Technical Support Document for the Clean Water Rule: Definition of Waters of the United States

May 27, 2015

U.S. Environmental Protection Agency

U.S. Department of the Army

This Technical Support Document addresses in more detail the legal basis and the existing scientific literature in support of the significant nexus determinations underpinning the Clean Water Rule. The Preamble, the Science Report, this Technical Support Document, the Response to Comments, and the rest of the administrative record provide the basis for the definition of "waters of the United States" established in the rule. Where this Technical Support Document does not reflect the language in the preamble and final rule, the language in the final preamble and rule controls and should be used for purposes of understanding the scope, requirements, and basis of the final rule.

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A. The Clean Water Act

i. Background

Congress enacted the Federal Water Pollution Control Act Amendments of 1972, Pub. L. No. 92-500, 86 Stat. 816, as amended, Pub. L. No. 95-217, 91 Stat. 1566, 33 U.S.C. 1251 et seq. (Clean Water Act or CWA or Act) "to restore and maintain the chemical, physical and biological integrity of the Nation's waters." Section 101(a). One of the goals of the CWA is to attain "water quality which provides for the protection and propagation of fish, shellfish, and wildlife." Section 101(a)(2). A major tool in achieving that purpose is a prohibition on the discharge of any pollutants, including dredged or fill material, into "navigable waters" except in accordance with the Act. Section 301(a).

The CWA provides that "[t]he term 'navigable waters' means the waters of the United States, including the territorial seas." Section 502(7). The Conference Report accompanying the CWA explained that "[t]he conferees fully intend that the term 'navigable waters' be given the broadest possible constitutional interpretation unencumbered by agency determinations which have been made or may be made for administrative purposes." S. Conf. Rep. No. 1236, 92d Cong., 2d Sess. 144 (1972). The House and Senate Committees expressed concern that "navigable waters" might be given an unduly narrow reading. Thus, the House Report observed: "One term that the Committee was reluctant to define was the term "navigable waters." The reluctance was based on the fear that any interpretation would be read narrowly. However, this is not the Committee's intent. The Committee fully intends that the term "navigable waters" be given the broadest possible constitutional interpretation unencumbered by agency determinations which have been made or may be made for administrative purposes." H.R. Rep. No. 911, 92d

Cong., 2d Sess. 131 (1972). Referring to the term "integrity" in the statutory goals, the House Report stated: "[T]he word 'integrity' … refers to a condition in which the natural structure and function of ecosystems [are] maintained." H.R. Rep. No. 92-911, 92nd Cong. 2d Sess. 76 (1972) (*quoted in United States v. Riverside Bayview Homes, Inc.*, 474 U.S. 121, 132-33 (1985)).

The Senate Report stated that "[t]hrough a narrow interpretation of the definition of interstate waters the implementation [of the] 1965 Act was severely limited. Water moves in hydrologic cycles and it is essential that discharge of pollutants be controlled at the source." S. Rep. No. 414, 92d Cong., 1st Sess. 77 (1971).

The Conference Committee deleted the word "navigable" from the definition of "navigable waters," broadly defining the term to include "the waters of the United States." As noted above, the Conference Report explained that the definition was intended to repudiate earlier limits on the reach of federal water pollution efforts: "The conferees fully intend that the term 'navigable waters' be given the broadest possible constitutional interpretation unencumbered by agency determinations which have been made or may be made for administrative purposes." S. Conf. Rep. No. 1236, 92d Cong., 2d Sess. 144 (1972). See Section I.C. below for discussion of Supreme Court decisions regarding the scope of the CWA.

The Environmental Protection Agency (EPA) administers the CWA except as otherwise explicitly provided. Section 101(d). The Attorney General has determined that the "ultimate administrative authority to determine the reach of the term 'navigable waters' for purposes of § 404" resides with EPA. 43 Op. Att'y Gen. 197 (1979). EPA has had a consistent view as to the broad scope of the jurisdiction conferred by the CWA.

In 1977, Congress considered a legislative proposal that would have limited the class of waters subject to the U.S. Army Corps of Engineers' (Corps) permitting authority under Section

404 of the CWA. A bill passed by the House of Representatives provided that for purposes of Section 404, the Corps' permitting authority would extend to navigable waters "and adjacent wetlands," with the term "navigable waters" defined to mean waters navigable in fact, or capable of being made so by "reasonable improvement." 123 Cong. Rec. 10,420 (1977); *see id*. at 10,434 (passage of bill). A similar amendment was defeated in the Senate, however, *see id*. at 26,728, and the provision to redefine the term "navigable waters" was eliminated by the Conference Committee, *see* H.R. Conf. Rep. No. 830, 95th Cong., 1st Sess. 97-105 (1977). Congress rejected the proposal to limit the geographic reach of section 404 because it wanted a permit system with "no gaps" in its protective sweep. 123 Cong. Rec. 26707 (1977) (remarks of Sen. Randolph). Rather than alter the *geographic* reach of section 404, Congress amended the statute by exempting certain *activities* -- most notably certain agricultural and silvicultural activities -- from the permit requirements of section 404. *See* Section 404(f). Congress also established a mechanism by which a State may assume responsibility for administration of the Section 404 program with respect to waters "other than" traditional navigable waters and their adjacent wetlands. Section 404(g)(1).

Other evidence abounds to support the conclusion that when Congress rejected the attempt to limit the geographic reach of Section 404, it was well aware of the jurisdictional scope of EPA and the Corps' definition of "waters of the United States." For example, Senator Baker stated:

> Interim final regulations were promulgated by the [C]orps [on] July 25, 1975. . . . Together the regulations and [EPA] guidelines established a management program that focused the decisionmaking process on significant threats to aquatic areas while avoiding unnecessary regulation of minor activities. On July 19, 1977, the [C]orps revised its regulations to further streamline the program and correct several misunderstandings. . . .
>
> Continuation of the comprehensive coverage of this program is essential for the protection of the aquatic environment. The once seemingly separable types of

> aquatic systems are, we now know, interrelated and interdependent. We cannot expect to preserve the remaining qualities of our water resources without providing appropriate protection for the entire resource.
> Earlier jurisdictional approaches under the [Rivers and Harbors Act] established artificial and often arbitrary boundaries . . . .
> 123 Cong. Rec. 26718 (1977).

ii. The Rule is Consistent with the Statute

The U.S. Environmental Protection Agency (EPA) and the Department of the Army (collectively referred to as “the agencies”) have promulgated a rule designed to implement Congress’ foundational goal for the CWA “to restore and maintain the chemical, physical and biological integrity of the Nation’s waters.” Section 101(a). Some commenters stated that the proposed rule was inconsistent with the CWA because it impinged on the role of States to “prevent, reduce and eliminate pollution, to plan the development and use (including restoration, preservation, and enhancement) of land and water resources.” Section 101(b). To the contrary, the agencies recognize that States and tribes play a vital role in the implementation and enforcement of the CWA. Nothing in this rule limits or impedes any existing or future state or tribal efforts to further protect their waters. States and tribes, consistent with the CWA, retain full authority to implement their own programs to more broadly and more fully protect the waters in their jurisdiction. Under Section 510 of the CWA, unless expressly stated, nothing in the CWA precludes or denies the right of any state or tribe to establish more protective standards or limits than the CWA. Many states and tribes, for example, regulate groundwater, and some others protect wetlands that are vital to their environment and economy but which are outside the scope of the CWA.

In addition, when Congress passed the Federal Water Pollution Control Act Amendments of 1972 it was not acting on a blank slate. It was amending existing law that provided for a federal/state program to address water pollution. The Supreme Court has recognized that

Congress, in enacting the CWA in 1972, "intended to repudiate limits that had been placed on federal regulation by earlier water pollution control statutes and to exercise its powers under the Commerce Clause to regulate at least some waters that would not be deemed 'navigable' under the classical understanding of that term." *Riverside Bayview Homes v. U.S.,*474 U.S. 121,133 (1985); *see also International Paper Co. v. Ouellette*, 479 U.S. 481, 486, n.6 (1987). The final rule interprets the term "waters of the United States" consistent with the stated goals on policies of the CWA as a whole.

Other commenters stated that the proposed rule was inconsistent with Sections 101(g) and 510(2) of the CWA, because it interfered with States' rights over waters and will impinge upon allocation and movement of State waters. Section 101(g) of the CWA states, "It is the policy of Congress that the authority of each State to allocate quantities of its water within its jurisdiction shall not be superseded, abrogated or otherwise impaired by [the CWA and] that nothing in [the CWA] shall be construed to supersede or abrogate rights to quantities of water which have been established by any State." Similarly, Section 510(2) provides that nothing in the Act shall "be construed as impairing or in any manner affecting any right or jurisdiction of the States with respect to the waters . . . of such States." The rule is entirely consistent with these policies. The rule does not impact or diminish State authorities to allocate water rights or to manage their water resources. Nor does the rule alter the CWA's underlying regulatory process. Having been enacted with the objective of restoring and maintaining the chemical, physical, and biological integrity of our nation's waters, the CWA serves to protect water quality. Neither the CWA nor the rule impairs the authorities of States to allocate quantities of water. Instead, the CWA and the rule serve to enhance the quality of the water that the States allocate.

Even if the rule were to have an incidental effect on water quantity or allocation, which it does not, the rule would still be consistent with Section 101(g) of the CWA. In *PUD No. 1 of Jefferson County v. Washington Dept. of Ecology*, 511 U.S. 700, 720, 114 S.Ct. 1900, 1913, 128 L.Ed.2d 716, 733 (1994) the United States Supreme Court held, "Sections 101(g) and 510(2) [of the CWA] preserve the authority of each State to allocate water quantity as between users; they do not limit the scope of water pollution controls that may be imposed on users who have obtained, pursuant to state law, a water allocation." First, the Court stated: "The Federal Water Pollution Control Act, commonly known as the Clean Water Act, 86 Stat. 816, as amended, 33 U.S.C. § 1251 *et seq.*, is a comprehensive water quality statute designed to 'restore and maintain the chemical, physical, and biological integrity of the Nation's waters.' § 1251(a). The Act also seeks to attain 'water quality which provides for the protection and propagation of fish, shellfish, and wildlife.' § 1251(a)(2). To achieve these ambitious goals, the Clean Water Act establishes distinct roles for the Federal and State Governments. Under the Act, the Administrator of the Environmental Protection Agency (EPA) is required, among other things, to establish and enforce technology-based limitations on individual discharges into the country's navigable waters from point sources. See §§ 1311, 1314. Section 303 of the Act also requires each State, subject to federal approval, to institute comprehensive water quality standards establishing water quality goals for all intrastate waters. §§ 1311(b) (1)(C), 1313. These state water quality standards provide 'a supplementary basis . . . so that numerous point sources, despite individual compliance with effluent limitations, may be further regulated to prevent water quality from falling below acceptable levels.' *EPA* v. *California ex rel. State Water Resources Control Bd.*, 426 U.S. 200, 205, n. 12, 48 L. Ed. 2d 578, 96 S. Ct. 2022 (1976)." 511 U.S. at 704.

Petitioners in the case argued that the Clean Water Act is only concerned with water "quality," and does not allow the regulation of water "quantity." The Court held: "This is an artificial distinction. In many cases, water quantity is closely related to water quality; a sufficient lowering of the water quantity in a body of water could destroy all of its designated uses, be it for drinking water, recreation, navigation or, as here, as a fishery. In any event, there is recognition in the Clean Water Act itself that reduced stream flow, *i.e.*, diminishment of water quantity, can constitute water pollution. First, the Act's definition of pollution as 'the man-made or man induced alteration of the chemical, physical, biological, and radiological integrity of water' encompasses the effects of reduced water quantity. 33 U.S.C. § 1362(19). This broad conception of pollution -- one which expressly evinces Congress' concern with the physical and biological integrity of water -- refutes petitioners' assertion that the Act draws a sharp distinction between the regulation of water 'quantity' and water 'quality.' Moreover, § 304 of the Act expressly recognizes that water 'pollution' may result from 'changes in the movement, flow, or circulation of any navigable waters . . ., including changes caused by the construction of dams.' 33 U.S.C. § 1314(f)." 511 U.S. at 719-20.

Petitioners also argued that Sections 101(g) and 510(2) exclude the regulation of water quantity from the coverage of the Act. The Supreme Court held: "we read these provisions more narrowly than petitioners. Sections 101(g) and 510(2) preserve the authority of each State to allocate water quantity as between users; they do not limit the scope of water pollution controls that may be imposed on users who have obtained, pursuant to state law, a water allocation. In *California* v. *FERC*, 495 U.S. 490, 498, 109 L. Ed. 2d 474, 110 S. Ct. 2024 (1990), construing an analogous provision of the Federal Power Act, we explained that "minimum stream flow requirements neither reflect nor establish 'proprietary rights'" to water. Cf. *First Iowa Hydro-*

Electric Cooperative v. *FPC*, 328 U.S. 152, 176, 90 L. Ed. 1143, 66 S. Ct. 906, and n. 20 (1946). Moreover, the certification itself does not purport to determine petitioners' proprietary right to the water of the Dosewallips. In fact, the certification expressly states that a "State Water Right Permit (Chapters 90.03.250 RCW and 508-12 WAC) must be obtained prior to commencing construction of the project." App. to Pet. for Cert. 83a. The certification merely determines the nature of the use to which that proprietary right may be put under the Clean Water Act, if and when it is obtained from the State. Our view is reinforced by the legislative history of the 1977 amendment to the Clean Water Act adding § 101(g). See 3 Legislative History of the Clean Water Act of 1977 (Committee Print compiled for the Committee on Environment and Public Works by the Library of Congress), Ser. No. 95-14, p. 532 (1978) ('The requirements [of the Act] may incidentally affect individual water rights. . . . It is not the purpose of this amendment to prohibit those incidental effects. It is the purpose of this amendment to insure that State allocation systems are not subverted, and that effects on individual rights, if any, are prompted by legitimate and necessary water quality considerations')." 511 U.S. at 720-21. The rule is consistent with the Supreme Court's reading of these provisions consistent with the "ambitious goals" of the Act.

Under the rule, States, tribes, and local governments, consistent with the CWA, retain full authority to implement their own CWA programs to protect their waters more broadly or more fully than under the CWA. According to Section 510 of the CWA, unless expressly stated in the CWA, nothing in the CWA precludes or denies the right of any State, tribe, or political subdivision to establish its own standards or limits, as long as these standards and limits are at least as protective as those under the federal CWA. Many States and tribes, for example, protect groundwater. Others protect wetlands that are vital to their environment and economy but are outside the regulatory coverage of the CWA. Nothing in the rule limits or impedes any existing or future State, tribal, or local efforts to further protect waters. In fact, by providing greater clarity regarding what waters are subject to the CWA, the rule will assist States and tribes authorized Section 402 and 404 CWA permitting programs, because it will reduce the need for case-specific jurisdictional determinations.

Some commenters stated that the proposed rule was inconsistent with the Clean Water Act because the agencies considered biological effects on downstream traditional navigable waters, interstate waters, or the territorial seas. Again, the objective of the Act, and, therefore, the scope of the significant nexus under the statute and Justice Kennedy's standard is "to restore and maintain the chemical, physical, and *biological* integrity of the Nation's waters." Section 101(a)(emphasis added). Among the means to achieve the CWA's objective to restore and maintain the chemical, physical, and biological integrity of the Nation's waters, Congress established an interim national goal to achieve wherever possible "water quality which provides for the protection and propagation of fish, shellfish, and wildlife and provides for recreation in and on the water." Section 101(a)(2). Therefore, the agencies disagree that consideration of biological effects on downstream waters is inconsistent with the CWA.

First, the agencies considered biological functions for purposes of the significant nexus determinations in support of the rule only to the extent that the functions provided by tributaries and adjacent water affected the biological integrity of the downstream traditional navigable waters, interstate waters, or the territorial seas. For example, to protect Pacific and Atlantic salmon in traditional navigable waters (and their associated commercial and recreational fishing industries), headwater streams must be protected. Pacific and Atlantic salmon require both freshwater and marine habitats over their life cycles and therefore migrate along river networks, providing one of the clearest illustrations of biological connectivity. Many Pacific salmon species spawn in headwater streams, where their young grow for a year or more before migrating downstream, living their adult life stages in the ocean, and then migrating back upstream to spawn. These species thereby create a biological connection along the entire length of the river network. Science Report at 2-40.

Second, as is clear from the CWA's objective of protecting the "biological integrity" of the Nation's waters and the interim goal of achieving wherever possible water quality which provides for the protection and propagation of fish, shellfish, and wildlife, the statute is clear that protection of aquatic wildlife is an important aspect of protecting water quality and is addressed by the CWA. Among the many other provisions in which the CWA addresses wildlife are Section 102, comprehensive programs for water pollution control, "[i]n the development of such comprehensive programs due regard shall be given to the improvements which are necessary to conserve such waters for the protection and propagation of fish and aquatic life and wildlife;" Section 104, the Administrator will conduct continuing "comprehensive studies of the effects of pollution, including sedimentation, in the estuaries and estuarine zones of the United States on fish and wildlife, on sport and commercial fishing, on recreation, on water supply and water power, and on other beneficial purposes"; Section 301(h) provide that "[n]o permit issued under this subsection shall authorize the discharge of any pollutant into saline estuarine waters which at the time of application do not support a balanced indigenous population of shellfish, fish and wildlife"; Section 302, requiring effluent limitations for, among other things, "protection and propagation of a balanced population of shellfish, fish and wildlife"; Section 303(d) requiring States to "identify those waters or parts thereof within its boundaries for which controls on thermal discharges under section 301 are not stringent enough to assure protection and propagation of a balanced indigenous population of shellfish, fish, and wildlife"; Section 304, requiring the Administrator to develop criteria for water quality accurately reflecting the latest scientific knowledge: "(A) on the kind and extent of all identifiable effects on health and welfare including, but not limited to, plankton, fish, shellfish, wildlife, plant life, shorelines, beaches, esthetics, and recreation which may be expected from the presence of pollutants in any body of water, including ground water; (B) on the concentration and dispersal of pollutants, or their byproducts, through biological, physical, and chemical processes; and (C) on the effects of pollutants on biological community diversity, productivity, and stability, including information on the factors affecting rates of eutrophication and rates of organic and inorganic sedimentation for varying types of receiving waters"; and, Section 404, authorizing the Administrator to prohibit the specification of any defined area as a disposal site, if, among other considerations, the discharge of dredged or fill material will have an unacceptable adverse effect on "shellfish beds and fishery areas (including spawning and breeding areas), wildlife."

Some commenters stated that the exclusion of groundwater from the rule is inconsistent with the CWA and that the rule should instead include groundwater in the definition of "waters of the United States." EPA has never interpreted "waters of the United States" to include groundwater. This interpretation is reflected in the existing regulation, and all previous regulations, which does not define "waters of the United States" to include groundwater. The courts which have considered the issue generally agree that "waters of the United States" do not include groundwater. *Idaho Rural Council v. Bosma*, 143 F.Supp. 2d. 1169, 1179 (D.Id. 2001). Those courts reach this conclusion based largely upon the legislative history of the CWA which indicates that Congress specifically chose not to regulate groundwater, largely because "the jurisdiction regarding groundwaters is so complex and varied from State to State." S. Rep. No.

414, 92d Cong., 1st Sess. 73 (1971), U.S. Code Cong. & Admin. News 1972, pp. 3668, 3749, reprinted in 2 *Congressional Research Service of the Library of Congress, A Legislative History of the Water Pollution Control Act Amendments of 1972*, 93d Cong., 1st Sess., at 1491 (Comm. Print 1973). The majority of courts have also concluded that this interpretive history "does not suggest that Congress intended to exclude from regulation discharges into hydrologically connected groundwater which adversely affect surface water." *Bosma* at 1180. While EPA has never interpreted the CWA to include groundwater as a "water of the United States," EPA's longstanding interpretation is that point source discharges of pollutants to "waters of the United States" via groundwater with a direct hydrologic connection to surface waters are discharges subject to the CWA. *See* Concentrated Animal Feeding Operation Proposed Rule, 66 FR 2960, 3015 (Jan. 12, 2001). The exclusion for groundwater in the rule does not affect this longstanding interpretation as the agency has never considered the groundwater itself to be a "water of the United States."

Several commenters cited to *Hawai'i Wildlife Fund v. County of Maui* to argue the agencies should include groundwater as "waters of the United States." The court there held that groundwater was a "conduit" through which pollutants were being discharged into the ocean, requiring an NPDES permit. This finding is consistent with agency interpretation that discharges of pollutants to "waters of the United States" via groundwater with a direct hydrologic connection to surface waters to be subject to the CWA. While the court analyzed whether a discharge of pollutant into groundwater itself would require a permit, the court acknowledged the agencies' interpretation, including citing to the proposed rule. The court further acknowledged that if the agencies promulgated a final rule that reflected their interpretation, it would be entitled to Chevron deference.

B. Historic Scope of Regulatory Definition of "Waters of the United States"

i. Existing Regulation

The existing regulatory definition of "waters of the United States" is:[1]

The term waters of the United States means:

1. All waters which are currently used, or were used in the past, or may be susceptible to use in interstate or foreign commerce, including all waters which are subject to the ebb and flow of the tide;
2. All interstate waters including interstate wetlands;
3. All other waters such as intrastate lakes, rivers, streams (including intermittent streams), mudflats, sandflats, wetlands, sloughs, prairie potholes, wet meadows, playa lakes, or natural ponds, the use, degradation or destruction of which could affect interstate or foreign commerce including any such waters:
    a. Which are or could be used by interstate or foreign travelers for recreational or other purposes; or
    b. From which fish or shellfish are or could be taken and sold in interstate or foreign commerce; or
    c. Which are used or could be used for industrial purposes by industries in interstate commerce;
4. All impoundments of waters otherwise defined as waters of the United States under this definition;
5. Tributaries of waters identified in paragraphs (s)(1) through (4) of this section;

[1] There are some minor differences between the regulations for the various CWA programs that utilize the term "waters of the United States," but they are fundamentally consistent.

6. The territorial sea;
7. Wetlands adjacent to waters (other than waters that are themselves wetlands) identified in paragraphs (s)(1) through (6) of this section; waste treatment systems, including treatment ponds or lagoons designed to meet the requirements of CWA (other than cooling ponds as defined in 40 CFR 423.11(m) which also meet the criteria of this definition) are not waters of the United States.

Waters of the United States do not include prior converted cropland. Notwithstanding the determination of an area's status as prior converted cropland by any other federal agency, for the purposes of the Clean Water Act, the final authority regarding Clean Water Act jurisdiction remains with EPA.

Discharges of dredged or fill material into "waters of the United States" may be authorized by a permit issued by the Corps pursuant to Section 404 of the CWA. Regulations implementing the Corps' Section 404 permitting authority were first published in 1974. 39 Fed. Reg. 12,115. Those regulations defined the term "navigable waters" to mean "those waters of the United States which are subject to the ebb and flow of the tide, and/or are presently, or have been in the past, or may be in the future susceptible for use for purposes of interstate or foreign commerce." 33 C.F.R. 209.120(d)(1) (1974); *see also* 33 C.F.R. 209.260(e)(1) (1974) (explaining that "[i]t is the water body's capability of use by the public for purposes of transportation or commerce which is the determinative factor"). Discharges of all other pollutants from a point source to a "water of the United States" may be authorized by, most often, a Section 402 permit issued by EPA or an authorized state. While the Corps' initial regulations implementing the CWA limited its jurisdiction under Section 404 to traditional navigable waters, EPA's implementing regulations were clear that "waters of the United States" were distinct from and broader than traditional navigable waters. *38 Fed. Reg.* 13528, 13528-29 (May 3, 1973).

The Corps' initial view of the scope of its Section 404 jurisdiction met with substantial opposition. Several federal courts considering the coverage of wetlands adjacent to other waters held that the Corps had given Section 404 an unduly restrictive reading. *See, e.g., United States v. Holland*, 373 F. Supp. 665, 670-676 (M.D. Fla. 1974). EPA and the House Committee on Government Operations expressed agreement with the decision in *Holland*.[2] In *Natural Resources Defense Council, Inc. v. Callaway*, 392 F. Supp. 685, 686 (D.D.C. 1975), the court held that in the CWA Congress had "asserted federal jurisdiction over the nation's waters to the maximum extent permissible under the Commerce Clause of the Constitution. Accordingly, as used in the Water Act, the term ['navigable waters'] is not limited to the traditional tests of navigability." The court ordered the Corps to publish new regulations "clearly recognizing the full regulatory mandate of the Water Act." *Id.*

In response to the district court's order in Callaway, the Corps promulgated interim final regulations providing for a phased-in expansion of its Section 404 jurisdiction. 40 Fed. Reg. 31,320 (1975); see 33 C.F.R. 209.120(d)(2) and (e)(2) (1976). The interim regulations revised

[2] EPA expressed the view that "the *Holland* decision provides a necessary step for the preservation of our limited wetland resources," and that "the [*Holland*] court properly interpreted the jurisdiction granted under the [CWA] and Congressional power to make such a grant." See Section 404 of the Federal Water Pollution Control Act Amendments of 1972: Hearings Before the Senate Comm. on Pub. Works, 94th Cong., 2d Sess. 349 (1976) (letter dated June 19, 1974, from Russell E. Train, Administrator of EPA, to Lt. Gen. W.C. Gribble, Jr., Chief of Corps of Engineers). EPA explained that it "firmly believe[d] that the Conference Committee deleted 'navigable' from the [CWA] definition of 'navigable waters' in order to free pollution control from jurisdictional restrictions based on 'navigability.' " Id. at 350. Shortly thereafter, the House Committee on Government Operations discussed the disagreement between the two agencies (as reflected in EPA's June 19 letter) and concluded that the Corps should adopt the broader view of the term "waters of the United States" taken by EPA and by the court in *Holland*. See H.R. Rep. No. 1396, 93d Cong., 2d Sess. 23-27 (1974). The Committee urged the Corps to adopt a new definition that "complies with the congressional mandate that this term be given the broadest possible constitutional interpretation." Id. at 27 (internal quotation marks omitted).

the definition of "waters of the United States" to include, inter alia, waters (sometimes referred to as "isolated waters") that are not connected by surface water or adjacent to traditional navigable waters. 33 C.F.R. 209.120(d)(2)(i) (1976).[3] On July 19, 1977, the Corps published its final regulations, in which it revised the 1975 interim regulations to clarify many of the definitional terms. 42 Fed. Reg. 37,122. The 1977 final regulations defined the term "waters of the United States" to include, inter alia, "isolated wetlands and lakes, intermittent streams, prairie potholes, and other waters that are not part of a tributary system to interstate waters or to navigable waters of the United States, the degradation or destruction of which could affect interstate commerce." 33 C.F.R. 323.2(a)(5) (1978).[4] The Corps' current regulation contains similar language, see 33 C.F.R. 328.3(a)(3),[5] and EPA has promulgated regulations that include a substantially identical definition of the term "waters of the United States." See 40 C.F.R. 230.3(s)(3); 40 C.F.R. 232.2; 40 C.F.R. 122.2.

In 1986, the Corps consolidated and recodified its regulatory provisions defining "waters of the United States" for purposes of the Section 404 program. See 51 Fed. Reg. 41,216-41,217 (1986). The Corps explained that the new regulations neither reduced nor expanded its jurisdiction. *Id.* at 41,217. Rather, their "purpose was to clarify the scope of the 404 program by defining the terms in accordance with the way the program is presently being conducted." *Id.* In

[3] Phase I, which was immediately effective, included coastal waters and traditional inland navigable waters and their adjacent wetlands. 40 Fed. Reg. 31,321, 31,324, 31,326 (1975). Phase II, which took effect on July 1, 1976, extended the Corps' jurisdiction to lakes and primary tributaries of Phase I waters, as well as wetlands adjacent to the lakes and primary tributaries. Id. Phase III, which took effect on July 1, 1977, extended the Corps' jurisdiction to all remaining areas encompassed by the regulations, including "intermittent rivers, streams, tributaries, and perched wetlands that are not contiguous or adjacent to navigable waters." Id. at 31,325; see also 42 Fed. Reg. 37,124 (1977) (describing the three phases).

[4] An explanatory footnote published in the Code of Federal Regulations stated that "[p]aragraph (a)(5) incorporates all other waters of the United States that could be regulated under the Federal government's Constitutional powers to regulate and protect interstate commerce." 33 C.F.R. 323.2(a)(5), at 616 n.2 (1978).

[5] The current regulation defines "waters of the United States" to include, inter alia, "[a]ll other waters such as intrastate lakes, rivers, streams (including intermittent streams), mudflats, sandflats, wetlands, sloughs, prairie potholes, wet meadows, playa lakes, or natural ponds, the use, degradation or destruction of which could affect interstate or foreign commerce." 33 C.F.R. 328.3(a)(3).

the preamble to the regulations, the Corps observed that EPA had "clarified that waters of the United States" include waters "[w]hich are or would be used as habitat by birds protected by Migratory Bird Treaties," as well as waters "[w]hich are or would be used as habitat by other migratory birds which cross state lines." *Id.*

Note that as early as 1975 the Corps stated that "[w]etlands considered to perform functions important to the public interest include * * * [w]etlands which serve important natural biological functions, including food chain production, general habitat, and nesting, spawning, rearing and resting sites for aquatic or land species." 40 Fed. Reg. 31,328 (1975).

ii. Caselaw

As discussed in Section I.A. above, with the enactment of the Clean Water Act, Congress adopted a comprehensive approach to regulating pollution and improving the quality of the nation's waters, expressly stating its goal "to restore and maintain the chemical, physical, and biological integrity of the Nation's waters." Section 101(a).

The expression of statutory goals combined with the legislative history of the CWA historically was interpreted as evincing an intent by Congress to extend application of the Clean Water Act broadly to the fullest extent allowed by the Constitution. The earliest court decisions established two principles that would become the bedrock for interpreting the extent of CWA applicability. The first is that the CWA embodies Congress' understanding that water flows into traditionally navigable waters from upstream sources; pollution added to non-navigable upstream waters ultimately will cause harmful effects on downstream traditionally navigable waters; and consequently, it would be futile to regulate direct discharges into traditionally navigable waters without also regulating discharges to upstream waters. For example, in an early decision construing the applicability of the CWA, the U.S. Court of Appeals for the Sixth Circuit stated in *United States v. Ashland Oil and Transportation Co.*, 504 F.2d 1317, 1326 (6th Cir. 1974):

> It would, of course, make a mockery … if authority [under the Clean Water Act] to control pollution was limited to the bed of the navigable stream itself. The tributaries which join to form the river could then be used as open sewers as far as federal regulation was concerned. The navigable part of the river could become a mere conduit for upstream waste.

The Sixth Circuit went on to state: "Pollution control of navigable streams can only be exercised by controlling pollution of their tributaries." *Id.* at 1327.

The second principle derived by early court decisions from the language and legislative history of the 1972 Act is a distinction between traditional navigable waters and the broader term "waters of the United States," which describes the waters subject to the CWA. This distinction consistently has been acknowledged by nearly every court to consider the issue, including the Supreme Court in *Riverside Bayview Homes, Solid Waste Agency of Northern Cook County v. U.S. Army Corps of Engineers*, 531 U.S. 159 (2001) ("*SWANCC*"), and *Rapanos v. United States*, 547 U.S. 715 (2006).

This distinction found early judicial expression in *Natural Resources Defense Council v. Callaway*, 392 F. Supp. 685 (D.D.C. 1975). In striking Corps regulations limiting the Corps' jurisdiction under Section 404 of the CWA to traditional navigable waters, that decision held that Congress intended the CWA to extend beyond waters that are traditional navigable waters:

> Congress by defining the term 'navigable waters' in Section 502(7) of the Federal Water Pollution Control Act Amendments of 1972, 86 Stat. 816, 33 U.S.C. § 1251 et seq. (the 'Water Act') to mean 'the waters of the United States, including the territorial seas,' asserted federal jurisdiction over the nation's waters to the maximum extent permissible under the Commerce Clause of the Constitution. Accordingly, as used in the Water Act, the term is not limited to the traditional tests of navigability.

As discussed earlier, in response to the *Callaway* decision, the Corps in 1975 issued interim regulations (to be phased in over three periods of time) that defined navigable waters for purposes of the Clean Water Act to include non-navigable tributaries, freshwater wetlands adjacent to primary navigable waters, and lakes and all other waters covered under the statute, including "intermittent rivers, streams, tributaries, and perched wetlands that are not contiguous or adjacent to navigable waters" whenever the Corps determines the regulation is necessary for the protection of water quality. 40 Fed. Reg. 31320 (July 25, 1975). In 1977, the Corps issued a final rule that included isolated wetlands and waters whose degradation or destruction could affect interstate commerce. 42 Fed. Reg. 37,122 (July 19, 1977).

During the late 1970s and early 1980s, the courts that considered the issue gave broad application to the CWA. For example, in *Quivira Mining Co. v. EPA*, 765 F.2d 126, 130 (10th Cir. 1985), the U.S. Court of Appeals for the Tenth Circuit held that the CWA applied to creeks and arroyos that were connected to streams during intense rainfall. During the late 1970s and early 1980s, the courts that considered the issue gave broad application to the CWA. Similarly, the court in *United States v. Phelps Dodge Corp.*, 391 F. Supp. 1181, 1187 (D. Ariz. 1975) stated: "Thus a legal definition of 'navigable waters' or 'waters of the United States' within the scope of the Act includes any waterway within the United States also including normally dry arroyos through which water may flow, where such water will ultimately end up in public waters such as a river or stream, tributary to a river or stream, lake, reservoir, bay, gulf, sea or ocean either within or adjacent to the United States."

The court in *United States v. Byrd*, 609 F.2d 1204, 1210-11 (7th Cir. 1979) (footnotes omitted), held:

> The recreational use of inland lakes has a significant impact on interstate commerce, as is testified to by the number of out-of-state visitors to Lake Wawasee in particular. The

> value of these lakes depends, in part, on the purity of their water for swimming, or the abundance of fish and other wildlife inhabiting them or the surrounding wetland and land areas. The Corps, among other authorities, has come to recognize the importance of wetlands adjacent to lakes in preserving the biological, chemical, and physical integrity of the lakes they adjoin. Destruction of all or most of the wetlands around Lake Wawasee, for example, could significantly impair the attraction the lake holds for interstate travelers by degrading the water quality of the lake, thereby indirectly affecting the flow of interstate commerce. We conclude that Congress constitutionally may extend its regulatory control of navigable waters under the Commerce Clause to wetlands which adjoin or are contiguous to intrastate lakes that are used by interstate travelers for water-related recreational purposes as defined by 33 C.F.R. § 209.120(d)(2)(i) (G) and (H) (1977). Furthermore, these regulatory definitions promulgated by the Corps are reasonably related to Congress' purpose: "The objective of this chapter is to restore and maintain the chemical, physical, and biological integrity of the Nation's waters". 33 U.S.C. § 1251(a).

Other courts also relied upon a connection with interstate commerce as a basis to apply the CWA. In *Utah v. Marsh,* 740 F.2d 799, 803-804 (10th Cir. 1984), the Tenth Circuit held that the CWA could apply to an intrastate lake:

> Waters from the Lake are used to irrigate crops which are sold in interstate commerce, and the lake supports the State's most valuable warm water fishery which markets most of the catch out of state. The lake also provides recreationists with opportunities to fish, hunt, boat, water ski, picnic, and camp, as well as the opportunity to observe, photograph, and appreciate a variety of bird and animal life…. Finally, the lake is on the flyway of several species of migratory waterfowl….

In *United States v. Eidson*, 108 F.3d 1336 (11th Cir. 1997), the United States Court of Appeals for the Eleventh Circuit held that the CWA applies to a discharges to a sewer drain that flows to a drainage ditch that flows to a drainage canal that empties into a tributary to Tampa Bay. The Eleventh Circuit held: "There is no reason to suspect that Congress intended to regulate only the natural tributaries of navigable waters. Pollutants are equally harmful to this country's water quality whether they travel along man-made or natural routes. The fact that bodies of water are 'man-made makes no difference.... That the defendants used them to convey the pollutants without a permit is the matter of importance.' *United States v. Holland*, 373 F. Supp. 665, 673 (M.D.Fla.1974); *see also Leslie Salt Co. v. United States*, 896 F.2d 354, 358 (9th Cir.1990) (noting that protection of the CWA "does not depend on the how the property at issue became a water of the United States"), *cert. denied*, 498 U.S. 1126, 111 S. Ct. 1089, 112 L. Ed. 2d 1194 (1991). Consequently, courts have acknowledged that ditches and canals, as well as streams and creeks, can be "waters of the United States" under 1362(7). *See, e.g., United States v. Velsicol Chemical Corp.,* 438 F. Supp. 945, 947 (W.D.Tenn.1976) (sewers that lead to Mississippi River); *Holland*, 373 F. Supp. at 673 (mosquito canals that empty into bayou arm of Tampa Bay)." 108 F.3d at 1342.

The United States Court of Appeals for the Second Circuit in *United States v. TGR Corp.,* 171 F.3d 762 (2d Cir. 1999), held that a drain to a storm water discharge system that flowed to a tributary of a traditionally navigable water is within the scope of the CWA. *See also United States v. Banks*, 115 F.3d 916, 920-21 (11th Cir. 1997) (affirming district court's conclusion that wetlands located at least one-half mile away from any navigable channels were adjacent in light of the district court's conclusion that water from the wetlands reached navigable channels through both groundwater and surface water connections and because there was "ecological adjacency"); *United States v. Pozsgai*, 999 F.2d 719, 727-32 (3d Cir. 1993) (wetlands adjacent to a non-navigable in fact tributary that flows into traditionally navigable waters are within the scope of the CWA); *Conant v. United States*, 786 F.2d 1008 (11th Cir. 1986) (per curiam) (affirming a district court's finding that wetlands were adjacent even though they did not directly abut a navigable river because the wetlands served as filters for the river and thus had a hydrological connection).

At least one appellate court, however, clarified that jurisdiction under the CWA was not unlimited. In *United States v. Wilson*, 133 F. 3d 251 (4th Cir. 1997), the U.S. Court of Appeals for the Fourth Circuit reversed criminal convictions under the CWA for unauthorized discharges to wetlands because the Corps relied in part on 33 C.F.R. § 328.3(a)(3), the regulatory provision covering isolated wetlands and waters whose degradation or destruction could affect interstate commerce. The verdict did not identify the basis on which the jury had found CWA applicability, and it was possible, therefore, that the jury had found CWA applicability based solely upon Section 328.3(a)(3). The Fourth Circuit reasoned that the term "navigable" was a limiting term, and therefore Section 328.3(a)(3) was invalid on its face because it purported to extend applicability of the CWA to waters that had no connection or nexus with traditionally navigable or interstate waters. The matter ultimately was remanded to the district court for retrial to allow the United States to assert other bases for jurisdiction.

Even after the Supreme Court addressed the scope of the CWA in *SWANCC,* see discussion in I.C. below, the majority of federal appellate and district courts, along with EPA and the Corps, ultimately construed *SWANCC* narrowly and continued to view a broad interpretation of the applicability of the CWA as necessary to and consistent with Congressional goals.[6] The majority of courts viewed most pre-*SWANCC* cases such as *Eidson* and *Ashland Oil* as good law and unaffected by *SWANCC.*

Most courts that considered the issue held that the *SWANCC* decision was limited either to the Migratory Bird Rule or to isolated waters where the only basis for an assertion of jurisdiction was a connection to interstate commerce pursuant to 33 U.S.C. § 328.3(a)(3). These courts held that *SWANCC* did not affect the ability of the Corps or EPA to assert jurisdiction under the CWA pursuant to any other subsection of the regulations. *See, e.g., United States* v. *Krilich,* 393F.3d 784 (7th Cir. 2002) (rejecting motion to vacate consent decree, finding that

[6] A minority of court decisions, primarily in the U.S. Court of Appeals for the Fifth Circuit, construed the reasoning of *SWANCC* broadly as a basis for interpreting the scope of applicability of the CWA narrowly *See In re Needham,* 354 F.3d 340 (5th Cir. 2003); *Rice v. Harken Exploration Co.,* 250 F.3d 264 (5th Cir. 2001); *FD&P Enterprises, Inc. v. U.S. Army Corps of Eng'rs,* 239 F. Supp. 2d 509 (D.N.J. 2003).

SWANCC did not alter regulations interpreting "waters of the U.S." other than 33 C.F.R. § 328.3(a)(3)) and the cases cited *infra. See also* Robert E. Fabricant, General Counsel, U.S. Environmental Protection Agency & Stephen J. Morello, General Counsel, U.S. Department of the Army, *Joint Memorandum*, 68 Fed. Reg. 1995-1998 (Jan. 15, 2003).

The majority of federal appellate and district court decisions following *SWANCC* coalesced around the view that CWA jurisdiction extends to all waters that have a hydrologic connection to and form part of the tributary system of a traditionally navigable water, including streams that flow intermittently or ephemerally, and roadside ditches. "In sum, the Corps' unremarkable interpretation of the term 'waters of the United States' as including wetlands adjacent to tributaries of navigable waters is permissible under the CWA because pollutants added to any of these tributaries will inevitably find their way to the very waters that Congress has sought to protect." *Treacy v. Newdunn Assoc., LLP*, 344 F. 3d 407, 416-17 (4th Cir. 2003), *cert. denied sub nom, Newdunn Assoc., LLP v. U.S. Army Corps of Eng'rs*, 541 U.S. 972 (2004) (upholding Corps' assertion of jurisdiction over wetlands connected to a traditionally navigable water through approximately 2.4 miles of ditches and streams). *See, e.g., United States v. Interstate General Co.*, No. 01-4513, slip op. at 7 (2002 WL 1421411 (4th Cir. July 2, 2002) (refusing to grant a writ of *coram nobis,* rejecting an argument that *SWANCC* eliminated jurisdiction over wetlands adjacent to non-navigable tributaries); *Headwaters* v. *Talent Irrigation Dist.*, 243 F.3d 526, 534 (9th Cir. 2001) ("Even tributaries that flow intermittently are 'waters of the United States'"); *Idaho Rural Council* v. *Bosma*, 143 F. Supp. 2d 1169, 1178 (D. Idaho 2001) ("waters of the United States include waters that are tributary to navigable waters"); *Aiello* v. *Town of Brookhaven*, 136 F. Supp. 2d 81, 118 (E.D. N.Y. 2001) (non-navigable pond and creek determined to be tributaries of navigable waters, and therefore "waters of the United States under the CWA"); *United States* v. *Rueth Dev. Co.,* No. 2:96CV540, 2001 WL 17580078 (N.D. Ind. Sept. 26, 2001) (refusing to reopen a consent decree in a CWA case and determining that jurisdiction remained over wetlands adjacent to a non-navigable (manmade) waterway that flows into a navigable water).

