND DOWNSTREAM NAVIGABLE WATERS, AND THAT DEFINITION ENCOMPASSES THE RAPANOS AND CARABELL WETLANDS.

Given the demonstrated physical interconnections between wetlands, adjacent tributaries and navigable waters, Clean Water Act jurisdiction over wetlands adjacent to tributaries will serve to protect the biological, chemical and physical integrity of traditional navigable waters. The federal "adjacent" wetlands definition accurately reflects the known interrelation of such wetlands with navigable waters and thus further the aim of the Clean Water Act. Further, information in the record of these cases supports the conclusion that the *Rapanos* and *Carabell* wetlands qualify as regulated adjacent wetlands.

The federal regulation applied in these cases defines waters of the United States to include wetlands that are "adjacent" to traditional navigable waters or their tributaries. 33 C.F.R. § 328.3(a)(7); 40 C.F.R. § 230.3(s)(7). The term "adjacent" is defined to mean "bordering, contiguous, or neighboring," *id.*, with the further provision that "[w]etlands separated from other waters of the United States by man-made dikes or barriers, natural river berms, beach dunes and the like are 'adjacent wetlands.'" 33 C.F.R. § 328.3(c); 40 C.F.R. § 230.3(b). As discussed in Section I, *supra* at 14-17,

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[32] R.L. Delany & M.R. Craig, *Longitudinal Changes in Mississippi River Floodplain Structure* (U.S. Geological Survey 1997).

numerous studies demonstrate that wetlands bordering, contiguous, or neighboring tributaries have hydrological interconnections with those water bodies and with waters downstream, such that the water quality functions of those wetlands are effectively transmitted to navigable waters. The regulatory definition of adjacent wetlands accurately encompasses wetlands that are important to maintaining and protecting the integrity of waters of the United States.

Scientific understanding also supports the regulation's effective presumption that "man-made dikes or barriers, natural river berms, beach dunes and the like" do not operate to defeat the rationale for extending jurisdiction to wetlands that are "bordering, contiguous, or neighboring" to other waters, including tributaries. Wetlands and neighboring surface waters can interact through a variety of means, including surface flows caused by local wet weather events (e.g., rainwater causing overflow from a wetland into a tributary); surface flows caused by remote wet weather (e.g., upstream precipitation causing a tributary to flood into a wetland); and by flows that travel at least temporarily through the ground before discharging into the tributary.[33] Thus, even though adjacent wetlands may lack constant, obvious, or contiguous surface water connection to a nearby tributary, they can still possess significant hydrologic connectivity and functional linkage.[34]

Turning to application of the regulation, the Rapanos property includes three wetland areas, all with surface water connections through tributaries to traditionally navigable waters. *United States v. Rapanos*, 376 F.3d 629, 642-643 (6th Cir. 2004). As the Rapanos do not dispute that their wetlands have direct connections to tributaries, those wetlands fall

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[33] *See* Gonthier, *supra* note 29 (describing flow of water from wetland into local aquifer and then into river).

[34] *See id.*; Albert, *supra* note 34; Mitsch, *supra* note 27.

within the definition of adjacent wetlands. 33 C.F.R. § 328.3(a)(7); 40 C.F.R. § 230.3(s)(7).

The 19.6 acre Carabell property includes approximately 16 acres of forested wetlands that are a remnant of the once more expansive Lake St. Clair, which lies about one mile southeast of the tract. *Carabell v. United States*, 391 F.3d 704, 705 (6th Cir. 2004). At some time in the past, a ditch was excavated from the wetland and the spoil material cast along both sides of the ditch, creating a berm. 391 F.3d at 705. The ditch connects with the Sutherland-Oemig Drain which flows into Auvase Creek, which in turn flows into Lake St. Clair, a traditionally navigable water that connects to Lake Erie. JA Vol. 4 at 847 (Magistrate's Report and Recommendation).

The administrative record supports the conclusion that the Carabell wetlands are "adjacent" under federal regulation. The ditch was excavated out of wetlands contiguous to the delineated wetlands on the site, with removed wetland materials "sidecast" along the ditch to form the berm. JA Vol. 3 at 532. The record contains little clarifying information about this sidecast berm's manner or mode of construction, its size, or its actual demonstrated performance as a hydrological barrier between the wetlands, ditch, and drain, particularly during wet-weather events. Based on what was before it, however, the Corps concluded that the ditch remained adjacent to the wetlands from which it was dug for the purposes of its regulatory jurisdiction. JA Vol. 3 at 516, 523, 531-534. While the frequency and extent of surface water connection between the wetland and the neighboring tributaries is not clear from this record, what does appear clear is the fact that a periodic surface water connection exists.[35] The record also presents evidence of subsurface

[35] The Carabells' attorney stated that "at least" three "lateral cuts, drainage cuts that run through the berm," through which rainwater could "go over," JA Vol. 3 at 639, while another

connection between the wetlands and ditch.[36] The hydrologic connectivity between the Carabell wetlands and nearby tributaries supports the Corps' conclusion that water quality functions could be lost if these wetlands were destroyed. *Compare* JA Vol. 3 at 519 (Corps determination stating wetlands on site provide "valuable seasonal habitat for aquatic organisms" and "water storage functions that, if destroyed, could result in an increased risk of erosion and degradation of water quality in the Sutherland-Oemig Drain, Auvase Creek, and Lake St. Clair.") *with* Section I, *supra* at 6-11 (discussing water storage, pollution reduction and biological habitat values of wetlands for navigable waters).

CONCLUSION

Peer-reviewed scientific studies demonstrate that wetlands adjacent to tributaries are functionally interrelated with, and physically interconnected to traditionally navigable waters, and play an important role in restoring and maintaining "the chemical, physical, and biological integrity of the Nation's

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Carabell consultant objected to the proposition that the existing wetlands were essentially "offline" with "no outflow," stating that a three-and-a-half-inch rain would result in "some overflow." JA Vol. 3 at 639.

[36] The Carabells' consultant stated that that the Sutherland-Oemig "drain dropped the water table three, four feet, so it has been a long slow drying out process, and I'm not so sure that that process isn't continuing today." JA Vol. 3 at 629 (statement of Mr. Leighton). And the Corps' site inspector, addressing the question of "Site Hydrology" and the nearest water receiving runoff from the site, answered "perhaps drain, perhaps groundwater discharge." JA Vol. 3 at 487. *See also United States v. Deaton*, 332 F.3d 698, 702-703 (4th Cir. 2003) (discussing drainage ditch dug in wetlands with sidecasting as increasing drainage with a purpose to "destroy wetland characteristics").

waters." 33 U.S.C. § 1251. Federal regulations defining waters of the United States to include those wetlands accordingly have a sound foundation in science. Those regulations, applied to the wetlands in this case, support federal jurisdiction in both *Carabell* and *Rapanos*. The decisions below should be affirmed.

Respectfully submitted.

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