The lower courts generally held that CWA jurisdiction was present even when the tributaries in question flowed for a significant distance before reaching a navigable water or were several times removed from the navigable waters (*i.e.*, "tributaries of tributaries"). *See, e.g., United States v. Deaton*, 332 F.3d 698 (4th Cir. 2003), *cert. denied*, 541 U.S. 972 (2004) (Corps had authority to regulate wetlands bordering a "roadside ditch" that took a "winding, thirty-two mile path to the Chesapeake Bay," including flow through roadside ditches, culverts, Beaverdam Creek and the Wicomico River, a traditionally navigable water); *Community Ass'n for Restoration of the Env't* v. *Henry Bosma Dairy*, 305 F.3d 953 (9th Cir. 2002) (drain that flowed into a canal that flows into a river is jurisdictional); *United States v. Hummel*, 2003 WL 1845365 (N.D. Ill. Apr. 8, 2003) (wetlands adjacent to a tributary to a traditionally navigable water are jurisdictional: "Although the [wetlands are] two steps removed from an actually navigable water, the Court finds a significant nexus to exist to establish jurisdiction"); *North Carolina Shellfish Growers Ass'n v. Holly Ridge Associates, LLC,* 278 F. Supp. 2d 654 (E.D.N.C. 2003) (intermittent streams and tributaries are capable of carrying pollutants downstream during rain events and therefore fall within the jurisdiction of the CWA); *California Sportfishing Protection Alliance v. Diablo Grande, Inc.*, 209 F. Supp. 2d 1059 (E.D. Cal. 2002) (CWA jurisdiction extends to a tributary that flows through an underground pipeline prior to reaching a traditionally navigable water); *United States* v. *Lamplight Equestrian Ctr.,* No. 00 C 6486, 2002 WL 360652, at *8 (ND. Ill. Mar. 8, 2002) ("Even where the distance from the tributary to the navigable water is significant, the quality of the tributary is still vital to the quality of navigable waters"); *United States* v. *Buday,* 138 F. Supp. 2d 1282, 1291–92 (D.Mont. 2001) ("water quality of tributaries . . . distant though the tributaries may be from navigable streams, is vital to the quality of navigable waters").

iii. The Rule is Narrower in Scope than Existing Regulation

In light of the broad provisions of the existing regulatory definition and the expansive historic interpretation of the existing regulation, and as a result of the Supreme Court decisions in *SWANCC* and *Rapanos*, the scope of "waters of the United States" in this rule is narrower than that under the existing regulations. The most substantial change is the deletion of the existing regulatory provision that defines "waters of the United States" as all other waters such as intrastate lakes, rivers, streams (including intermittent streams), mudflats, sandflats, wetlands, sloughs, prairie potholes, wet meadows, playa lakes, or natural ponds, the use, degradation or destruction of which could affect interstate or foreign commerce including any such waters: which are or could be used by interstate or foreign travelers for recreational or other purposes; from which fish or shellfish are or could be taken and sold in interstate or foreign commerce; or which are used or could be used for industrial purposes by industries in interstate commerce. 33 CFR § 328.3(a)(3); 40 CFR § 122.2. Under the final rule, an interstate commerce connection is not sufficient to meet the definition of "waters of the United States." Further, waters in a watershed in which there is no connection to a traditional navigable water, interstate water or the territorial seas would not be "waters of the United States." In addition, the rule would, for the first time, explicitly exclude some features and waters over which the agencies have not generally asserted jurisdiction and in so doing eliminates the authority of the agencies to determine in case-specific circumstances that some such waters are jurisdictional "waters of the

United States." The rule also provides new limitations on the scope of tributaries by establishing a definition of "tributary" for the first time. Together all of these changes serve to narrow the scope of the rule in comparison to the existing regulation.

Some commenters argued that the proposed rule provides for even broader jurisdiction than the existing rule, including jurisdiction over non-navigable features such as isolated wetlands, ephemeral drainages, and isolated ponds, that lack any meaningful connection to navigable waters and that have previously been non-jurisdictional. Those commenters argued that the proposed rule allowed for sweeping jurisdiction based on connections as tenuous as the Migratory Bird Rule that was rejected in *SWANCC*, and essentially amounts to the "any connection" theory that was rejected in *Rapanos*. The agencies disagree. The rule does not establish jurisdiction based on the Migratory Bird Rule. In fact, the agencies have explicitly deleted the (a)(3) provision from the existing regulation that was interpreted by the Migratory Bird Rule. In addition, the agencies' conclusions that certain categories of waters are jurisdictional are not based on an "any connection" theory; instead they are based on careful examinations of the science and the law to conclude that particular categories of waters significantly affect the chemical, physical, and biological integrity of a traditional navigable water, interstate water, or the territorial seas. Further, for those limited waters for which the agencies will perform a case-specific significant nexus analysis, there is no authorization for considering migratory birds in the rule and the preamble is explicit that non-aquatic species or species such as non-resident migratory birds do not demonstrate a life cycle dependency on the identified aquatic resources and are not evidence of biological connectivity for purposes of the rule. Finally, while commenters argued that under the proposed rule the agencies' authority to assert jurisdiction is limitless, the final rule provides explicit limitations on the agencies' authority to make case-specific determinations. Case-specific determinations of jurisdiction are only authorized for five specific types of waters under (a)(7), and for waters located within the 100-year floodplain of a traditional navigable water, interstate water, or the territorial seas and waters located within 4,000 feet of the ordinary high water mark or high tide line of an (a)(1) through (a)(5) water under (a)(8).

Based on the history of the existing regulations and the caselaw discussed above, the agencies disagree that all such waters were previously non-jurisdictional. The agencies further disagree that the final rule provides for jurisdiction over waters "that lack any meaningful connection." To the contrary, the rule and its supporting documentation demonstrate that agencies are asserting jurisdiction over traditional navigable waters, interstate waters, the territorial seas, and those waters that have a significant nexus to them. Consistent with *SWANCC* and *Rapanos*, the agencies have narrowed the definition of "waters of the United States" compared to the longstanding, existing definition.

Some commenters stated that the proposed rule is an expansion of jurisdiction because it would change the provision for "adjacent wetlands" to "adjacent waters." The agencies acknowledge that under the existing rule, the adjacency provision applied only to wetlands adjacent to "waters of the United States." As noted in *San Francisco Baykeeper v. Cargill Salt*, 481 F.3d 700 (9th Cir. 2007), this provision of the agencies' regulations only defines adjacent wetlands, not adjacent ponds, as "waters of the United States." However, under the existing regulations, "other waters" (such as intrastate rivers, lakes and wetlands that are not otherwise jurisdictional under other sections of the rule) could be determined to be jurisdictional if the use, degradation or destruction of the water could affect interstate or foreign commerce. This provision reflected the agencies' interpretation at the time of the jurisdiction of the CWA to extend to the maximum extent permissible under the Commerce Clause of the Constitution. Therefore, while the language of the specific adjacency provision may have expanded from wetlands to waters, that does not represent an expansion of jurisdiction as a whole, since adjacent non-wetland waters would have been subject to jurisdiction under the “other waters” provision. Moreover, as a matter of practice in the past, the agencies generally relied on the presence of migratory birds to indicate an effect on interstate commerce and conclude that waters, such as adjacent ponds, were jurisdictional. In 2001, the Supreme Court in *SWANCC* rejected the use of migratory birds as a sole basis to establish jurisdiction over such “isolated” intrastate nonnavigable waters. The rule does not protect all waters that were protected under the “other waters” provision of the existing rule, and therefore the inclusion of adjacent ponds, for example, in the adjacent waters provision of the rule does not reflect an overall expansion of jurisdiction when compared to the existing rule.

Some commenters also express confusion that the agencies conclude that the scope of jurisdiction of the CWA in this rule is narrower than that under the existing regulations while at the same time concluding in an economic analysis that a percentage of negative jurisdictional determinations would change to positive jurisdictional determinations under the new rule. This apparent inconsistency is simply the result of comparing the scope of the rule to different baselines – compared to the historic scope of the existing rule, the final rule is narrower; compared to agency practice in light of guidance issued after *SWANCC* and *Rapanos*, the final rule is generally broader, but not broader than the existing rule. The scope of waters covered by the CWA today is considerably smaller than the scope of waters historically covered prior to the 2001 and 2006 Supreme Court decisions. Based on the reduction in the scope of CWA jurisdiction, the agencies conclude that the new rule would impose no additional costs when compared to historic application of the regulation it replaces. For purposes of the economic analysis, however, the agencies evaluated costs and benefits associated with the difference in assertions of jurisdiction in jurisdictional determinations between the new rule and current field practice, which is based on the 2008 EPA and Corps jurisdiction guidance. Compared to this baseline, the agencies anticipate the new rule will result in an increase in the number of positive jurisdictional determinations and an associated increase in both costs and benefits that derive from the implementation of CWA programs.

C. Supreme Court Decisions Concerning "Waters of the United States"

i. Supreme Court Decisions

The U.S. Supreme Court first addressed the scope of "waters of the United States" protected by the CWA in *United States v. Riverside Bayview Homes,* 474 U.S. 121 (1985), which involved wetlands adjacent to a traditional navigable water in Michigan. In a unanimous opinion, the Court deferred to the Corps' ecological judgment that adjacent wetlands are "inseparably bound up" with the waters to which they are adjacent, and upheld the inclusion of adjacent wetlands in the regulatory definition of "waters of the United States." *Id*. at 134. The Court observed that the broad objective of the CWA to restore and maintain the integrity of the Nation's waters "incorporated a broad, systemic view of the goal of maintaining and improving water quality …. Protection of aquatic ecosystems, Congress recognized, demanded broad federal authority to control pollution, for '[w]ater moves in hydrologic cycles and it is essential that discharge of pollutants be controlled at the source.' In keeping with these views, Congress chose to define the waters covered by the Act broadly." *Id.* at 132-33 (*citing* Senate Report 92-414).

The Court also recognized that "[i]n determining the limits of its power to regulate discharges under the Act, the Corps must necessarily choose some point at which water ends and land begins. Our common experience tells us that this is often no easy task: the transition from water to solid ground is not necessarily or even typically an abrupt one. Rather, between open waters and dry land may lie shallows, marshes, mudflats, swamps, bogs — in short, a huge array of areas that are not wholly aquatic but nevertheless fall far short of being dry land. Where on this continuum to find the limit of 'waters' is far from obvious." *Id*. The Court then deferred to the agencies' interpretation: "In view of the breadth of federal regulatory authority contemplated by the Act itself and the inherent difficulties of defining precise bounds to regulable waters, the Corps' ecological judgment about the relationship between waters and their adjacent wetlands provides an adequate basis for a legal judgment that adjacent wetlands may be defined as waters under the Act." *Id.* at 134.

In a footnote, the Court stated that to achieve the goal of preserving and improving adjacent wetlands that have significant ecological and hydrological impacts on navigable waters, it was appropriate for the Corps to regulate all adjacent wetlands, even though some might not have any impacts on navigable waters. *Id.* at 135 n.9. The Court acknowledged that some adjacent wetlands might not have significant hydrological and biological connections with navigable waters, but concluded that the Corps' regulation was valid in part because such connections exist in the majority of cases. *Id.*

Notably, while integral to its holding, the Court did not precisely define the meaning of "adjacent" in terms of distance from or impact on navigable waters. The Court left in place the Corps' 1985 definition of "adjacent": "The term adjacent means bordering, contiguous, or neighboring. Wetlands 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.'" The Court expressly reserved the question of whether the Act applies to "wetlands that are not adjacent to open waters." *Id.* at 131 n.8.

The issue of CWA jurisdiction over "waters of the United States" was addressed again by the Supreme Court in *Solid Waste Agency of Northern Cook County v. U.S. Army Corps of Engineers*, 531 U.S. 159 (2001) (*SWANCC*). In *SWANCC,* the Court (in a 5-4 opinion) held that the use of "isolated" nonnavigable intrastate ponds by migratory birds was not by itself a sufficient basis for the exercise of federal regulatory authority under the CWA. The *SWANCC* Court noted that in *Riverside* it had "found that Congress' concern for the protection of water quality and aquatic ecosystems indicated its intent to regulate wetlands 'inseparably bound up' with the 'waters of the United States'" and that "it was the significant nexus between the wetlands and 'navigable waters' that informed our reading of the CWA" in that case. *Id.* at 167. While recognizing that in *Riverside Bayview Homes,* it had found the term "navigable" to be of limited import, the Court in *SWANCC* noted that the term "navigable" could not be read entirely out of the Act. *Id.* at 172. The Court stated: "We said in *Riverside Bayview Homes* that the word 'navigable' in the statute was of 'limited effect' and went on to hold that § 404(a) extended to nonnavigable wetlands adjacent to open waters. But it is one thing to give a word limited effect and quite another to give it no effect whatever. The term 'navigable' has at least the import of showing us what Congress had in mind as its authority for enacting the CWA: its traditional jurisdiction over waters that were or had been navigable in fact or which could reasonably be so made. See, *e.g., United States* v. *Appalachian Elec. Power Co.,* 311 U.S. 377, 407-408, 85 L. Ed. 243, 61 S. Ct. 291 (1940)." *SWANCC* did not invalidate (a)(3) or other parts of the regulatory definition of "waters of the United States."

Five years after *SWANCC*, the Court again addressed the CWA term "waters of the United States" in *Rapanos v. United States*, 547 U.S. 715 (2006). *Rapanos* involved two consolidated cases in which the CWA had been applied to wetlands adjacent to nonnavigable tributaries of traditional navigable waters. All Members of the Court agreed that the term "waters of the United States" encompasses some waters that are not navigable in the traditional sense. A four-Justice plurality in *Rapanos* interpreted the term "waters of the United States" as covering "relatively permanent, standing or continuously flowing bodies of water . . .," *id.* at 739, that are connected to traditional navigable waters, *id.* at 742, as well as wetlands with a "continuous surface connection . . ." to such water bodies, *id*. (Scalia, J., plurality opinion). The *Rapanos* plurality noted that its reference to "relatively permanent" waters did "not necessarily exclude streams, rivers, or lakes that might dry up in extraordinary circumstances, such as drought," or "*seasonal* rivers, which contain continuous flow during some months of the year but no flow during dry months . . . ." *Id.* at 732 n.5 (emphasis in original).

Justice Kennedy's concurring opinion took a different approach. Justice Kennedy concluded that "to constitute 'navigable waters' under the Act, a water or wetland must possess a 'significant nexus' to waters that are or were navigable in fact or that could reasonably be so made." *Id*. at 759 (*citing SWANCC*, 531 U.S. at 167, 172). He concluded that wetlands possess the requisite significant nexus if the wetlands "either alone or in combination with similarly situated [wet]lands in the region, significantly affect the chemical, physical, and biological integrity of other covered waters more readily understood as 'navigable.'" 547 U.S. at 780. Justice Kennedy's opinion notes that such a relationship with navigable waters must be more than "speculative or insubstantial." *Id*. at 780. For additional discussion of Justice Kennedy's standard see sections II, VII, and VIII below.

In *Rapanos*, the four dissenting Justices in *Rapanos*, who would have affirmed the court of appeals' application of the agencies' regulation, also concluded that the term "waters of the United States" encompasses, inter alia, all tributaries and wetlands that satisfy "either the plurality's [standard] or Justice Kennedy's." *Id.* at 810 & n.14 (Stevens, J., dissenting). The four dissenting Justices stated: "the proper analysis is straightforward. The Army Corps has determined that wetlands adjacent to tributaries of traditionally navigable waters preserve the quality of our Nation's waters by, among other things, providing habitat for aquatic animals, keeping excessive sediment and toxic pollutants out of adjacent waters, and reducing downstream flooding by absorbing water at times of high flow. The Corps' resulting decision to treat these wetlands as encompassed within the term "waters of the United States" is a quintessential example of the Executive's reasonable interpretation of a statutory provision. See *Chevron U.S.A., Inc.* v. *NRDC*, 467 U.S. 837, 842-845, 104 S. Ct. 2778, 81 L. Ed. 2d 694 (1984). Our unanimous decision in *United States* v. *Riverside Bayview Homes, Inc.*, 474 U.S. 121, 106 S. Ct. 455, 88 L. Ed. 2d 419 (1985), was faithful to our duty to respect the work product of the Legislative and Executive Branches of our Government." *Id* at 788.

Further, the four dissenting Justices stated: "As we recognized in *Riverside Bayview*, the Corps has concluded that such wetlands play important roles in maintaining the quality of their adjacent waters, see *id.*, at 134-135, 106 S. Ct. 455, 88 L. Ed. 2d 419, and consequently in the waters downstream. Among other things, wetlands can offer 'nesting, spawning, rearing and resting sites for aquatic or land species'; 'serve as valuable storage areas for storm and flood waters'; and provide 'significant water purification functions.' 33 CFR § 320.4(b)(2) (2005); 474 U.S., at 134-135, 106 S. Ct. 455, 88 L. Ed. 2d 419. These values are hardly '*independent*' ecological considerations as the plurality would have it, *ante*, at 741, 165 L. Ed. 2d, at 179--

instead, they are integral to the ‘chemical, physical, and biological integrity of the Nation’s waters,’ 33 U.S.C. § 1251(a). Given that wetlands serve these important water quality roles and given the ambiguity inherent in the phrase ‘waters of the United States,’ the Corps has reasonably interpreted its jurisdiction to cover nonisolated wetlands. See 474 U.S., at 131-135, 106 S. Ct. 455, 88 L. Ed. 2d 419.” *Id.* at 796.

The four dissenting Justices went on to state: “The Corps’ exercise of jurisdiction is reasonable even though not every wetland adjacent to a traditionally navigable water or its tributary will perform all (or perhaps any) of the water quality functions generally associated with wetlands. *Riverside Bayview* made clear that jurisdiction does not depend on a wetland-by-wetland inquiry. 474 U.S., at 135, n. 9, 106 S. Ct. 455, 88 L. Ed. 2d 419. Instead, it is enough that wetlands adjacent to tributaries generally have a significant nexus to the watershed's water quality. If a particular wetland is ‘not significantly intertwined with the ecosystem of adjacent waterways,’ then the Corps may allow its development ‘simply by issuing a permit.’ *Ibid.*” *Id.* at 797.

The dissent was clear that it found the existing regulations reasonable and worthy of deference: “The Corps defines ‘adjacent’ as ‘bordering, contiguous, or neighboring,’ and specifies 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 CFR § 328.3(c) (2005). This definition is plainly reasonable, both on its face and in terms of the purposes of the Act. While wetlands that are physically separated from other waters may perform less valuable functions, this is a matter for the Corps to evaluate in its permitting decisions. We made this clear in *Riverside Bayview*, 474 U.S., at 135, n. 9, 106 S. Ct. 455, 88 L. Ed. 2d 419.” *Id. a*t 805-6.

Finally, the dissent opined on significant nexus, stating: "I think it clear that wetlands adjacent to tributaries of navigable waters generally have a 'significant nexus' with the traditionally navigable waters downstream. Unlike the 'nonnavigable, isolated, intrastate waters' in *SWANCC*, 531 U.S., at 171, 121 S. Ct. 675, 148 L. Ed. 2d 576, these wetlands can obviously have a cumulative effect on downstream water flow by releasing waters at times of low flow or by keeping waters back at times of high flow. This logical connection alone gives the wetlands the 'limited' connection to traditionally navigable waters that is all the statute requires, *see id.*, at 172, 121 S. Ct. 675, 148 L. Ed. 2d 576; 474 U.S., at 133, 106 S. Ct. 455, 88 L. Ed. 2d 419 --and disproves Justice Kennedy's claim that my approach gives no meaning to the word "'navigable,'" *ante,* at 779, 165 L. Ed. 2d, at 202 (opinion concurring in judgment). Similarly, these wetlands can preserve downstream water quality by trapping sediment, filtering toxic pollutants, protecting fish-spawning grounds, and so forth." *Id.* at 808.

Neither the plurality nor the Kennedy opinions invalidated any of the regulatory provisions defining "waters of the United States."

ii. Post-*Rapanos* Appellate Court Decisions

The earliest post-*Rapanos* decisions by the United States Courts of Appeals focused on which standard to apply, fulfilling Chief Justice Roberts' observation in his concurring opinion:

> It is unfortunate that no opinion commands a majority of the Court on precisely how to read Congress' limits on the reach of the Clean Water Act. Lower courts and regulated entities will now have to feel their way on a case-by-case basis.

547 U.S. at 758 (Roberts, Chief J., concurring).

Chief Justice Roberts went on to cite as applicable precedent *Marks v. United States,* 430 U.S. 188 (1977) ("When a fragmented Court decides a case and no single rationale explaining the result enjoys the assent of five Justices, the holding of the Court may be viewed as the position taken by those Members who concurred in the judgments on the narrowest grounds"). The dissenting Justices in *Rapanos* also spoke to future application of the divided decision. While Justice Stevens stated that he assumed Justice Kennedy's significant nexus standard would apply in most instances, the dissenting Justices noted that they would find the CWA extended to waters meeting either the standard articulated by Justice Scalia or the "significant nexus" standard described by Justice Kennedy. 547 U.S. at 810 & n.14 (Stevens, J., dissenting).

That the standards articulated by the plurality and Justice Kennedy are premised on entirely different analyses with little analytical overlap has presented a challenge for the lower courts in identifying which standard should apply and more particularly, which represents "the narrowest grounds" under *Marks.* All nine of the United States Courts of Appeals to have considered the issue have stated that Justice Kennedy's significant nexus standard may be used to establish applicability of the CWA. *Precon Dev. Corp. v. U.S. Army Corps of Eng'rs,* 633 F.3d 278 (4th Cir. 2011); *United States v. Donovan,* 661 F.3d 174 (3d Cir. 2011), *cert. denied,* 132 S. Ct. 2409 (2012); *United States v. Bailey,* 571 F.3d 791 (8th Cir. 2009); *United States v. Cundiff,* 555 F.3d 200 (6th Cir.), *cert. denied,* 130 S. Ct. 74 (2009); *United States v. Lucas*, 516 F.3d 316 (5th Cir.), *cert. denied,* 555 U.S. 822 (2008); *United States v. Robison,* 505 F.3d 1208 (11th Cir. 2007), *cert. denied sub nom McWane v. United States*, 555 U.S. 1045 (2008); *Northern California River Watch v. City of Healdsburg,*496 F.3d 993 (9th Cir. 2007) (superseding the original opinion published at 457 F.3d 1023 (9th Cir. 2006)), *cert. denied,* 552 U.S. 1180 (2008);

United States v. Johnson, 467 F.3d 56 (1st Cir. 2006), *cert. denied,* 552 U.S. 948 (2007); *United States v. Gerke Excavating, Inc.*, 464 F.3d 723 (7th Cir. 2006), *cert. denied,* 552 U.S. 810 (2007).

Of these, only the Eleventh Circuit in *Robison* has held that *only* Justice Kennedy's standard applies. The First, Third and Eighth Circuits, consistent with the *Rapanos* dissent's reasoning, have held that the CWA applies where a water meets either the plurality's standard or Justice Kennedy's standard. *Bailey,* 571 F.3d at 799; *Donovan,* 661 F.3d at 182; *Johnson,* 467 F.3d at 62-64. The Fifth and Sixth Circuits did not reach the question of which standard would be controlling because, in the cases before them, the waters satisfied both standards. *Cundiff,* 555 F.3d at 210; *Lucas,* 516 F.3d at 327. The Seventh and Ninth Circuits applied Justice Kennedy's standard to the facts before them, but left open whether the plurality's standard could be applicable in appropriate circumstances. *Northern California River Watch,* 496 F.3d at 999-1000; *Gerke Excavating,* 464 F.3d at 725; *see also Northern California River Watch v. Wilcox,* 633 F.3d 766 (9th Cir. Aug. 25, 2010, amended Jan. 26, 2011). In *United States v. Vierstra,* 2012 U.S. App. LEXIS 16876 (9th Cir. Aug. 13, 2012) (unpublished opinion), the Ninth Circuit upheld a district court opinion (803 F. Supp. 2d 1166 (D. Idaho 2011)) that applied both standards. The Fourth Circuit in *Precon* did not determine the applicability of the plurality standard because the parties in that case had agreed that Justice Kennedy's standard applied. *Precon,* 633 F.3d at 278. The Fourth Circuit later upheld a district court's application of both standards. *Deerfield Plantation Phase II-B Property Owners Ass'n, Inc. v. U.S. Army Corps of Engineers,* 2012 U.S. App. LEXIS 26402 (4th Cir. Dec. 26, 2012) (unpublished decision).

Those appellate courts that have applied the standard articulated by the plurality have found a variety of waters to be "relatively permanent" waters meeting that standard. In *Deerfield,* the Fourth Circuit upheld the Corps finding that two non-navigable tributaries were "relatively permanent waters" because they "'typically flow year-round or have continuous flow at least seasonally (e.g., typically 3 months)…. [E]ach had a firm sandy bottom with a clearly-defined channel that was free of vegetation, which 'demonstrates continuous flow more than seasonally, because vegetation will not have a chance to establish itself due to the water's flow'… evidence of a clearly-defined ordinary high water mark, groundwater influx, and the degree of curvature (or 'sinuousity') of the tributaries." *Deerfield Plantation Phase II-B Property Owners Ass'n,* 2012 U.S. App. LEXIS 26402 *6 (citations omitted).

In *Cundiff,* the Sixth Circuit held that wetlands with surface connections to relatively permanent waters flowing ultimately to a traditionally navigable water satisfied the plurality standard. 555 F.3d at 211-13. Among other things, the Sixth Circuit rejected an argument that wetlands at a different elevation than the receiving creeks lacked a continuous surface connection. The court interpreted the plurality standard's concept of "continuous surface connection" as requiring a surface hydrologic connection, but not limited to perpetually flowing creeks. "In other words, the [plurality's standard] requires a topical flow of water between a navigable-in-fact waterway or its tributary with a wetland and that connection requires some kind of dampness such that polluting a wetland would have a proportionate effect on the traditional waterway." *Id.* at 212. In addition, the Sixth Circuit found the existence of "additional (and substantial) surface connections between the wetlands and permanent water bodies 'during storm events, bank full periods, and/or ordinary high flows' provides additional evidence of a continuous surface connection." *Id.* The court also found whether or not the channel forming the hydrologic connection was man-made to be of no import. *Id.* at 213.

In *Donovan,* the Third Circuit found that wetlands with continuous surface connection to two perennial streams flowing to traditionally navigable waters satisfied the plurality standard.

661 F.3d at 185-86. In *United States v. Vierstra,* 2012 U.S. LEXIS 16876 (9th Cir. Aug. 13, 2012) (unpublished decision), the Ninth Circuit upheld a district court decision (803 F. Supp. 2d 1166 (D. Idaho 2011)) holding that a man-made canal that flowed six to eight months per year was a relatively permanent water that satisfied the plurality standard. The Fifth Circuit in *Lucas* held that a site that drained in three directions through various tributaries to traditionally navigable waters satisfied the plurality standard based on qualitative evidence including government testimony, photographs, maps and aerial photographs. 516 F.3d at 326-27.

The lower courts also have applied Justice Kennedy's significant nexus standard with some consistency. The Eighth Circuit emphasized there is no need to perform a case-specific determination of significant nexus where the waters at issue are adjacent to a traditionally navigable water because significant nexus can be presumed as a matter of law in that circumstance. *Bailey,* 571 F.3d at 799 ("Justice Kennedy's opinion holds that when a wetland is adjacent to the navigable-in-fact waters, then a significant nexus exists as a matter of law"). All of the courts of appeals that have addressed the issue have agreed that a nexus is formed between a non-navigable water and a traditionally navigable water when the non-navigable water, alone or in combination with other similarly situated waters in the region, performs a function or otherwise has an effect on a downstream traditionally navigable water that is neither speculative nor insubstantial. The types of functions found to form a significant nexus with a downstream traditionally navigable water have included contribution of flow (*Donovan*, 661 F.3d at 186), runoff or floodwater storage (*Precon Dev. Corp., Inc. v. U.S. Army Corps of Eng'rs*, 2015 U.S. App. LEXIS 3704 (4th Cir. March 10, 2015) (unpublished decision); *Cundiff,* 555 F.3d at 210-11; *Lucas*, 516 F.3d at 327), nutrient recycling (*Precon Dev. Corp., Inc. v. U.S. Army Corps of Eng'rs*, 2015 U.S. App. LEXIS 3704 (4th Cir. March 10, 2015) (unpublished decision); *Donovan*, 661 F.3d at 186), pollutant trapping or filtering (*Donovan,* 661 F.3d at 186; *Cundiff,* 555 F.3d at 211; *Lucas,* 516 F.3d at 327), export of organic matter and/or food resources as part of the aquatic food web (*Donovan,* 661 F.3d at 186), pollutant transport (*Northern California Riverwatch*, 496 F.3d at 1001) and fish and wildlife habitat (*Donovan,* 661 F.3d at 186; *Cundiff,* 555 F.3d at 211; *Northern California Riverwatch*, 496 F.3d at 1000-1001)).

The Fourth Circuit has considered application of Justice Kennedy's statement that the significant nexus inquiry should focus on whether "wetlands, either alone or *in combination with similarly situated lands in the region*, significantly affect the chemical, physical, and biological integrity of other covered waters more readily understood as 'navigable.'" *Rapanos*, 547 U.S. at 780 (Kennedy, J., concurring in the judgment) (emphasis added)." *Precon*, 633 F.3d at 290. In *Precon*, the Corps had analyzed as "similarly situated" wetlands that either directly abutted two tributary ditches or were adjacent to those tributaries and separated from them by a berm. *Id*. at 291. Noting that "Justice Kennedy's instruction that 'similarly situated lands in the region' can be evaluated together is a broad one," *id.* at 292, the Fourth Circuit rejected Precon's argument that it was inappropriate to treat abutting and adjacent wetlands as similarly situated: "[W]e find no evidence that Justice Kennedy … intended to differentiate between abutting and other adjacent wetlands. To the contrary, his concurrence explicitly approved of the Corps' regulatory definition of 'adjacent,' which includes both those wetlands that directly abut waters of the United States and those separated from other waters 'by man-made dikes or barriers, natural river berms, beach dunes, and the like.'" *Id.* at 291. The court accepted the Corps' explanation that a berm separating 4.8 acres of wetlands from one of the tributary ditches did not inhibit the functions being performed by those wetlands. *Id.* at 291-92. The Fourth Circuit also accepted the Corps' determination to consider as similarly situated wetlands adjacent to two tributary ditches because the two ditches together had been part of the same naturally defined wetland drainage before being altered by man. *Id.* at 292 ("There is both logical and practical appeal to treating man-made ditches that would naturally be part of the same drainage feature together").

While the lower courts generally have agreed on the types of function that can form a nexus, they have had a harder time describing when such a nexus is "significant." Justice Kennedy simply stated that a significant nexus is one that is neither speculative nor insubstantial. *Rapanos,* 547 U.S. at 780. The term "significant" as used by Justice Kennedy was not intended to require statistical significance. *Precon Dev. Corp., Inc. v. U.S. Army Corps of Eng'rs,* 2015 U.S. App. LEXIS 3704 * 6 (4th Cir. March 10, 2015) (*Precon II)* (unpublished decision). The Fourth Circuit has noted that the standard "is a 'flexibly ecological inquiry,'" and that "[q]uantitative or qualitative evidence may support [applicability of the CWA]." *Precon II,* 2015 U.S. App. LEXIS 3704 * 6 (4th Cir. March 10, 2015). The same court also has clarified that the burden of establishing applicability of the CWA should not be "unreasonable." *Precon,* 633 F.3d at 297. While the appellate courts have accepted laboratory analysis or quantitative or empircal data (*Donovan,* 661 F.3d at 186); *Northern California Riverwatch,* 496 F.3d at 1000-1001), the appellate courts have not required such quantitative evidence. *Precon,* 633 F.3d at 294 ("We agree that the significant nexus test does not require laboratory tests or any particular quantitative measurements in order to establish significance"); *Cundiff,* 555 F.3d at 211 ("Though no doubt a district court could find such evidence persuasive, the Cundiffs point to nothing – no expert opinion, no research report or article, and nothing in any of the various *Rapanos* opinions – to indicate that [laboratory analysis] is the sole method by which a significant nexus may be proved"). The appellate courts have accepted a variety of evidence, including but not limited to, photographs, visual observation of stream condition, flow and morphology, studies, dye tests, scientific literature, maps, aerial photographs, and remote sensing data. *Lucas,* 516 F.3d at 326-27. *See also Deerfield Plantation Phase II-B Property Owners Ass'n,* 2012 U.S. App. LEXIS 26402 *5 (in addition to conducting two site visits, Corps relied upon infrared aerial photography, agency records, a county soil survey, a topographic map and a wetland inventory); *Donovan,* 661 F. 3d at 185-86.

Waters have been found to be relatively permanent under the plurality standard or sufficient to form a significant nexus under Justice Kennedy's standard even when they flow less than year round. *Cundiff*, 555 F.3d at 211-12 (waters forming hydrologic connection flow for "all but a few weeks a year"); *Moses*, 496 F.3d at 989-91 (portion of stream that receives flow two months of the year is within the scope of the Act); *see also United States v. Vierstra,* 2012 U.S. LEXIS 16876 (9th Cir. Aug. 13, 2012) (unpublished decision) (upholding district court opinion that canal that flows seasonally for six to eight months of the year is a relatively permanent water). The appellate courts generally have not distinguished between naturally occurring and man-made waters that meet the standards laid out by the plurality or Justice Kennedy. *Cundiff*, 555 F.3d at 213 ("[I]n determining whether the Act confers jurisdiction, it does not make a difference whether the channel by which water flows from a wetland to a navigable-in-fact waterway or its tributary was man-made or formed naturally"); *Moses,* 496 F.3d at 988-89 (man-made diversion does not change the character of a water of the U.S.); *see also United States v. Vierstra,* 2012 U.S. LEXIS 16876 (9th Cir. Aug. 13, 2012) (unpublished decision) (upholding district court opinion that relatively permanent water can be man-made).

iii. The Rule is Consistent with Supreme Court Decisions

With this rule, the agencies interpret the scope of the "waters of the United States" for the CWA in light of the goals, objectives, and policies of the statute, the Supreme Court case law, the relevant and available science, and the agencies' technical expertise and experience. The key to the agencies' interpretation of the CWA is the significant nexus standard as informed by the ecological and hydrological connection the Supreme Court noted in *Rverside Bayview*, established by the Supreme Court in *SWANCC,* and refined in Justice Kennedy's opinion in *Rapanos.* Waters are "waters of the United States" if they, either alone or in combination with similarly situated waters in the region, significantly affect the chemical, physical, or biological integrity of traditional navigable waters, interstate waters or the territorial seas. The agencies have also utilized the plurality standard by establishing boundaries and primarily in support of the exclusions from the definition of "waters of the United States." The plurality opinion in *Rapanos* noted that there were certain features that were not primarily the focus of the CWA. *See* 547 U.S. at 734. In the rule, the agencies are drawing lines and concluding that certain waters and features are not subject to the jurisdiction of the Clean Water Act. The Supreme Court has recognized that clarifying the lines of jurisdiction is a difficult task: "Our common experience tells us that this is often no easy task: the transition from water to solid ground is not necessarily or even typically an abrupt one. Rather, between open waters and dry land may lie shallows, marshes, mudflats, swamps, bogs — in short, a huge array of areas that are not wholly aquatic but nevertheless fall far short of being dry land. Where on this continuum to find the limit of 'waters' is far from obvious." *Riverside Bayview* at 132-33. The exclusions reflect the agencies' determinations of the lines of jurisdiction based on science, the case law and the agencies' experience and expertise. The position of the United States is that a water is jurisdictional if it meets either the plurality's standard or the Kennedy standard. Upon the effective date of this rule, a water will be jurisdictional if it meets the rule's definition of "waters of the United States."

Some commenters argue that to comply with Supreme Court precedent, the rule should only find jurisdiction where both the plurality's and Justice Kennedy's standards are satisfied. Those commenters further argue that the agencies cannot rely solely on Justice Kennedy's significant nexus standard. While the Courts of Appeals are split on the proper interpretation of *Rapanos*, none has adopted the position that the agencies cannot rely on Justice Kennedy's standard or that jurisdiction exists only where both the plurality's and Justice Kennedy's standards are satisfied.

The Third Circuit in *United States v. Donovan* rejected that interpretation of *Rapanos* and provided a detailed analysis of the proper interpretation of *Rapanos*. 661 F.3d 174 (3d Cir. 2011), *cert. denied*, 132 S. Ct. 2409 (2012). The agencies' rule is consistent with every Circuit Court decision to address this issue. The Third Circuit's thorough analysis states:

> The Courts of Appeals for the Seventh and Eleventh Circuits have concluded that Justice Kennedy's test alone creates the applicable standard for CWA jurisdiction over wetlands. *United States v. Gerke Excavating, Inc*., 464 F.3d 723, 724–25 (7th Cir.2006); *United States v. Robison*, 505 F.3d 1208, 1221–22 (11th Cir.2007). These courts based their conclusions on an analysis of the Supreme Court's decision in *United States v. Marks*, in which the Court directed that, "[w]hen a fragmented Court decides a case and no single rationale explaining the result enjoys the assent of five Justices, the holding of the Court may be viewed as that position taken by those Members who concurred in the judgments on the narrowest grounds." 430 U.S. 188, 193, 97 S.Ct. 990, 51 L.Ed.2d 260 (1977) (citation and internal quotation marks omitted). In their view, Justice Kennedy's opinion in *Rapanos* controls because, among those Justices concurring in the judgment, Justice Kennedy's view is the least restrictive of federal jurisdiction. *Gerke*, 464 F.3d at 724–25; Robison, 505 F.3d at 1221–22.
>
> The Courts of Appeals for the First and Eighth Circuits have taken a different view. These courts examined the Supreme Court's directive in *Marks*, but found that the *Rapanos* opinions did not lend themselves to a *Marks* analysis because neither the plurality opinion nor Justice Kennedy's opinion relied on "narrower" grounds than the other. *United States v. Johnson*, 467 F.3d 56, 62–64 (1st Cir.2006); *United States v. Bailey*, 571 F.3d 791, 799 (8th Cir.2009). Judge Lipez, writing for the majority of the panel in Johnson, disagreed that the "narrowest grounds" in the *Marks* sense necessarily means those grounds least restrictive of federal jurisdiction. The court in Johnson stated that "it seems just as plausible to conclude that the narrowest ground of decision in *Rapanos* is the ground *most* restrictive of government authority. . . because that ground avoids the

constitutional issue of how far Congress can go in asserting jurisdiction under the Commerce Clause." 467 F.3d at 63 (emphasis added). Even if one were to conclude that the opinion resting on the narrowest grounds is the one that relies on "less sweeping reasons than the other"—meaning that it requires the same outcome (here, the presence of federal regulatory jurisdiction) in only a subset of the cases that the other opinion would, and in no other cases—the court in *Johnson* concluded that *Marks* is unhelpful in determining which *Rapanos* test controls. *Id.* at 64. This is because Justice Kennedy's test would find federal jurisdiction in some cases that did not satisfy the plurality's test, and vice versa. *Id.* For example, if there is a small surface water connection between a wetland and a remote navigable water, the plurality would find jurisdiction, while Justice Kennedy might not. Furthermore, a wetland that lacks a surface connection with other waters, but significantly affects the chemical, physical, and biological integrity of a nearby river would meet Justice Kennedy's test but not the plurality's. *See id.* It is therefore difficult, if not impossible, to identify the "narrowest" approach.

Accordingly, the *Johnson* Court looked to Justice Stevens's approach in *Rapanos* and found it to provide "a simple and pragmatic way to assess what grounds would command a majority of the Court." *Id.* According to the *Johnson* Court, following Justice Stevens's instructions and looking to see if either *Rapanos* test is satisfied "ensures that lower courts will find jurisdiction in all cases where a majority of the Court would support such a finding." Id.[6] Therefore, the Courts of Appeals for the First and Eighth Circuits held that federal regulatory jurisdiction can be established over wetlands that meet either the plurality's or Justice Kennedy's test from *Rapanos*. *Id*. at 66; *Bailey*, 571 F.3d at 799.[7]

[6] The *Johnson* Court also suggested that the Supreme Court has moved away from the *Marks* formulation, citing several instances in which "members of the Court have indicated that whenever a decision is fragmented such that no single opinion has the support of five Justices, lower courts should examine the plurality, concurring and dissenting opinions to extract the principles that a majority has embraced." 467 F.3d at 65-66 (citing cases). Moreover, the *Johnson* Court stated that "the fact that Justice Stevens does not even refer to *Marks* indicates that he found its framework inapplicable." *Id*. at 66.

[7] Several Circuit Courts of Appeals have expressly reserved the issue of which *Rapanos* test, or tests, governs CWA enforcement actions. *See Precon Dev. Corp. v. U.S. Army Corps of Eng'rs*, 633 F.3d 278, 288 (4th Cir. 2011) (reserving judgment on whether Corps jurisdiction can be established under either *Rapanos* test); *N. Cal. River Watch v. Wilcox*, 633 F.3d 766, 781 (9th Cir. 2011) (same); *United States v. Cundiff*, 555 F.3d 200, 210 (6th Cir. 2009) (declining to decide which *Rapanos* test or tests govern because jurisdiction was proper under both); *United States v. Lucas*, 516 F.3d 316, 325-27 (5th Cir. 2008) (upholding Corps jurisdiction over

wetlands where evidence at trial supported jurisdiction under the reasoning of the plurality, Justice Kennedy, and Justice Stevens).

We agree with the conclusion of the First Circuit Court of Appeals that neither the plurality's test nor Justice Kennedy's can be viewed as relying on narrower grounds than the other, and that, therefore, a strict application of *Marks* is not a workable framework for determining the governing standard established by *Rapanos*. We also agree with its conclusion that each of the plurality's test and Justice Kennedy's test should be used to determine the Corps' jurisdiction under the CWA.

As we have stated in discussing *Marks*, our goal in analyzing a fractured Supreme Court decision is to find "a single legal standard . . . [that] when properly applied, produce[s] results with which a majority of the Justices in the case articulating the standard would agree." *Planned Parenthood of Southeastern Pa. v. Casey*, 947 F.2d 682, 693 (3d Cir.1991), modified on other grounds, 505 U.S. 833, 112 S.Ct. 2791, 120 L.Ed.2d 674 (1992). To that end, we have looked to the votes of dissenting Justices if they, combined with votes from plurality or concurring opinions, establish a majority view on the relevant issue. *See United States v. Richardson*, No. 11–1202, ––– F.3d ––––, 2011 WL 4430808, at *5 (3d Cir. Sept.23, 2011) (viewing as "persuasive authority" the shared view of a four-Justice dissent and a single-Justice concurrence); *Horn v. Thoratec Corp*., 376 F.3d 163, 176 & n. 18 (3d Cir.2004) ("Thus, on the state requirement issue, Justice Breyer joined with the four-member dissent to make a majority."); *Student Pub. Interest Research Grp. of N.J., Inc. v. AT & T Bell Labs*, 842 F.2d 1436, 1451 (3d Cir.1988) (deriving holding from one Justice concurrence and four dissenting Justices).

The Supreme Court has also employed this mode of analysis. In *United States v. Jacobsen*, 466 U.S. 109, 111, 104 S.Ct. 1652, 80 L.Ed.2d 85 (1984), the Supreme Court determined that the rule of law established by its prior decision in *Walter v. United States*, 447 U.S. 649, 100 S.Ct. 2395, 65 L.Ed.2d 410 (1980), could be divined by combining the opinion of the *Walter* Court (which garnered only two votes) with the opinion of four dissenting Justices. Justice Stevens, writing for a majority of the Justices in *Jacobsen*, downplayed its reliance on the votes of the dissenting Justices in extrapolating a legal standard from *Walter*, saying that "the disagreement between the majority and the dissenters in [*Walter*] with respect to the [application of law to fact] is less significant than the agreement on the standard to be applied." *Jacobsen*, 466 U.S. at 117 n. 12; *see also Vasquez v. Hillery*, 474 U.S. 254, 261 n. 4, 106 S.Ct. 617, 88 L.Ed.2d 598 (1986) (describing as "unprecedented" the argument that "a statement of legal opinion joined by five Justices"—including some Justices in dissent—"does not carry the force of law"), *Alexander v. Choate*, 469 U.S. 287, 293 & nn. 8–9, 105 S.Ct. 712, 83 L.Ed.2d 661 (1985) (deriving holdings from opinion of the Court, concurring opinions, and dissenting opinions); *Moses H. Cone Mem. Hosp. v. Mercury Const. Corp.*, 460 U.S. 1, 17, 103 S.Ct. 927, 74 L.Ed.2d 765 (1983) ("On remand, the Court of Appeals correctly recognized that the four dissenting Justices and Justice Blackmun formed a majority to require application of the Colorado River test.”).

Thus, we are to examine the dissenting Justices' views to see if there is common ground. Here, there is more than just common ground. While our sister Courts of Appeals have struggled to divine the proper approach, we conclude that the struggle is greatly lessened because Justice Stevens, along with the other three Justices who joined his opinion, have actually told us what jurisdictional test is to be applied.

As we noted above, Justice Stevens specifically states:

> I would affirm the judgments in both cases, and respectfully dissent from the decision of five Members of this Court to vacate and remand. I close, however, by noting an unusual feature of the Court's judgments in these cases. It has been our practice in a case coming to us from a lower federal court to enter a judgment commanding that court to conduct any further proceedings pursuant to a specific mandate. That prior practice has, on occasion, made it necessary for Justices to join a judgment that did not conform to their own views. In these cases, however, while both the plurality and Justice Kennedy agree that there must be a remand for further proceedings, their respective opinions define different tests to be applied on remand. Given that all four Justices who have joined this opinion would uphold the Corps' jurisdiction in both of these cases—and in all other cases in which either the plurality's or Justice Kennedy's test is satisfied—on remand each of the judgments should be reinstated if either of those tests is met.

Rapanos, 547 U.S. at 810 (Stevens, J., dissenting) (footnotes omitted). And, lest there be any confusion, he adds, “in these and future cases the United States may elect to prove jurisdiction under either test.” *Id*. at 810 n. 14. Recognizing that the plurality and Justice Kennedy had failed to give a mandate to the Court of Appeals on remand, Justice Stevens and the dissenters provided the mandate. Were we to disregard this key aspect of his opinion we would be ignoring the directive of the dissenters. They have spoken and said that, while they would have chosen a broader test, they nonetheless agree that jurisdiction exists if either the pluralitys or Justice Kennedys test is met.

Accordingly, Donovan's invocation of our decision in *Rappa* is unavailing. In *Rappa*, we confronted a Supreme Court case in which the three opinions “share[d] no common denominator” and each failed to garner a majority of the Justices' votes. *Rappa*, 18 F.3d at 1060 (analyzing *Metromedia, Inc. v. San Diego*, 453 U.S. 490, 101 S.Ct. 2882, 69 L.Ed.2d 800 (1981)). Faced with precedent in which there was no majority and no point of agreement whatsoever among the disparate opinions, we determined that the Supreme Court failed to establish a governing standard, and we therefore looked to prior case law to determine the relevant rule of law. Id. That is not the case here. Instead, in *Rapanos* there is a point of agreement and no basis for disregarding the Supreme Court's directive that two new tests should apply.[8] Because each of the tests for Corps jurisdiction laid out in *Rapanos* received the explicit endorsement of a majority of the Justices, *Rapanos* creates a governing standard for us to apply: the CWA is applicable to wetlands that meet either the test laid out by the plurality or by Justice Kennedy in *Rapanos.*

> 8 Because the four *Rapanos* dissenters explicitly endorsed both the plurality's and Justice Kennedy's jurisdictional tests, we are not faced with a concern, like in *Rappa*, that combining the votes of Justices who joined in different opinions would lead to unprincipled outcomes. . . . *Rapanos* creates no such dilemma. We need not "combine" the votes of Justices relying on different rationales to find that a majority of the *Rapanos* Justices would come out a particular way in a given case. Two separate rationales *each independently* enjoy the support of five or more *Rapanos* Justices, without any need to "count[] the votes" of Justices relying on different rationales. *See id*.

In any given case, this disjunctive standard will yield a result with which a majority of the *Rapanos* Justices would agree. *See Casey*, 947 F.2d at 693. If the wetlands have a continuous surface connection with "waters of the United States," the plurality and dissenting Justices would combine to uphold the Corps' jurisdiction over the land, whether or not the wetlands have a "substantial nexus" (as Justice Kennedy defined the term) with the covered waters. If the wetlands (either alone or in combination with similarly situated lands in the region) significantly affect the chemical, physical, and biological integrity of "waters of the United States," then Justice Kennedy would join the four dissenting Justices from *Rapanos* to conclude that the wetlands are covered by the CWA, regardless of whether the wetlands have a continuous surface connection with "waters of the United States." Finally, if neither of the tests is met, the plurality and Justice Kennedy would form a majority saying that the wetlands are not covered by the CWA.

In sum, we find that *Rapanos* establishes two governing standards and Donovan's reliance on pre-*Rapanos* case law is misplaced. We hold that federal jurisdiction to regulate wetlands under the CWA exists if the wetlands meet either the plurality's test or Justice Kenned's test from *Rapanos*.

661 F.3rd at 180-184.

Some commenters argued that the significant nexus standard should not be applied to non-wetlands. Based on the statute, its goals and objectives, and the Supreme Court caselaw, the agencies conclude that the significant nexus standard applies to non-wetland waters and that

Justice Kennedy's explication of the significant nexus standard applies to non-wetlands waters as well. In *Rapanos*, Justice Kennedy reasoned that *Riverside Bayview* and *SWANCC* "establish the framework for" determining whether an assertion of regulatory jurisdiction constitutes a reasonable interpretation of "navigable waters" - "the connection between a non-navigable water or wetland and a navigable water may be so close, or potentially so close, that the Corps may deem the water or wetland a 'navigable water' under the Act;" and "[a]bsent a significant nexus, jurisdiction under the Act is lacking." 547 U.S. at 767. "The required nexus must be assessed in terms of the statute's goals and purposes. Congress enacted the law to 'restore and maintain the chemical, physical, and biological integrity of the Nation's waters,' 33 U.S.C. § 1251(a), and it pursued that objective by restricting dumping and filling in 'navigable waters,' §§ 1311(a), 1362(12)." *Id.* at 779. Justice Kennedy concluded that the term "waters of the United States" encompasses wetlands and other waters that "possess a 'significant nexus' to waters that are or were navigable in fact or that could reasonably be so made." *Id.* at 759. While Justice Kennedy's discussion of the application of the significant nexus standard focused on adjacent wetlands in light of the facts of the cases before him, his opinion is clear that he does not conclude that the significant nexus analysis only applies to adjacent wetlands. As he explicitly states "the connection between a *non-navigable water* or wetland and a navigable water may be so close, or potentially so close, that the Corps may deem *the water* or wetland a 'navigable water' under the Act." *Id*. at 767 (emphases added). Fundamentally, Justice Kennedy's significant nexus analysis is about the fact, long-acknowledged by Supreme Court caselaw, that protection of waters from pollution can only be achieved by controlling pollution of upstream waters. It would be inconsistent with Justice Kennedy's opinion as a whole, science, and common sense to apply Justice Kennedy's significant nexus standard to wetlands adjacent to tributaries and not to the tributaries themselves. Moreover, commenters appear to assume that if Justice Kennedy's significant nexus analysis does not apply to tributaries the result would be that each individual tributary must be determined alone to have a significant nexus. Nowhere in Justice Kennedy's opinion does he state or imply that is the result of his opinion. In fact, Justice Kennedy's opinion did not reject the existing regulation's definition of "waters of the United States" to include tributaries.

The assertion of jurisdiction over tributaries as defined in the rule is consistent with Justice Kennedy's opinion in *Rapanos*. Justice Kennedy concluded that "*a water* or wetland must possess a 'significant nexus' to waters that are or were navigable in fact or that could reasonably be so made. *Id.*, at 167, 172." *Rapanos* at 759 (citing *SWANCC*)(emphasis added). Therefore, the agencies disagree that Justice Kennedy's opinion reflects an intention that his significant nexus standard applies only to wetlands. With respect to tributaries, Justice Kennedy rejected the plurality's approach that only "relatively permanent" tributaries are within the scope of CWA jurisdiction. He stated that the plurality's requirement of "permanent standing water or continuous flow, at least for a period of 'some months' . . . makes little practical sense in a statute concerned with downstream water quality." *Id.* at 769. Instead, Justice Kennedy concluded that "Congress could draw a line to exclude irregular waterways, but nothing in the statute suggests it has done so;" in fact, he stated that Congress has done "[q]uite the opposite . . . ." *Id.* at 769. Further, Justice Kennedy concluded, based on "a full reading of the dictionary definition" of "waters," that "*the Corps can reasonably interpret the Act to cover the paths of such impermanent streams*." *Id.* at 770 (emphasis added). Most fundamentally, the scientific literature demonstrates that tributaries, as a category and as the agencies propose to define them, play a critical role in the integrity of aquatic systems comprising traditional navigable waters and interstate waters, and therefore are "waters of the United States" within the meaning of the Clean Water Act.

Moreover, as noted above, Justice Kennedy's opinion did not reject the agencies' existing regulations governing tributaries. The consolidated cases in *Rapanos* involved discharges into *wetlands* adjacent to nonnavigable tributaries and, therefore, Justice Kennedy's analysis focused on the requisite showing for *wetlands.* Justice Kennedy described the Corps' standard for asserting jurisdiction over tributaries: "the Corps deems a water a tributary if it feeds into a traditional navigable water (or a tributary thereof) and possesses an ordinary high water mark . . . ." *Id.* at 781, *see also id* at 761. He acknowledged that this requirement of a perceptible ordinary high water mark for ephemeral streams, 65 FR 12828, March 9, 2000, "[a]ssuming it is subject to reasonably consistent application, . . . may well provide a reasonable measure of whether specific minor tributaries bear a sufficient nexus with other regulated waters to constitute navigable waters under the Act." 547 U.S. at 781, *see also id.* at 761. With respect to wetlands, Justice Kennedy concluded that the breadth of this standard for tributaries precluded use of adjacency to such tributaries as the determinative measure of whether *wetlands* adjacent to such tributaries "are likely to play an important role in the integrity of an aquatic system comprising navigable waters as traditionally understood." *Id.* at 781. He did not, however, reject the Corps' use of "ordinary high water mark" to assert regulatory jurisdiction over tributaries themselves. *Id.*

In the foregoing passage regarding the existing regulatory standard for ephemeral streams, Justice Kennedy also provided a "but see" citation to a 2004 U.S. General Accounting Office (now the U.S. Government Accountability Office) (GAO) report "noting variation in results among Corps district offices." *Id*. In 2005, the Corps issued a regulatory guidance letter

(RGL 05-05) to Corps districts on OHWM identification that was designed to ensure more consistent practice. U.S. Army Corps of Engineers 2005b. The Corps has also issued documents to provide additional technical assistance for problematic OHWM delineations. *See, e.g.*, Lichvar and McColley 2008; Mersel and Lichvar 2014. Moreover, the agencies' rule for the first time provides a regulatory definition of "tributary." The definition expressly addresses some of the issues with respect to identification of an OHWM that caused many of the inconsistencies reported by the GAO. For example, this regulation clearly provides that a water that otherwise meets the definition of tributary remains a jurisdictional tributary even if there are natural or man-made breaks in the OHWM. The definition also provides a non-exclusive list of examples of breaks in the OHWM to assist in clearly and consistently determining what meets the definition of tributary. The preamble to the rule also includes extensive discussion of the tools and information available to clearly and consistently implement the definition of tributary.

Some commenters also argued that Justice Kennedy's significant nexus standard does not apply to non-wetland waters based on a statement by the Ninth Circuit in *San Francisco Baykeeper v. Cargill Salt Division,* 481 F.3d 700,707 (9^{th} Cir. 2007) ("No Justice, even in dictum, addressed the question whether all waterbodies with a significant nexus to navigable waters are covered by the Act."). First, to the extent the Ninth Circuit is stating that Justice Kennedy's significant nexus standard is limited to wetlands, the statement is wrong. Justice Kennedy stated: "to constitute 'navigable waters' under the Act, *a water* or wetland must possess a 'significant nexus' to waters that are or were navigable in fact or that could reasonably be so made." *Rapanos* at 759 (*citing SWANCC*, 531 U.S. at 167, 172) (emphasis added). Second, in the context of the case, the statement is about the interplay between the existing regulatory definition of "waters of the United States" and the *Rapanos* case. The existing provision of the regulations regarding adjacency applies only to wetlands and the water at issue in the case was a pond. As the Ninth Circuit stated, "Under the controlling regulations, therefore, the only areas that are defined as waters of the United States by reason of adjacency to other such waters are 'wetlands.' . . . Disregarding the unambiguous regulations limiting to wetlands the areas subject to the CWA because of adjacency, the district court determined that the Pond is covered by the Act because 'the same characteristics that justif[y] protection of adjacent wetlands . . . apply as well to adjacent ponds.' This analysis was improper." 481 F.3d at 705. Because the adjacency provision did not cover the pond at issue, the citizen's group argued that it was a "water of the United States" under *Rapanos* because it had a significant nexus. And the Ninth Circuit held "Baykeeper's reliance on *Rapanos v. United States*, 126 S. Ct. 2208, 165 L. Ed. 2d 159 (2006), is similarly misplaced." In that context, the Ninth Circuit was holding that *Rapanos* did not establish jurisdiction for waters that did not first meet a provision in the agencies' regulations.

The Ninth Circuit's decisions after *Baykeeper* further demonstrate that commenters' view of the decision is erroneous; the Ninth Circuit did not hold that Kennedy's standard does not apply to non-wetland waters. In *Northern California River Watch v. City of Healdsburg*, 496 F.3d 993, 998 (9th Cir. 2007), the Ninth Circuit stated "The Basalt Pond and its surrounding area are therefore regulable under the Clean Water Act, because they qualify as wetlands under the regulatory definition. The district court explicitly found that the Pond is not only surrounded by extensive wetlands, which connect to the Russian River, but also that the Pond's shoreline has receded so substantially that much of the area that was originally Basalt Pond has turned into wetland. This case is thus different than our recent decision in *San Francisco Baykeeper v. Cargill Salt Div.*, 481 F.3d 700 (9th Cir. 2007), because here, the Pond is not isolated; it contains and is surrounded by wetlands, rendering it regulable under the CWA." And in *United States v. Vierstra*, 2012 U.S. Appeal LEXIS 16876, **3 (9th Cir. Aug. 9, 2012), the Ninth Circuit upheld a finding of jurisdiction over a tributary based on the significant nexus standard: "Sufficient evidence supported the jury's verdict because, viewing the evidence in the light most favorable to the government, *United States v. Ramirez*, 537 F.3d 1075, 1081 (9th Cir. 2008), a rational jury could have concluded that a 'significant nexus' existed between the Low Line Canal and the Snake River. *Rapanos v. United States*, 547 U.S. 715, 767, 126 S. Ct. 2208, 165 L. Ed. 2d 159 (2006) (Kennedy, J., concurring in the judgment); see *N. Cal. River Watch v. City of Healdsburg*, 496 F.3d 993, 999-1000 (9th Cir. 2007) (describing the effect of the Supreme Court's various opinions). For six to eight months a year, the Low Line Canal flows continuously and directly into a tributary of the Snake River, a traditionally navigable water. Additionally, the canal has a significant flow of water, an ordinary high water mark, and a defined bed and bank."

Finally, the Ninth Circuit did not view its opinion as establishing limitations on the authority of the agencies and clearly stated that they would defer to the agencies' definition of "waters of the United States": "it is most appropriate to defer to the administering agencies in construing the statutory term 'waters of the United States,' which establishes the reach of the CWA. Deference is especially suitable because this borderline determination of non-navigable areas to be made subject to the CWA is one that involves 'conflicting policies' and expert factual considerations for which the agencies are especially well suited. See Wash., Dep't of Ecology, 752 F.2d at 1469. Because we do not want to undermine or throw into chaos the EPA's and the Corps' construction of the statute that establishes the reach of the CWA, *Chevron* deference is required, even in this citizen suit." *Id.* at 706. Even if the Ninth Circuit had held that Justice

Kennedy's significant nexus standard was inapplicable to non-wetland waters, such a holding would not be binding on the agencies nationwide.

Some commenters also argued that the proposed rule's aggregation approach is inconsistent with Justice Kennedy's opinion, stating that Justice Kennedy imposed limitations on what is "similarly situated" based on proximity to navigable water, regularity of flow, or duration of the function being performed. While Justice Kennedy discussed some of these as possible factors in significant nexus generally, Justice Kennedy did not define either "similarly situated" or "in the region," and no Circuit Court has held that the limitations commenters identify exist in Justice Kennedy's opinion. As the Fourth Circuit stated, while Justice Kennedy's significant nexus test clearly allows for aggregation of wetlands in determining whether a significant nexus exists, "his concurrence provided no further explanation of what 'similarly situated,' or, for that matter, 'region,' should be taken to mean in this context." *Precon*, 633 F.3d at 291. Moreover, a number of Circuit Courts have noted that this is precisely the type of issue to which deference would be due when the agency proceeds through notice and comment rulemaking. The Fourth Circuit, for instance, recognizing the Corps' expertise in administering the CWA, gave some deference to its interpretation and application of Justice Kennedy's test where appropriate, citing *United States v. Mead Corp*., 533 U.S. 218, 234, 121 S. Ct. 2164, 150 L. Ed. 2d 292 (2001) ("[A]n agency's interpretation may merit some deference whatever its form, given the 'specialized experience and broader investigations and information' available to the agency . . . ." (quoting *Skidmore v. Swift*, 323 U.S. 134, 140, 65 S. Ct. 161, 89 L. Ed. 124 (1944)), and noted that greater deference would be accorded under *Chevron U.S.A. Inc. v. Natural Resources Defense Council, Inc*., 467 U.S. 837, 104 S. Ct. 2778, 81 L. Ed. 2d 694 (1984), once the agencies adopted an interpretation of navigable waters" that incorporates the concept of significant nexus through notice-and-comment rulemaking, but instead has interpreted the term only in a non-binding guidance document. 633 F.3d at n.10. The Fourth Circuit noted further that "Justice Kennedy's instruction that 'similarly situated lands in the region' can be evaluated together is a broad one." *Id.* at 292.

The agencies have determined that tributaries, as defined, are "similarly situated," adjacent waters, as defined, are "similarly situated," and the five subcategories of waters identified in (a)(7) are "similarly situated," for the reasons articulated in the preamble at Sections III and IV and in the relevant sections of this Technical Support Document. The agencies have also provided a definition of "significant nexus," including a definition of "similarly situated" for purposes of case-specific significant nexus determinations under (a)(8) of the rule. The SAB found that the available science provides an adequate scientific basis for the key components of the proposed rule. The SAB noted that although water bodies differ in degree of connectivity that affects the extent of influence they exert on downstream waters (*i.e.*, they exist on a "connectivity gradient"), the available science supports the conclusion that the types of water bodies identified as "waters of the United States" in the proposed rule exert strong influence on the chemical, physical, and biological integrity of downstream waters. In particular, the SAB expressed support for the proposed rule's inclusion of tributaries and adjacent waters as categorical waters of the United States and the inclusion of "other waters" on a case-specific basis, though noting that certain "other waters" can be determined as a subcategory to be similarly situated. Thus, the agencies determinations with respect to "similarly situated" and the final rule are supported by the science and consistent with Justice Kennedy's standard.

Some commenters also stated that the proposed rule's definition of significant nexus, that establishes that for an effect to be significant it must be more than speculative or insubstantial, is inconsistent with Justice Kennedy's opinion. These commenters cite to dictionary definitions of the word "significant" in support of their contention that the agencies' definition is inconsistent with Justice Kennedy's opinion. The agencies' definition of the term "significant nexus" in the rule is consistent with language in *SWANCC* and *Rapanos*, and with the goals, objectives, and policies of the CWA. The definition reflects that not all waters have a requisite connection to traditional navigable waters, interstate waters, or the territorial seas sufficient to be determined jurisdictional. Justice Kennedy was clear that to be covered, waters must significantly affect the chemical, physical, or biological integrity of a downstream navigable water and that the requisite nexus must be more than "speculative or insubstantial," *Rapanos,* at 780. The agencies define significant nexus in precisely those terms. Under the rule a "significant nexus" is established by a showing of a significant chemical, physical, or biological effect. Since the agencies have used the precise language Justice Kennedy used in his opinion, the agencies disagree that this definition is inconsistent with Justice Kennedy's opinion. Further, the agencies disagree that a dictionary definition of the word "significant" is more representative of Justice Kennedy's opinion than Justice Kennedy's opinion itself. In *Rapanos*, Justice Kennedy stated that in both the consolidated cases before the Court the record contained evidence suggesting the possible existence of a significant nexus according to the principles he identified. *See id.* at 783. Justice Kennedy concluded that "the end result in these cases and many others to be considered by the Corps may be the same as that suggested by the dissent, namely, that the Corps' assertion of jurisdiction is valid." *Id.* Justice Kennedy remanded the cases because neither the agency nor the reviewing courts properly applied the controlling legal standard – whether the wetlands at issue had a significant nexus. *See id.* Justice Kennedy was clear however, that "[m]uch the same evidence should permit the establishment of a significant nexus with navigable-in-fact waters, particularly if supplemented by further evidence about the significance of the tributaries to which the wetlands are connected." *Id.* at 784.

With respect to one of the wetlands at issue in the consolidated *Rapanos* cases, Justice Kennedy stated:

> In *Carabell*, No. 04-1384, the record also contains evidence bearing on the jurisdictional inquiry. The Corps noted in deciding the administrative appeal that "[b]esides the effects on wildlife habitat and water quality, the [district office] also noted that the project would have a major, long-term detrimental effect on wetlands, flood retention, recreation and conservation and overall ecology. . . . The Corps' evaluation further noted that by 'eliminat[ing] the potential ability of the wetland to act as a sediment catch basin," the proposed project "would contribute to increased runoff and . . . accretion along the drain and further downstream in Auvase Creek.' . . . . And it observed that increased runoff from the site would likely cause downstream areas to "see an increase in possible flooding magnitude and frequency."

Id. at 785-86. Justice Kennedy also expressed concern that "[t]he conditional language in these assessments—'potential ability,' 'possible flooding'—could suggest an undue degree of speculation." *Id.*at 786. Justice Kennedy's observations regarding the underlying case provide guidance as to what it means for a nexus to be more than merely speculative or insubstantial and inform the definition of "significant nexus."

Some commenters also stated that Justice Kennedy's significant nexus standard requires chemical, physical, <u>and</u> biological effects. The agencies' definition of the term "significant nexus" in the rule is consistent with language in *SWANCC* and *Rapanos*, and with the goals, objectives, and policies of the CWA. The definition reflects that not all waters have a requisite connection to traditional navigable waters, interstate waters, or the territorial seas sufficient to be determined jurisdictional. Justice Kennedy was clear that to be covered, waters must significantly affect the chemical, physical, or biological integrity of a downstream navigable water and that the requisite nexus must be more than "speculative or insubstantial," *Rapanos*, at 780. The agencies define significant nexus in precisely those terms. Under the rule a "significant nexus" is established by a showing of a significant chemical, physical, or biological effect. In characterizing the significant nexus standard, Justice Kennedy stated: "[t]he required nexus must be assessed in terms of the statute's goals and purposes. Congress enacted the [CWA] to 'restore and maintain the chemical, physical, and biological integrity of the Nation's waters' . . . ." 547 U.S. at 779. It is clear that Congress intended the CWA to "restore and maintain" all three forms of "integrity," Section 101(a), so if any one is compromised then that is contrary to the statute's stated objective. It would subvert the objective if the CWA only protected waters upon a showing that they had effects on every attribute of the integrity a traditional navigable water, interstate water, or the territorial sea.

Some commenters stated that because the agencies did not provide metrics to quantify when chemical, physical, or biological effects amount to a significant nexus, the proposed rule is based on simple identification of the presence of connections and is therefore inconsistent with Justice Kennedy's opinion. First, neither Justice Kennedy's opinion nor any Circuit Court to address this issue required metrics or quantification of the waters' effects on the downstream chemical, physical or biological integrity. As noted above, the Circuit Courts have held that the term "significant" as used by Justice Kennedy was not intended to require statistical significance. *Precon Dev. Corp., Inc. v. U.S. Army Corps of Eng'rs,* 2015 U.S. App. LEXIS 3704 * 6 (4th Cir. March 10, 2015) (*Precon II)* (unpublished decision). The Fourth Circuit has noted that the standard "is a 'flexibly ecological inquiry,'" and that "[q]uantitative or qualitative evidence may support [applicability of the CWA]." *Precon II,* 2015 U.S. App. LEXIS 3704 * 6 (4th Cir. March 10, 2015). The same court also has clarified that the burden of establishing applicability of the CWA should not be "unreasonable." *Precon,* 633 F.3d at 297. While the appellate courts have accepted laboratory analysis or quantitative or empircal data (*Donovan,* 661 F.3d at 186);

Northern California Riverwatch, 496 F.3d at 1000-1001), the appellate courts have not required such quantitative evidence. *Precon*, 633 F.3d at 294 ("We agree that the significant nexus test does not require laboratory tests or any particular quantitative measurements in order to establish significance"); *Cundiff*, 555 F.3d at 211 ("Though no doubt a district court could find such evidence persuasive, the Cundiffs point to nothing – no expert opinion, no research report or article, and nothing in any of the various *Rapanos* opinions – to indicate that [laboratory analysis] is the sole method by which a significant nexus may be proved"). The appellate courts have accepted a variety of evidence, including but not limited to, photographs, visual observation of stream condition, flow and morphology, studies, dye tests, scientific literature, maps, aerial photographs, and remote sensing data. *Lucas,* 516 F.3d at 326-27. *See also Deerfield Plantation Phase II-B Property Owners Ass'n,* 2012 U.S. App. LEXIS 26402 *5 (in addition to conducting two site visits, Corps relied upon infrared aerial photography, agency records, a county soil survey, a topographic map and a wetland inventory); *Donovan*, 661 F. 3d at 185-86.

With respect to the comment that without quantifying "significant" the agencies are asserting jurisdiction based on the presence of connections that are the equivalent of "any hydrologic connection," the agencies disagree with both the characterization of the science and the suggestion that the jurisdictional conclusions reflected in the rule are based on mere hydrologic connections. First, the science did not assess a mere nexus to downstream waters, but also examined the degree of connection and effect. Some commenters may have been confused by the terminology of the Science Report – "connectivity" does not mean a mere hydrologic connection. The term connectivity is defined in the Science Report as the degree to which components of a watershed are joined and interact by transport mechanisms that function across multiple spatial and temporal scales. Connectivity is determined by the characteristics of both the physical landscape and the biota of the specific system. The Science Report found strong evidence supporting the central roles of the physical, chemical, and biological connectivity of streams, wetlands, and open waters—encompassing varying degrees of both connection and isolation—in maintaining the structure and function of downstream waters, including rivers, lakes, estuaries, and oceans. The Science Report also found strong evidence demonstrating the various mechanisms by which material and biological linkages from streams, wetlands, and open waters affect downstream waters, classified here into five functional categories (source, sink, refuge, lag, and transformation; discussed below), and modify the timing of transport and the quantity and quality of resources available to downstream ecosystems and communities. Thus, the currently available literature provides a large body of evidence for assessing the types of connections and functions by which streams and wetlands produce the range of observed effects on the integrity of downstream waters. Regarding tributaries, the SAB found, "[t]here is strong scientific evidence to support the EPA's proposal to include all tributaries within the jurisdiction of the Clean Water Act. Tributaries, as a group, exert strong influence on the physical, chemical, and biological integrity of downstream waters, even though the degree of connectivity is a function of variation in the frequency, duration, magnitude, predictability, and consequences of physical, chemical, and biological process." SAB 2014b at 2. Regarding adjacent waters and wetlands, the SAB stated, "[t]he available science supports the EPA's proposal to include adjacent waters and wetlands as a waters of the United States. …because [they] have a strong influence on the physical, chemical, and biological integrity of navigable waters." *Id.*

In the rule, the agencies have also provided more detail in the definition of significant nexus as to the functions to be considered for the purposes of determining significant nexus: sediment trapping, nutrient recycling, pollutant trapping transformation, filtering and transport, retention and attenuation of floodwaters, runoff storage, contribution of flow, export of organic matter, export of food resources, or provision of life-cycle dependent aquatic habitat (such as foraging, feeding, nesting, breeding, spawning, use as a nursery area) for species located in traditional navigable waters, interstate waters, or the territorial seas. These functions are consistent with the agencies' scientific understanding of the functioning of aquatic ecosystems. A water does not need to perform all of the functions listed in paragraph (c)(5) in order to have a significant nexus. Depending upon the particular water and the functions it provides, if a water, either alone or in combination with similarly situated waters, performs just one function, and that function has a significant impact on the integrity of a traditional navigable water, interstate water, or the territorial seas, that water would have a significant nexus.

Some commenters stated that the proposed rule's definition of tributary is inconsistent with the *Rapanos* plurality and Justice Kennedy's opinion and sweeps in waters beyond the reach of the CWA. The agencies agree that some tributaries as defined in the final rule may not be "relatively permanent" under the plurality's test, but as addressed above, no court has held that waters must meet the plurality test or must meet both the plurality test and the Kennedy test. The agencies disagree that the definition of tributary is inconsistent with Justice Kennedy's opinion. First, as discussed earlier, Justice Kennedy did not raise concerns with the agencies' existing jurisdiction over tributaries themselves; rather, Justice Kennedy's concern arose with respect to wetlands adjacent to those tributaries without case-specific significant nexus analysis until the agencies undertook a rulemaking. Second, the final rule requires tributaries to have both a bed and banks and another indicatory of ordinary high water mark. This narrows the waters that meet the definition of tributary compared to current practice that simply requires one indicator of ordinary high water mark.

Some commenters stated that the proposed definition was inconsistent with Justice Kennedy's opinion because it did not require consideration of frequency or duration of flow. Justice Kennedy's opinion reflected that he thought that a significant nexus analysis for jurisdiction over adjacent wetlands should consider duration and frequency of flow of the tributaries to which the wetlands were adjacent. Moreover, the definition of tributary in the rule is based on considerations of duration and frequency of flow because those are demonstrated by the physical indicators of an ordinary high water mark. By requiring two indicators of an ordinary high water mark, the agencies defined tributary to require more flow and be more limited than existing practice which determined waters were tributary based on just one indicator of ordinary high water mark. In fact, the SAB commented that not all tributaries have ordinary high water marks, and any such waters will not be tributaries under the rule. The rule explicitly excludes any ephemeral features that do not meet the definition of tributary. Finally, contrary to some commenters assertions that the proposed rule's assertion of jurisdiction over tributaries amounts to the "any hydrological connection standard," as discussed in the preamble and further below, the agencies carefully evaluated the extensive science on the significant effects that tributaries have on chemical, physical, and biological integrity. Therefore, the rule's jurisdiction over tributaries is consistent with Justice Kennedy's opinion.

Some commenters stated the proposed rule's protection of small intermittent and ephemeral streams and their adjacent waters, as defined in the rule, is inconsistent with Justice Kennedy's opinion. Justice Kennedy stated:

> As applied to wetlands adjacent to navigable-in-fact waters, the Corps' conclusive standard for jurisdiction rests upon a reasonable inference of ecologic interconnection, and the assertion of jurisdiction for those wetlands is sustainable under the Act by showing adjacency alone. That is the holding of *Riverside Bayview*. Further, although the *Riverside Bayview* Court reserved the question of the Corps' authority over "wetlands that are not adjacent to bodies of open water,"

> 474 U.S., at 131-132, n. 8, 106 S. Ct. 455, 88 L. Ed. 2d 419, and in any event addressed no factual situation other than wetlands adjacent to navigable-in-fact waters, it may well be the case that *Riverside Bayview*'s reasoning--supporting jurisdiction without any inquiry beyond adjacency--could apply equally to wetlands adjacent to certain major tributaries. Through regulations or adjudication, the Corps may choose to identify categories of tributaries that, due to their volume of flow (either annually or on average), their proximity to navigable waters, or other relevant considerations, are significant enough that wetlands adjacent to them are likely, in the majority of cases, to perform important functions for an aquatic system incorporating navigable waters.

547 U.S. at 780-81.

With the rule, the agencies interpret the scope of the "waters of the United States" for the CWA in light of the goals, objectives, and policies of the statute, the Supreme Court case law, the relevant and available science, and the agencies' technical expertise and experience. In the rule, the agencies determine that tributaries, as defined, have a significant nexus to downstream traditional navigable waters, interstate waters, and the territorial seas and therefore are "waters of the United States." Informed by science, the agencies identified a category of tributaries that were "waters of the United States" based on those waters having sufficient volume, duration, and frequency of flow to form two physical indicators of flow – a bed and banks and another indicator of ordinary high water mark. The science demonstrates how valuable these tributaries are for the chemical, physical or biological integrity of downstream traditional navigable waters, interstate waters, or the territorial seas. Commenters appear to view Justice Kennedy's opinion as foreclosing protection under the CWA of small streams at the head of the tributary system and therefore also foreclosing protection of any waters adjacent to those streams. The agencies do not interpret the statute, or view Justice Kennedy's opinion, to foreclose protection of such waters; in fact, based on the science and consistent with Justice Kennedy's opinion, the agencies have determined that those small streams at the beginning of the tributary system are key to the chemical, physical or biological integrity of the downstream traditional navigable water, interstate water, or the territorial seas, and waters adjacent to them similarly protect those important tributaries and through them the downstream waters.

The agencies therefore disagree with commenters that state the rule is inconsistent with Justice Kennedy's opinion. In light of the statute, the available science, and Justice Kennedy's opinion, the agencies defined tributaries based on their flow (demonstrated by physical indicators of flow), consideration of proximity (effects on the closest traditional navigable water, interstate water, or the territorial seas), and other relevant considerations (the importance of the functions provided by the tributaries, as defined, to the closest downstream traditional navigable water interstate water or the territorial seas). Once these tributaries were identified, the agencies assessed the effects of waters and wetlands on the tributaries and downstream and concluded that tributaries as defined "are significant enough that wetlands adjacent to them are likely, in the majority of cases, to perform important functions for an aquatic system incorporating navigable waters." *Id.*

The Science Report found that those small, farther away streams, headwater streams, which are the smallest channels where streamflows begin, are the cumulative source of approximately 60% of the total mean annual flow to all northeastern U.S. streams and rivers. In addition to downstream transport, headwaters convey water into local storage compartments such as ponds, shallow aquifers, or stream banks, and into regional and alluvial aquifers which important sources of water for maintaining baseflow in rivers. Headwater streams, including ephemeral and intermittent streams, shape river channels by accumulating and gradually or episodically releasing stored materials such as sediment and large woody debris. These materials help structure stream and river channels by slowing the flow of water through channels and providing substrate and habitat for aquatic organisms. There is strong evidence that headwater streams function as nitrogen sources (via export) and sinks (via uptake and transformation) for river networks. For example, one study estimated that rapid nutrient cycling in small streams with no agricultural or urban impacts removed 20−40% of the nitrogen that otherwise would be delivered to downstream waters. Nutrients are necessary to support aquatic life, but excess nutrients lead to eutrophication and hypoxia, in which over-enrichment causes dissolved oxygen concentrations to fall below the level necessary to sustain most aquatic animal life in the stream and streambed. Thus, the influence of streams on nutrient loads can have significant repercussions for hypoxia in downstream waters. Headwaters provide habitat that is critical for completion of one or more life-cycle stages of many aquatic and semiaquatic species capable of moving throughout river networks. Use of headwater streams as habitat is especially critical for the many species that migrate between small streams and marine environments during their life cycles (e.g., Pacific and Atlantic salmon, American eels, certain lamprey species). The presence of these species within river networks provides robust evidence of biological connections between headwaters and larger rivers; because these organisms also transport nutrients and other materials as they migrate, their presence also provides evidence of biologically mediated chemical connections. The Science Report concludes that streams, regardless of their flow regime, have important effects on larger downstream waters. The Science Advisory Board's final review of the Science Report strongly supports this conclusion. In their comments, the SAB found, "[t]here is strong scientific evidence to support the EPA's proposal to include all tributaries within the jurisdiction of the Clean Water Act. Tributaries, as a group, exert strong influence on the physical, chemical, and biological integrity of downstream waters, even though the degree of connectivity is a function of variation in the frequency, duration, magnitude, predictability, and consequences of physical, chemical, and biological process."

In light of these scientific conclusions about the importance of these smaller intermittent and ephemeral streams, the agencies did not subcategorize tributaries, but rather focused on defining tributary to reasonably ensure that tributaries, as defined, had a significant nexus to downstream traditional navigable waters, interstate waters, or the territorial seas. The agencies then focused on defining adjacent waters to ensure that they, too, "perform[ed] important functions for an aquatic system." Adjacent waters, as defined, function together to maintain the chemical, physical, or biological health of traditional navigable waters, interstate waters, and the territorial seas to which they are directly adjacent or to which they are connected by the tributary system. This functional interaction can result from hydrologic connections or because adjacent waters can act as water storage areas holding damaging floodwaters or filtering harmful pollutants. These chemical, physical, and biological connections affect the integrity of downstream traditional navigable waters, interstate waters, and the territorial seas through the temporary storage and deposition of channel-forming sediment and woody debris, temporary storage of local groundwater sources of baseflow for downstream waters and their tributaries, and transformation and transport of organic matter. Covered adjacent waters improve water quality through the assimilation, transformation, or sequestration of pollutants, including excess nitrogen and phosphorus and chemical contaminants such as pesticides and metals that can degrade downstream water integrity. In addition to providing effective buffers to protect downstream waters from pollution, covered adjacent waters form integral components of downstream food webs, providing nursery habitat for breeding fish and amphibians, colonization opportunities for stream invertebrates, and maturation habitat for stream insects. Covered adjacent waters serve an important role in the integrity of traditional navigable waters, interstate waters, and the territorial seas by subsequently releasing (desynchronizing) floodwaters and retaining large volumes of stormwater, sediment, nutrients, and contaminants that could otherwise negatively impact the condition or function of traditional navigable waters, interstate waters, and the territorial seas. Therefore, the agencies disagree that the rule is inconsistent with Justice Kennedy's opinion.

Some commenters stated that ditches should be excluded from regulation and that the proposed rule's inclusion of ditches would subject ditches to regulation for the first time and was contrary to *Rapanos*. The agencies disagree that the rule subjects ditches to regulation for the first time. The courts of appeals have consistently held that, for purposes of the regulatory definition of "waters of the United States," a man-made ditch can be a "tributary" of the downstream waters to which the ditch ultimately contributes flow. *See, e.g., United States v. Gerke Excavating, Inc.*, 412 F.3d 804, 805-806 (7th Cir. 2005); *Parker v. Scrap Metal Processors, Inc*., 386 F.3d 993, 1009 (11th Cir. 2004); *Treacy v. Newdunn Assocs.*, 344 F.3d 407, 417 (4th Cir. 2003), cert. denied, 541 U.S. 972 (2004); *United States v. Rapanos*, 339 F.3d 447, 449, 451-452 (6th Cir. 2003), cert. denied, 541 U.S. 972 (2004); *United States v. Deaton*, 332 F.3d 698, 710-712 (4th Cir. 2003), cert. denied, 541 U.S. 972 (2004); *Headwaters, Inc. v. Talent Irrigation Dist*., 243 F.3d 526, 533 (9th Cir. 2001); *United States v. Eidson*, 108 F.3d 1336, 1341-1342 (11th Cir.), cert. denied, 522 U.S. 899 and 1004 (1997); *United States v. Ashland Oil & Transp. Co*., 504 F.2d 1317, 1325 (6th Cir. 1974). *But cf. In re Needham*, 354 F.3d 340, 347 (5th Cir. 2003) ("[T]he term 'adjacent' cannot include every possible source of water that eventually flows into a navigable-in-fact waterway.").

In fact, the rule for the first time explicitly excludes certain ditches from the definition of waters of the United States. First, excluding all ditches from CWA jurisdiction would be inconsistent with the CWA and Congressional intent by nullifying a provision of the statute.

Section 404(f)(1)(C) of the CWA states that, with some exceptions, the discharge of dredge or fill material "for the purpose of construction or maintenance of farm or stock ponds or irrigation ditches, or the maintenance of drainage ditches" is not prohibited by or otherwise subject to regulation under the CWA. There would be no need for such a permitting exemption if ditches were excluded from "waters of the United States." To be clear, under the rule a ditch may be a "water of the United States" only if it meets the definition of tributary and is not otherwise excluded under section (b) of the rule.

In addition, the agencies' longstanding interpretation of the CWA is that it is not relevant whether a water is man-altered or man-made for purposes of determining whether a water is jurisdictional under the CWA. The agencies' long-standing regulations defining "waters of the United States," for example, did not distinguish between "natural" and "man-made" waters, except to explicitly exclude only one category of man-made or man-altered waters – waste treatment systems designed to meet the requirements of the CWA. In 1975, the General Counsel of EPA issued an opinion interpreting the CWA: "it should be noted that what is prohibited by section 301 is '*any addition* of *any pollutant* to navigable waters from any point source.' It is therefore my opinion that, even should the finder of fact determine that any *given* irrigation ditch is a navigable water, it would still be permittable as a point source where it discharges into another navigable water body, provided that the other point source criteria are also present." *In re Riverside Irrigation District* at 4 (emphasis in original). The opinion stated that "to define the waters here at issue as navigable waters and use that as a basis for exempting them from the permit requirement appears to fly directly in the face of clear legislative intent to the contrary." *Id*.

In *S.D. Warren v. Maine Board of Envt'l Protection*, Justice Stevens, writing for a unanimous Court, stated: "nor can we agree that one can denationalize national waters by exerting private control over them." Cf. *United States* v. *Chandler-Dunbar Water Power Co.*, 229 U.S. 53, 69, 33 S. Ct. 667, 57 L. Ed. 1063 (1913) ("[T]hat the running water in a great navigable stream is capable of private ownership is inconceivable"). 126 S.Ct. 1843, 1849 n.5 (2006). In *Rapanos*, all members of the Court generally agreed that "it is also true that highly artificial, manufactured, enclosed conveyance systems -- such as 'sewage treatment plants,' *post*, at 15 (opinion of Kennedy, J.), and the 'mains, pipes, hydrants, machinery, buildings, and other appurtenances and incidents' of the city of Knoxville's 'system of waterworks,' *Knoxville Water Co.* v. *Knoxville*, 200 U.S. 22, 27, 26 S. Ct. 224, 50 L. Ed. 353, 3 Ohio L. Rep. 572 (1906), cited *post*, at 17, n. 12 (opinion of Stevens, J.) -- likely do not qualify as "waters of the United States," despite the fact that they may contain continuous flows of water. See *post*, at 15 (opinion of Kennedy, J.); *post*, at 17, n. 12 (opinion of Stevens, J.)." 547 U.S. at 737 (opinion of Scalia, J.). But there was also agreement that certain waters that are man-made or man-altered, such as canals with relatively permanent flow, are waters of the United States. 547 U.S. at 736, at n. 7 (opinion of Scalia J.). Justice Kennedy and the dissent rejected the conclusion that because the word "ditch" was in the definition of "point source" a ditch could never be a water of the United States: "certain water bodies could conceivably constitute both a point source and a water." *Id*. at 772 (opinion of Kennedy, J.); *see also*, *Id*. at 802 (dissent of Stevens, J.) ("The first provision relied on by the plurality--the definition of "point source" in 33 U.S.C. § 1362(14) --has no conceivable bearing on whether permanent tributaries should be treated differently from intermittent ones, since 'pipe[s], ditch[es], channel[s], tunnel[s], conduit[s], [and] well[s]' can all hold water permanently as well as intermittently.") While the plurality, Justice Kennedy, and the dissent formulated different standards for determining what is a "water of the United States," no test based jurisdiction on a distinction between "natural" versus "man-made" or "man-altered" waters or excluded ditches in their entirety.

No Circuit Court has interpreted *Rapanos* to exclude ditches from the CWA. The discussion of caselaw above demonstrates that ditches have long been subject to regulation as "waters of the United States." The D.C. Circuit recently confirmed that ditches are not categorically rendered non-jurisdictional for purposes of the CWA. In *National Association of Home Builders (NAHB) v. Corps of Engineers* (No. 10-5169), the NAHB sought a declaratory judgment that ditches are not waters of the United States. The D.C. Circuit did not grant the motion for a declaratory judgment and instead held that NAHB did not have standing to challenge the nationwide permit for certain ditches that NAHB sought to have overturned. Upland ditches are, by their very nature, man-made. The D.C. Circuit concluded that the Corps' permit for activities in certain upland ditches did not injure NAHB's members because "The risk of sanctions attendant on filling upland ditches without Corps approval predates, and is in no way aggravated by, the issuance of [the permit]." Slip op. at 5. The court did not question the underlying premise of the permit that certain upland ditches would be "waters of the United States."

Some commenters also cite to Justice Kennedy's critique that "the dissent would permit federal regulation whenever wetlands lie alongside a ditch or drain, however remote and insubstantial, that eventually may flow into traditional navigable waters," 547 at 778, to demonstrate that the proposed rule's regulation of ditches and of adjacent waters is inconsistent with Justice Kennedy's opinion. First, with this statement Justice Kennedy is expressing concern about the categorical regulation of <u>wetlands</u> adjacent to remote and insubstantial ditches and drains. Second, the agencies' final rule explicitly excludes ephemeral ditches (that are not constructed in tributaries themselves), so wetlands will not be jurisdictional under the rule based on their adjacency to such ditches. In addition, "ditches and drainages" that do not meet the definition of tributary in the final rule – including having a bed and banks and another indicator of ordinary high water mark—are not jurisdictional and wetlands will not be jurisdictional under the rule based on their adjacency to such ditches and drainages.

Some commenters stated that the proposed rule's regulation of adjacent waters expands CWA jurisdiction over such waters for the first time and is inconsistent with *SWANCC* and *Rapanos*. As stated in the preamble to the proposed rule, and as demonstrated by the discussion above of caselaw prior to the *SWANCC* decision, while the rule reflects a change from the existing regulation by addressing adjacent waters in one provision rather than adjacent wetlands and adjacent other waters in two separate provisions, this would not be the first time the agencies asserted jurisdiction over such waters. For the reasons discussed in this preamble, the agencies do not interpret the *SWANCC* decision as prospectively invalidating the regulation of adjacent open waters along with adjacent wetlands. Nor did the Ninth Circuit's decision in *Baykeeper* reject the possibility of the agencies in rulemaking asserting jurisdiction over adjacent waters.

Some commenters stated the proposed rule's assertion of jurisdiction over "isolated waters" violates *SWANCC*. These commenters contended that *SWANCC* invalidated the use of the existing regulation's (a)(3) other waters provision and that it is unlawful to assert jurisdiction over waters that are not tributaries or adjacent waters. The Supreme Court did not vacate (a)(3) of the existing regulation. Rather, in *SWANCC,* the Court held that the use of "isolated" nonnavigable intrastate ponds by migratory birds was not by itself a sufficient basis for the exercise of federal regulatory authority under the CWA. The *SWANCC* Court noted that in

Riverside it had "found that Congress' concern for the protection of water quality and aquatic ecosystems indicated its intent to regulate wetlands 'inseparably bound up' with the 'waters of the United States'" and that "it was the significant nexus between the wetlands and 'navigable waters' that informed our reading of the CWA" in that case. *Id.* at 167. No Circuit Court has interpreted *SWANCC* to have vacated the other waters provision of the existing regulation. Justice Kennedy concluded that *SWANCC* held that "to constitute 'navigable waters' under the Act, a water or wetland must possess a 'significant nexus' to waters that are or were navigable in fact or that could reasonably be so made." *Rapanos* at 759 (*citing SWANCC*, 531 U.S. at 167, 172). And the Supreme Court in *SWANCC* did not prospectively invalidate a regulation that authorizes case-specific significant nexus determinations for some waters.

Other commenters expressed concern about the proposed rule's deletion of the existing provision covering other waters where "the use, degradation or destruction of" such waters "could affect interstate or foreign commerce," stating that this change is not compelled by either *SWANCC* or *Rapanos*. Presented with an assertion of jurisdiction under that provision of teh existing rule and based on the effects of migratory birds' on interstate or foreign commerce, the Court stated in *SWANCC* that "[t]he term 'navigable' has at least the import of showing us what Congress had in mind as its authority for enacting the CWA: its traditional jurisdiction over waters that were or had been navigable in fact or which could reasonably be so made. See, *e.g.*, *United States* v. *Appalachian Elec. Power Co.*, 311 U.S. 377, 407-408, 85 L. Ed. 243, 61 S. Ct. 291 (1940)," *SWANCC* at 172. In light of that statement, the agencies concluded that the general other waters provision in the existing regulation that asserted jurisdiction based on a different aspect of Congress' Commerce Clause authority – authority over activities that "could affect interstate or foreign commerce" – was not consistent with Supreme Court precedent. The final rule provides for case-specific analysis of certain waters to determine whether they are "waters of the U.S.," but that determination will be based on the significant nexus standard and not whether "the use, degradation or destruction of" such waters "could affect interstate or foreign commerce."

Some commenters stated that in the 2008 Guidance the United States interpreted *Rapanos* to convey jurisdiction when either Justice Kennedy's or the plurality's standard is met and the agencies failed to explain their basis for dispensing with that interpretation and taking a very different approach in the 2014 Proposed Rule. In the rule, the agencies are establishing a binding definition of the "waters of the United States" in light of the goals, objectives, and policies of the statute, the Supreme Court case law, the relevant and available science, and the agencies' technical expertise and experience, whereas the guidance was simply a practical guide to field staff on how to proceed, in the absence of rulemaking, with case-specific jurisdictional determinations, permitting actions, and other relevant actions in light of the split opinions in *Rapanos*. While the agencies' interpretation and rulemaking is most informed by the significant nexus standard as informed by the ecological and hydrological connections the Supreme Court noted in *Riverside Bayview*, *SWANCC*, and Justice Kennedy's opinion, particularly in light of Justice Kennedy's recognition that the agencies could identify categorically jurisdictional waters, and in light of the available science, the agencies are also informed by the plurality opinion, as discussed in the preamble, with respect to drawing lines to exclude features. The agencies do not view the 2008 Guidance as an interpretation of the Clean Water Act, but to the extent the agencies have changed their interpretation, they disagree that they failed to explain their basis. Further, to the extent the agencies have changed an interpretation in a guidance document, they can do so under the Administrative Procedure Act (APA), and they can especially do so where, as here, the agencies have proceeded through notice and comment rulemaking.

The 2008 Guidance was clearly guidance, as the agencies stated: "The CWA provisions and regulations described in this document contain legally binding requirements. This guidance does not substitute for those provisions or regulations, nor is it a regulation itself. It does not impose legally binding requirements on EPA, the Corps, or the regulated community, and may not apply to a particular situation depending on the circumstances. Any decisions regarding a particular water will be based on the applicable statutes, regulations, and case law. Therefore, interested persons are free to raise questions about the appropriateness of the application of this guidance to a particular situation, and EPA and/or the Corps will consider whether or not the recommendations or interpretations of this guidance are appropriate in that situation based on the statutes, regulations, and case law." 2008 Guidance at 4 n.16. Further, the agencies were clear that the guidance was an interim step and that the agencies intended to proceed through rulemaking, as appropriate: "The agencies are issuing this memorandum in recognition of the fact that EPA regions and Corps districts need guidance to ensure that jurisdictional determinations, permitting actions, and other relevant actions are consistent with the decision and supported by the administrative record. Therefore, the agencies have evaluated the *Rapanos* opinions to identify those waters that are subject to CWA jurisdiction under the reasoning of a majority of the justices. This approach is appropriate for a guidance document. The agencies intend to more broadly consider jurisdictional issues, including clarification and definition of key terminology, through rulemaking or other appropriate policy process." 2008 Guidance at 3. The goals of the 2008 Guidance were: "To ensure that jurisdictional determinations, administrative enforcement actions, and other relevant agency actions are consistent with the

Rapanos decision, the agencies in this guidance address which waters are subject to CWA § 404 jurisdiction. Specifically, this guidance identifies those waters over which the agencies will assert jurisdiction categorically and on a case-by-case basis, based on the reasoning of the *Rapanos* opinions. EPA and the Corps will continually assess and review the application of this guidance to ensure nationwide consistency, reliability, and predictability in our administration of the statute." *Id*. at 4. In the proposed rule, the agencies explained that one of the reasons they were promulgating a rule was that the 2008 Guidance had failed to achieve its goals. As the agencies stated in the preamble to the proposed rule: "The *SWANCC* and *Rapanos* decisions resulted in the agencies evaluating the jurisdiction of waters on a case-specific basis far more frequently than is best for clear and efficient implementation of the CWA. This approach results in confusion and uncertainty to the regulated public and results in significant resources being allocated to these determinations by federal and state regulators. The agencies are proposing this rule to fully carry out their responsibilities under the Clean Water Act. The agencies are providing clarity to regulated entities as to whether individual water bodies are jurisdictional and discharges are subject to permitting, and whether individual water bodies are not jurisdictional and discharges are not subject to permitting." 79 FR at 22188. The agencies further stated: "The proposed rule will reduce documentation requirements and the time currently required for making jurisdictional determinations. It will provide needed clarity for regulators, stakeholders and the regulated public for identifying waters as 'waters of the United States,' and reduce time and resource demanding case-specific analyses prior to determining jurisdiction and any need for permit or enforcement actions." 79 FR at 22191. The agencies also noted some inconsistencies in practice in implementing the 2008 guidance.

The 2008 Guidance is nothing more than an internal guidance document that does not carry the "force and effect of law." *Perez v. Mortgage Bankers Ass'n*, 135 S. Ct. 1199, 1204 (2015). As the Supreme Court in *Perez* makes clear, "the APA permit[s] agencies to promulgate freely [interpretive] rules -- whether or not they are consistent with earlier interpretations" of the agency's regulations. *Id.* at 1207; s*ee also Hudson v. FAA*, 192 F.3d 1031, 1035-36 (D.C. Cir. 1999) (holding that an agency may change its policy statements as it sees fit without following APA notice and comment procedures). As noted in *Perez*, "[o]ne would not normally say that a court 'amends' a statute when it interprets its text. So too can an agency 'interpret' a regulation without 'effectively amend[ing]' the underlying source of law." *Id.* at 1208 (alteration in original). And "[b]ecause an agency is not required to use notice-and-comment procedures to issue an initial interpretive rule, it is also not required to use those procedures when it amends or repeals that interpretive rule." *Id.* at 1206. Thus, to the extent there is a change, the agencies of course may proceed by rulemaking.

Even if the agencies had reversed the approach they took in guidance, they agencies disagree with commenters that the rule is therefore arbitrary or unreasonable. The Supreme Court has held: "We find no basis in the Administrative Procedure Act or in our opinions for a requirement that all agency change be subjected to more searching review. The Act mentions no such heightened standard. And our opinion in *State Farm* neither held nor implied that every agency action representing a policy change must be justified by reasons more substantial than those required to adopt a policy in the first instance. That case, which involved the rescission of a prior regulation, said only that such action requires 'a reasoned analysis for the change beyond that which may be required when an agency *does not act* in the first instance.' 463 U. S., at 42 (emphasis added). . . . The statute makes no distinction, however, between initial agency action and subsequent agency action undoing or revising that action." *FCC v. Fox*, 556 U.S. 502, 514-15 (2009). The Supreme Court continued: "To be sure, the requirement that an agency provide reasoned explanation for its action would ordinarily demand that it display awareness that it is changing position. An agency may not, for example, depart from a prior policy *sub silentio* or simply disregard rules that are still on the books. *See United States v. Nixon*, 418 U. S. 683, 696 (1974). And of course the agency must show that there are good reasons for the new policy. But it need not demonstrate to a court's satisfaction that the reasons for the new policy are better than the reasons for the old one; it suffices that the new policy is permissible under the statute, that there are good reasons for it, and that the agency believes it to be better, which the conscious change of course adequately indicates. This means that the agency need not always provide a more detailed justification than what would suffice for a new policy created on a blank slate." *Id*. As noted above, with this rule the agencies are interpreting the statute in light the goals of the statute, the science, and the opinions in *SWANCC* and *Rapanos*. To the extent this reflects a change, it is not a silent one and the agencies have articulated good reasons for it.

iv. The Rule is Consistent with the Constitution

Some commenters argued that the proposed rule asserts expansive jurisdiction that is beyond the commerce authority Congress exercised in enacting the CWA. In particular, commenters argued that the Constitution allows for the CWA to reach more than "navigable in fact" waters, but that asserting jurisdiction over a water based on a mere connection to a "navigable in fact" water raises serious constitutional concerns. The final rule does not assert jurisdiction over a water based on a "mere connection." Again, as demonstrated in the rule and its supporting documentation, the agencies are asserting jurisdiction over traditional navigable waters, interstate waters, the territorial seas, and those waters that have a significant nexus to them. Some commenters argued that the proposed rule exceeds the limits of Congress' authority under the Constitution by encroaching on the traditional power of the States to regulate land and water. Justice Kennedy explicitly addressed these Constitutional concerns in *Rapanos*, stating "In *SWANCC*, by interpreting the Act to require a significant nexus with navigable waters, the Court avoided applications—those involving waters without a significant nexus—that appeared likely, as a category, to raise constitutional difficulties and federalism concerns." 547 at 776.

Justice Kennedy further stated, "As for States' 'responsibilities and rights,' §1251(b), it is noteworthy that 33 States plus the District of Columbia have filed an *amici* brief in this litigation asserting that the Clean Water Act is important to their own water policies. See Brief for States of New York et al. 1–3. These *amici* note, among other things, that the Act protects downstream States from out-of-state pollution that they cannot themselves regulate. *Ibid.*" *Id.* at 777.

Finally, Justice Kennedy concluded of the significant nexus standard:

> This interpretation of the Act does not raise federalism or Commerce Clause concerns sufficient to support a presumption against its adoption. To be sure, the significant nexus requirement may not align perfectly with the traditional extent of federal authority. Yet in most cases regulation of wetlands that are adjacent to tributaries and possess a significant nexus with navigable waters will raise no serious constitutional or federalism difficulty. Cf. *Pierce County* v. *Guillen*, 537 U. S. 129, 147 (2003) (upholding federal legislation "aimed at improving safety in the channels of commerce"); *Oklahoma ex rel. Phillips* v. *Guy F. Atkinson Co.*, 313 U. S. 508, 524–525 (1941) ("[J]ust as control over the non-navigable parts of a river may be essential or desirable in the interests of the navigable portions, so may the key to flood control on a navigable stream be found in whole or in part in flood control on its tributaries . . . . [T]he exercise of the granted power of Congress to regulate interstate commerce may be aided by appropriate and needful control of activities and agencies which, though intrastate, affect that commerce"). As explained earlier, moreover, and as exemplified by *SWANCC*, the significant-nexus test itself prevents problematic applications of the statute. See *supra*, at 19–20; 531 U. S., at 174. The possibility of legitimate Commerce Clause and federalism concerns in some circumstances does not require the adoption of an interpretation that departs in all cases from the Act's text and structure. See *Gonzales* v. *Raich*, 545 U. S. 1, __ (2005) (slip op., at 14) ("[W]hen a general regulatory statute bears a substantial relation to commerce, the

> *de minimis* character of individual instances arising under that statute is of no consequence" (internal quotation marks omitted)).
> Id. at 782-83.

Justice Stevens, in his dissent on behalf of four Justices, also addressed the issue of Commerce Clause concerns and stated: "the plurality suggests that the canon of constitutional avoidance applies because the Corps' approach might exceed the limits of our Commerce Clause authority. Setting aside whether such a concern was proper in *SWANCC*, 531 U.S., at 173, 121 S. Ct. 675, 148 L. Ed. 2d 576; but see *id.*, at 192-196, 121 S. Ct. 675, 148 L. Ed. 2d 576 (Stevens, J., dissenting), it is plainly not warranted here. The wetlands in these cases are not 'isolated' but instead are adjacent to tributaries of traditionally navigable waters and play important roles in the watershed, such as keeping water out of the tributaries or absorbing water from the tributaries. 'There is no constitutional reason why Congress cannot, under the commerce power, treat the watersheds as a key to flood control on navigable streams and their tributaries." *Oklahoma ex rel. Phillips* v. *Guy F. Atkinson Co.*, 313 U.S. 508, 525, 61 S. Ct. 1050, 85 L. Ed. 1487 (1941).'" *Rapanos* at 803-4.

Some commenters raise due process concerns with respect to case-specific significant nexus determinations for one water in a watershed to bind other "similarly situated" waters in the watershed. Justice Kennedy's standard itself establishes that whether a water significantly effects the downstream water must be determined "alone or in combination" with other "similarly situated" waters, so any consequences for "similarly situated" waters are a result of the significant nexus standard. In addition, jurisdictional determinations are not final agency actions so due process is not implicated. Any subsequent jurisdictional determinations with respect to other "similarly situated" waters in the same region by an agency cannot be inconsistent with an existing jurisdictional determination without explanation, but once the agency has taken a final agency action such as issuing a permit or denying a permit, a recipient has administrative and judicial processes available to challenge the action including any underlying jurisdictional determination. The Fifth and Ninth Circuits have held that a Corps' jurisdictional determination was not a "final agency action" subject to judicial review under the Administrative Procedure Act (APA). *Belle Co. LLC v. Corps (*retitled as *Kent Recycling)*, 761 F.3d 383 (5th Cir. 2014); *Fairbanks N. Star Borough* v. *United States Army Corps of Eng'rs*, 543 F.3d 586 (9th Cir. 2008), cert. denied, 557 U.S. 919 (2009); *but see Hawkes Co. v. U.S. Army Corps of Engineers*, No. 13-3067, 2015 WL 1600465 (8th Cir. Apr. 10, 2015).

The APA authorizes judicial review of "final agency action for which there is no other adequate remedy in a court." 5 U.S.C. 704. Two conditions must be met for agency action to be "final." *Bennett*, 520 U.S. at 177-178. "First, the action must mark the consummation of the agency's decision making process—it must not be of a merely tentative or interlocutory nature. And second, the action must be one by which rights or obligations have been determined, or from which legal consequences will flow." *Id.* (internal citations and quotation marks omitted). In *Belle*, the Fifth Circuit held that the Corps' jurisdictional determination was not "final agency action" subject to judicial review under the APA. 761 F.3d 383. In reaching that conclusion, the court applied the two requirements for "final agency action" identified by the Supreme Court in *Bennett v. Spear*. 761 F.3d at 387. The Fifth Circuit concluded that the Corps' determination satisfied the first *Bennett* requirement because "the Corps has asserted its final position on the facts underlying jurisdiction—that is, the presence or absence on Belle's property of waters of the United States as defined in the CWA." *Id.* The Fifth Circuit concluded, however, that the Corps' jurisdictional determination did not satisfy *Bennett*'s second requirement because it did not impose obligations or legal consequences on petitioner and Belle. *Id*. The court explained that, when "'the action sought to be reviewed may have the effect of forbidding or compelling conduct on the part of the person seeking to review it, but only if some further action is taken by the [agency],' that action is nonfinal and nonreviewable because it 'does not of itself adversely affect complainant but only affects his rights adversely on the contingency of future administrative action.' " *Id*. (quoting *Rochester Tel. Corp.* v. *United States*, 307 U.S. 125, 129-130 (1939), and citing *FTC* v. *Standard Oil Co.*, 449 U.S. 232, 240- 241 (1980)). The court also observed that it had previously held that a jurisdictional determination was not final. *Id*. at 388 (citing *Greater Gulfport Props., LLC* v. *United States Army Corps of Eng'rs*, 194 Fed. Appx. 250, 250 (2006) (per curiam)). Therefore, the rule does not raise due process concerns.

Some commenters stated that the proposed rule, and the CWA itself, is void for vagueness and fails to meet Constitutional requirement for due process. The Clean Water Act is not void for vagueness. The Supreme Court has found that the term "waters of the United States" is ambiguous in some respects, but has never found that the phrase "waters of the United States" is void for vagueness. *See Rapanos*, 547 U.S. at 752 (plurality opinion), 804 (dissent). Indeed, in light of that ambiguity, Chief Justice Roberts' concurrence in *Rapanos* emphasized that "[a]gencies delegated rulemaking authority under a statute such as the Clean Water Act are afforded generous leeway by the courts in interpreting the statute they are entrusted to administer." *Id.* at 758.

The final rule also is not vague, clearly identifying waters that are jurisdictional, waters that are not jurisdictional, and a limited set of waters for which case-specific significant nexus analyses will be performed. Preamble, IV. Some commenters expressed concern that the terms and definitions in the proposed rule were unclear or inadequately defined or requested additional definitions of terms used in the proposed rule. The agencies responded to the suggestions for new and amended definitions in various ways. In some cases, the terms are not used in the rule;

therefore, the agencies did not provide definitions (*e.g.*, riparian area, uplands). Other clarifications were added to the preamble (*e.g*., ephemeral, intermittent, and perennial). In some cases, the agencies also made changes directly to the rule to clarify definitions (*e.g*., significant nexus). While the agencies considered other requests for definitions, the agencies reasonably concluded that the rule and the preamble provide definitions and clarifications of the key terms that demarcate the boundaries of CWA jurisdiction and provide for increased clarity, certainty and consistent implementation. The agencies also concluded that attempting to add new definitions for some terms, such as ditches, would actually introduce confusion. Preamble, IV. Moreover, a regulation will not be deemed impermissibly vague as long as the standard is sufficient to put the regulated party on notice as to what conduct is required. *Brock v. L.R. Willson & Sons, Inc*., 773 F.2d 1377, 1387 (D.C. Cir. 1985); *see Komjathy v. National Transportation Safety Bd*., 832 F.2d 1294, 1296 (D.C. Cir. 1987), *cert. denied*, 486 U.S. 1057 (1988). This standard does not require a precise definition for each phrase used. Thus, the Supreme Court has upheld statutes prohibiting "excess profits," providing for "just and reasonable rates," proscribing "unfair methods of competition," and requiring "fair and reasonable rent." *Montgomery National Bank v. Clarke,* 882 F.2d 87, 90 (3d Cir. 1989) (citing *Lichter v. United States*, 334 U.S. 742, 786 (1948) (collecting cases). In *Nat'l Oilseed Processors Ass'n v. OSHA*, 769 F.3d 1173 (D.C. Cir 2014), the D.C. Circuit rejected a challenge that OSHA violated the Due Process Clause because a final rule was unconstitutionally vague on its face, holding: "The Final Rule satisfies Due Process because the term 'combustible dust' is clear enough to provide fair warning of enforcement, and OSHA has provided additional guidance on how the revised Hazard Communication Standard will be enforced. 'If, by reviewing the regulations and other public statements issued by the agency, a regulated party acting in good faith would be able to identify, with "ascertainable certainty," the standards with which the agency expects parties to conform, then the agency has fairly notified a petitioner of the agency's interpretation.' *Gen. Elec. Co. v. EPA*, 53 F.3d 1324, 1329, 311 U.S. App. D.C. 360 (D.C. Cir. 1995) (*quoting Diamond Roofing Co. v. OSHRC*, 528 F.2d 645, 649 (5th Cir. 1976)); *see also Aeronautical Repair Station Ass'n, Inc. v. FAA*, 494 F.3d 161, 174, 377 U.S. App. D.C. 329 (D.C. Cir. 2007)." Again, by identifying waters that are jurisdictional, waters that are not jurisdictional, and a limited set of waters for which case-specific significant nexus analyses will be performed, the rule fairly notifies a regulated party acting in good faith of the agencies' interpretation of "waters of the United States."

Some commenters stated that the proposed rule would result in regulatory takings, in violation of the Fifth Amendment. The rule does not constitute a taking of private property in violation of the Fifth Amendment. As a matter of law, an agency's determination of jurisdiction cannot constitute a taking. *See, e.g., United States v. Riverside Bayview Homes*, 474 U.S. 121 (1985). Even if a finding of jurisdiction means that a property owner must obtain a permit, such a requirement, by itself, does not constitute a taking. The existence of a permit system leaves open the possibility that a landowner may be permitted to use the property as he or she wishes. Even where a permit is denied, other economically viable uses of the land may be available to the owner. Because the permit system leaves open a number of potential outcomes at any given property, challenging the agency's permit requirement in the abstract is premature (or "unripe"). Under the CWA, any person discharging a pollutant from a point source into navigable waters must obtain a permit. The rule clarifies which navigable waters trigger the permit requirement. As stated by a unanimous Supreme Court in *Riverside Bayview Homes*, *supra*, "A requirement that a person obtain a permit before engaging in a certain use of his or her property does not itself 'take' the property in any sense: after all, the very existence of a permit system implies that permission may be granted, leaving the landowner free to use the property as desired. Moreover, even if the permit is denied, there may be other viable uses available to the owner. Only when a permit is denied and the effect of the denial is to prevent 'economically viable' use of the land in question can it be said that a taking has occurred." 474 U.S. at 127, 106 S.Ct. at 459, 88 L.Ed.2d 419 (1985).

Some commenters also argued that the proposed rule violates Executive Order 12630, takings assessments. EPA has fully complied with E.O. 12630. Moreover, by its terms, E.O. 12630 creates no right enforceable at law by a party against the agency. The Order is intended "only to improve the internal management of the Executive Branch…."

Some commenters asserted that the rule violates the Tenth Amendment of the U.S. Constitution. This rule does not violate the Tenth Amendment. Under the Tenth Amendment, the Supreme Court has stated that for a federal activity to be limited under the commerce clause, the "federal statute at issue must regulate 'the States as States.'" *Garcia v. San Antonio Metropolitan Transit Authority et al*., 469 U.S. 528, 537 (1985), citing *Hodel v. Virginia Surface Mining & Recla. Assn*., 452 U.S. 264 (1981). In *New York v. United States*, and specifically citing the CWA as an example, the Court held that '[t]the Constitution enables the Federal Government to pre-empt state regulation contrary to federal interests, and it permits the Federal Government to hold out incentives to the States as a means of encouraging them to adopt suggested regulatory schemes." However, "[t]he federal government may not compel the States to enact or administer a federal regulatory program." *New York v. United States*, 505 U.S. 144, 158 (1992). The Court continued:

> Where Congress has the authority to regulate private activity under the Commerce Clause, we have recognized Congress' power to offer States the choice of regulating that activity according to federal standards or having state law pre-empted by federal regulation. . . . These include the Clean Water Act, 86 Stat. 816, as amended, 33 U.S.C. § 1251 *et seq.*, see *Arkansas v. Oklahoma*, 503 U.S. 91, 101, 112 S.Ct. 1046, 1054, 117 L.Ed.2d 239 (1992) (Clean Water Act "anticipates a partnership between the States and

> the Federal Government, animated by a shared objective"); . . ." *Id.* at 166-167. See also, *Printz v. United States*, 521 U.S. 898, 925 (1997).

Here, neither the rule nor the Act compel action on the part of the states to implement the regulatory definition promulgated in the rule. Implementation programs such as permitting programs under 402 or 404 of the Act, all of which are unchanged by and outside the scope of the rule, will continue to be conducted by both the states and the agencies. Under Section 510 of the CWA, the states may have other definitions than the federal definition subject to the limitations in Section 510. While this rule does not compel the states to conform their definition to the federal definition, the agencies recognize that the existence of a federal definition may persuade the state to implement the federal definition, but this does not violate the Tenth Amendment. Under *New York*, "there are a variety of methods, short of outright coercion, by which Congress may urge a State to adopt a legislative program consistent with federal interests. *New York* at 144. After citing two methods of persuasion, pre-emption or holding out incentives to the States as a means of encouraging them to adopt suggested regulatory approaches, the Court stated, "By either of these two methods, as by any other permissible method of encouraging a State to conform to federal policy choices, the residents of the State retain the ultimate decision as to whether or not the State will comply." *New York* at 145. In the case of the Clean Water Rule, the existence of a federal definition may persuade some states to adopt the same regulatory definition, but this is state action under state law; and therefore, the rule is consistent with the Tenth Amendment. Because this rule does not regulate the "States as States," *See e.g., Garcia* at 537, or "compel the States to enact or administer a federal regulatory program" *see New York* at 158, it does not violate the Tenth Amendment.

II. Significant Nexus Analysis

With the rule, the agencies interpret the scope of the "waters of the United States" for the CWA in light of the goals, objectives, and policies of the statute, the Supreme Court caselaw, the relevant and currently available science, and the agencies' technical expertise and experience. The key to the agencies' interpretation of the CWA is the significant nexus standard, as established and refined in Supreme Court opinions: waters are "waters of the United States" if they, either alone or in combination with similarly situated waters in the region, significantly affect the chemical, physical, and biological integrity of traditional navigable waters, interstate waters or the territorial seas. The agencies interpret specific aspects of the significant nexus standard in light of the science, the law, and the agencies' technical expertise: the scope of the region to assess when making a significant nexus determination; the waters to evaluate in combination with each other; and the functions provided by waters and strength of those functions, and when such waters significantly affect the chemical, physical, or biological integrity of the downstream traditional navigable waters, interstate waters, or the territorial seas.

In the rule, the agencies determine that tributaries, as defined ("covered tributaries"), and adjacent waters, as defined ("covered adjacent waters"), have a significant nexus to downstream traditional navigable waters, interstate waters, and the territorial seas and therefore are "waters of the United States." In the rule, the agencies also establish that defined sets of additional waters may be determined to have a significant nexus on a case-specific basis: (1) five types of waters that the agencies conclude are "similarly situated" and therefore must be analyzed "in combination" in the watershed that drains to the nearest traditional navigable water, interstate water, or the territorial seas when making a case-specific significant nexus analysis; and (2) waters within the 100-year floodplain of traditional navigable waters, interstate waters, or the territorial seas and waters within 4,000 feet of the high tide line or ordinary high water mark of traditional navigable waters, interstate waters, the territorial seas, impoundments or covered tributaries. The rule establishes a definition of significant nexus, based on Supreme Court opinions and the science, to use when making these case-specific determinations.

Significant nexus is not purely a scientific determination. Further, the opinions of the Supreme Court have noted that as the agencies charged with interpreting the statute, EPA and the Corps must develop the outer bounds of the scope of the CWA, while science does not provide bright lines with respect to where "water ends" for purposes of the CWA. Therefore, the agencies' interpretation of the CWA is informed by the Science Report and the review and comments of the SAB, but not dictated by them.

With this context, this section of the Technical Support Document addresses in more detail the relevant scientific conclusions reached by analysis of existing scientific literature and the agencies' significant nexus determinations underpinning the rule. Specific sections of the Technical Support Document below address in more detail the precise definitions of the covered waters promulgated by the agencies to provide the bright lines identifying "waters of the United States."

A. Science Report and Scientific Review

i. Science Report: Synthesis of Peer-Reviewed Scientific Literature

In preparation for this rule, more than 1,200 peer-reviewed scientific papers and other data and information including jurisdictional determinations, relevant agency guidance and implementation manuals, and federal and state reports that address connectivity of aquatic resources and effects on downstream waters were reviewed and considered. EPA's Office of Research and Development (ORD) prepared a peer-reviewed synthesis of published peer-reviewed scientific literature discussing the nature of connectivity and effects of tributaries and wetlands on downstream waters. U.S. Environmental Protection Agency 2015, hereinafter, "Science Report." The Science Report was directly considered in the development of this rule, as was the peer review of the Science Report led by EPA's Scientific Advisory Board (SAB), and is available at http://cfpub.epa.gov/ncea/cfm/recordisplay.cfm?deid=296414. The SAB peer review is discussed in detail in section II. The Science Report also underwent an earlier external independent peer review, and the results of both peer reviews are available in the docket for the rule. Prior to the earlier peer review, the Science Report also underwent a peer consultation.

The Science Report summarizes and assesses relevant and currently available scientific literature that is part of the administrative record for this rule. In addition, the agencies considered other sources of scientific information and literature, particularly for topics that were not addressed in the Science Report. This includes peer reviewed literature, federal and state government reports, and other relevant information. As anticipated, additional data and information became available during the rulemaking process, including that provided during the public comment process, and by additional research, studies, and investigations that took place before the rulemaking process concluded. The agencies have reviewed the entirety of the completed administrative record, including the final Science Report reflecting SAB review, and have made adjustments to the rule, as further described in the preamble. Section II.a. of this document provides the conclusions of the Science Report. Sections VI through IX provide additional detail of the scientific literature and the agencies' reasoning in support of the rule.

The Science Report reviews and synthesizes the peer-reviewed scientific literature on the connectivity or isolation of streams and wetlands relative to large water bodies such as rivers, lakes, estuaries, and oceans. The purpose of the review and synthesis is to summarize current scientific understanding about the connectivity and mechanisms by which streams and wetlands, singly or in aggregate, affect the physical, chemical, and biological integrity of downstream waters. Specific types of connections considered in the Science Report include transport of physical materials and chemicals such as water, wood, and sediment, nutrients, pesticides, and mercury; movement of organisms or their seeds or eggs; and hydrologic and biogeochemical interactions occurring in surface and groundwater flows, including hyporheic zones and alluvial aquifers. A hyporheic zone is the area next to and beneath a stream or river in which hyporheic flow (water from a stream or river channel that enters subsurface materials of the stream bed and bank and then returns to the stream or river) occurs. Science Report at A-6. An alluvial aquifer is an aquifer with geologic materials deposited by a stream or river (alluvium) that retains a hydraulic connection with the depositing stream. *Id.* at A-1.

The Science Report consists of six chapters. Chapter 1 outlines the purpose, scientific context, and approach of the report. Chapter 2 describes the components of a river system and watershed; the types of physical, chemical, and biological connections that link those components; the factors that influence connectivity at various temporal and spatial scales; and methods for quantifying connectivity. Chapter 3 reviews literature on connectivity in stream networks in terms of physical, chemical, and biological connections and their resulting effects on downstream waters. Chapter 4 reviews literature on the connectivity and effects of nontidal wetlands and certain open waters on downstream waters. Chapter 5 applies concepts and evidence from previous chapters to six case studies from published literature on Carolina and Delmarva bays, oxbow lakes, prairie potholes, prairie streams, southwestern streams, and vernal pools. Chapter 6 summarizes key findings and conclusions, identifies data gaps, and briefly discusses research approaches that could fill those gaps. A glossary of scientific terms used in the report and detailed case studies of selected systems (summarized in Chapter 5) are included in Appendix A and Appendix B, respectively.

1. Summary of Major Conclusions

Based on the review and synthesis of more than 1,200 publications from the peer reviewed scientific literature, the evidence supports five major conclusions. Citations have been omitted from the text to improve readability; please refer to individual chapters of the Science Report for supporting publications and additional information.

Conclusion 1: Streams

The scientific literature unequivocally demonstrates that streams, individually or cumulatively, exert a strong influence on the integrity of downstream waters. All tributary streams, including perennial, intermittent, and ephemeral streams, are physically, chemically, and biologically connected to downstream rivers via channels and associated alluvial deposits where water and other materials are concentrated, mixed, transformed, and transported. Streams are the dominant source of water in most rivers, and the majority of tributaries are perennial, intermittent, or ephemeral headwater streams. Headwater streams also convey water into local storage compartments such as ponds, shallow aquifers, or stream banks, and into regional and alluvial aquifers; these local storage compartments are important sources of water for maintaining baseflow in rivers. In addition to water, streams transport sediment, wood, organic matter, nutrients, chemical contaminants, and many of the organisms found in rivers. The literature provides robust evidence that streams are biologically connected to downstream waters by the dispersal and migration of aquatic and semiaquatic organisms, including fish, amphibians, plants, microorganisms, and invertebrates, that use both upstream and downstream habitats during one or more stages of their life cycles, or provide food resources to downstream communities. In addition to material transport and biological connectivity, ephemeral, intermittent, and perennial flows influence fundamental biogeochemical processes by connecting channels and shallow ground water with other landscape elements. Physical, chemical, and biological connections between streams and downstream waters interact via integrative processes such as nutrient spiraling, in which stream communities assimilate and chemically transform large quantities of nitrogen and other nutrients that otherwise would be transported directly downstream, increasing nutrient loads and associated impairments due to excess nutrients in downstream waters.

Conclusion 2: Riparian/Floodplain Wetlands and Open Waters

The literature clearly shows that wetlands and open waters in riparian areas and floodplains are physically, chemically, and biologically integrated with rivers via functions that improve downstream water quality, including the temporary storage and deposition of channel-forming sediment and woody debris, temporary storage of local ground water that supports baseflow in rivers, and transformation and transport of stored organic matter. Riparian/floodplain wetlands and open waters improve water quality through the assimilation, transformation, or sequestration of pollutants, including excess nutrients and chemical contaminants such as pesticides and metals, that can degrade downstream water integrity. In addition to providing effective buffers to protect downstream waters from point source and nonpoint source pollution, these systems form integral components of river food webs, providing nursery habitat for breeding fish and amphibians, colonization opportunities for stream invertebrates, and maturation habitat for stream insects. Lateral expansion and contraction of the river in its floodplain result in an exchange of organic matter and organisms, including fish populations that are adapted to use floodplain habitats for feeding and spawning during high water, that are critical to river ecosystem function. Riparian/floodplain wetlands and open waters also affect the integrity of downstream waters by subsequently releasing (desynchronizing) floodwaters and retaining large volumes of stormwater, sediment, and contaminants in runoff that could otherwise negatively affect the condition or function of downstream waters.

Wetlands and open waters in non-floodplain landscape settings (hereafter called "non-floodplain wetlands") provide numerous functions that benefit downstream water integrity. These functions include storage of floodwater; recharge of ground water that sustains river baseflow; retention and transformation of nutrients, metals, and pesticides; export of organisms or reproductive propagules (*e.g.*, seeds, eggs, spores) to downstream waters; and habitats needed for stream species. This diverse group of wetlands (*e.g*., many prairie potholes, vernal pools, playa lakes) can be connected to downstream waters through surface-water, shallow subsurface-water, and groundwater flows and through biological and chemical connections.

In general, connectivity of non-floodplain wetlands occurs along a gradient (Conclusion 4), and can be described in terms of the frequency, duration, magnitude, timing, and rate of change of water, material, and biotic fluxes to downstream waters. These descriptors are influenced by climate, geology, and terrain, which interact with factors such as the magnitudes of the various functions within wetlands (e.g., amount of water storage or carbon export) and their proximity to downstream waters to determine where wetlands occur along the connectivity gradient. At one end of this gradient, the functions of non-floodplain wetlands clearly affect the condition of downstream waters if a visible (e.g., channelized) surface-water or a regular shallow subsurface-water connection to the river network is present. For non-floodplain wetlands lacking a channelized surface or regular shallow subsurface connection (i.e., those at intermediate points along the gradient of connectivity), generalizations about their specific effects on downstream waters from the available literature are difficult because information on both function and connectivity is needed. Although there is ample evidence that non-floodplain wetlands provide hydrologic, chemical, and biological functions that affect material fluxes, to date, few scientific studies explicitly addressing connections between non-floodplain wetlands and river networks have been published in the peer-reviewed literature. Even fewer publications specifically focus on the frequency, duration, magnitude, timing, or rate of change of these connections. In addition, although areas that are closer to rivers and streams have a higher probability of being connected than areas farther away when conditions governing the type and quantity of flows—including soil infiltration rate, wetland storage capacity, hydraulic gradient, etc.—are similar, information to determine if this similarity holds is generally not provided in the studies we reviewed. Thus, current science does not support evaluations of the degree of connectivity for specific groups or classes of wetlands (e.g., prairie potholes or vernal pools). Evaluations of individual wetlands or groups of wetlands, however, could be possible through case-by-case analysis.

Some effects of non-floodplain wetlands on downstream waters are due to their isolation, rather than their connectivity. Wetland “sink” functions that trap materials and prevent their export to downstream waters (e.g., sediment and entrained pollutant removal, water storage) result because of the wetland’s ability to isolate material fluxes. To establish that such functions influence downstream waters, we also need to know that the wetland intercepts materials that otherwise would reach the downstream water. The literature reviewed does provide limited examples of direct effects of wetland isolation on downstream waters, but not for classes of wetlands (e.g., vernal pools). Nevertheless, the literature reviewed supports the conclusion that sink functions of non-floodplain wetlands, which result in part from their relative isolation, will affect a downstream water when these wetlands are situated between the downstream water and known point or nonpoint sources of pollution, and thus intersect flowpaths between the pollutant source and downstream waters.

Conclusion 4: Degrees and Determinants of Connectivity

Watersheds are integrated at multiple spatial and temporal scales by flows of surface water and ground water, transport and transformation of physical and chemical materials, and movements of organisms. Although all parts of a watershed are connected to some degree—by the hydrologic cycle or dispersal of organisms, for example—the degree and downstream effects of those connections vary spatially and temporally, and are determined by characteristics of the physical, chemical, and biological environments and by human activities.

Stream and wetland connections have particularly important consequences for downstream water integrity. Most of the materials—broadly defined as any physical, chemical, or biological entity—in rivers, for example, originate from aquatic ecosystems located upstream or elsewhere in the watershed. Longitudinal flows through ephemeral, intermittent, and perennial stream channels are much more efficient for transport of water, materials, and organisms than diffuse overland flows, and areas that concentrate water provide mechanisms for the storage and transformation, as well as transport, of materials.

Connectivity of streams and wetlands to downstream waters occurs along a continuum that can be described in terms of the frequency, duration, magnitude, timing, and rate of change of water, material, and biotic fluxes to downstream waters. These terms, which are referred to collectively as connectivity descriptors, characterize the range over which streams and wetlands vary and shift along the connectivity gradient in response to changes in natural and anthropogenic factors and, when considered in a watershed context, can be used to predict probable effects of different degrees of connectivity over time. The evidence unequivocally demonstrates that the stream channels and riparian/floodplain wetlands or open waters that together form river networks are clearly connected to downstream waters in ways that profoundly influence downstream water integrity. The connectivity and effects of non-floodplain wetlands and open waters are more variable and thus more difficult to address solely from evidence available in peer-reviewed studies.

Variations in the degree of connectivity influence the range of functions provided by streams and wetlands, and are critical to the integrity and sustainability of downstream waters. Connections with low values of one or more descriptors (*e.g.*, low-frequency, low-duration streamflows caused by flash floods) can have important downstream effects when considered in the context of other descriptors (*e.g.*, large magnitude of water transfer). At the other end of the frequency range, high-frequency, low-magnitude vertical (surface-subsurface) and lateral flows contribute to aquatic biogeochemical processes, including nutrient and contaminant transformation and organic matter accumulation. The timing of an event can alter both connectivity and the magnitude of its downstream effect. For example, when soils become saturated by previous rainfall events, even low or moderate rainfall can cause streams or wetlands to overflow, transporting water and materials to downstream waters. Fish that use nonperennial or perennial headwater stream habitats to spawn or rear young, and invertebrates that move into seasonally inundated floodplain wetlands prior to emergence, have life cycles that are synchronized with the timing of flows, temperature thresholds, and food resource availability in those habitats.

Conclusion 5: Cumulative Effects

The incremental effects of individual streams and wetlands are cumulative across entire watersheds and therefore must be evaluated in context with other streams and wetlands. Downstream waters are the time-integrated result of all waters contributing to them. For example, the amount of water or biomass contributed by a specific ephemeral stream in a given year might be small, but the aggregate contribution of that stream over multiple years, or by all ephemeral streams draining that watershed in a given year or over multiple years, can have substantial consequences on the integrity of the downstream waters. Similarly, the downstream effect of a single event, such as pollutant discharge into a single stream or wetland, might be negligible but the cumulative effect of multiple discharges could degrade the integrity of downstream waters.

In addition, when considering the effect of an individual stream or wetland, all contributions and functions of that stream or wetland should be evaluated cumulatively. For example, the same stream transports water, removes excess nutrients, mitigates flooding, and provides refuge for fish when conditions downstream are unfavorable; if any of these functions is ignored, the overall effect of that stream would be underestimated.

2. Discussion of Major Conclusions

The Science Report synthesizes a large body of scientific literature on the connectivity and mechanisms by which streams, wetlands, and open waters, singly or in aggregate, affect the physical, chemical, and biological integrity of downstream waters. The major conclusions reflect the strength of evidence currently available in the peer-reviewed scientific literature for assessing the connectivity and downstream effects of water bodies identified in Chapter 1 of the Science Report.

The conclusions of the Science Report were corroborated by two independent peer reviews by scientists identified in the front matter of the Science Report.

The term connectivity is defined in the Science Report as the degree to which components of a watershed are joined and interact by transport mechanisms that function across multiple spatial and temporal scales. Connectivity is determined by the characteristics of both the physical landscape and the biota of the specific system. ORD's review found strong evidence supporting the central roles of the physical, chemical, and biological connectivity of streams, wetlands, and open waters—encompassing varying degrees of both connection and isolation—in maintaining the structure and function of downstream waters, including rivers, lakes, estuaries, and oceans. ORD's review also found strong evidence demonstrating the various mechanisms by which material and biological linkages from streams, wetlands, and open waters affect downstream waters, classified here into five functional categories (source, sink, refuge, lag, and transformation; discussed below), and modify the timing of transport and the quantity and quality of resources available to downstream ecosystems and communities. Thus, the currently available literature provided a large body of evidence for assessing the types of connections and functions by which streams and wetlands produce the range of observed effects on the integrity of downstream waters.

ORD identified five categories of functions by which streams, wetlands, and open waters influence the timing, quantity, and quality of resources available to downstream waters:

- Source: the net export of materials, such as water and food resources;
- Sink: the net removal or storage of materials, such as sediment and contaminants;
- Refuge: the protection of materials, especially organisms;

- Transformation: the transformation of materials, especially nutrients and chemical contaminants, into different physical or chemical forms; and
- Lag: the delayed or regulated release of materials, such as stormwater.

These functions are not mutually exclusive; for example, the same stream or wetland can be both a source of organic matter and a sink for nitrogen. The presence or absence of these functions, which depend on the biota, hydrology, and environmental conditions in a watershed, can change over time; for example, the same wetland can attenuate runoff during storm events and provide groundwater recharge following storms. Further, some functions work in conjunction with others; a lag function can include transformation of materials prior to their delayed release. Finally, effects on downstream waters should consider both actual function and potential function. A potential function represents the capacity of an ecosystem to perform that function under suitable conditions. For example, a wetland with high capacity for denitrification is a potential sink for nitrogen, a nutrient that becomes a contaminant when present in excessive concentrations. In the absence of nitrogen, this capacity represents the wetland's potential function. If nitrogen enters the wetland (e.g., from fertilizer in runoff), it is removed from the water; this removal represents the wetland's actual function. Both potential and actual functions play critical roles in protecting and restoring downstream waters as environmental conditions change.

The evidence unequivocally demonstrates that the stream channels and riparian/floodplain wetlands or open waters that together form river networks are clearly connected to downstream waters in ways that profoundly influence downstream water integrity. The body of literature documenting connectivity and downstream effects was most abundant for perennial and intermittent streams, and for riparian/floodplain wetlands. Although less abundant, the evidence for connectivity and downstream effects of ephemeral streams was strong and compelling, particularly in context with the large body of evidence supporting the physical connectivity and cumulative effects of channelized flows that form and maintain stream networks.

As stated in Conclusion 3, the connectivity and effects of wetlands and open waters that lack visible surface connections to other water bodies are more difficult to address solely from evidence available in the peer-reviewed literature. The limited evidence currently available shows that these systems have important hydrologic, water-quality, and habitat functions that can affect downstream waters where connections to them exist; the literature also provides limited examples of direct effects of non-floodplain wetland isolation on downstream water integrity. Currently available peer-reviewed literature, however, does not identify which types or classes of non-floodplain wetlands have or lack the types of connections needed to convey the effects on downstream waters of functions, materials, or biota provided by those wetlands.

3. Key Findings for Major Conclusions

This section summarizes key findings for each of the five major conclusions, above and in Chapter 6 of the Science Report. Citations have been omitted from the text to improve readability; please refer to individual chapters of the Science Report for supporting publications and additional information.

Conclusion 1, Streams: Key Findings

- Streams are hydrologically connected to downstream waters via channels that convey surface and subsurface water either year-round (*i.e.*, perennial flow), weekly to seasonally (*i.e.*, intermittent flow), or only in direct response to precipitation *(i.e.*, ephemeral flow). Streams are the dominant source of water in most rivers, and the majority of tributaries are perennial, intermittent, or ephemeral headwater streams. For example, headwater streams, which are the smallest channels where streamflows begin, are the cumulative source of approximately 60% of the total mean annual flow to all northeastern U.S. streams and rivers.

- In addition to downstream transport, headwaters convey water into local storage compartments such as ponds, shallow aquifers, or stream banks, and into regional and alluvial aquifers. These local storage compartments are important sources of water for maintaining baseflow in rivers. Streamflow typically depends on the delayed (i.e., lagged) release of shallow ground water from local storage, especially during dry periods and in areas with shallow groundwater tables and pervious subsurfaces. For example, in the southwestern United States, short-term shallow groundwater storage in alluvial floodplain aquifers, with gradual release into stream channels, is a major source of annual flow in rivers.
- Infrequent, high-magnitude events are especially important for transmitting materials from headwater streams in most river networks. For example, headwater streams, including ephemeral and intermittent streams, shape river channels by accumulating and gradually or episodically releasing stored materials such as sediment and large woody debris. These materials help structure stream and river channels by slowing the flow of water through channels and providing substrate and habitat for aquatic organisms.
- There is strong evidence that headwater streams function as nitrogen sources (via export) and sinks (via uptake and transformation) for river networks. For example, one study estimated that rapid nutrient cycling in small streams with no agricultural or urban impacts removed 20−40% of the nitrogen that otherwise would be delivered to

downstream waters. Nutrients are necessary to support aquatic life, but excess nutrients lead to eutrophication and hypoxia, in which over-enrichment causes dissolved oxygen concentrations to fall below the level necessary to sustain most aquatic animal life in the stream and streambed. Thus, the influence of streams on nutrient loads can have significant repercussions for hypoxia in downstream waters.

- Headwaters provide habitat that is critical for completion of one or more life-cycle stages of many aquatic and semiaquatic species capable of moving throughout river networks. Evidence is strong that headwaters provide habitat for complex life-cycle completion; refuge from predators, competitors, parasites, or adverse physical conditions in rivers (e.g., temperature or flow extremes, low dissolved oxygen, high sediment); and reservoirs of genetic- and species-level diversity. Use of headwater streams as habitat is especially critical for the many species that migrate between small streams and marine environments during their life cycles (e.g., Pacific and Atlantic salmon, American eels, certain lamprey species). The presence of these species within river networks provides robust evidence of biological connections between headwaters and larger rivers; because these organisms also transport nutrients and other materials as they migrate, their presence also provides evidence of biologically mediated chemical connections. In prairie streams, many fishes swim upstream into tributaries to release eggs, which develop as they are transported downstream.
- Human alterations affect the frequency, duration, magnitude, timing, and rate of change of connections between headwater streams, including ephemeral and intermittent streams, and downstream waters. Human activities and built structures (e.g., channelization, dams, groundwater withdrawals) can either enhance or fragment longitudinal connections

between headwater streams and downstream waters, while also constraining lateral and vertical exchanges and tightly controlling the temporal dimension of connectivity. In many cases, research on human alterations has enhanced our understanding of the headwater stream-downstream water connections and their consequences. Recognition of these connections and effects has encouraged the development of more sustainable practices and infrastructure to reestablish and manage connections, and ultimately to protect and restore the integrity of downstream waters.

Conclusion 2, Riparian/Floodplain Wetlands and Open Waters: Key Findings

- Riparian areas and floodplains connect upland and aquatic environments through both surface and subsurface hydrologic flowpaths. These areas are therefore uniquely situated in watersheds to receive and process waters that pass over densely vegetated areas and through subsurface zones before the waters reach streams and rivers. When pollutants reach a riparian or floodplain wetland, they can be sequestered in sediments, assimilated into wetland plants and animals, transformed into less harmful or mobile forms or compounds, or lost to the atmosphere. A wetland's potential for biogeochemical transformations (*e.g.*, denitrification) that can improve downstream water quality is influenced by local factors, including anoxic conditions and slow organic matter decomposition, shallow water tables, wetland plant communities, permeable soils, and complex topography.
- Riparian/floodplain wetlands can reduce flood peaks by storing and desynchronizing floodwaters. They can also maintain river baseflows by recharging alluvial aquifers. Many studies have documented the ability of riparian/floodplain wetlands to reduce flood

pulses by storing excess water from streams and rivers. One review of wetland studies reported that riparian wetlands reduced or delayed floods in 23 of 28 studies. For example, peak discharges between upstream and downstream gaging stations on the Cache River in Arkansas were reduced 10–20% primarily due to floodplain water storage.

- Riparian areas and floodplains store large amounts of sediment and organic matter from upstream and from upland areas. For example, riparian areas have been shown to remove 80–90% of sediments leaving agricultural fields in North Carolina.
- Ecosystem function within a river system is driven in part by biological connectivity that links diverse biological communities with the river system. Movements of organisms that connect aquatic habitats and their populations, even across different watersheds, are important for the survival of individuals, populations, and species, and for the functioning of the river ecosystem. For example, lateral expansion and contraction of the river in its floodplain result in an exchange of matter and organisms, including fish populations that are adapted to use floodplain habitats for feeding and spawning during high water. Wetland and aquatic plants in floodplains can become important seed sources for the river network, especially if catastrophic flooding scours vegetation and seed banks in other parts of the channel. Many invertebrates exploit temporary hydrologic connections between rivers and floodplain wetland habitats, moving into these wetlands to feed, reproduce, or avoid harsh environmental conditions and then returning to the river network. Amphibians and aquatic reptiles commonly use both streams and riparian/floodplain wetlands to hunt, forage, overwinter, rest, or hide from predators. Birds can spatially integrate the watershed landscape through biological connectivity.

Conclusion 3, Non-floodplain Wetlands and Open Waters: Key Findings

- Water storage by wetlands well outside of riparian or floodplain areas can affect streamflow. Hydrologic models of prairie potholes in the Starkweather Coulee subbasin (North Dakota) that drains to Devils Lake indicate that increasing the volume of prairie pothole storage across the subbasin by approximately 60% caused simulated total annual streamflow to decrease 50% during a series of dry years and 20% during wet years. Similar simulation studies of watersheds that feed the Red River of the North in North Dakota and Minnesota demonstrated qualitatively comparable results, suggesting that the ability of prairie potholes to modulate streamflow could be widespread across eastern portions of the prairie pothole region. This work also indicates that reducing water storage capacity of wetlands by connecting formerly isolated prairie potholes through ditching or drainage to the Devils Lake and Red River basins could increase stormflow and contribute to downstream flooding. In many agricultural areas already crisscrossed by extensive drainage systems, total streamflow and baseflow are increased by directly connecting prairie potholes to stream networks. The impacts of changing streamflow are numerous, including altered flow regime, stream geomorphology, habitat, and ecology. The presence or absence of an effect of prairie pothole water storage on streamflow depends on many factors, including patterns of precipitation, topography, and degree of human alteration. For example, in parts of the prairie pothole region with low precipitation, low stream density, and little human alteration, hydrologic connectivity between prairie potholes and streams or rivers is likely to be low.

- Non-floodplain wetlands act as sinks and transformers for various pollutants, especially nutrients, which at excess levels can adversely impact human and ecosystem health and pose a serious pollution problem in the United States. In one study, sewage wastewaters were applied to forested wetlands in Florida for 4.5 years; more than 95% of the phosphorus, nitrate, ammonium, and total nitrogen were removed by the wetlands during the study period, and 66−86% of the nitrate removed was attributed to the process of denitrification (chemical and biological processes that remove nitrogen from water). In another study, sizeable phosphorus retention occurred in marshes that comprised only 7% of the lower Lake Okeechobee basin area in Florida. A non-floodplain bog in Massachusetts was reported to sequester nearly 80% of nitrogen inputs from various sources, including atmospheric deposition, and prairie pothole wetlands in the upper Midwest were found to remove >80% of the nitrate load via denitrification. A large prairie marsh was found to remove 86% of nitrate, 78% of ammonium, and 20% of phosphate through assimilation and sedimentation, sorption, and other mechanisms. Together, these and other studies indicate that onsite nutrient removal by non-floodplain wetlands is substantial and geographically widespread. The effects of this removal on rivers are generally not reported in the literature.
- Non-floodplain wetlands provide unique and important habitats for many species, both common and rare. Some of these species require multiple types of waters to complete their full life cycles, including downstream waters. Abundant or highly mobile species play important roles in transferring energy and materials between non-floodplain wetlands and downstream waters.

- Biological connections are likely to occur between most non-floodplain wetlands and downstream waters through either direct or stepping stone movement of amphibians, invertebrates, reptiles, mammals, and seeds of aquatic plants, including colonization by invasive species. Many species in those groups that use both stream and wetland habitats are capable of dispersal distances equal to or greater than distances between many wetlands and river networks. Migratory birds can be an important vector of long-distance dispersal of plants and invertebrates between non-floodplain wetlands and the river network, although their influence has not been quantified. Whether those connections are of sufficient magnitude to impact downstream waters will either require estimation of the magnitude of material fluxes or evidence that these movements of organisms are required for the survival and persistence of biota that contribute to the integrity of downstream waters.
- Spatial proximity is one important determinant of the magnitude, frequency and duration of connections between wetlands and streams that will ultimately influence the fluxes of water, materials and biota between wetlands and downstream waters. However, proximity alone is not sufficient to determine connectivity, due to local variation in factors such as slope and permeability.
- The cumulative influence of many individual wetlands within watersheds can strongly affect the spatial scale, magnitude, frequency, and duration of hydrologic, biological and chemical fluxes or transfers of water and materials to downstream waters. Because of their aggregated influence, any evaluation of changes to individual wetlands should be considered in the context of past and predicted changes (*e.g.*, from climate change) to other wetlands within the same watershed.

- Non-floodplain wetlands can be hydrologically connected directly to river networks through natural or constructed channels, nonchannelized surface flows, or subsurface flows, the latter of which can travel long distances to affect downstream waters. A wetland surrounded by uplands is defined as "geographically isolated." Our review found that, in some cases, wetland types such as vernal pools and coastal depressional wetlands are collectively—and incorrectly—referred to as geographically isolated. Technically, the term "geographically isolated" should be applied only to the particular wetlands within a type or class that are completely surrounded by uplands. Furthermore, "geographic isolation" should not be confused with functional isolation, because geographically isolated wetlands can still have hydrologic, chemical, and biological connections to downstream waters.
- Non-floodplain wetlands occur along a gradient of hydrologic connectivity-isolation with respect to river networks, lakes, or marine/estuarine water bodies. This gradient includes, for example, wetlands that serve as origins for stream channels that have permanent surface-water connections to the river network; wetlands with outlets to stream channels that discharge to deep groundwater aquifers; geographically isolated wetlands that have local groundwater or occasional surface-water connections to downstream waters; and geographically isolated wetlands that have minimal hydrologic connection to other water bodies (but which could include surface and subsurface connections to other wetlands). This gradient can exist among wetlands of the same type or in the same geographic region.
- Caution should be used in interpreting connectivity for wetlands that have been designated as "geographically isolated" because (1) the term can be applied broadly to a

heterogeneous group of wetlands, which can include wetlands that are not actually geographically isolated; (2) wetlands with permanent channels could be miscategorized as geographically isolated if the designation is based on maps or imagery with inadequate spatial resolution, obscured views, etc.; and (3) wetland complexes could have connections to downstream waters through stream channels even if individual wetlands within the complex are geographically isolated. For example, a recent study examined hydrologic connectivity in a complex of wetlands on the Texas Coastal Plain. The wetlands in this complex have been considered to be a type of geographically isolated wetland; however, collectively they are connected both geographically and hydrologically to downstream waters in the area: During an almost 4-year study period, nearly 20% of the precipitation that fell on the wetland complex flowed out through an intermittent stream into downstream waters. Thus, wetland complexes could have connections to downstream waters through stream channels even when the individual wetland components are geographically isolated.

Conclusion 4, Degrees and Determinants of Connectivity: Key Findings

- The surface-water and groundwater flowpaths (hereafter, hydrologic flowpaths), along which water and materials are transported and transformed, determine variations in the degree of physical and chemical connectivity. These flowpaths are controlled primarily by variations in climate, geology, and terrain within and among watersheds and over time. Climate, geology, and terrain are reflected locally in factors such as rainfall and snowfall intensity, soil infiltration rates, and the direction of groundwater flows. These local factors interact with the landscape positions of streams and wetlands relative to downstream waters, and with functions (such as the removal or transformation of pollutants) performed by those streams and wetlands to determine connectivity gradients.

- Gradients of biological connectivity (i.e., the active or passive movements of organisms through water or air and over land that connect populations) are determined primarily by species assemblages, and by features of the landscape (*e.g.*, climate, geology, terrain) that facilitate or impede the movement of organisms. The temporal and spatial scales at which biological pathways connect aquatic habitats depend on characteristics of both the landscape and species, and overland transport or movement can occur across watershed boundaries. Dispersal is essential for population persistence, maintenance of genetic diversity, and evolution of aquatic species. Consequently, dispersal strategies reflect aquatic species' responses and adaptations to biotic and abiotic environments, including spatial and temporal variation in resource availability and quality. Species' traits and behaviors encompass species-environment relationships over time, and provide an ecological and evolutionary context for evaluating biological connectivity in a particular watershed or group of watersheds.
- Pathways for chemical transport and transformation largely follow hydrologic flowpaths, but sometimes follow biological pathways (*e.g.*, nutrient transport from wetlands to coastal waters by migrating waterfowl, upstream transport of marine-derived nutrients by spawning of anadromous fish, uptake and removal of nutrients by emerging stream insects).
- Human activities alter naturally occurring gradients of physical, chemical, and biological connectivity by modifying the frequency, duration, magnitude, timing, and rate of change of fluxes, exchanges, and transformations. For example, connectivity can be reduced by

dams, levees, culverts, water withdrawals, and habitat destruction, and can be increased by effluent discharges, channelization, drainage ditches and tiles, and impervious surfaces.

Conclusion 5, Cumulative Effects: Key Findings

- Structurally and functionally, stream-channel networks and the watersheds they drain are fundamentally cumulative in how they are formed and maintained. Excess water from precipitation that is not evaporated, taken up by organisms, or stored in soils and geologic layers moves downgradient by gravity as overland flow or through channels carrying sediment, chemical constituents, and organisms. These channels concentrate surface-water flows and are more efficient than overland (i.e., diffuse) flows in transporting water and materials, and are reinforced over time by recurrent flows.
- Connectivity between streams and rivers provides opportunities for materials, including nutrients and chemical contaminants, to be transformed chemically as they are transported downstream. Although highly efficient at the transport of water and other physical materials, streams are dynamic ecosystems with permeable beds and banks that interact with other ecosystems above and below the surface. The exchange of materials between surface and subsurface areas involves a series of complex physical, chemical, and biological alterations that occur as materials move through different parts of the river system. The amount and quality of such materials that eventually reach a river are determined by the aggregate effect of these sequential alterations that begin at the source waters, which can be at some distance from the river. The opportunity for transformation of material (*e.g.*, biological uptake, assimilation, or beneficial transformation) in

intervening stream reaches increases with distance to the river. Nutrient spiraling, the process by which nutrients entering headwater streams are transformed by various aquatic organisms and chemical reactions as they are transported downstream, is one example of an instream alteration that exhibits significant beneficial effects on downstream waters. Nutrients (in their inorganic form) that enter a headwater stream (*e.g.*, via overland flow) are first removed from the water column by streambed algal and microbial populations. Fish or insects feeding on algae and microbes take up some of those nutrients, which are subsequently released back into the stream via excretion and decomposition (i.e., in their organic form), and the cycle is repeated. In each phase of the cycling process—from dissolved inorganic nutrients in the water column, through microbial uptake, subsequent transformations through the food web, and back to dissolved nutrients in the water column—nutrients are subject to downstream transport. Stream and wetland capacities for nutrient cycling have important implications for the form and concentration of nutrients exported to downstream waters.

- Cumulative effects across a watershed must be considered when quantifying the frequency, duration, and magnitude of connectivity, to evaluate the downstream effects of streams and wetlands. For example, although the probability of a large-magnitude transfer of organisms from any given headwater stream in a given year might be low (i.e., a low-frequency connection when each stream is considered individually), headwater streams are the most abundant type of stream in most watersheds. Thus, the overall probability of a large-magnitude transfer of organisms is higher when considered for all headwater streams in a watershed—that is, a high-frequency connection is present when headwaters are considered cumulatively at the watershed scale, compared with probabilities of transport for streams individually. Similarly, a single pollutant discharge might be negligible but the cumulative effect of multiple discharges could degrade the integrity of downstream waters. Riparian open waters (*e.g.*, oxbow lakes), wetlands, and vegetated areas cumulatively can retain up to 90% of eroded clays, silts, and sands that otherwise would enter stream channels. The larger amounts of snowmelt and precipitation cumulatively held by many wetlands can reduce the potential for flooding at downstream locations. For example, wetlands in the prairie pothole region cumulatively stored about 11−20% of the precipitation in one watershed.

- The combination of diverse habitat types and abundant food resources cumulatively makes floodplains important foraging, hunting, and breeding sites for fish, aquatic life stages of amphibians, and aquatic invertebrates. The scale of these cumulative effects can be extensive; for example, coastal ibises travel up to 40 km to obtain food from freshwater floodplain wetlands for nesting chicks, which cannot tolerate salt levels in local food resources until they fledge.

4. Science Report: Framework for Analysis

In support of the conclusions addressed above in this section, Chapter 2 of the Science Report essentially provides the framework for the analysis by describing the components of a river system and watershed; the types of physical, chemical, and biological connections that link those components; the factors that influence connectivity at various temporal and spatial scales; and methods for quantifying connectivity. In addition, Chapter 1 of the Science Report introduces the approach used for the analysis of the peer-reviewed literature. Justice Kennedy's opinion in *Rapanos* established the framework for a significant nexus analysis that mirrors the framework through which scientists assess a river system – examining how the components of the system (*e.g*., wetlands), in the aggregate (in combination), in the watershed (in the region), contribute and connect to the river (significantly affect the chemical, physical, or biological integrity of the river). While some commenters stated that the agencies' proposed rule asserted jurisdiction simply based on "any hydrologic connection," this framework, and the Science Report and preamble, demonstrate that the agencies instead undertook a very thorough analysis of the complex interactions between upstream waters and wetlands and the downstream river in order to reach the significant nexus conclusions underlying the provisions of the rule.

To identify connections and effects of streams, wetlands, and other water bodies on downstream waters, the Science Report used two types of evidence from peer-reviewed, published literature: (1) direct evidence that demonstrated a connection or effect (*e.g.*, observed transport of materials or movement of organisms from streams or wetlands to downstream waters) and (2) indirect evidence that suggested a connection or effect (*e.g.*, presence of environmental factors known to influence connectivity, a gradient of impairment associated with cumulative loss of streams or wetlands). In some cases, an individual line of evidence demonstrated connections along the entire river network (*e.g.*, from headwaters to large rivers). In most cases, multiple sources of evidence were gathered and conclusions drawn via logical inference—for example, when one body of evidence shows that headwater streams are connected to downstream segments, another body of evidence shows those downstream segments are linked to other segments farther downstream, and so on. This approach, which borrows from weight-of-evidence approaches in causal analysis is an effective way to synthesize the diversity of evidence needed to address questions at larger spatial and longer temporal scales than are often considered in individual scientific studies. Science Report at 1-14, 1-16 (citing Suter *et al*. 2002; Suter and Cormier 2011).

A river is the time-integrated result of all waters contributing to it, and connectivity is the property that spatially integrates the individual components of the watershed. In discussions of connectivity, the watershed scale is the appropriate context for interpreting technical evidence about individual watershed components. Science Report at 2-1 (citing Newbold *et al.* 1982b; Stanford and Ward 1993; Bunn and Arthington 2002; Power and Dietrich 2002; Benda *et al*. 2004; Naiman *et al*. 2005; Nadeau and Rains 2007; Rodriguez-Iturbe *et al*. 2009). Such interpretation requires that freshwater resources be viewed within a landscape—or systems—context. *Id.* (citing Baron *et al*. 2002). Addressing the questions asked in the Science Report, therefore, requires an integrated systems perspective that considers both the components contributing to the river and the connections between those components and the river.

Components of the River System

In the Science Report, the term river refers to a relatively large volume of flowing water within a visible channel, including subsurface water moving in the same direction as the surface water and lateral flows exchanged with associated floodplain and riparian areas. *Id.* at 2-2 (Naiman and Bilby 1998). Channels are natural or constructed passageways or depressions of perceptible linear extent that convey water and associated materials downgradient. They are defined by the presence of continuous bed and bank structures, or uninterrupted (but permeable) bottom and lateral boundaries. Although bed and bank structures might in places appear to be disrupted (*e.g.*, bedrock outcrops, braided channels, flow-through wetlands), the continuation of the bed and banks downgradient from such disruptions is evidence of the surface connection with the channel that is upgradient of the perceived disruption. Such disruptions are associated with changes in the gradient and in the material over and through which the water flows. If a disruption in the bed and bank structure prevented connection, the area downgradient would lack a bed and banks, be colonized with terrestrial vegetation, and be indiscernible from the nearby land. The concentrated longitudinal movement of water and sediment through these channels lowers local elevation, prevents soil development, selectively transports and stores sediment, and hampers the colonization and persistence of terrestrial vegetation. Streams are defined in a similar manner as rivers: a relatively small volume of flowing water within a visible channel, including subsurface water moving in the same direction as the surface water and lateral flows exchanged with associated floodplain and riparian areas. *Id.* (citing Naiman and Bilby 1998).

A river network is a hierarchical, interconnected population of channels that drains surface and subsurface water from a watershed to a river and includes the river itself. Watershed boundaries traditionally are defined topographically, such as by ridges. These channels can convey water year-round, weekly to seasonally, or only in direct response to rainfall and snowmelt. *Id.* (citing Frissell *et al*. 1986; Benda *et al*. 2004). The smallest of these channels, where streamflows begin, are considered headwater streams. Headwater streams are first- to third-order streams, where stream order is a classification system based on the position of the stream in the river network. *Id.* (citing Strahler 1957; Vannote *et al.* 1980; Meyer and Wallace 2001; Gomi *et al*. 2002; Fritz *et al*. 2006b; Nadeau and Rains 2007). The point at which stream or river channels intersect within a river network is called a confluence. The confluence of two streams with the same order results in an increase of stream order (*i.e*., two first-order streams join to form a second-order stream, two second-order streams join to form a third-order stream, and so on); when streams of different order join, the order of the larger stream is retained.

Terminal and lateral source streams[7] typically originate at channel heads, which occur where surface-water runoff is sufficient to erode a definable channel. *Id.* at 2-3 (citing Dietrich and Dunne 1993). The channel head denotes the upstream extent of a stream's continuous bed and banks structure. Channel heads are relatively dynamic zones in river networks, as their position can advance upslope by overland or subsurface flow-driven erosion, or retreat downslope by colluvial infilling. Source streams also can originate at seeps or springs and associated wetlands.

When two streams join at a confluence, the smaller stream (*i.e.*, that with the smaller drainage area or lower mean annual discharge) is called a tributary of the larger stream, which is referred to as the mainstem. A basic way of classifying tributary contributions to a mainstem is the symmetry ratio, which describes the size of a tributary relative to the mainstem at their confluence, in terms of their respective discharges, drainage areas, or channel widths. *Id.* at 2-4 (citing Roy and Woldenberg 1986; Rhoads 1987; Benda 2008).

Surface-water hydrologic connectivity within river network channels occurs, in part, through the unidirectional movement of water from channels at higher elevations to ones at lower elevations—that is, hydrologic connectivity exists because water flows downhill. In essence, the river network represents the aboveground flow route and associated subsurface-water interactions, transporting water, energy, and materials from the surrounding watershed to downstream rivers, lakes, estuaries, and oceans (The River Continuum Concept). *Id.* (citing (Vannote *et al.* 1980).

[7] Mock (1971) presented a classification of the streams comprising stream or river networks. He designated first-order streams that intersect other first-order streams as sources. We refer to these as terminal source streams. Mock defined first-order streams that flow into higher order streams as tributary sources, and we refer to this class of streams as lateral source streams.

Streamflow and the quantity and character of sediment—interacting with watershed geology, terrain, soils and vegetation—shape morphological changes in the stream channel that occur from river network headwaters to lower rivers. *Id.* (citing Montgomery 1999; Church 2002). Headwater streams are typically erosion zones in which sediment from the base of adjoining hillslopes moves directly into stream channels and is transported downstream. As stream channels increase in size and decrease in slope, a mixture of erosion and deposition processes usually is at work. At some point in the lower portions of river networks, sediment deposition becomes the dominant process and floodplains form. Floodplains are level areas bordering stream or river channels that are formed by sediment deposition from those channels under present climatic conditions. These natural geomorphic features are inundated during moderate to high water events. *Id.* (citing Leopold 1994; Osterkamp 2008). Floodplain and associated river channel forms (*e.g.*, meandering, braided, anastomosing) are determined by interacting fluvial factors, including sediment size and supply, channel gradient, and streamflow. *Id.* (citing Church 2002; Church 2006).

Both riparian areas and floodplains are important components of river systems. Riparian areas are transition zones between terrestrial and aquatic ecosystems that are distinguished by gradients in biophysical conditions, ecological processes, and biota. They are areas through which surface and subsurface hydrology connect water bodies with their adjoining uplands, and they include those portions of terrestrial ecosystems that significantly influence exchanges of energy and matter with aquatic ecosystems. *Id.* (citing National Research Council 2002). Riparian areas often have high biodiversity. *Id.* (citing Naiman *et al*. 2005). They occur near lakes and estuarine-marine shorelines and along river networks, where their width can vary from narrow bands along headwater streams to broad zones that encompass the floodplains of large rivers.

Floodplains are also considered riparian areas, but not all riparian areas have floodplains. All rivers and streams within river networks have riparian areas, but small streams in constrained valleys are less likely to have floodplains than larger streams and rivers in unconstrained valleys. The "100-year floodplain" is the area with a one percent annual chance of flooding. *Id.* at 2-5 (citing Federal Emergency Management Agency); U.S. Geological Survey. The 100-year floodplain can but need not coincide with the geomorphic floodplain.

Wetlands are transitional areas between terrestrial and aquatic ecosystems. Wetlands include areas such as swamps, bogs, fens, marshes, ponds, and pools. Science Report at 2-6 (citing Mitsch *et al.* 2009).

Many classification systems have been developed for wetlands. *Id.* (citing Mitsch and Gosselink 2007). These classifications can focus on vegetation, hydrology, hydrogeomorphic characteristics, or other factors. *Id.* (citing Cowardin *et al*. 1979; Brinson 1993; Tiner 2003a; Comer *et al*. 2005). Because the Science Report focuses on downstream connectivity, it considered two landscape settings in which wetlands occur based on directionality of hydrologic flows. Directionality of flow also is included as a component of hydrodynamic setting in the hydrogeomorphic approach and as an element of water flowpath in an enhancement of National Wetlands Inventory data (the National Wetlands Inventory is a mapping dataset of the U.S. Fish and Wildlife Service regarding the extent and types of wetlands and deepwater habitats across the country). *Id.* (citing Brinson 1993; Smith *et al*. 1995, Tiner 2011). This emphasis on directionality of flow is necessary because hydrologic connectivity plays a dominant role in determining the types of effects wetlands have on downstream waters.

A non-floodplain wetland setting is a landscape setting where a potential exists for unidirectional, lateral hydrologic flows from wetlands to the river network through surface water or ground water. Such a setting would include upgradient areas such as hillslopes or upland areas outside of the floodplain. Any wetland setting where water could only flow from the wetland toward a river network would be considered a non-floodplain setting, regardless of the magnitude and duration of flows and of travel times. The Science Report refers to wetlands that occur in these settings as non-floodplain wetlands.

A riparian/floodplain wetland setting is a landscape setting (*e.g.*, floodplains, most riparian areas, lake and estuarine fringes) that is subject to bidirectional, lateral hydrologic flows. Wetlands in riparian/floodplain settings can have some of the same types of hydrologic connections as those in non-floodplain settings. In addition, wetlands in these settings also have bidirectional flows. For example, wetlands within a riparian area are connected to the river network through lateral movement of water between the channel and riparian area (*e.g.*, through overbank flooding, hyporheic flow). Given the Science Report's interest in addressing the effects of wetlands on downstream waters, it focused in particular on the subset of these wetlands that occur in riparian areas with and without floodplains (collectively referred to hereafter as riparian/floodplain wetlands); the Science Report generally does not address wetlands at lake and estuarine fringes. Riparian wetlands are portions of riparian areas that meet the Cowardin *et al*. (1979) three-attribute wetland criteria (*i.e*., having wetland hydrology, hydrophytic vegetation, or hydric soils); floodplain wetlands are portions of the floodplain that meet these same criteria. *Id.* at 2-7. Given that even infrequent flooding can have profound effects on wetland development and function, the Science Report considers such a wetland to be in a riparian/floodplain setting.

Note that the scientific definition of "wetland" used in the Science Report is not the same as the longstanding Clean Water Act regulatory definition of "wetland," retained in the final rule. Only aquatic resources that meet the regulatory definition of wetland at paragraph (c)(4) are considered to be wetlands for Clean Water Act purposes under the final rule. The agencies are not changing their longstanding regulation that requires that an aquatic resource must meet all three parameters under normal circumstances to be considered a wetland in the regulatory sense. As noted above, Cowardin wetlands need to have only one of the parameters. Conclusions in the Science Report apply to the Cowardin wetlands, and the Cowardin definition of wetlands encompasses a larger universe of wetlands than the regulatory definition. Therefore, the Science Report conclusions regarding Cowardin wetlands apply to the wetlands meeting the regulatory definition because those wetlands are a subset of the Cowardin wetlands. All wetlands that meet the regulatory definition also meet the Cowardin definition of wetlands. Because wetlands under the regulatory definition of wetland must meet all three parameters, it is even more likely that they provide the many functions described in the Science Report due to the conditions in the waters that make them wetlands – that is, their hydric soils (inundated or saturated soils), hydrophytic vegetation (plants that thrive in wet conditions), and wetland hydrology (inundation or saturation at the surface at some time during the growing season). In addition, many of the Cowardin wetland types are in fact open waters, as the Cowardin definition encompasses open waters like ponds, and the Science Report utilizes many references that includes such open waters when discussing floodplain and nonfloodplain wetlands. Thus, open waters also provide the many functions described in the Science Report and throughout this document. The Science Report acknowledges that its conclusions apply to open waters as well as wetlands, stating, "although the literature review did not address other non-floodplain water bodies to the same extent as wetlands, our overall conclusions also apply to these water bodies (*e.g.*, ponds and lakes that lack surface water inlets) because the same principles govern hydrologic connectivity between these water bodies and downstream waters." *Id.* at 4-41. Wetlands and open waters are only jurisdictional when they meet the definition of "waters of the United States."

A major consequence of the two different landscape settings (non-floodplain versus riparian/floodplain) is that waterborne materials can be transported only from the wetland to the river network for a non-floodplain wetland, whereas waterborne materials can be transported from the wetland to the river network and from the river network to the wetland for a riparian/floodplain wetland. In the latter case, there is a mutual, interacting effect on the structure and function of both the wetland and river network. In contrast, a non-floodplain wetland can affect a river through the transport of waterborne material, but the opposite is not true. Note that the Science Report limits use of riparian/floodplain and non-floodplain landscape settings to describe the direction of hydrologic flow; the terms cannot be used to describe directionality of geochemical or biological flows. For example, mobile organisms can move from a stream to a non-floodplain wetland. *Id*. at 2-8 (citing, *e.g.*, Subalusky *et al.* 2009a; Subalusky *et al.* 2009b).

Both non-floodplain and riparian/floodplain wetlands can include geographically isolated wetlands, or wetlands completely surrounded by uplands. *Id.* (citing Tiner 2003b). These wetlands have no apparent surface-water outlets, but can hydrologically connect to downstream waters through spillage or groundwater. The Science Report defines an upland as any area not meeting the Cowardin et al. (1979) three-attribute wetland criteria, meaning that uplands can occur in both terrestrial and riparian areas.[8] *Id.* Thus, a wetland that is located on a floodplain but is surrounded by upland would be considered a geographically isolated, riparian/floodplain

[8] Note that this definition of upland is the one that is used in the Science Report. The agencies are not promulgating a definition of upland in the final rule.

wetland that is subject to periodic inundation from the river network. Although the term "geographically isolated" could be misconstrued as implying functional isolation, the term has been defined in the peer-reviewed literature to refer specifically to wetlands surrounded by uplands. Furthermore, the literature explicitly notes that geographic isolation does not imply functional isolation. *Id.* (citing Leibowitz 2003; Tiner 2003b). Discussion of geographically isolated wetlands is essential because hydrologic connectivity (an element of connectivity, which is the focus of the Science Report) is generally difficult to characterize for these wetlands.

River System Hydrology

River system hydrology is controlled by hierarchical factors that result in a broad continuum of belowground and aboveground hydrologic flowpaths connecting river basins and river networks. *Id.* (citing Winter 2001; Wolock *et al.* 2004; Devito *et al*. 2005; Poole *et al*. 2006; Wagener *et al*. 2007; Poole 2010; Bencala *et al*. 2011; Jencso and McGlynn 2011). At the broadest scale, regional climate interacts with river-basin terrain and geology to shape inherent hydrologic infrastructure that bounds the nature of basin hydrologic flowpaths. Different climate-basin combinations form identifiable hydrologic landscape units with distinct hydrologic characteristics. *Id.* at 2-8 to 2-9 (Winter, 2001; Wigington *et al*. 2013). Buttle (2006) posited three first-order controls of watershed streamflow generated under specific hydroclimatic conditions: (1) the ability of different landscape elements to generate runoff by surface or subsurface lateral flow of water; (2) the degree of hydrologic linkage among landscapes by which surface and subsurface runoff can reach river networks; and (3) the capacity of the river network itself to convey runoff downstream to the river-basin outlet. *Id.* at 2-9. River and stream waters are influenced by not only basin-scale or larger ground-water systems, but also local-scale, vertical and lateral hydrologic exchanges between water in channels and sediments beneath and contiguous with river network channels. *Id.* at 2-9 (citing Ward 1989; Woessner 2000; Malard *et al*. 2002; Bencala 2011). The magnitude and importance of river-system hydrologic flowpaths at all spatial scales can radically change over time at hourly to yearly temporal scales. *Id.* (citing Junk *et al*. 1989; Ward 1989; Malard *et al*. 1999; Poole *et al*. 2006).

Because interactions between groundwater and surface waters are essential processes in rivers, knowledge of basic groundwater hydrology is necessary to understand the interaction between surface and subsurface water and their relationship to connectivity within river systems. Subsurface water occurs in two principal zones: the unsaturated zone and the saturated zone. *Id.* (citing Winter *et al.* 1998). In the unsaturated zone, the spaces between soil, gravel, and other particles contain both air and water. In the saturated zone, these spaces are completely filled with water. Ground water refers to any water that occurs and flows (saturated groundwater flow) in the saturated zone beneath a watershed surface. *Id.* (citing Winter *et al*. 1998). Rapid flow (interflow) of water can occur through large pore spaces in the unsaturated zone. *Id.* (citing Beven and Germann 1982).

Other hydrologic flowpaths are also significant in determining the characteristics of river systems. The most obvious is the downstream water movement within stream or river channels, or open-channel flow. River water in stream and river channels can reach riparian areas and floodplains via overbank flow, which occurs when floodwaters flow over stream and river channels. *Id.* at 2-12 (citing Mertes 1997). Overland flow is the portion of streamflow derived from net precipitation that flows over the land surface to the nearest stream channel with no infiltration. *Id.* (citing Hewlett 1982). Overland flow can be generated by several mechanisms. Infiltration-excess overland flow occurs when the rainfall rates exceed the infiltration rates of land surfaces. *Id.* (citing Horton 1945). Saturation-excess overland flow occurs when precipitation inputs cause water tables to rise to land surfaces so that precipitation inputs to the land surfaces cannot infiltrate and flow overland. *Id.* (citing Dunne and Black 1970). Return flow occurs when water infiltrates, percolates through the unsaturated zones, enters saturated zones, and then returns to and flows over watershed surfaces, commonly at hillslope-floodplain transitions. *Id.* (citing Dunne and Black 1970).

Alluvium consists of deposits of clay, silt, sand, gravel, or other particulate materials that running water has deposited in a streambed, on a floodplain, on a delta, or in a fan at the base of a mountain. These deposits occur near active river systems but also can be found in buried river valleys—the remnants of relict river systems. *Id.* (citing Lloyd and Lyke 1995). The Science Report was concerned primarily with alluvium deposited along active river networks. Commonly, alluvium is highly permeable, creating an environment conducive to groundwater flow. Alluvial groundwater (typically a mixture of river water and local, intermediate, and regional groundwater) moves through the alluvium. Together, the alluvium and alluvial ground water comprise alluvial aquifers. Alluvial aquifers are closely associated with floodplains and have high levels of hyporheic exchange. *Id.* (citing Stanford and Ward 1993; Amoros and Bornette 2002; Poole *et al*. 2006). Hyporheic exchange occurs when water moves from stream or river channels into alluvial deposits and then returns to the channels. *Id.* at 2-12, 4-8 (citing Sjodin *et al*. 2001; Bencala 2005;Gooseff *et al*. 2008; Leibowitz *et al*. 2008; Bencala 2011). Hyporheic exchange allows for the mixing of surface water and groundwater. It occurs during both high- and low-flow periods, and typically has relatively horizontal flowpaths at scales of meters to tens of meters and vertical flowpaths with depths ranging from centimeters to tens of meters. Science Report at 2-12 (citing Stanford and Ward 1988; Woessner 2000 and references therein; Bencala 2005).

Riparian areas and floodplains can have a diverse array of hydrologic inputs and outputs, which, in turn influence riparian/floodplain wetlands. Riparian areas and floodplains receive water from precipitation; overland flow from upland areas; local, intermediate, regional ground water; and hyporheic flows. *Id.* at 4-14 (National Research Council 2002; Richardson *et al*. 2005; Vidon *et al*. 2010). Water flowing over the land surface in many situations can infiltrate soils in riparian areas. *Id.* If low permeability subsoils or impervious clay layers are present, water contact with the plant root zone is increased and the water is subject to ecological functions such as denitrification before it reaches the stream channel. *Id.* (citing National Research Council 2002; Naiman *et al*. 2005; Vidon *et al*. 2010).

The relative importance of the continuum of hydrologic flowpaths among river systems varies, creating streams and rivers with different flow duration (or hydrologic permanence) classes. Perennial streams or stream reaches typically flow year-round. They are maintained by local or regional ground-water discharge or streamflow from higher in the stream or river network. Intermittent streams or stream reaches flow continuously, but only at certain times of the year (*e.g.*, during certain seasons such as spring snowmelt); drying occurs when the water table falls below the channel bed elevation. Ephemeral streams or stream reaches flow briefly (typically hours to days) during and immediately following precipitation; these channels are above the water table at all times. Streams in these flow duration classes often transition longitudinally, from ephemeral to intermittent to perennial, as drainage area increases and elevation decreases along river networks. Many headwater streams, however, originate from permanent springs and flow directly into intermittent downstream reaches. At low flows, intermittent streams can contain dry segments alternating with flowing segments. Transitions between flow duration classes can coincide with confluences or with geomorphic discontinuities within the network. *Id.* at 2-14 (citing May and Lee 2004; Hunter *et al*. 2005). Variation of streamflow within river systems occurs in response to hydrologic events resulting from rainfall or snowmelt. Stormflow is streamflow that occurs in direct response to rainfall or snowmelt, which might stem from multiple groundwater and surface-water sources. *Id.* (citing Dunne and Leopold 1978). Baseflow is streamflow originating from groundwater discharge or seepage (locally or from higher in the river network), which sustains water flow through the channel between hydrologic events. Perennial streams have baseflow year-round; intermittent streams have baseflow seasonally; ephemeral streams have no baseflow. All three stream types convey stormflow. Thus, perennial streams are more common in areas receiving high precipitation, whereas intermittent and ephemeral streams are more common in the more arid portions of the United States. *Id.* (citing NHD 2008). The distribution of headwater streams (perennial, intermittent, or ephemeral) as a proportion of total stream length is similar across geographic regions and climates.

Similar to streams, the occurrence and persistence of riparian/floodplain wetland and non-floodplain wetland hydrologic connections with river networks, via surface water (both channelized and nonchannelized) or groundwater, can be continuous, seasonal, or ephemeral, depending on the overall hydrologic conditions in the watershed. For example, a non-floodplain wetland might have a direct groundwater connection with a river network during wet conditions but an indirect regional ground-water connection (via groundwater recharge) under dry conditions. Geographically isolated wetlands can be hydrologically connected to the river network via nonchannelized surface flow (*e.g.*, swales or overland flow) or groundwater.

The portions of river networks with flowing water expand and contract longitudinally (in an upstream-downstream direction) and laterally (in a stream channel-floodplain direction) in response to seasonal environmental conditions and precipitation events. *Id.* at 2-18 (citing Hewlett and Hibbert 1967; Gregory and Walling,1968; Dunne and Black 1970; Day 1978; Junk *et al*. 1989; Hunter *et al*. 2005; Wigington *et al*. 2005; Rains *et al*. 2006; Rains *et al*. 2008). The longitudinal expansion of channels with flowing water in response to major precipitation events represents a transient increase in the extent of headwater streams. Intermittent and perennial streams flow during wet seasons, whereas ephemeral streams flow only in response to rainfall or snowmelt. During dry periods, flowing portions of river networks are limited to perennial streams; these perennial portions of the river network can be discontinuous or interspersed with intermittently flowing stream reaches. *Id.* (citing Stanley et al. 1997; Hunter *et al*. 2005; Larned *et al*. 2010). Thus, stream reaches can be perennial even if the entire stream channel is not. As discussed previously, perennial streams typically flow year-round, intermittent streams flow continuously only at certain times of the year (*e.g.*, when they receive water from a spring, groundwater source, or surface snow such as melting snow), and ephemeral streams flow briefly in direct response to precipitation. In perennial streams, baseflow (the portion of flow contributed by groundwater) is typically present year-round. The definition of "perennial" allows for infrequent periods of severe drought to cause some perennial streams to not have flow year-round. *Leopold* 1994. Some studies have noted that perennial flow is present greater than 90% of the time, except in periods of severe drought, or greater than 80% of the time, and these definitions are consistent with the one used in the Science Report. Hedman and Osterkamp 1982; Hewlett 1982.

The dominant sources of water to a stream can shift during river network expansion and contraction. *Id.* (citing Malard *et al*. 1999; McGlynn and McDonnell 2003; McGlynn *et al*. 2004; Malard *et al.* 2006). Rainfall and snowmelt cause a river network to expand in two ways. First, local aquifers expand and water moves into dry channels, which increases the total length of the wet channel; the resulting intermittent streams will contain water during the entire wet season. *Id.* (citing Winter *et al*. 1998). Second, stormflow can cause water to enter ephemeral and intermittent streams. The larger the rainfall or snowmelt event, the greater the number of ephemeral streams and total length of flowing channels that occur within the river network. Ephemeral flows cease within days after rainfall or snowmelt ends, causing the length of wet channels to decrease and river networks to contract. The flowing portion of river networks further shrinks as the spatial extent of aquifers with ground water in contact with streams contract and intermittent streams dry. In many river systems across the United States, stormflow comprises a major portion of annual streamflow. *Id.* (citing Hewlett *et al*. 1977; Miller *et al*. 1988; Turton *et al*. 1992; Goodrich *et al*. 1997; Vivoni *et al*. 2006). In these systems, intermittent and ephemeral streams are major sources of river water. When rainfall or snowmelt induces stormflow in headwater streams or other portions of the river network, water flows downgradient through the network to its lower reaches. As water moves downstream through a river network, the hydrograph for a typical event broadens with a lower peak. This broadening of the hydrograph shape results from transient storage of water in river network channels and nearby alluvial aquifers. *Id.* (citing Fernald *et al*. 2001).

During very large hydrologic events, aggregate flows from headwaters and other tributary streams can result in overbank flooding in river reaches with floodplains; this occurrence represents lateral expansion of the river network. *Id.* (citing Mertes 1997). Water from overbank flows can recharge alluvial aquifers, supply water to floodplain wetlands, surficially connect floodplain wetlands to rivers, and shape the geomorphic features of the floodplain. *Id.* at 2-18 to 2-19 (citing Wolman and Miller 1960; Hammersmark *et al*. 2008). Bidirectional exchanges of water between ground water and river networks, including hyporheic flow, can occur under a wide range of streamflows, from flood flows to low flows. *Id.* at 2-19 to 2-20 (citing National Research Council 2002; Naiman *et al*. 2005; Vivoni *et al*. 2006).

Many studies have documented the fact that riparian/floodplain wetlands can attenuate flood pulses of streams and rivers by storing excess water from streams and rivers. Bullock and Acreman (2003) reviewed wetland studies and reported that wetlands reduced or delayed floods in 23 of 28 studies. *Id.* at 2-21. For example, Walton *et al*. (1996) found that peak discharges between upstream and downstream gaging stations on the Cache River in Arkansas were reduced 10–20% primarily due to floodplain water storage. *Id.* Locations within floodplains and riparian areas with higher elevations likely provide flood storage less frequently than lower elevation areas.

The interactions of high flows with floodplains and associated alluvial aquifers of river networks are important determinants of hydrologic and biogeochemical conditions of rivers. *Id.* at 2-21 (citing Ward 1989; Stanford and Ward 1993; Boulton *et al*. 1998; Burkart *et al*. 1999; Malard *et al*. 1999; Amoros and Bornette 2002; Malard *et al*. 2006; Poole 2010). Bencala (1993; 2011) noted that streams and rivers are not pipes; they interact with the alluvium and geologic materials adjoining and under channels. *Id.* In streams or river reaches constrained by topography, significant floodplain and near-channel alluvial aquifer interactions are limited. In reaches with floodplains, however, stormflow commonly supplies water to alluvial aquifers during high-flow periods through the process of bank storage. *Id.* at 2-22 (citing Whiting and Pomeranets 1997; Winter *et al*. 1998; Chen and Chen 2003). As streamflow decreases after hydrologic events, the water stored in these alluvial aquifers can serve as another source of baseflow in rivers.

In summary, the extent of wetted channels is dynamic because interactions between surface water in the channel and alluvial ground water, via hyporheic exchange, determine open-channel flow. The flowing portion of river networks expands and contracts in two primary dimensions: (1) longitudinally, as intermittent and ephemeral streams wet up and dry; and (2) laterally, as floodplains and associated alluvial aquifers gain (via overbank flooding, bank storage, and hyporheic exchange) and lose (via draining of alluvial aquifers and evapotranspiration) water. Vertical ground-water exchanges between streams and rivers and underlying alluvium are also key connections, and variations in these vertical exchanges contribute to the expansion and contraction of the portions of river networks with open-channel flow. Numerous studies have documented expansion and contraction of river systems; the temporal and spatial pattern of this expansion and contraction varies in response to many factors, including interannual and long-term dry cycles, climatic conditions, and watershed characteristics. *Id.* (citing Gregory and Walling 1968; Cayan and Peterson 1989; Fleming *et al*. 2007).

<u>Influence of Streams and Wetlands on Downstream Waters</u>

The structure and function of rivers are highly dependent on the constituent materials stored in and transported through them. Most of these materials, broadly defined here as any physical, chemical, or biological entity, including water, heat energy, sediment, wood, organic matter, nutrients, chemical contaminants, and organisms, originate outside of the river; they originate from either the upstream river network or other components of the river system, and then are transported to the river by water movement or other mechanisms. Thus, the fundamental way in which streams and wetlands affect river structure and function is by altering fluxes of materials to the river. This alteration of material fluxes depends on two key factors: (1) functions within streams and wetlands that affect material fluxes, and (2) connectivity (or isolation) between streams and wetlands and rivers that allows (or prevents) transport of materials between the systems. *Id.*

Streams and wetlands affect the amounts and types of materials that are or are not delivered to downstream waters, ultimately contributing to the structure and function of those waters. Leibowitz *et al*. (2008) identified three functions, or general mechanisms of action, by which streams and wetlands influence material fluxes into downstream waters: source, sink, and refuge. *Id.* at 2-22 to 2-23. The Science Report expanded on this framework to include two additional functions: lag and transformation. These five functions provide a framework for understanding how physical, chemical, and biological connections between streams and wetlands and downstream waters influence river systems.

These five functions are neither static nor mutually exclusive, and often the distinctions between them are not sharp. A stream or wetland can provide different functions at the same time. These functions can vary with the material considered (*e.g.*, acting as a source of organic matter and a sink for nitrogen) and can change over time (*e.g.*, acting as a water sink when evapotranspiration is high and a water source when evapotranspiration is low). The magnitude of a given function also is likely to vary temporally; for example, streams generally are greater sources of organic matter and contaminants during high flows. *Id.* at 2-24.

Leibowitz *et al*. (2008) explicitly focused on functions that benefit downstream waters, but these functions also can have negative effects—for example, when streams and wetlands serve as sources of chemical contamination. *Id.* In fact, benefits need not be linear with respect to concentration; a beneficial material could be harmful at higher concentrations due to nonlinear and threshold effects. For example, nitrogen can be beneficial at lower concentrations but can reduce water quality at higher concentrations. Although the Science Report focused primarily on the effects of streams and wetlands on downstream waters, these same functions can describe effects of downstream waters on streams and wetlands (*e.g.*, downstream rivers can serve as sources of colonists for upstream tributaries). *Id.*

Because many of these functions depend on import of materials and energy into streams and wetlands, distinguishing between actual function and potential function is instructive. For example, a wetland with appropriate conditions (*e.g.*, a reducing environment and denitrifying bacteria) is a potential sink for nitrogen: If nitrogen is imported into the wetland, the wetland can remove it by denitrification. The wetland will not serve this function, however, if nitrogen is not imported. Thus, even if a stream and wetland do not currently serve a function, it has the potential to provide that function under appropriate conditions (*e.g.*, when material imports or environmental conditions change). These functions can be instrumental in protecting those waters from future impacts. Ignoring potential function also can lead to the paradox that degraded streams and wetlands (*e.g.*, those receiving nonpoint-source nitrogen inputs) receive more protection than less impacted systems. *Id.* (citing Leibowitz *et al*. 2008).

Three factors influence the effect that material and energy fluxes from streams and wetlands have on downstream waters: (1) proportion of the material originating from (or reduced by) streams and wetlands relative to the importance of other system components, such as the river itself; (2) residence time of the material in the downstream water; and (3) relative importance of the material. *Id.* In many cases, the effects on downstream waters need to be considered in aggregate. For example, the contribution of material by a particular stream and wetland (*e.g.*, a specific ephemeral stream) might be small, but the aggregate contribution by an entire class of streams and wetlands (*e.g.*, all ephemeral streams in the river network) might be substantial. Integrating contributions over time also might be necessary, taking into account the frequency, duration, and timing of material export and delivery. Considering the cumulative material fluxes that originate from a specific stream and wetland, rather than the individual materials separately, is essential in understanding the effects of material fluxes on downstream waters. *Id.* at 2-26.

In general, the more frequently a material is delivered to the river, the greater its effect. The effect of an infrequently supplied material, however, can be large if the material has a long residence time in the river. *Id.* (citing Leibowitz *et al.* 2008). For example, woody debris might be exported to downstream waters infrequently but it can persist in downstream channels. In addition, some materials are more important in defining the structure and function of a river. For example, woody debris can have a large effect on river structure and function because it affects water flow, sediment and organic matter transport, and habitat. *Id.* (citing Harmon *et al*. 1986; Gurnell *et al*. 1995). Another example is salmon migrating to a river: They can serve as a keystone species to regulate other populations and as a source of marine-derived nutrients. *Id.* (citing Schindler *et al*. 2005).

The functions discussed above represent general mechanisms by which streams and wetlands influence downstream waters. For these altered material and energy fluxes to affect a river, however, transport mechanisms that deliver (or could deliver) these materials to the river are necessary. Connectivity describes the degree to which components of a system are connected and interact through various transport mechanisms; connectivity is determined by the characteristics of both the physical landscape and the biota of the specific system. *Id.* This definition is related to, but is distinct from, definitions of connectivity based on the actual flow of materials between system components. *Id.* (citing, *e.g.*, Pringle 2001). That connectivity among river-system components, including streams and wetlands, plays a significant role in the structure and function of these systems is not a new concept. In fact, much of the theory developed to explain how these systems work focuses on connectivity and linkages between system components. *Id.* (citing, *e.g.*, Vannote *et al.* 1980; Newbold *et al*. 1982a; Newbold *et al*. 1982b; Junk *et al*. 1989; Ward 1989; Benda *et al*. 2004; Thorp *et al*. 2006).

In addition to its central role in defining river systems, water movement through the river system is the primary mechanism providing physical connectivity both within river networks and between those networks and the surrounding landscape. *Id.* (citing Fullerton *et al*. 2010). Hydrologic connectivity results from the flow of water, which provides a "hydraulic highway" along which physical, chemical, and biological materials associated with the water are transported (*e.g.*, sediment, woody debris, contaminants, organisms). *Id.* (citing Fausch *et al*. 2002)

Ecosystem functions within a river system are driven by interactions between the river system's physical environment and the diverse biological communities living within it. *Id.* (Wiens 2002; Schroder 2006). Thus, river system structure and function also depend on biological connectivity among the system's populations of aquatic and semiaquatic organisms. Biological connectivity refers to the movement of organisms, including transport of reproductive materials (*e.g*., seeds, eggs, genes) and dormant stages, through river systems. *Id.* at 2-26 to 2-27. These movements link aquatic habitats and populations in different locations through several processes important for the survival of individuals, populations, and species. *Id.* at 2-27. Movements include dispersal, or movement away from an existing population or parent organism; migration, or long-distance movements occurring seasonally; localized movement over an organism's home range to find food, mates, or refuge from predators or adverse conditions; and movement to different habitats to complete life-cycle requirements. Biological connectivity can occur within aquatic ecosystems or across ecosystem or watershed boundaries, and it can be multidirectional. For example, organisms can move downstream from perennial, intermittent, and ephemeral headwaters to rivers; upstream from estuaries to rivers to headwaters; or laterally between floodplain wetlands, geographically isolated wetlands, rivers, lakes, or other water bodies.

As noted above, streams and rivers are not pipes; they provide opportunities for water to interact with internal components (*e.g.*, alluvium, organisms) through the five functions by which streams and wetlands alter material fluxes. *Id.* (citing Bencala 1993; Bencala *et al*. 2011). Connectivity between streams and wetlands provides opportunities for material fluxes to be altered sequentially by multiple streams and wetlands as the materials are transported downstream. The aggregate effect of these sequential fluxes determines the proportion of material that ultimately reaches the river. The form of the exported material can be transformed as it moves down the river network, however, making quantitative assessments of the importance of individual stream and wetland resources within the entire river system difficult. For example, organic matter can be exported from headwater streams and consumed by downstream macroinvertebrates. Those invertebrates can drift farther downstream and be eaten by juvenile fish that eventually move into the mainstem of the river, where they feed further and grow.

The assessment of stream and wetland influence on rivers also is complicated by the cumulative time lag resulting from these sequential transformations and transportations. For example, removal of nutrients by streambed algal and microbial populations, subsequent feeding by fish and insects, and release by excretion or decomposition delays the export of nutrients downstream.

The opposite of connectivity is isolation, or the degree to which transport mechanisms (*i.e.*, pathways between system components) are lacking; isolation acts to reduce material fluxes between system components. *Id.* at 2-28. Although the Science Report primarily focused on the benefits that connectivity can have on downstream systems, isolation also can have important positive effects on the condition and function of downstream waters. For example, waterborne contaminants that enter a wetland cannot be transported to a river if the wetland is hydrologically isolated from the river, except by non-hydrologic pathways. *Id.* at 2-28 to 2-29. Increased isolation can decrease the spread of pathogens and invasive species, and increase the rate of local adaptation. *Id.* at 2-29 (citing, *e.g.*, Hess 1996; Bodamer and Bossenbroek 2008; Fraser *et al*. 2011). Thus, both connectivity and isolation should be considered when examining material fluxes from streams and wetlands, and biological interactions should be viewed in light of the natural balance between these two factors.

<u>Spatial and Temporal Variability of Connectivity</u>

Connectivity is not a fixed characteristic of a system, but varies over space and time. *Id.* (citing Ward 1989; Leibowitz 2003; Leibowitz and Vining 2003). Variability in hydrologic connectivity results primarily from the longitudinal and lateral expansion and contraction of the river network and transient connection with other components of the river system. The variability of connectivity can be described in terms of frequency, duration, magnitude, timing, and rate of change. When assessing the effects of connectivity or isolation and the five general functions (sources, sinks, refuges, lags, and transformations) on downstream waters, dimensions of time and space must be considered. *Id.* Water or organisms transported from distant headwater streams or wetlands generally will take longer to travel to a larger river than materials transported from streams or wetlands near the river. This can introduce a lag between the time the function occurs and the time the material arrives at the river. In addition, the distribution of streams and wetlands can be a function of their distance from the mainstem channel. For example, in a classic dendritic network, there is an inverse geometric relationship between number of streams and stream order. In such a case, the aggregate level of function could be greater for terminal source streams, compared to higher order or lateral source streams. This is one reason why watersheds of terminal source streams often provide the greatest proportion of water for major rivers. Connectivity, however, results from many interacting factors. For example, the relationship between stream number and order can vary with the shape of the watershed and the configuration of the network.

The expansion and contraction of river networks affects the extent, magnitude, timing, and type of hydrologic connectivity. For example, intermittent and ephemeral streams flow only during wetter seasons or during and immediately following precipitation events. Thus, the spatial extent of connectivity between streams and wetlands and rivers increases greatly during these high-flow events because intermittent and ephemeral streams are estimated to account for 59% of the total length of streams in the contiguous United States. *Id.* (citing Nadeau and Rains 2007). Changes in the spatial extent of connectivity due to expansion and contraction are even more pronounced in the arid and semiarid Southwest, where more than 80% of all streams are intermittent or ephemeral. *Id.* at 2-29 to 2-30 (citing Levick *et al*. 2008). Expansion and contraction also affect the magnitude of connectivity because larger flows provide greater potential for material transport. *Id.* at 2-30.

Besides affecting the spatial extent and magnitude of hydrologic connectivity, expansion and contraction of the stream network also affect the duration and timing of flow in different portions of the network. Perennial streams have year-round connectivity with a downstream river, while intermittent streams have seasonal connectivity. The temporal characteristics of connectivity for ephemeral streams depend on the duration and timing of storm events. Similarly, connectivity between wetlands and downstream waters can range from permanent to seasonal to episodic.

The expansion and contraction of river systems also affect the type of connectivity. For example, during wet periods when input from precipitation can exceed evapotranspiration and available storage, non-floodplain wetlands could have connectivity with other wetlands or streams through surface spillage. *Id.* (citing Leibowitz and Vining 2003; Rains *et al*. 2008). When spillage ceases due to drier conditions, hydrologic connectivity could only occur through groundwater. *Id.* (citing Rains *et al*. 2006; Rains *et al*. 2008).

When the flow of water mediates dispersal, migration, and other forms of biotic movement, biological and hydrologic connectivity can be tightly coupled. For example, seasonal flooding of riparian/floodplain wetlands creates temporary habitat that fish, aquatic insects, and other organisms use. *Id.* (citing Junk *et al*. 1989; Smock 1994; Tockner *et al*. 2000; Robinson *et al*. 2002; Tronstad *et al*. 2007). Factors other than hydrologic dynamics also can affect the temporal and spatial dynamics of biological connectivity. Such factors include movement associated with seasonal habitat use and shifts in habitat use due to life-history changes, quality or quantity of food resources, presence or absence of favorable dispersal conditions, physical differences in aquatic habitat structure, or the number and sizes of nearby populations. *Id.* (citing Moll 1990; Smock 1994; Huryn and Gibbs 1999; Lamoureux and Madison 1999; Gibbons *et al*. 2006; Gamble *et al*. 2007; Grant *et al*. 2007; Subalusky *et al*. 2009a; Schalk and Luhring 2010). For a specific river system with a given spatial configuration, variability in biological connectivity also occurs due to variation in the dispersal distance of organisms and reproductive propagules. *Id.* (citing Semlitsch and Bodie 2003).

Finally, just as connectivity from temporary or seasonal wetting of channels can affect downstream waters, temporary or seasonal drying also can affect river networks. Riverbeds or streambeds that temporarily dry up are used by aquatic organisms that are specially adapted to wet and dry conditions, and can serve as egg and seed banks for several organisms, including aquatic invertebrates and plants. *Id* at 2-30 (citing Steward *et al*. 2012). These temporary dry areas also can affect nutrient dynamics due to reduced microbial activity, increased oxygen availability, and inputs of terrestrial sources of organic matter and nutrients. *Id.* (citing Steward *et al*. 2012).

Numerous factors affect physical, chemical, and biological connectivity within river systems. These factors operate at multiple spatial and temporal scales, and interact with each other in complex ways to determine where components of a system fall on the connectivity-isolation gradient at a given time. *Id.* at 2-30 to 2-31. The Science Report focused on five key factors: climate, watershed characteristics, spatial distribution patterns, biota, and human activities and alterations. *Id.* at 2-31. These are by no means the only factors influencing connectivity, but they illustrate how many different variables shape physical, chemical, and biological connectivity.

Climate-watershed Characteristics

The movement and storage of water in watersheds varies with climatic, geologic, physiographic, and edaphic characteristics of river systems. *Id.* (citing Winter 2001; Wigington *et al*. 2013). At the largest spatial scale, climate determines the amount, timing, and duration of water available to watersheds and river basins. Key characteristics of water availability that influence connectivity include annual water surplus (precipitation minus evapotranspiration), timing (seasonality) of water surplus during the year that is heavily influenced by precipitation timing and form (*e.g.*, rain, snow), and rainfall intensity.

Annual runoff generally reflects water surplus and varies widely across the United States. Seasonality of water surplus during the year determines when and for how long runoff and ground-water recharge occur. Precipitation and water surplus in the eastern United States is less seasonal than in the West. *Id.* (Finkelstein and Truppi 1991). The Southwest experiences summer monsoonal rains, while the West Coast and Pacific Northwest receive most precipitation during the winter season. *Id.* (citing Wigington *et al*. 2013). Throughout the West, winter precipitation in the mountains occurs as snowfall, where it accumulates in seasonal snowpack and is released during the spring and summer melt seasons to sustain streamflow during late spring and summer months. *Id.* (citing Brooks *et al*. 2012). The flowing portions of river networks tend to have their maximum extent during seasons with the highest water surplus, when conditions for flooding are most likely. Typically, the occurrence of ephemeral and intermittent streams is greatest in watersheds with low annual runoff and high water surplus seasonality but also is influenced by watershed geologic and edaphic features. *Id.* (citing Gleeson *et al.* 2011).

Rainfall intensity can affect hydrologic connectivity in localities where watershed surfaces have low infiltration capacities relative to rainfall intensities. Infiltration-excess overland flow occurs when rainfall intensity exceeds watershed surface infiltration, and it can be an important mechanism in providing water to wetlands and river networks (Goodrich *et al*. 1997; Levick *et al*. 2008). Overland flow is common at low elevations in the Southwest, due to the presence of desert soils with low infiltration capacities combined with relatively high rainfall intensities. The Pacific Northwest has low rainfall intensities, whereas many locations in the

Mid-Atlantic, Southeast, and Great Plains have higher rainfall intensities. The prevalence of impermeable surfaces in urban areas can generate overland flow in virtually any setting. *Id.* (citing Booth *et al*. 2002).

River system topography and landscape form can profoundly influence river network drainage patterns, distribution of wetlands, and ground-water and surface-water flowpaths. Winter (2001) described six generalized hydrologic landscape forms common throughout the United States. *Id.* Mountain Valleys and Plateaus and High Plains have constrained valleys through which streams and rivers flow. *Id.* at 2-31, 2-33. The Mountain Valleys form has proportionally long, steep sides with narrow to nonexistent floodplains resulting in the rapid movement of water downslope. In contrast, Riverine Valleys have extensive floodplains that promote strong surface-water, hyporheic water, and alluvial ground-water connections between wetlands and rivers. *Id.* at 2-33 to 2-34. Small changes in water table elevations can influence the water levels and hydrologic connectivity of wetlands over extensive areas in this landscape form. Local ground-water flowpaths are especially important in Hummocky Terrain. Constrained valleys, such as the Mountain Valley landform, have limited opportunities for the development of floodplains and alluvial aquifers, whereas unconstrained valleys, such as the Riverine Valley landform, provide opportunities for the establishment of floodplains. Some river basins can be contained within a single hydrologic landscape form, but larger river basins commonly comprise complexes of hydrologic landscape forms. For example, the James River in Virginia, which flows from mountains through the Piedmont to the Coastal Plain, is an example of a Mountain Valley-High Plateaus and Plains-Coastal Terrain-Riverine Valley complex.

Floodplain hydrologic connectivity to rivers and streams occurs primarily through overbank flooding, shallow ground-water flow, and hyporheic flow. Water-table depth can influence connectivity across a range of hydrologic landscape forms, but especially in floodplains. Rivers and wetlands can shift from losing reaches (or recharge wetlands) during dry conditions to gaining reaches (or discharge wetlands) during wet conditions. Wet, high water-table conditions influence both ground-water and surface-water connectivity. When water tables are near the watershed surface, they create conditions in which swales and small stream channels fill with water and flow to nearby water bodies. *Id.* at 2-34 (Wigington *et al*. 2003; Wigington *et a*l. 2005). Nanson and Croke (1992) noted that a complex interaction of fluvial processes forms floodplains, but their character and evolution are essentially a product of stream power (the rate of energy dissipation against the bed and banks of a river or stream) and sediment characteristics. *Id.* They proposed three floodplain classes based on the stream power-sediment characteristic paradigm: (1) high-energy noncohesive, (2) medium-energy noncohesive, and (3) low-energy cohesive. The energy term describes stream power during floodplain formation, and the cohesiveness term depicts the nature of material deposited in the floodplain. In addition, hyporheic and alluvial aquifer exchanges are more responsive to seasonal discharge changes in floodplains with complex topography. *Id.* (citing Poole *et al*. 2006).

Within hydrologic landscape forms, soil and geologic formation permeabilities are important determinants of hydrologic flowpaths. Permeable soils promote infiltration that results in ground-water hydrologic flowpaths, whereas the presence of impermeable soils with low infiltration capacities is conducive to overland flow. In situations in which ground-water outflows from watersheds or landscapes dominate, the fate of water depends in part on the permeability of deeper geologic strata. The presence of an aquiclude (a confining layer) near the watershed surface leads to shallow subsurface flows through soil or geologic materials.

These local ground-water flowpaths connect portions of watersheds to nearby wetlands or streams. *Id.* at 2-35. Alternatively, if a deep permeable geologic material (an aquifer) is present, water is likely to move farther downward within watersheds and recharge deeper aquifers. *Id.* at 2-35 to 2-36. The permeability of soils and geologic formations both can influence the range of hydrologic connectivity between non-floodplain wetlands and river networks. *Id.* at 2-36.

Climate and watershed characteristics directly affect spatial and temporal patterns of connectivity between streams and wetlands and rivers by influencing the timing and extent of river network expansion and contraction. *Id.* at 2-38. They also influence the spatial distribution of water bodies within a watershed, and in particular, the spatial relationship between those water bodies and the river. *Id.* (citing, *e.g.*, Tihansky 1999)

Hydrologic connectivity between streams and rivers can be a function of the distance between the two water bodies. *Id.* (Bracken and Croke 2007; Peterson *et al*. 2007). If channels functioned as pipes, this would not be the case, and any water and its constituent materials exported from a stream eventually would reach the river. Because streams and rivers are not pipes, water can be lost from the channel through evapotranspiration and bank storage and diluted through downstream inputs. *Id.* (Bencala 1993). Thus, material from a headwater stream that flowed directly into the river would be subject to less transformation or dilution. On the other hand, the greater the distance a material travels between a particular stream reach and the river, the greater the opportunity for that material to be altered (*e.g.*, taken up, transformed, or assimilated) in intervening stream reaches; this alteration could reduce the material's direct effect on the river, but it could also allow for beneficial transformations. For example, organic matter exported from a headwater stream located high in a drainage network might never reach the river in its original form, instead becoming reworked and incorporated into the food chain. Similarly, higher order streams generally are located closer to rivers and, therefore, can have higher connectivity than upstream reaches of lower order. Note that although an individual low-order stream can have less connectivity than a high-order stream, a river network has many more low-order streams, which can represent a large portion of the watershed; thus, the magnitude of the cumulative effect of these low-order streams can be significant.

The relationship between streams and the river network is a function of basin shape and network configuration. Elongated basins tend to have trellis networks where relatively small streams join a larger mainstem; compact basins tend to have dendritic networks with tree-like branching, where streams gradually increase in size before joining the mainstem. This network configuration describes the incremental accumulation of drainage area along rivers, and therefore provides information about the relative contributions of streams to downstream waters. Streams in a trellis network are more likely to connect directly to a mainstem, compared with a dendritic network. The relationship between basin shape, network configuration, and connectivity, however, is complex. A mainstem in a trellis network also is more likely to have a lower stream order than one in a dendritic network. *Id.* at 2-38 to 2-39.

Distance also affects connectivity between non-floodplain and riparian/floodplain wetlands and downstream waters. *Id.* at 2-39. Riverine wetlands that serve as origins for lateral source streams that connect directly to a mainstem river have a more direct connection to that river than wetlands that serve as origins for terminal source streams high in a drainage network. This also applies to riparian/floodplain wetlands that have direct surface-water connections to streams or rivers. If geographically isolated non-floodplain wetlands have surface-water outputs (*e.g.*, depressions that experience surface-water spillage or ground-water seeps), the probability that surface water will infiltrate or be lost through evapotranspiration increases with distance. For non-floodplain wetlands connected through ground-water flows, less distant areas are generally connected through shallower flowpaths, assuming similar soil and geologic properties. These shallower ground-water flows have the greatest interchange with surface waters and travel between points in the shortest amount of time. Although elevation is the primary factor determining areas that are inundated through overbank flooding, connectivity with the river generally will be higher for riparian/floodplain wetlands located near the river's edge compared with riparian/floodplain wetlands occurring near the floodplain edge.

Distance from the river network also influences biological connectivity among streams and wetlands. For example, mortality of an organism due to predators and natural hazards generally increases with the distance it has to travel to reach the river network. The likelihood that organisms or propagules traveling randomly or by diffusive mechanisms such as wind will arrive at the river network decreases as distance increases.

The distribution of distances between wetlands and river networks depends on both the drainage density of the river network (the total length of stream channels per unit area) and the density of wetlands. *Id.* at 2-40. Climate and watershed characteristics influence these spatial patterns, which can vary widely.

Biota

Biological connectivity results from the interaction of physical characteristics of the environment—especially those facilitating or restricting dispersal—and species' traits or behaviors, such as life-cycle requirements, dispersal ability, or responses to environmental cues. *Id.* Thus, the types of biota within a river system are integral in determining the river system's connectivity, and landscape features or species traits that necessitate or facilitate movement of organisms tend to increase biological connectivity among water bodies.

Diadromous fauna (*e.g.*, Pacific and Atlantic salmon, certain freshwater shrimps and snails, American eels), which require both freshwater and marine habitats over their life cycles and therefore migrate along river networks, provide one of the clearest illustrations of biological connectivity. Many of these taxa are either obligate or facultative users of headwater streams, meaning that they either require (obligate) or can take advantage of (facultative) these habitats; these taxa thereby create a biological connection along the entire length of the river network. *Id.* (citing Erman and Hawthorne 1976; Wigington *et al*. 2006). For example, many Pacific salmon species spawn in headwater streams, where their young grow for a year or more before migrating downstream, living their adult life stages in the ocean, and then migrating back upstream to spawn. Many taxa also can exploit temporary hydrologic connections between rivers and floodplain wetland habitats caused by flood pulses, moving into these wetlands to feed, reproduce, or avoid harsh environmental conditions and then returning to the river network. *Id.* at 2-40, 2-43 (citing Copp 1989; Junk *et al*. 1989; Smock 1994; Tockner *et al*. 2000; Richardson *et al*. 2005).

Biological connectivity does not solely depend on diadromy, however, as many non-diadromous organisms are capable of significant movement within river networks. *Id.* at 2-40. For example, organisms such as pelagic-spawning fish and mussels release directly into the water eggs or larvae that disperse downstream with water flow; many fish swim significant distances both upstream and downstream; and many aquatic macroinvertebrates move or drift downstream. *Id.* at 2-40 (citing, *e.g.*, Elliott 1971; Müller 1982; Gorman 1986; Brittain and Eikeland 1988; Platania and Altenbach 1998; Elliott, 2003; Hitt and Angermeier 2008; Schwalb *et al*. 2010). Taxa capable of movement over land, via either passive transport (*e.g.*, wind dispersal or attachment to animals capable of terrestrial dispersal) or active movement (*e.g.*, terrestrial dispersal or aerial dispersal of winged adult stages), can establish biotic linkages between river networks and wetlands, as well as linkages across neighboring river systems. Science Report at 2-40 (citing Hughes *et al*. 2009).

Human Activities and Alterations

Human activities frequently alter connectivity between headwater streams, riparian/floodplain wetlands, non-floodplain wetlands, and downgradient river networks. *Id.* at 2-44. In doing so, they alter the transfer and movement of materials and energy between river system components. In fact, the individual or cumulative effects of headwater streams and wetlands on river networks often become discernible only following human-mediated changes in degree of connectivity. These human-mediated changes can increase or decrease hydrologic and biological connectivity (or, alternatively, decrease or increase hydrologic and biological isolation). *Id* at 2-44 to 2-45. For example, activities and alterations such as dams, levees, water abstraction, piping, channelization, and burial can reduce hydrologic connectivity between streams and wetlands and rivers, whereas activities and alterations such as wetland drainage, irrigation, impervious surfaces, interbasin transfers, and channelization can enhance hydrologic connections. *Id.* at 2-45. Biological connectivity can be affected similarly: For example, dams and impoundments might impede biotic movement, whereas nonnative species introductions artificially increase biotic movement. Further complicating the issue is that a given activity or alteration might simultaneously increase and decrease connectivity, depending on which part of the river network is considered. For example, channelization and levee construction reduce lateral expansion of the river network (thereby reducing hydrologic connections with floodplains), but might increase this connectivity downstream due to increased frequency and magnitude of high flows.

The greatest human impact on riparian/floodplain wetlands and non-floodplain wetlands has been through wetland drainage, primarily for agricultural purposes. Estimates show that, in the conterminous United States, states have lost more than half their original wetlands (50%), with some losing more than 90%; wetland surface areas also have declined significantly. *Id.* (citing Dahl 1990).

Drainage causes a direct loss of function and connectivity in cases where wetland characteristics are completely lost. *Id.* at 2-45. In the Des Moines lobe of the prairie pothole region, where more than 90% of the wetlands have been drained, a disproportionate loss of smaller and larger wetlands has occurred. Accompanying this loss have been significant decreases in perimeter area ratios—which are associated with greater biogeochemical processing and groundwater recharge rates—and increased mean distances between wetlands, which reduces biological connectivity. *Id.* at 2-45 to 2-46 (citing Van Meter and Basu 2015). Wetland drainage also increases hydrologic connectivity between the landscape—including drained areas that retain wetland characteristics—and downstream waters. Effects of this enhanced hydrologic connectivity include (1) reduced water storage and more rapid conveyance of water to the network, with subsequent increases in total runoff, baseflows, stormflows, and flooding risk; (2) increased delivery of sediment and pollutants to downstream waters; and (3) increased transport of water-dispersing organisms. *Id.* at 2-46 to 2-47 (citing Babbitt and Tanner 2000; Baber *et al*. 2002; Mulhouse and Galatowitsch 2003; Wiskow and van der Ploeg 2003; Blann *et al*. 2009). Biological connectivity, however, also can decrease with drainage and ditching, as average distances between wetlands increase and limit the ability of organisms to disperse between systems aerially or terrestrially. *Id.* at 2-47 (citing Leibowitz, 2003). Groundwater withdrawal also can affect wetland connectivity by reducing the number of wetlands. Of particular concern in the arid Southwest is that ground-water withdrawal can decrease regional and local water tables, reducing or altogether eliminating ground-water-dependent wetlands. *Id.* (citing Patten *et al*. 2008). Groundwater withdrawal, however, also can increase connectivity in areas where that ground water is applied or consumed.

5. Science Report Executive Summary Closing Comments

The structure and function of downstream waters highly depend on materials—broadly defined as any physical, chemical, or biological entity—that originate outside of the downstream waters. Most of the constituent materials in rivers, for example, originate from aquatic ecosystems located upstream in the drainage network or elsewhere in the drainage basin, and are transported to the river through flowpaths illustrated in the introduction to this report. Thus, the effects of streams, wetlands, and open waters on rivers are determined by the presence of (1) physical, chemical, or biological pathways that enable (or inhibit) the transport of materials and organisms to downstream waters; and (2) functions within the streams, wetlands, and open waters that alter the quantity and quality of materials and organisms transported along those pathways to downstream waters.

The strong hydrologic connectivity of river networks is apparent in the existence of stream channels that form the physical structure of the network itself. Given the evidence reviewed in the Science Report, it is clear that streams and rivers are much more than a system of physical channels for efficiently conveying water and other materials downstream. The presence of physical channels, however, is a compelling line of evidence for surface-water connections from tributaries, or water bodies of other types, to downstream waters. Physical channels are defined by continuous bed-and-banks structures, which can include apparent disruptions (such as by bedrock outcrops, braided channels, flow-through wetlands) associated with changes in the material and gradient over and through which water flows. The continuation of bed and banks downgradient from such disruptions is evidence of the surface connection with the channel that is upgradient of the perceived disruption.

Although currently available peer-reviewed literature does not identify which types of non-floodplain wetlands have or lack the types of connections needed to convey functional effects to downstream waters, additional information (*e.g.*, field assessments, analysis of existing or new data, reports from local resource agencies) could be used in case-by-case analysis of non-floodplain wetlands. Importantly, information from emerging research into the connectivity of non-floodplain wetlands, including studies of the types identified in Section 4.5.2 of the Science Report, could close some of the current data gaps in the near future. Recent scientific advances in the fields of mapping, assessment, modeling, and landscape classification indicate that increasing availability of high-resolution data sets, promising new technologies for watershed-scale analyses, and methods for classifying landscape units by hydrologic behavior can facilitate and improve the accuracy of connectivity assessments. Emerging research that expands our ability to detect and monitor ecologically relevant connections at appropriate scales, metrics to accurately measure effects on downstream integrity, and management practices that apply what we already know about ecosystem function will contribute to our ability to identify waters of national importance and maintain the long-term sustainability and resiliency of valued water resources.

6. Emerging Science

The agencies will continue a transparent review of the science, and gain experience and expertise as the agencies implement the rule. If evolving science and the agencies' experience lead to a need for action to alter the jurisdictional categories, any such action will be conducted as part of a rule-making process. As stated in Conclusion 3 of the Science Report, the connectivity and effects of wetlands and open waters that are not structurally linked to other waters by stream channels and their lateral extensions into riparian areas and floodplains are more difficult to address solely from evidence available in peer-reviewed studies. The literature on non-floodplain wetlands shows that these systems have important hydrologic, water-quality, and habitat functions that can affect downstream waters where connections to them exist; the literature also provides limited examples of direct effects of non-floodplain wetland isolation on downstream water integrity. Currently available peer-reviewed literature, however, does not identify which types of non-floodplain wetlands have or lack the types of connections needed to convey the effects on downstream waters of functions, materials, or biota provided by those wetlands. These limitations of the literature, considered in context with the relatively small number of studies examining the relationships of non-floodplain wetlands to downstream waters and with comments from the Science Advisory Board on an external review draft of the Science Report, are reflected in the lower strength of evidence expressed in the conclusions of the Science Report.

The relatively small body of literature currently available could reflect either a lack of downstream connections and effects from non-floodplain wetlands, or a lack of peer-reviewed published studies focused on the connections to and effects of these systems on downstream waters. Information from other sources, including state and local reports, can be used in case-by-case analysis of non-floodplain wetlands. Importantly, data from emerging research not yet published in the peer-reviewed literature could close current data gaps in the near future. Recent scientific advances in the fields of mapping (*e.g.*, Heine *et al*. 2004; Tiner 2011; Lang *et al*. 2012), assessment (*e.g.*, McGlynn and McDonnell 2003; Gergel 2005; McGuire *et al*. 2005; Ver Hoef *et al*. 2006; Leibowitz *et al*. 2008; Moreno-Mateos *et al*. 2008; Lane and D’Amico 2010;

Ver Hoef and Peterson 2010; Shook and Pomeroy 2011; Powers *et al*. 2012; McDonough *et al*. 2015), modeling (*e.g*., Golden *et al*. 2013; McLaughlin *et al*. 2014), and landscape classification (*e.g.*, Wigington *et al*. 2013) indicate that increasing availability of high-resolution data sets, promising new technologies for watershed-scale analyses, and methods for classifying landscape units by hydrologic behavior can facilitate such assessments by broadening their scope and improving their accuracy. *Id.* at 6-13. Emerging research that expands our ability to detect and monitor ecologically relevant connections at appropriate scales, metrics to accurately measure effects on downstream integrity, and management practices that apply what we already know about ecosystem function, will contribute to our ability to identify waters of national importance and maintain the long-term sustainability and resiliency of valued water resources.

ii. Scientific Review

1. Peer Review of the Connectivity Report

The process for developing the Science Report followed standard information quality guidelines for EPA. In September 2013, EPA released a draft of the Science Report for an independent SAB review and invited submissions of public comments for consideration by the SAB panel. In October 2014, after several public meetings and hearings, the SAB completed its peer review of the draft Science Report. The SAB was highly supportive of the draft Science Report's conclusions regarding streams, riparian and floodplain wetlands, and open waters, and recommended strengthening the conclusion regarding non-floodplain waters to include a more definitive statement that reflects how numerous functions of such waters sustain the integrity of downstream waters. SAB 2014a. The final peer review report is available on the SAB website, as well as in the docket for this rulemaking. EPA revised the draft Science Report based on comments from the public and recommendations from the SAB panel.

The SAB was established in 1978 by the Environmental Research, Development, and Demonstration Authorization Act (ERDDAA), to provide independent scientific and technical advice to the EPA Administrator on the technical basis for Agency positions and regulations. Advisory functions include peer review of EPA's technical documents, such as the Science Report. At the time the peer review was completed, the chartered SAB comprised more than 50 members from a variety of sectors including academia, non-profit organizations, foundations, state governments, consulting firms, and industry. To conduct the peer review, EPA's SAB staff formed an ad hoc panel based on nominations from the public to serve as the primary reviewers. The panel consisted of 27 technical experts in array of relevant fields, including hydrology, wetland and stream ecology, biology, geomorphology, biogeochemistry, and freshwater science. Similar to the chartered SAB, the panel members represented sectors including academia, a federal government agency, non-profit organizations, and consulting firms. The chair of the panel was a member of the chartered SAB.

The SAB process is open and transparent, consistent with the Federal Advisory Committee Act, 5 U.S.C., App 2, and agency policies regarding Federal advisory committees. Consequently, the SAB has an approved charter, which must be renewed biennially, announces its meetings in the *Federal Register*, and provides opportunities for public comment on issues before the Board. The SAB staff announced via the *Federal Register* that they sought public nominations of technical experts to serve on the expert panel: SAB Panel for the Review of the EPA Water Body Connectivity Report (via a similar process the public also is invited to nominate chartered SAB members). The SAB staff then invited the public to comment on the list of candidates for the panel. Once the panel was selected, the SAB staff posted a memo on its website addressing the formation of the panel and the set of determinations that were necessary for its formation (*e.g.*, no conflicts of interest). In the public notice of the first public meetings interested members of the public were invited to submit relevant comments for the SAB Panel to consider pertaining to the review materials, including the charge to the Panel. Over 133,000 public comments were received by the Docket. Every meeting was open to the public, noticed in the *Federal Register*, and had time allotted for the public to present their views. In total, the Panel held a two-day in-person meeting in Washington, DC, in December 2013, and three four-hour public teleconferences in April, May, and June 2014. The SAB Panel also compiled four draft versions of its peer review report to inform and assist the meeting deliberations that were posted on the SAB website. In September 2014, the chartered SAB conducted a public teleconference to conduct the quality review of the Panel's final draft peer review report. The peer review report was approved at that meeting, and revisions were made to reflect the chartered SAB's review. The culmination of that public process was the release of the final peer review report in October 2014. All meeting minutes and draft reports are available on the SAB website for public access.

2. SAB Review of the Proposed Rule

In addition to its peer review of the draft Science Report, in a separate effort the SAB also reviewed the adequacy of the scientific and technical basis of the proposed rule and provided its advice and comments on the proposal in September 2014. SAB 2014b.The same SAB Panel that reviewed the draft Science Report met via two public teleconferences in August 2014 to discuss the scientific and technical basis of the proposed rule. The Panel submitted comments to the Chair of the chartered SAB. SAB 2014c. A work group of chartered SAB members considered comments provided by panel members, agency representatives, and the public on the adequacy of the science informing the rule. This work group then led the September 2014 public teleconference discussion of the chartered SAB. The public had an opportunity to submit oral or written comments during these two public meetings. The SAB's final letter to the EPA Administrator can be found on the SAB website and in the docket for this rule.

The SAB found that the available science provides an adequate scientific basis for the key components of the proposed rule. The SAB noted that although water bodies differ in degree of connectivity that affects the extent of influence they exert on downstream waters (*i.e.*, they exist on a "connectivity gradient"), the available science supports the conclusion that the types of water bodies identified as "waters of the United States" in the proposed rule exert strong influence on the chemical, physical, and biological integrity of downstream waters. In particular, the SAB expressed support for the proposed rule's inclusion of tributaries and adjacent waters as categorical waters of the United States and the inclusion of "other waters" on a case-specific basis, though noting that certain "other waters" can be determined as a subcategory to be similarly situated.

Regarding tributaries, the SAB found, "[t]here is strong scientific evidence to support the EPA's proposal to include all tributaries within the jurisdiction of the Clean Water Act. Tributaries, as a group, exert strong influence on the physical, chemical, and biological integrity of downstream waters, even though the degree of connectivity is a function of variation in the frequency, duration, magnitude, predictability, and consequences of physical, chemical, and biological process." SAB 2014b at 2. The Board advised the agencies to reconsider the definition of tributaries because not all tributaries have ordinary high water marks (*e.g.*, ephemeral streams with arid and semi-arid environments or in low gradient landscapes where the flow of water is unlikely to cause an ordinary high water mark). The SAB also advised the agencies to consider changing the wording in the definition to "bed, bank, and other evidence of flow." *Id.* at 2. In addition, the SAB suggested that the agencies reconsider whether flow-through lentic systems should be included as adjacent waters and wetlands, rather than as tributaries.

Regarding adjacent waters and wetlands, the SAB stated, "[t]he available science supports the EPA's proposal to include adjacent waters and wetlands as a waters of the United States. …because [they] have a strong influence on the physical, chemical, and biological integrity of navigable waters." *Id.* In particular, the SAB noted, "the available science supports defining adjacency or determination of adjacency on the basis of functional relationships," rather than "solely on the basis of geographical proximity or distance to jurisdictional waters." *Id.* at 2-3.

In the evaluation of "other waters" the SAB found that "scientific literature has established that 'other waters' can influence downstream waters, particularly when considered in aggregate." *Id.* at 3. The SAB thus found it "appropriate to define 'other waters' as waters of the United States on a case-specific basis, either alone or in combination with similarly situated waters in the same region." *Id.* The SAB found that distance could not be the sole indicator used to evaluate the connection of "other waters" to jurisdictional waters. The SAB also expressed support for language in one of the options discussed in the preamble to the proposed rule. Specifically, the SAB stated there is "also adequate scientific evidence to support a determination that certain subcategories and types of 'other waters' in particular regions of the United States (e.g., Carolina and Delmarva Bays, Texas coastal prairie wetlands, prairie potholes, pocosins, western vernal pools) are similarly situated (i.e., they have a similar influence on the physical, chemical, and biological integrity of downstream waters and are similarly situated on the landscape) and thus could be considered waters of the United States." *Id.* The Board noted that other sets of wetlands could be identified as "similarly situated" as the science continues to develop and that science does not support excluding groups of "other waters" or subcategories thereof from jurisdiction.

The exclusions paragraph of the proposed rule generated the most comments from the SAB. The SAB noted, "[t]he Clean Water Act exclusions of groundwater and certain other exclusions listed in the proposed rule and the current regulation do not have scientific justification." *Id.* With regard to ditches, the Board found that there is a lack of scientific knowledge to determine whether ditches should be categorically excluded. For example, some ditches that would be excluded in the Midwest may drain Cowardin wetlands and may provide certain ecosystem services, while gullies, rills, and non-wetland swales can be important conduits for moving water between jurisdictional waters. The SAB also noted that artificial lakes or ponds, or reflection pools, can be directly connected to jurisdictional waters via either shallow or deep groundwater. The SAB also recommended that the agencies clarify in the preamble to the final rule that "significant nexus" is a legal term, not a scientific one.

In finalizing the rule, the agencies took the SAB's advice into careful consideration and made some changes in response, as well as in response to public comments. These changes included removing in-stream wetlands and open waters from the tributary category and including them in the adjacent waters category instead, as well as determining by rule that the five subcategory waters are similarly situated when located in the same point of entry watershed. Although the available science is an important factor in the agencies' decision-making, policy and legal considerations were also carefully contemplated when finalizing the rule.

B. Scope of Significant Nexus Analysis: "Similarly Situated"

Under the significant nexus standard, waters possess the requisite significant nexus if they "either alone or in combination with similarly situated [wet]lands in the region, significantly affect the chemical, physical, and biological integrity of other covered waters more readily understood as 'navigable.'" *Rapanos* at 780. Several terms in this standard were not defined. In this rule the agencies interpret these terms and the scope of "waters of the United States" based on the goals, objectives, and policies of the statute, the scientific literature, the Supreme Court opinions, and the agencies' technical expertise and experience. Therefore, for purposes of a significant nexus analysis, the agencies have determined (1) which waters are "similarly situated," and thus should be in analyzed in combination in (2) the "region," for purposes of a significant nexus analysis, and (3) the types of functions that should be analyzed to determine if waters significantly affect the chemical, physical, and biological integrity of traditional navigable waters, interstate waters and the territorial seas. These determinations underpin many of the key elements of the rule and are reflected in the definition of "significant nexus" in the rule.

i. Analyzing "Similarly situated" Waters in Combination

For purposes of the rule, waters are "similarly situated" where they function alike and are sufficiently close to function together in affecting downstream waters. This approach of assessing the functions of identified waters in combination is consistent with the science.

Streams, wetlands, and other surface waters interact with ground water and terrestrial environments throughout the landscape, "from the mountains to the oceans." *Id.* at 1-2 (citing Winter *et al*. 1998). Thus, an integrated perspective of the landscape, provides the appropriate scientific context for evaluating and interpreting evidence about the physical, chemical, and biological connectivity of streams, wetlands, and open waters to downstream waters.

Connectivity has long been a central tenet for the study of aquatic ecosystems. The River Continuum Concept viewed the entire length of rivers, from source to mouth, as a complex hydrologic gradient with predictable longitudinal patterns of ecological structure and function. *Id.* (citing Vannote *et al.* 1980). The key pattern is that downstream communities are organized, in large part, by upstream communities and processes. *Id.* (citing Vannote *et al.* 1980; Battin *et al*. 2009). The Serial Discontinuity Concept built on the River Continuum Concept to improve our understanding of how dams and impoundments disrupt the longitudinal patterns of flowing waters with predictable downstream effects. *Id.* (Ward and Stanford 1983). The Spiraling Concept described how river network connectivity can be evaluated and quantified as materials cycle from dissolved forms to transiently stored forms taken up by living organisms, then back to dissolved forms, as they are transported downstream. *Id.* at 1-3 (citing Webster and Patten 1979; Newbold *et al*. 1981; Elwood *et al*. 1983). These three conceptual frameworks focused on the longitudinal connections of river ecosystems, whereas the subsequent flood pulse concept examined the importance of lateral connectivity of river channels to floodplains, including wetlands and open waters, through seasonal expansion and contraction of river networks. *Id.* (citing Junk *et al*. 1989). Ward (1989) summarized the importance of connectivity to lotic ecosystems along four dimensions: longitudinal, lateral, vertical (surface-subsurface), and temporal connections; he concluded that running water ecosystems are open systems that are highly interactive with both contiguous habitats and other ecosystems in the surrounding landscape. *Id.* As these conceptual frameworks illustrate, scientists have long recognized the hydrologic connectivity the physical structure of river networks represents.

More recently, scientists have incorporated this connected network structure into conceptual frameworks describing ecological patterns in river ecosystems and the processes linking them to other watershed components, including wetlands and open waters. *Id.* (citing Power and Dietrich 2002; Benda *et al*. 2004; Nadeau and Rains 2007; Rodriguez-Iturbe *et al*. 2009). Sheaves (2009) emphasized the key ecological connections—which include process-based connections that maintain habitat function (*e.g.*, nutrient dynamics, trophic function) and movements of individual organisms—throughout a complex of interlinked freshwater, tidal wetlands, and estuarine habitats as critical for the persistence of aquatic species, populations, and communities over the full range of time scales. *Id.*

Scientists routinely aggregate the effects of groups of waters, multiplying the known effect of one water by the number of similar waters in a specific geographic area, or to a certain scale. This kind of functional aggregation of non-adjacent (and other types of waters) is well-supported in the scientific literature. *See*, *e.g.*, Stevenson and Hauer 2002; Leibowitz 2003; Gamble *et al*. 2007; Lane and D'Amico 2010; Wilcox *et al.* 2011. Similarly, streams and rivers are routinely aggregated by scientists to estimate their combined effect on downstream waters in the same watershed. This is because chemical, physical, or biological integrity of downstream waters is directly related to the aggregate contribution of upstream waters that flow into them, including any tributaries and connected wetlands. As a result, the scientific literature and the Science Report consistently document that the health of larger downstream waters is directly related to the aggregate health of waters located upstream, including waters such as wetlands that may not be hydrologically connected but function together to prevent floodwaters and contaminants from reaching downstream waters.

Stream and wetland connectivity to downstream waters, and the resulting effects on downstream water integrity, must be considered cumulatively. Science Report at 1-10. First, when considering the effect of an individual stream or wetland, including the cumulative effect of all the contributions and functions that a stream or wetland provides is essential. For example, the same stream transports water, removes excess nutrients, mitigates flooding, and provides refuge for fish when conditions downstream are unfavorable; ignoring any of these functions would underestimate the overall effect of that stream.

Secondly, and perhaps more importantly, stream channel networks and the watersheds they drain are fundamentally cumulative in how they are formed and maintained. Excess precipitation that is not evaporated, taken up by organisms, or stored in soils and geologic layers moves downgradient as overland flow or through channels, which concentrate flows and carry sediment, chemical constituents, and organisms. As flows from numerous headwater channels combine in larger channels, the volume and effects of those flows accumulate as they move through the river network. As a result, the incremental contributions of individual streams and wetlands accumulate in the downstream waters. Important cumulative effects are exemplified by ephemeral flows in arid landscapes, which are key sources of baseflow for downgradient waters, and by the high rates of denitrification in headwater streams. *Id.* (citing Schlesinger and Jones 1984; Baillie *et al*. 2007; Izbicki 2007). The amount of nutrients removed by any one stream over multiple years or by all headwater streams in a watershed in a given year can have substantial consequences for downstream waters. *Id.* (citing Alexander *et al*. 2007; Alexander *et al.* 2009; Böhlke *et al*. 2009; Helton *et al*. 2011). Similar cumulative effects on downstream waters have been documented for other material contributions from headwater streams in the Science Report. For example, although the probability of a large-magnitude transfer of organisms from any given headwater stream in a given year might be low (*i.e*., a low-frequency connection when each stream is considered individually), headwater streams are the most abundant type of stream in most watersheds. Thus, the overall probability of a large-magnitude transfer of organisms is higher when considered for all headwater streams in a watershed—that is, there is a high-frequency connection when considered cumulatively at the watershed scale, compared with probabilities of transport for streams individually. Similarly, a single pollutant discharge might be negligible but the cumulative effect of multiple discharges could degrade the integrity of downstream waters.

Evaluating cumulative contributions over time is critical in streams and wetlands with variable degrees of connectivity. *Id.* at 1-11. For example, denitrification in a single headwater stream in any given year might affect downstream waters; over multiple years, however, this effect could accumulate. Western vernal pools provide another example of cumulative effects over time. These pools typically occur as complexes in which the hydrology and ecology are tightly coupled with the local and regional geological processes that formed them. When seasonal precipitation exceeds wetland storage capacity and wetlands overflow into the river network and generate stream discharge, the vernal pool basins, swales, and seasonal streams function as a single surface-water and shallow ground-water system connected to the river network.

In the aggregate, similarly situated wetlands may have significant effects on the quality of water many miles away, particularly in circumstances where numerous similarly situated waters are located in the region and are performing like functions that combine to influence downstream waters. *See, e.g.,* Jansson *et al*. 1998; Mitsch *et al*. 2001; Forbes *et al.* 2012. Cumulatively, many small wetlands can hold a large amount of snowmelt and precipitation, reducing the likelihood of flooding downstream. Science Report at 4-24 (citing Hubbard and Linder 1986).

Scientists can and do routinely classify similar waters and wetlands into groups for a number of different reasons; because of their inherent physical characteristics, because they provide similar functions, because they were formed by similar geomorphic processes, and by their level of biological diversity, for example. Classifying wetlands based on their functions is also the basis for the U.S. Army Corps of Engineers hydrogeomorphic (HGM) classification of wetlands. Brinson 1993. The HGM method is a wetlands assessment approach pioneered by the Corps in the 1990s, and extensively applied via regional handbooks since then. The Corps HGM method uses a conceptual framework for identifying broad wetland classes based on common structural and functional features, which includes a method for using local attributes to further subdivide the broad classes into regional subclasses. Assessment methods like the HGM provide a basis for determining if waters provide similar functions based on their structural attributes and indicator species. Scientists also directly measure attributes and processes taking place in particular types of waters during in-depth field studies that provide reference information that informs the understanding of the functions performed by many types of aquatic systems nationwide.

Consideration of the aggregate effects of wetlands and other waters often gives the most complete information about how such waters influence the chemical, physical, or biological integrity of downstream waters. In many watersheds, wetlands have a disproportionate effect on water quality relative to their surface area because wetland plants slow down water flow, allowing suspended sediments, nutrients, and pollutants to settle out. They filter these materials out of the water received from large areas, absorbing or processing them, and then releasing higher quality water. National Research Council 1995. For an individual wetland, this is most pronounced where it lies immediately upstream of a drinking water intake, for example. *See, e.g.*, Johnston *et al.* 1990. The cumulative influence of many individual wetlands within watersheds can strongly affect the spatial scale, magnitude, frequency, and duration of hydrologic, biological and chemical fluxes or transfers of water and materials to downstream waters. Science Report at ES-11.

For example, as discussed in section VII.B., excess nutrients discharged into small tributary streams in the aggregate can cause algal blooms downstream that reduce dissolved oxygen levels and increase turbidity in traditional navigable waters, interstate waters, and the territorial seas. This oxygen depletion in waters, known as hypoxia, has impacted commercial and recreational fisheries in the northern Gulf of Mexico, as water low in dissolved oxygen cannot support living aquatic organisms. Committee on Environment and Natural Resources 2000; Freeman *et al.* 2007. In this instance, the cumulative effects of nutrient export from the many small headwater streams of the Mississippi River have resulted in large-scale ecological and economically harmful impacts hundreds of miles downstream. *See, e.g.,* Goolsby *et al.*1999.

In their review of the scientific and technical adequacy of the rule, the SAB panel members "generally agreed that aggregating 'similarly situated' waters is scientifically justified, given that the combined effects of these waters on downstream waters are often only measurable in aggregate. Panelists also were generally comfortable with the idea of using "similarly situated" waters to guide aggregation." SAB 2014c at 4 to 5. One of the main conclusions of the Science Report is that the incremental contributions of individual streams and wetlands are cumulative across entire watersheds, and their effects on downstream waters should be evaluated within the context of other streams and wetlands in that watershed. For example, the Science Report finds, "[t]he amount of nutrients removed by any one stream over multiple years or by all headwater streams in a watershed in a given year can have substantial consequences for downstream waters." Science Report at 1-10. Cumulative effects of streams, wetlands, and open waters across a watershed must be considered because "[t]he downstream consequences (*e.g.,* the amount and quality of materials that eventually reach a river) are determined by the aggregate effect of contributions and sequential alterations that begin at the source waters and function along continuous flowpaths to the watershed outlet." *Id*. at 1-19.

ii. Rationale for Conclusion

As reflected in the rule's definition of "significant nexus," the agencies determined that it is reasonable to consider waters as "similarly situated" where they function alike and are sufficiently close to function together in affecting downstream waters. Since the focus of the significant nexus standard is on protecting and restoring the chemical, physical, and biological integrity of the nation's waters, the agencies interpret the phrase "similarly situated" in terms of whether particular waters are providing common, or similar, functions for downstream waters such that it is reasonable to consider their effect together. Regarding covered tributaries and covered adjacent waters, the agencies define each water type such that the functions provided are similar and the waters are situated so as to provide those functions together to affect downstream traditional navigable waters as a landscape unit.

The science demonstrates that covered tributaries provide many common vital functions important to the chemical, physical, and biological integrity of downstream waters, regardless of the size of the tributaries. The science also demonstrates that tributaries within a single point of entry watershed act together as a system in affecting downstream waters. Structurally and functionally, tributary networks and the watersheds they drain are fundamentally cumulative in how they are formed and maintained. Science Report at ES-13. The science also supports the conclusion that sufficient volume, duration, and frequency of flow are required to create a bed and banks and ordinary high water mark. The agencies conclude that covered tributaries with a bed and banks and ordinary high water mark are similarly situated for purposes of the agencies' significant nexus analysis.

For covered adjacent waters, the science demonstrates that these waters provide many similar vital functions to downstream waters, and the agencies defined adjacent waters with distances limitations to ensure that the waters are providing similar functions to downstream waters and that the waters are located comparably in the landscape such that the agencies' reasonably judged them to be similarly situated. In addition, the science supports that interacting wetland complexes might best be understood as a functional unit, supporting their evaluation in combination due to their close proximity to each other. *Id.* at 4-22.

For waters for which a case-specific significant nexus determination is required the agencies have determined that some waters in specific regions are similarly situated; for other specified waters, the determination of whether there are any other waters providing similar functions in a similar situation in the region must be made as part of a case-specific determination. See preamble and discussion below.

For purposes of analyzing the significant nexus of tributaries and adjacent waters, tributaries that meet the definition of "tributary" in a watershed draining to an (a)(1) through (a)(3) water are similarly situated, and adjacent waters that meet the definition of "adjacent" in a watershed draining to an (a)(1) through (a)(3) water are similarly situated. That is reasonable because the agencies are identifying characteristics of these waters through the regulation and documenting the science that demonstrates that these defined tributaries and defined adjacent waters provide similar functions in the watershed. Assessing the functions of identified waters in combination is consistent not only with Justice Kennedy's significant nexus standard, but with the science. As stated above, the functions of the tributaries are inextricably linked and have a cumulative effect on the integrity of the downstream traditional navigable water or interstate water. There is also an obvious locational relationship between the (a)(1), (a)(2) or (a)(3) water and the streams, lakes, and wetlands that meet the definition of tributaries and the definition of adjacent waters; these waters have a clear linear relationship resulting from the simple existence of the channel itself and the direction of flow.

For waters for which a case-specific significant nexus analysis is required, numerous factors affect chemical, physical, and biological connectivity, operating at multiple spatial and temporal scales, and interacting with each other in complex ways, to determine where components of aquatic systems fall on the connectivity-isolation gradient at a given time. Some of these factors include climate, watershed characteristics, spatial distribution patterns, biota, and human activities and alterations. *Id.* at 3-33. Recognizing the limits on the ability to observe or document all of these interacting factors, it is reasonable to look for visible patterns in the landscape and waters that are often indicative of the connectivity factors, in determining what waters to aggregate. Due to relative similarity of soils, topography, or groundwater connections, for example, there may be a group of wetlands scattered throughout a watershed, at similar distances from the tributaries in the watershed and performing similar functions. It is appropriate to assess the significance of the nexus of those waters in the aggregate, consistent with Justice Kennedy's standard.

The agencies conclude, consistent with the science and the goals and purposes of the CWA, that it is reasonable to assess the effects of waters in combination based on the similarity of the functions they provide to the downstream water and their location in the watershed.

C. "In the Region"

i. Identifying "In the Region" As the Point of Entry Watershed

The watershed that drains to the single point of entry to a traditional navigable water, interstate water or territorial sea is a logical spatial framework for the evaluation of the nexus. Scientists utilize watersheds to evaluate the connections and strength of those connections that are fundamental to the significant nexus inquiry. The Science Report stated that watersheds are integrated at multiple spatial and temporal scales by flows of surface water and ground water, transport and transformation of physical and chemical materials, and movements of organisms. Science Report at 6-8.

The watershed is also the most reasonable region within which to assess significant nexus from a water quality management perspective, because the traditional navigable water, interstate water, or the territorial sea is the downstream affected water whose quality is dependent on the condition of the contributing upstream waters, including streams, lakes, and wetlands. To restore or maintain the health of the downstream affected water, it is standard practice to evaluate the condition of the waters that are in the contributing watershed and to develop a plan to address the issues of concern. The functions of the contributing waters are inextricably linked and have a cumulative effect on the integrity of the downstream traditional navigable water, interstate water, or territorial sea. The size of that watershed can be determined by identifying the geographic area that drains to the nearest traditional navigable water, interstate water or the territorial seas, and then using that point of entry watershed to conduct a significant nexus evaluation. *See, e.g.*, Black 1997.

The Corps has used watershed framework approaches for water resources and navigation approaches for over 100 years, and in the regulatory program since its inception. Also, using a watershed framework is consistent with over two decades of practice by EPA and many other governmental, academic, and other entities which recognize that a watershed approach is the most effective framework to address water resource challenges. *See, e.g.,* U.S. Environmental Protection Agency 1996; U.S. Environmental Protection Agency 2010; U.S. Environmental Protection Agency 2014. The agencies both recognize the importance of the watershed approach by investing in opportunities to advance watershed protection and in developing useful watershed tools and services. Applying a watershed approach continues to be a priority of EPA, and is embedded in the agency's most recent strategic plans, which are used to drive progress toward the EPA's health and environmental goals. U.S. Environmental Protection Agency 2010; U.S. Environmental Protection Agency 2014.

ii. Rationale for Conclusion

The agencies have determined that because the movement of water from watershed drainage basins to river networks and lakes shapes the development and function of these systems in a way that is critical to their long term health, the watershed is reasonable and technically appropriate to use for purposes of interpreting "waters of the United States," in light of the phrase "in the region" in Justice Kennedy's standard. *See, e.g.*, Montgomery 1999. The agencies have reasonably limited the region to the watershed that drains to the <u>nearest</u> traditional navigable water, interstate water, or the territorial seas to ensure that the area for analysis is determined by those foundational waters protected by the CWA.

Using a watershed as the framework for conducting significant nexus evaluations is scientifically supportable. Watersheds are generally regarded as the most appropriate spatial unit for water resource management. *See, e.g.,* Omernik and Bailey 1997; Montgomery 1999; Winter 2001; Baron *et al*. 2002; Allan 2004; U.S. Environmental Protection Agency 2008; Wigington *et* *al.* 2013. Anthropogenic actions and natural events can have widespread effects within the watershed that collectively impact the quality of the relevant traditional navigable water, interstate water or territorial sea. Levick *et al.* 2008. For these reasons, it is more appropriate to conduct a significant nexus determination at the watershed scale than to focus on a specific site, such as an individual stream segment. The watershed size reflects the specific water management objective, and is scaled up or down as is appropriate to meet that objective. If the objective is to manage the water quality in a particular receiving water body (the "target" water body), the watershed should include all those waters that are contributing to that target water since they will primarily determine the quality of the receiving water.

The agencies recognize that the point of entry watershed will vary in size depending upon the region of the country and the distance a particular tributary network is from the nearest traditional navigable water, interstate water, or the territorial seas. That variation appropriately reflects regional variation in climate, geology, and terrain and also ensures that the "region" for purposes of a significant nexus evaluation represents a functioning aquatic system. In the arid West, the agencies recognize there may be situations where the single point of entry watershed is very large, and it may be reasonable to evaluate all similarly situated waters in a smaller watershed.

In addition, the Science Report also supports evaluating waters on a watershed scale, concluding, "[c]umulative effects *across a watershed* must be considered when quantifying the frequency, duration, and magnitude of connectivity, to evaluate the downstream effects of streams and wetlands. Science Report at ES-14 (emphasis added). In addition, the Science Report notes, "[a] river is the time-integrated result of all waters contributing to it, and connectivity is the property that spatially integrates the individual components of the watershed.

In discussions of connectivity, the watershed scale is the appropriate context for interpreting technical evidence about individual watershed components." *Id.* at 2-1 (citing Newbold *et al*. 1982b; Stanford and Ward 1993; Bunn and Arthington 2002; Power and Dietrich 2002; Benda *et al.* 2004; Naiman *et al.* 2005; Nadeau and Rains 2007; Rodriguez-Iturbe *et al*. 2009). In light of the scientific literature, the longstanding approach of the agencies' implementation of the CWA, and the statutory goals underpinning Justice Kennedy's significant nexus framework, the watershed draining to the nearest traditional navigable water, interstate water, or the territorial sea, is the appropriate "region" for a significant nexus analysis.

D. "Significant Nexus"

The agencies are defining the term "significant nexus" to mean "that a water, including wetlands, either alone or in combination with other similarly situated waters in the region, significantly affects the chemical, physical, or biological integrity" of a traditional navigable water, interstate water, or the territorial sea. For an effect to be significant, it must be more than speculative or insubstantial. For purposes of determining whether or not a water has a significant nexus, the water's effect on downstream (a)(1) through (a)(3) waters shall be assessed by evaluating the aquatic functions listed in the definition, which are highlighted below. A water has a significant nexus when any single function or combination of functions performed by the water, alone or together with similarly situated waters in the region, contributes significantly to the chemical, physical, or biological integrity of the nearest traditional navigable water, interstate water, or the territorial seas. Functions relevant to the significant nexus evaluation are the following: (A) sediment trapping, (B) nutrient recycling, (C) pollutant trapping, transformation, filtering, and transport, (D) retention and attenuation of flood waters, (E) runoff storage, (F) contribution of flow, (G) export of organic matter, (H) export of food resources, or (I) provision of life cycle dependent aquatic habitat (such as foraging, feeding, nesting, breeding, spawning, or use as a nursery area) for species located in an (a)(1) through (3) water.

The agencies' definition of the term "significant nexus" in the rule is consistent with language in *SWANCC* and *Rapanos*, and with the goals, objectives, and policies of the CWA. The definition reflects that not all waters have a requisite connection to traditional navigable waters, interstate waters, or the territorial seas sufficient to be determined jurisdictional. Justice Kennedy was clear that to be covered, waters must significantly affect the chemical, physical, or biological integrity of a downstream navigable water and that the requisite nexus must be more than "speculative or insubstantial," *Rapanos*, at 780. The agencies define significant nexus in precisely those terms. Under the rule a "significant nexus" is established by a showing of a significant chemical, physical, or biological effect.

Since the *Rapanos* decision, the agencies have extensive experience making significant nexus determinations, and that experience and expertise has informed the judgment of the agencies as reflected in the provisions of the rule. The agencies, most often the Corps, have made more than 400,000 CWA jurisdictional determinations since 2008. Of those, more than 120,000 have been case-specific significant nexus determinations. The agencies have made determinations in every state in the country, from the arid West to the tropics of Hawaii, from the Appalachian Mountains in the East to the lush forests of the Northwest. With field staff located across 38 Corps District offices and 10 EPA regional offices, the agencies have almost a decade of nationwide experience in making significant nexus determinations. Through this experience, the agencies developed wide-ranging technical expertise in assessing the hydrologic flowpaths along which water and materials are transported and transformed that determine the degree of chemical, physical, or biological connectivity, as well as the variations in climate, geology, and terrain within and among watersheds and over time that affect the functions (such as the removal or transformation of pollutants) performed by streams, wetlands, and open waters for downstream traditional navigable waters, interstate waters, or the territorial seas.

In addition, these individual jurisdictional determinations have been for waters ranging from an intermittent stream that provides flow to a drinking water source to a group of floodplain wetlands in North Dakota that provide important protection from floodwaters to downstream communities alongside the Red River to headwater mountain streams that provide high quality water that supplies baseflow and reduces the harmful concentrations of pollutants in the mainstem river below. The agencies utilized many tools and many sources of information to help make these determinations, including U.S. Geological Survey (USGS) and state and local topographic maps, aerial photography, National Wetlands Inventory data from the U.S. Fish and Wildlife Service, soil surveys, watershed studies, scientific literature and references, and field work. *See, e.g.*, U.S. Army Corps of Engineers 2007a. For example, USGS and state and local stream maps and datasets, aerial photography, gage data, flood predictions, historic records of water flow, statistical data, watershed assessments, monitoring data, and field observations are often used to help assess the contributions of flow of tributary streams, including intermittent and ephemeral streams, to downstream traditional navigable waters, interstate waters, or the territorial seas. *Id.*; U.S. Army Corps of Engineers 2005b. Similarly, floodplain and topographic maps of federal, state, and local agencies, modeling tools, and field observations can be used to assess how wetlands are trapping floodwaters that might otherwise affect downstream waters. Further, the agencies utilize the large body of scientific literature regarding the functions of tributary streams, regardless of their flow permanence, and of wetlands and open waters to inform their evaluations of significant nexus. In addition, the agencies have experience and expertise for decades prior to and since the *SWANCC* and *Rapanos* decisions with making jurisdictional determinations, and consider hydrology, ordinary high water mark, biota, and other technical factors in implementing Clean Water Act programs. This immersion in the science along with the practical expertise developed through case-specific determinations across the country and in diverse settings is reflected in the agencies' conclusions with respect to waters that have a significant nexus, as well as where the agencies have drawn lines demarking where "waters of the United States" end.

i. Scope of Significant Nexus Analysis

Under the significant nexus standard, waters possess the requisite significant nexus if they "either alone or in combination with similarly situated [wet]lands in the region, significantly affect the chemical, physical, and biological integrity of other covered waters more readily understood as 'navigable.'" *Rapanos* at 780. Several terms in this standard were not defined. In this rule the agencies interpret these terms and the scope of "waters of the United States" based on the goals, objectives, and policies of the statute, the scientific literature, the Supreme Court opinions, and the agencies' technical expertise and experience. Therefore, for purposes of a significant nexus analysis, the agencies have determined: (1) which waters are "similarly situated," and thus should be in analyzed in combination in (2) the "region," for purposes of a significant nexus analysis, and (3) the types of functions that should be analyzed to determine if waters significantly affect the chemical, physical, and biological integrity of traditional navigable waters, interstate waters and the territorial seas. These determinations underpin many of the key elements of the rule and are reflected in the definition of "significant nexus" in the rule.

In the rule's definition of "significant nexus," the agencies identify the functions that waters provide that can significantly affect the chemical, physical, or biological integrity of traditional navigable waters, interstate waters and the territorial seas. Functions to be considered for the purposes of determining significant nexus are sediment trapping; nutrient recycling; pollutant trapping, transformation, filtering, and transport; retention and attenuation of floodwaters; runoff storage; contribution of flow; export of organic matter; export of food resources; and provision of life-cycle dependent aquatic habitat (such as foraging, feeding, nesting, breeding, spawning, use as a nursery area) for species located in traditional navigable waters, interstate waters, or the territorial seas. The effect of an upstream water can be significant even when a water, alone or in combination, is providing a subset, or even just one, of the functions listed. In addition to the scientific support mentioned in this section for including these functions in the definition of significant nexus, sections VI, VII, and VIII also provide additional information on how impoundments, tributaries, and adjacent waters in providing these functions significantly affect (a)(1) through (a)(3) waters, while section XI highlights how the waters specified at (a)(7) and (a)(8) can provide such functions for a case-specific significant nexus determination.

Science demonstrates that these aquatic functions provided by smaller streams, ponds, wetlands and other waters are important for protecting the chemical, physical, and biological integrity of downstream traditional navigable waters, interstate waters, and the territorial seas. For example, States identify sediment and nutrients among the primary contaminants in the nation’s waters. *See, e.g.,* U.S. Environmental Protection Agency 2003; U.S. Environmental Protection Agency 2008. Sediment storage and export via streams to downstream waters is critical for maintaining the river network, including the formation of channel features. Science Report at 3-13. Although sediment is essential to river systems, excess sediment can impair ecological integrity by filling interstitial spaces, reducing channel capacity, blocking sunlight transmission through the water column, and increasing contaminant and nutrient concentrations. *Id*. (citing Wood and Armitage 1997). Streams and wetlands can prevent excess deposits of sediment downstream and reduce pollutant concentrations in downstream waters. *Id.* at ES-2 to ES-3; ES-8. Thus the function of trapping of excess sediment, along with export of sediment, has a significant effect on the chemical, physical, and biological integrity of downstream waters.

Nutrient recycling results in the uptake and transformation of large quantities of nitrogen and other nutrients that otherwise would be transported directly downstream, thereby decreasing nutrient loads and associated impairments due to excess nutrients in downstream waters. *Id.* at ES-8. Streams, wetlands, and open waters improve water quality through the assimilation, transformation, or sequestration of pollutants, including excess nutrients and chemical contaminants such as pesticides and metals that can degrade downstream water integrity. *Id.* at ES-2 to ES-3, ES-13. Nutrient transport exports nutrients downstream and can degrade water quality and lead to stream impairments. *Id.* at ES-2. Nutrients are necessary to support aquatic life, but excess nutrients lead to excessive plant growth and hypoxia, in which over-enrichment causes dissolved oxygen concentrations to fall below the level necessary to sustain most aquatic animal life in the downstream waters. *Id.* at ES-8. Nutrient recycling, retention, and export can significantly affect downstream chemical integrity by impacting downstream water quality.

The contribution of flow downstream is an important function, as upstream waters can be a cumulative source of the majority of the total mean annual flow to bigger downstream rivers and waters, including via the recharge of baseflow. *Id.* at ES-8. Streams, wetlands, and open waters contribute surface and subsurface water downstream, and are the dominant sources of water in most rivers. *Id.* at ES-2, ES-7, ES-9, ES-11. Contribution of flow can significantly affect the physical integrity of downstream waters, helping to sustain the volume of water in larger waters.

Small streams and wetlands are particularly effective at retaining and attenuating floodwaters. *Id.* at ES-2, ES-8, ES-9, ES-10. By subsequently releasing (desynchronizing) floodwaters and retaining large volumes of stormwater that could otherwise negatively affect the condition or function of downstream waters, streams and adjacent wetlands and open waters affect the physical integrity of downstream traditional navigable waters, interstate waters, or the territorial seas. *Id.* at ES-3. This function can reduce flood peaks downstream and can also maintain downstream river baseflows by recharging alluvial aquifers.

Streams, wetlands, and open waters supply downstream waters with dissolved and particulate organic matter (*e.g.*, leaves, wood), which support biological activity throughout the river network. *Id.* at ES-2, ES-3. In addition to organic matter, streams, wetlands, and open waters can also export other food resources downstream, such as aquatic insects that are the food source for fish in downstream waters. *Id*. The export of organic matter and food resources downstream is important to maintaining the food webs and thus the biological integrity of traditional navigable waters, interstate waters, and the territorial seas.

Streams, wetlands, and open waters provide life-cycle dependent aquatic habitat (such as foraging, feeding, nesting, breeding, spawning, and use as a nursery area) for species located in traditional navigable waters, interstate waters, or the territorial seas. *Id.* at ES-2, ES-3, ES-8, ES-9, ES-11. Many species require different habitats for different resources (*e.g.*, food, spawning habitat, overwintering habitat), and thus move throughout the river network over their life-cycles. *Id.* at ES-11, 3-38 (citing Schlosser 1991; Fausch *et al*. 2002). For example, headwater streams can provide refuge habitat under adverse conditions, enabling fish to persist and recolonize downstream areas once conditions have improved. *Id.* at 3-38 (citing Meyer and Wallace 2001; Meyer *et al*. 2004; Huryn *et al*. 2005). These upstream systems form integral components of downstream food webs, providing nursery habitat for breeding fish and amphibians, colonization opportunities for stream invertebrates, and maturation habitat for stream insects, including for species that are critical to downstream ecosystem function. *Id.* at ES-3. The provision of life-cycle dependent aquatic habitat for species located in downstream waters significantly affects the biological integrity of those downstream waters.

Tributaries, adjacent wetlands, and open waters can perform multiple functions, including functions that change depending upon the season. *Id.* at 2-24. For example, the same stream can contribute flow when evapotranspiration is low and can retain water when evapotranspiration is high. *Id*. These functions, particularly when considered in aggregate with the functions of similarly situated waters in the region, can significantly affect the chemical, physical, or biological integrity of a traditional navigable water, interstate water, or the territorial seas. When considering the effect of an individual stream, wetland, or open water, all contributions and functions that the water provides should be evaluated cumulatively. *Id.* at 6-10. For example, the same wetland retains sediment, removes excess nutrients, mitigates flooding, and provides habitat for amphibians that also live downstream; if any of these functions is ignored, the overall effect of that wetland would be underestimated. *See, e.g., id.* at ES-7, 6-10. It is important to note, however, that a water or wetland can provide just one function that may significantly affect the chemical, physical or biological integrity of the downstream water.

ii. Rationale for Conclusion

The agencies' definition of the term "significant nexus" in the rule is consistent with language in *Riverside Bayview, SWANCC,* and *Rapanos*, and with the goals, objectives, and policies of the CWA. The definition reflects that not all waters have a requisite connection to traditional navigable waters, interstate waters, or the territorial seas sufficient to be determined jurisdictional. Justice Kennedy was clear that to be covered, waters must significantly affect the chemical, physical, or biological integrity of a downstream navigable water and that the requisite nexus must be more than "speculative or insubstantial," *Rapanos*, at 780. The agencies define significant nexus in precisely those terms. Under the rule a "significant nexus" is established by a showing of a significant chemical, physical, or biological effect. In characterizing the significant nexus standard, Justice Kennedy stated: "[t]he required nexus must be assessed in terms of the statute's goals and purposes. Congress enacted the [CWA] to 'restore and maintain the chemical, physical, and biological integrity of the Nation's waters' . . . ." 547 U.S. at 779. It is clear that Congress intended the CWA to "restore and maintain" all three forms of "integrity," 33 U.S.C. § 1251(a), so if any one of these forms is compromised then that is contrary to the statute's stated objective. It would subvert the objective if the CWA only protected waters upon a showing that they had effects on every attribute of the integrity a traditional navigable water, interstate water, or the territorial sea.

The agencies define the term "significant nexus" consistent with language in *Riverside Bayview, SWANCC,* and *Rapanos.* The definition of "significant nexus" at (c)(7) relies most significantly on Justice Kennedy's *Rapanos* opinion which recognizes that not all waters have this requisite connection to waters covered by paragraphs (a)(1) through (a)(3) of the regulations. *Riverside Bayview* also informs the agencies' interpretation of the statute as the Court stated "to achieve the goal of preserving and improving adjacent wetlands that have significant ecological and hydrological impacts on navigable waters, it was appropriate for the Corps to regulate all adjacent wetlands, even though some might not have any impacts on navigable waters."

Riverside Bayview at 135 n.9. Justice Kennedy was clear that the requisite nexus must be more than "speculative or insubstantial. . . ," *Rapanos,* 547 U.S. at 780, in order to be significant and the rule defines significant nexus in precisely those terms. In *Rapanos*, Justice Kennedy stated that in both the consolidated cases before the Court the record contained evidence suggesting the possible existence of a significant nexus according to the principles he identified. *See id.* at 783. Justice Kennedy concluded that "the end result in these cases and many others to be considered by the Corps may be the same as that suggested by the dissent, namely, that the Corps' assertion of jurisdiction is valid." *Id.* Justice Kennedy remanded the cases because neither the agency nor the reviewing courts properly applied the controlling legal standard – whether the wetlands at issue had a significant nexus. *See id.* Justice Kennedy was clear however, that "[m]uch the same evidence should permit the establishment of a significant nexus with navigable-in-fact waters, particularly if supplemented by further evidence about the significance of the tributaries to which the wetlands are connected." *Id.* at 784.

With respect to one of the wetlands at issue in the consolidated *Rapanos* cases, Justice Kennedy stated:

> In *Carabell,* No. 04-1384, the record also contains evidence bearing on the jurisdictional inquiry. The Corps noted in deciding the administrative appeal that "[b]esides the effects on wildlife habitat and water quality, the [district office] also noted that the project would have a major, long-term detrimental effect on wetlands, flood retention, recreation and conservation and overall ecology. . . . The Corps' evaluation further noted that by 'eliminat[ing] the potential ability of the wetland to act as a sediment catch basin," the proposed project "would contribute to increased runoff and . . . accretion along the drain and further downstream in Auvase Creek.' . . . . And it observed that increased runoff

from the site would likely cause downstream areas to "see an increase in possible flooding magnitude and frequency."

Id. at 785-86. Justice Kennedy also expressed concern that "[t]he conditional language in these assessments—'potential ability,' 'possible flooding'—could suggest an undue degree of speculation." *Id.*at 786.

Justice Kennedy's observations regarding the underlying case provide guidance as to what it means for a nexus to be more than merely speculative or insubstantial and inform the definition of "significant nexus." It is important to note, however, that certain terms used in a scientific context do not have the same implications that they have in a legal or policy context. For example, discussion in the scientific literature of a wetland's "potential" to act as a sink for floodwater and pollutants, means that wetlands in general do indeed perform those functions, but whether a particular wetland performs that function is dependent upon there is a flood in the watershed. That does not mean, however, that this nexus to downstream waters is "speculative;" indeed the wetland will provide these functions when there is a flood or pollutants flow into the wetland.

The agencies' significant nexus determinations are informed by the Science Report's synthesis in Chapter 5. Based on the evidence presented in Chapters 3 and 4, ordering the three broad categories of water bodies considered in the Science Report—streams, floodplain wetlands, and non-floodplain wetlands—along a connectivity gradient is possible. Of these three water body types, streams are, in general, more connected to and have better-documented effects on downstream waters than either wetland category. Floodplain wetlands (and open waters), in turn, tend to be more connected to downstream waters, and have better-documented downstream effects, than non-floodplain wetlands (and open waters). This ordering must be recognized as a broad generalization, and considerable overlap can occur among the types, given the spatial and temporal variability in connectivity documented in these habitats. Nevertheless, several key lines of evidence support this hypothesized ordering of water body types along the gradient.

1. Streams are connected to rivers by a continuous channel, which is a physical reflection of surface connectivity. Formation of a channel indicates that connectivity, in terms of its combined descriptors (frequency, duration, magnitude, timing) is sufficiently strong (or "effective") and outweighs terrestrialization processes (*e.g.*, revegetation, wind-mediated processes, soil formation processes).

2. Within-channel flows are more efficient for moving water, sediment, pollutants, and other materials than overland flow; for some aquatic organisms, channels are the only possible transport routes. Channels are places where excess water and materials from the landscape are concentrated as they are transmitted downstream. Recurrent flow of sufficient magnitude over a given area of landscape selects routes with least resistance, which develop into branched channel networks with a repeating, cumulative pattern of smaller channels that join at confluences to form larger channels.

3. The continuous channels connecting streams to rivers also represent areas of relatively high shallow subsurface connectivity (shallow ground-water recharge and upwelling). Channels are typically more permeable than surrounding soils, lack dense terrestrial vegetation (and thus have lower uptake and evapotranspiration loss), and are topographic low points closer to concentrated shallow ground water.

4. Floodplain wetlands and open waters are connected to rivers by historical and recurrent surface connectivity. Riparian and floodplain wetlands are maintained by the recurrent

inundation and deposition of materials from streams and rivers during the peak and recession of flood flows.

5. Riparian and floodplain wetlands and open waters are close to river networks and thus more likely to have strong connectivity with the downstream water than more distant wetlands, when all other conditions are similar.

6. Non-floodplain wetlands are positioned outside the floodplain, and so are not subject to direct flooding from the river or stream. Any hydrologic connections to the river system are therefore unidirectional (from wetland to downstream water and not vice-versa). They are also likely to be more distant from the network, increasing the flowpath lengths and travel time to it.

7. Because of their large numbers, headwater streams and associated wetlands cumulatively represent a large portion of the land interface with a downstream water. These areas provide functions that enhance both exchanges with and buffering of the downstream water, making them critical to mediating the recognized relationship between the integrity of downstream waters and the land use and stressor loadings from the surrounding landscape.

8. Connectivity to downstream waters is reflected in the distribution of aquatic organisms and their dependence on particular aquatic habitats across different stages of their life cycles. For example, the recurrent presence of completely aquatic organisms (*i.e.*, organisms that lack terrestrial life stages, overland dispersal, stages resistant to drying) in streams and wetlands that periodically dry provides indirect evidence for surface-water connections. Because many aquatic species can move and disperse overland, aquatic habitats can be highly connected biologically in the absence of hydrologic connectivity.

III. Traditional Navigable Waters

EPA and the Corps are proposing no changes to the existing regulation related to traditional navigable waters and at paragraph (a)(1) will continue to assert jurisdiction over all waters which are currently used, or were used in the past, or may be susceptible to use in interstate or foreign commerce, including all waters which are subject to the ebb and flow of the tide. *See e.g.,* 33 CFR § 328.3(a)(1); 40 CFR § 230.3(s)(1); 40 CFR § 122.2 ("waters of the U.S.")). These "(a)(1)waters" are the "traditional navigable waters." These (a)(1) waters include all of the waters defined in 33 CFR Part 329, which implements sections 9 and 10 of the Rivers and Harbors Act, and by numerous decisions of the federal courts, plus all other waters that are navigable-in-fact (*e.g.*, the Great Salt Lake, UT and Lake Minnetonka, MN).

To determine whether a water body constitutes an (a)(1) water under the regulations, relevant considerations include Corps regulations, prior determinations by the Corps and by the federal courts, and case law. Corps districts and EPA regions would determine whether a particular water body is a traditional navigable water based on application of those considerations to the specific facts in each case.

As noted above, the (a)(1) waters include, but are not limited to, waters that meet any of the tests set forth in 33 CFR Part 329 (*e.g.*, the water body is (a) subject to the ebb and flow of the tide, and/or (b) the water body is presently used, or has been used in the past, or may be susceptible for use (with or without reasonable improvements) to transport interstate or foreign commerce). The Corps districts have made determinations in the past under these regulations for purposes of asserting jurisdiction under sections 9 and 10 of the Rivers and Harbors Act of 1899 (33 U.S.C. §§ 401 and 403). Pursuant to 33 CFR § 329.16, the Corps maintains lists of final determinations of navigability for purposes of Corps jurisdiction under the Rivers and Harbors

Act of 1899. While absence from the list should not be taken as an indication that the water is not navigable (329.16(b)), Corps districts and EPA Regions rely on any final Corps determination that a water body meets any of the tests set forth in Part 329.

If the federal courts have determined that a water body is navigable-in-fact under federal law for any purpose, that water body qualifies as a "traditional navigable water" subject to CWA jurisdiction under 33 CFR § 328.3(a)(1) and 40 CFR § 230.3(s)(1). Corps districts and EPA regions are guided by the relevant opinions of the federal courts in determining whether such water bodies are "currently used, or were used in the past, or may be susceptible to use in interstate or foreign commerce" (33 CFR § 328.3(a)(1); 40 CFR § 230.3(s)(1)) or "navigable-in-fact."

The definition of "navigable-in-fact" derives from a long line of cases originating with *The Daniel Ball*, 77 U.S. 557 (1870). The Supreme Court stated:

> Those rivers must be regarded as public navigable rivers in law which are navigable in fact. And they are navigable in fact when they are used, or are susceptible of being used, in their ordinary condition, as highways for commerce, over which trade and travel are or may be conducted in the customary modes of trade and travel on water.

The Daniel Ball, 77 U.S. at 563.

In *The Montello*, the Supreme Court clarified that "customary modes of trade and travel on water" encompasses more than just navigation by larger vessels:

> The capability of use by the public for purposes of transportation and commerce affords the true criterion of the navigability of a river, rather than the extent and manner of that use. If it be capable in its natural state of being used for purposes

> of commerce, no matter in what mode the commerce may be conducted, it is navigable in fact, and becomes in law a public river or highway.

The Montello, 87 U.S. 430, 441-42 (1874). In that case, the Court held that early fur trading using canoes sufficiently showed that the Fox River was a navigable water of the United States. The Court was careful to note that the bare fact of a water's capacity for navigation alone is not sufficient; that capacity must be indicative of the water's being "generally and commonly useful to some purpose of trade or agriculture." *Id.* at 442.

In *Economy Light & Power*, the Supreme Court held that a waterway need not be continuously navigable; it is navigable even if it has "occasional natural obstructions or portages" and even if it is not navigable "at all seasons . . . or at all stages of the water." *Economy Light & Power Co. v. U.S.*, 256 U.S. 113, 122 (1921).

In *United States v. Holt State Bank,* 270 U.S. 49 (1926), the Supreme Court summarized the law on navigability as of 1926 as follows:

> The rule long since approved by this court in applying the Constitution and laws of the United States is that streams or lakes which are navigable in fact must be regarded as navigable in law; that they are navigable in fact when they are used, or are susceptible of being used, in their natural and ordinary condition, as highways for commerce, over which trade and travel are or may be conducted in the customary modes of trade and travel on water; and further that navigability does not depend on the particular mode in which such use is or may be had - whether by steamboats, sailing vessels or flatboats- nor on an absence of occasional difficulties in navigation, but on the fact, if it be a fact, that the stream in its natural and ordinary condition affords a channel for useful commerce.

Holt State Bank, 270 U.S. at 56.

In *U.S. v. Utah*, 283 U.S. 64 (1931) and *U.S. v. Appalachian Elec. Power Co*, 311 U.S. 377 (1940), the Supreme Court held that so long as a water is susceptible to use as a highway of commerce, it is navigable-in-fact, even if the water has never been used for any commercial purpose. *U.S. v. Utah*, at 81-83 ("The question of that susceptibility in the ordinary condition of the rivers, rather than of the mere manner or extent of actual use, is the crucial question."); *U.S. v. Appalachian Elec. Power Co.*, 311 U.S. at 416 ("Nor is lack of commercial traffic a bar to a conclusion of navigability where personal or private use by boats demonstrates the availability of the stream for the simpler types of commercial navigation.") *Appalachian Power* further held that a water is navigable-in-fact even if it is not navigable and never has been but may become so by reasonable improvements. 311 U.S. at 407-08.

In 1971, in *Utah v. United States*, 403 U.S. 9 (1971), the Supreme Court held that the Great Salt Lake, an intrastate water body, was navigable under federal law even though it "is not part of a navigable interstate or international commercial highway." *Id*. at 10. In doing so, the Supreme Court stated that the fact that the Lake was used for hauling of animals by ranchers rather than for the transportation of "water-borne freight" was an "irrelevant detail." *Id*. at 11. "The lake was used as a highway and that is the gist of the federal test." *Id*.

Most recently, the Supreme Court explained:

> The *Daniel Ball* formulation has been invoked in considering the navigability of waters for purposes of assessing federal regulatory authority under the Constitution, and the application of specific federal statutes, as to the waters and their beds. See, *e.g., ibid.; The Montello,* 20 Wall. 430, 439, 22 L.Ed. 391 (1874); *United States v. Appalachian Elec. Power Co.,* 311 U.S. 377, 406, and n. 21, 61

S.Ct. 291, 85 L.Ed. 243 (1940) (Federal Power Act); *Rapanos v. United States,* 547 U.S. 715, 730-731, 126 S.Ct. 2208, 165 L.Ed.2d 159 (2006) (plurality opinion) (Clean Water Act); *id.,* at 761, 126 S.Ct. 2208 (KENNEDY, J., concurring in judgment) (same). It has been used as well to determine questions of title to water beds under the equal-footing doctrine. See *Utah, supra,* at 76, 51 S.Ct. 438; *Oklahoma v. Texas,* 258 U.S. 574, 586, 42 S.Ct. 406, 66 L.Ed. 771 (1922); *Holt State Bank, supra,* at 56, 46 S.Ct. 197. It should be noted, however, that the test for navigability is not applied in the same way in these distinct types of cases.

Among the differences in application are the following. For state title under the equal-footing doctrine, navigability is determined at the time of statehood, see *Utah, supra,* at 75, 51 S.Ct. 438, and based on the "natural and ordinary condition" of the water, see *Oklahoma, supra,* at 591, 42 S.Ct. 406. In contrast, admiralty jurisdiction extends to water routes made navigable even if not formerly so, see, *e.g., Ex parte Boyer,* 109 U.S. 629, 631-632, 3 S.Ct. 434, 27 L.Ed. 1056 (1884) (artificial canal); and federal regulatory authority encompasses waters that only recently have become navigable, see, *e.g., Philadelphia Co. v. Stimson,* 223 U.S. 605, 634-635, 32 S.Ct. 340, 56 L.Ed. 570 (1912), were once navigable but are no longer, see *Economy Light & Power Co. v. United States,* 256 U.S. 113, 123-124, 41 S.Ct. 409, 65 L.Ed. 847 (1921), or are not navigable and never have been but may become so by reasonable improvements, see *Appalachian Elec. Power Co., supra,* at 407-408, 61 S.Ct. 291. With respect to the federal commerce power, the inquiry regarding navigation historically focused on interstate

> commerce. See *The Daniel Ball,* 1229*1229 *supra,* at 564. And, of course, the commerce power extends beyond navigation. See *Kaiser Aetna v. United States,* 444 U.S. 164, 173-174, 100 S.Ct. 383, 62 L.Ed.2d 332 (1979). In contrast, for title purposes, the inquiry depends only on navigation and not on interstate travel. See *Utah, supra,* at 76, 51 S.Ct. 438. This list of differences is not exhaustive. Indeed, "[e]ach application of [the *Daniel Ball*] test . . . is apt to uncover variations and refinements which require further elaboration." *Appalachian Elec. Power Co., supra,* at 406, 61 S.Ct. 291.
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> *PPL Montana v. Montana*, 565 U.S. ___ (2012).

Also of note are two decisions from the courts of appeals. In *FPL Energy Marine Hydro*, a case involving the Federal Power Act, the D.C. Circuit reiterated the fact that "*actual use* is not necessary for a navigability determination" and repeated earlier Supreme Court holdings that navigability and capacity of a water to carry commerce could be shown through "physical characteristics and experimentation." *FPL Energy Marine Hydro LLC v. FERC*, 287 F.3d 1151, 1157 (D.C. Cir. 2002). In that case, the D.C. Circuit upheld a FERC navigability determination that was based upon three experimental canoe trips taken specifically to demonstrate the river's navigability. *Id*. at 1158-59.

The 9th Circuit has also implemented the Supreme Court's holding that a water need only be susceptible to being used for waterborne commerce to be navigable-in-fact. *Alaska v. Ahtna, Inc.*, 891 F.2d 1404 (9th Cir. 1989). In *Ahtna*, the 9th Circuit held that current use of an Alaskan river for commercial recreational boating was sufficient evidence of the water's capacity to carry waterborne commerce at the time that Alaska became a state. *Id*. at 1405. It was found to be irrelevant whether or not the river was actually being navigated or being used for commerce at the time, because current navigation showed that the river always had the capacity to support such navigation. *Id*. at 1404.

In summary, when determining whether a water body qualifies as a "traditional navigable water" (*i.e.*, an (a)(1) water), relevant considerations include whether the water body meets any of the tests set forth in Part 329, or a federal court has determined that the water body is "navigable-in-fact" under federal law for any purpose, or the water body is "navigable-in-fact" under the standards that have been used by the federal courts.

Some commenters argued that although the proposed rule would not change the regulatory text for traditional navigable waters from the existing regulations, the agencies' interpretation of the scope of waters that are considered traditional navigable waters broadly expands the concept of traditional navigable waters and is inconsistent with the definition relied on by the *Rapanos* plurality and Justice Kennedy's concurrence. The final rule makes no change to the agencies' longstanding regulatory text for traditional navigable waters. The agencies disagree that the interpretation and guidance in the preamble to the proposed rule and in this section represents an expansion of the concept of traditional navigable waters. The interpretation and guidance is not an expansion from that given by the agencies in 2008, and is simply based on existing caselaw. See Appendix B. Further, while the 2008 attachment, the preamble to the proposed rule, and this section reflect the considerations the agencies will use when making traditional navigable waters determinations, when such a determination is part of a final agency action, if challenged, the federal courts will decide whether a particular water is a traditional navigable water for purposes of the Clean Water Act.

IV. Interstate Waters

The agencies made no change to the interstate waters section of the existing regulations, and the agencies will continue to assert jurisdiction over interstate waters, including interstate wetlands. The language of the CWA is clear that Congress intended the term "navigable waters" to include interstate waters, and the agencies' interpretation, promulgated contemporaneously with the passage of the CWA, is consistent with the statute and legislative history. The Supreme Court's decisions in *SWANCC* and *Rapanos* did not address the interstate waters provision of the existing regulation.

The CWA was enacted in 1972. EPA's contemporaneous regulatory definition of "waters of the United States," promulgated in 1973, included interstate waters. The definition has been EPA's interpretation of the geographic jurisdictional scope of the CWA for approximately 40 years. Congress has also been aware of and has supported the Agency's longstanding interpretation of the CWA. "Where 'an agency's statutory construction has been fully brought to the attention of the public and the Congress, and the latter has not sought to alter that interpretation although it has amended the statute in other respects, then presumably the legislative intent has been correctly discerned.'" *North Haven Board of Education v. Bell,* 102 456 U.S. 512, 535 (1982) (*quoting United States v. Rutherford,* 442 U.S. 544 n. 10 (1979) (internal quotes omitted)).

A. The Language of the Clean Water Act, the Statute as a Whole, and the Statutory History Demonstrate Congress' Clear Intent to Include Interstate Waters as "Navigable Waters" Subject to the Clean Water Act

While as a general matter, the scope of the terms "navigable waters" and "waters of the United States" is ambiguous, the language of the CWA, particularly when read as a whole, demonstrates that Congress clearly intended to continue to subject interstate waters to federal regulation. The statutory history of federal water pollution control places the terms of the CWA in context and provides further evidence of Congressional intent to include interstate waters within the scope of the "navigable waters" protected by the Act. Congress clearly intended to subject interstate waters to CWA jurisdiction without imposing a requirement that they be water that is navigable for purposes of federal regulation under the Commerce Clause themselves or be connected to water that is navigable for purposes of federal regulation under the Commerce Clause.[9] The CWA is clear that interstate waters that were previously subject to federal regulation remain subject to federal regulation. The text of the CWA, specifically the CWA's provision with respect to interstate waters and their water quality standards, in conjunction with the definition of navigable waters, provides clear indication of Congress' intent. Thus, interstate waters are "navigable waters" protected by the CWA.

(1) The Plain Language of the Clean Water Act and the Statute as a Whole Clearly Indicate Congress' Intent to Include Interstate Waters within the Scope of "Navigable Waters" for Purposes of the Clean Water Act

Under well settled principles, the phrase "navigable waters" should not be read in isolation from the remainder of the statute. As the Supreme Court has explained:

> The definition of words in isolation, however, is not necessarily controlling in statutory construction. A word in a statute may or may not extend to the outer

[9] For purposes of the CWA, EPA and the Corps have interpreted the term "traditional navigable waters" to include all of the "navigable waters of the United States," defined in 33 CFR Part 329 and by numerous decisions of the federal courts, plus all other waters that are navigable-in-fact (e.g., the Great Salt Lake, UT and Lake Minnetonka MN). This section explains why EPA and the Corps do not interpret the CWA or the Supreme Court's decisions in *Solid Waste Agency of Northern Cook County (SWANCC) v. U.S. Army Corps of Engineers*, 531 U.S. 159 (2001) and *Rapanos v. United States*, 547 U.S. 715 (2006), to restrict CWA jurisdiction over interstate waters to only those interstate waters that are traditional navigable waters or that connect to traditional navigable waters.

> limits of its definitional possibilities. Interpretation of a word or phrase depends upon reading the whole statutory text, considering the purpose and context of the statute, and consulting any precedents or authorities that inform the analysis.

Dolan v. U.S. Postal Service, 546 U.S. 481, 486 (2006)*; see also United States Nat'l. Bank of Oregon v. Indep. Ins. Agents of Am., Inc.*, 508 U.S. 439, 455 (1993).

While the term "navigable waters" is ambiguous, interstate waters are waters that are clearly covered by the plain language of the definition of "navigable waters."[10] Congress defined "navigable waters" to mean "the waters of the United States, including the territorial seas." Interstate waters are waters of the several States and, thus, the United States. While the 1972 Act was clearly not limited to interstate waters, it was clearly intended to include interstate waters.

Furthermore, the CWA does not simply define "navigable waters." Other provisions of the statute provide additional textual evidence of the scope of this term of the Act. Most importantly, there is a specific provision in the 1972 CWA establishing requirements for those interstate waters which were subject to the prior Water Pollution Control Acts.

The CWA requires states to establish water quality standards for navigable waters and submit them to the Administrator for review.[11] Under section 303(a) of the Act, *in order to carry out the purpose of this Act*, any water quality standard applicable to *interstate waters* which was adopted by any State and submitted to, and approved by, or is awaiting approval by,

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[10] The Supreme Court has found that the term "waters of the United States" is ambiguous in some respects. *Rapanos*, 547 U.S. at 752 (plurality opinion), 804 (dissent).

[11] Section 303 of the Act requires the states to submit revised and new water quality standards to the Administrator for review. CWA section 303(c)(2)(A). Such revised or new water quality standards "shall consist of the designated uses of the navigable waters involved and the water quality criteria for such waters." *Id.* If the Administrator determines that a revised or new standard is not consistent with the Act's requirements, or determines that a revised or new standard is necessary to meet the Act's requirements, and the state does not make required changes, "[t]he Administrator shall promptly prepare and publish proposed regulations setting forth a revised or new water quality standard for the navigable waters involved." CWA section 303(c)(4).

the Administrator pursuant to this Act as in effect immediately prior to the date of enactment of the Federal Water Pollution Control Act Amendments of 1972, *shall remain in effect* unless the Administrator determined that such standard is not consistent with the applicable requirements of the Act as in effect immediately prior to the date of enactment of the Federal Water Pollution Control Act Amendments of 1972. If the Administrator makes such a determination he shall, within three months after the date of enactment of the Federal Water Pollution Control Act Amendments of 1972, notify the State and specify the changes needed to meet such requirements. If such changes are not adopted by the State within ninety days after the date of such notification, the Administrator shall promulgate such changes in accordance with subsection (b). CWA section 303(a)(1) (*emphasis added*).

Under the 1965 Act, as discussed in more detail below, states were directed to develop water quality standards establishing water quality goals for interstate waters. By the early 1970s, all the states had adopted such water quality standards. Advanced Notice of Proposed Rulemaking, Water Quality Standards Regulation, 63 FR 36742, 36745, July 7, 1998. In section 303(a), Congress clearly intended for existing federal regulation of interstate waters to continue under the amended CWA. Water quality standards for interstate waters were not merely to remain in effect, but EPA was required to actively assess those water quality standards and even promulgate revised standards for interstate waters if states did not make necessary changes. By the plain language of the statute, these water quality standards for interstate waters were to remain in effect "in order to carry out the purpose of this Act." The objective of the Act is "to restore and maintain the chemical, physical, and biological integrity of the Nation's waters." CWA section 101(a). It would contravene Congress' clearly stated intent for a court to impose an additional jurisdictional requirement on all rivers, lakes, and other waters that flow across, or form a part of, state boundaries ("interstate waters" as defined by the 1948 Act, § 10, 62 Stat. 1161), such that interstate waters that were previously protected were no longer protected because they lacked a connection to a water that is navigable for purposes of federal regulation under the Commerce Clause. Nor would all the existing water quality standards be "carry[ing] out the purpose of this Act," if the only water quality standards that could be implemented through the Act (through, for example, National Pollutant Discharge Elimination System permits under section 402) were those water quality standards established for interstate waters that are also waters that are navigable for purposes of federal regulation under the Commerce Clause or that connect to waters that are navigable for purposes of federal regulation under the Commerce Clause. Nowhere in section 303(a) does Congress make such a distinction.

(2) The Federal Water Pollution Control Statute That Became the Clean Water Act Covered Interstate Waters

In 1972, when Congress rewrote the law governing water pollution, two federal statutes addressed discharges of pollutants into interstate waters and water that is navigable for purposes of federal regulation under the Commerce Clause, and tributaries of each: the Water Pollution Control Act of 1948, as amended, and section 13 of the Rivers and Harbors Act of 1899 (known as the "Refuse Act"). The Water Pollution Control Act extended federal authority over interstate waters and their tributaries, while the Refuse Act extended federal jurisdiction over the "navigable waters of the United States" and their tributaries. These two separate statutes demonstrate that Congress recognized that interstate waters and "navigable waters of the United States" were independent lawful bases of federal jurisdiction.

i. The Federal Water Pollution Control Act Prior to 1972

From the outset, and through all the amendments pre-dating the 1972 Amendments, the federal authority to abate water pollution under the Water Pollution Control Act, and the Federal Water Pollution Control Act (FWPCA) as it was renamed in 1956, extended to interstate waters. In addition, since first enacted in 1948, and throughout all the amendments, the goals of the Act have been, inter alia, to protect public water supplies, propagation of fish and aquatic life, recreation, agricultural, industrial, and other legitimate uses. *See* 62 Stat. 1155 and 33 U.S.C. § 466 (1952), 33 U.S.C. § 466 (1958), 33 U.S.C. § 466 (1964), 33 U.S.C. § 1151 (1970).

In 1948, Congress enacted the Water Pollution Control Act in connection with the exercise of jurisdiction over the waterways of the Nation and in the consequence of the benefits to public health and welfare by the abatement of stream pollution. *See* Pub. L. No. 80-845, 62 Stat. 1155 (June 30, 1948). The Act authorized technical assistance and financial aid to states for stream pollution abatement programs, and made discharges of pollutants into interstate waters and their tributaries a nuisance, subject to abatement and prosecution by the United States. *See* § 2(d)(1),(4), 62 Stat. at 1156-1157 (section 2(d)(1) of the Water Pollution Control Act of 1948, 62 Stat. at 1156, stated that the "pollution of *interstate waters*" in or adjacent to any State or States (whether the matter causing or contributing to such pollution is discharged directly into such waters or reaches such waters after discharge into a tributary of such waters), which endangers the health or welfare of persons in a State other than that in which the discharge originates, is declared to be a public nuisance and subject to abatement as provided by the Act. (emphasis added)); § 2(a), 62 Stat. 1155 (requiring comprehensive programs for "interstate waters and tributaries thereof"); § 5, 62 Stat. 1158 (authorizing loans for sewage treatment to abate discharges into "interstate waters or into a tributary of such waters"). Under the statute, "interstate waters" were defined as all rivers, lakes, and other waters that flow across, or form a part of, state boundaries. § 10, 62 Stat. 1161.

In 1956, Congress strengthened measures for controlling pollution of interstate waters and their tributaries. Pub. L. No. 84-660, 70 Stat. 498 (1956) (directing further cooperation between the federal and state governments in development of comprehensive programs for eliminating or reducing "the pollution of interstate waters and tributaries" and improving the sanitary condition of surface and underground waters, and authorizing the Surgeon General to make joint investigations with States into the conditions of and discharges into "any waters of any State or States.").

In 1961, Congress amended the FWPCA to substitute the term "interstate or navigable waters" for "interstate waters." *See* Pub. L. No. 87-88, 75 Stat. 208 (1961). Accordingly, beginning in 1961, the provisions of the FWPCA applied to all interstate waters and navigable waters and the tributaries of each, *see* 33 U.S.C. §§ 466a, 466g(a) (1964).[12]

In 1965, Congress approved a second set of major legislative changes, requiring each state to develop water quality standards for interstate waters within its boundaries by 1967. Pub. L. No. 89-234, 79 Stat. 908 (1965).[13] Failing establishment of adequate standards by the state, the Act authorized establishment of water quality standards by federal regulation. *Id.* at 908. The 1965 Amendments provided that the discharge of matter "into such interstate waters or portions thereof," which reduces the quality of such waters below the water quality standards

[12] Congress did not define the term "navigable waters" in the 1961 Amendments, or in subsequent FWPCA Amendments, until 1972.

[13] In 1967, the state of Arizona created the Water Quality Control Council (Council) to implement the requirements of the 1965 FWPCA. The Council adopted water quality standards for those waters that were considered "interstate waters" pursuant to the existing federal law. The Council identified the Santa Cruz River as an interstate water and promulgated water quality standards for the river in accordance with federal law.

established under this subsection (whether the matter causing or contributing to such reduction is discharged directly into such waters or reaches such waters after discharge into tributaries of such waters), is subject to abatement through procedures specified in the Act, including (after conferences and negotiations and consideration by a Hearing Board) legal action in the courts. *Id.* at 909.[14]

ii. The Refuse Act

Since its original enactment in 1899, the Refuse Act has prohibited the discharge of refuse matter "into any navigable water of the United States, or into any tributary of any navigable water." Ch. 425, 30 Stat. 1152 (1899). It also has prohibited the discharge of such material on the bank of any tributary where it is liable to be washed into a navigable water. *Id.* Violators are subject to fines and imprisonment. *Id.* at 1153 (codified at 33 U.S.C. § 412). In 1966, the Supreme Court upheld the Corps' interpretation of the Refuse Act as prohibiting discharges that pollute the navigable waters, and not just those discharges that obstruct navigation. *United States v. Standard Oil Co*., 384 U.S. 224, 230 (1966). In 1970, President Nixon signed an Executive Order directing the Corps (in consultation with the Federal Water Pollution Control Administration[15]) to implement a permit program under section 13 of the RHA "to regulate the discharge of pollutants and other refuse matter into the navigable waters of the United States or their tributaries and the placing of such matter upon their banks." E.O. 11574, 35 F R 19627, Dec. 25, 1970. In 1971, the Corps promulgated regulations establishing the Refuse Act Permit Program. 36 FR 6564, 6565, April 7, 1971. The regulations made it unlawful

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[14] The 1966 Amendments authorized civil fines for failing to provide information about an alleged discharge causing or contributing to water pollution. Pub. L. No. 89-753, 80 Stat. 1250 (1966); *see also* S. Rep. No. 414, 92d Congress, 1st Sess. 10 (1972) (describing the history of the FWPCA).

[15] In December 1970, administration of the Federal Water Pollution Control Administration was transferred from the Secretary of the Interior to EPA. S. Rep. No. 414, 92d Congress, 1st Sess. (1972).

to discharge any pollutant (except those flowing from streets and sewers in a liquid state) into a navigable waterway or tributary, except pursuant to a permit. Under the permit program, EPA advised the Corps regarding the consistency of a proposed discharge with water quality standards and considerations, and the Corps evaluated a permit application for impacts on anchorage, navigation, and fish and wildlife resources. *Id*. at 6566.

iii. The Federal Water Pollution Control Act Amendments of 1972

When Congress passed the Federal Water Pollution Control Act Amendments of 1972 (referred to hereinafter as the CWA or CWA), it was not acting on a blank slate. It was amending existing law that provided for a federal/state program to address water pollution. The Supreme Court has recognized that Congress, in enacting the CWA in 1972, "intended to repudiate limits that had been placed on federal regulation by earlier water pollution control statutes and to exercise its powers under the Commerce Clause to regulate at least some waters that would not be deemed 'navigable' under the classical understanding of that term." *Riverside Bayview Homes*, 474 U.S. at 133; *see also International Paper Co. v. Ouellette*, 479 U.S. 481, 486, n.6 (1987).

The amendments of 1972 defined the term "navigable waters" to mean "the waters of the United States, including the territorial seas." 33 U.S.C. § 1362(7). While earlier versions of the 1972 legislation defined the term to mean "the navigable waters of the United States," the Conference Committee deleted the word "navigable" and expressed the intent to reject prior geographic limits on the scope of federal water-protection measures. Compare S. Conf. Rep. No. 1236, 92d Cong., 2d Sess. 144 (1972), with H.R. Rep. No. 911, 92 Cong., 2d Sess. 356 (1972) (bill reported by the House Committee provided that "[t]he term 'navigable waters' means the navigable waters of the United States, including the territorial seas"); *see also* S. Rep. No. 414, 92d Cong., 1st Sess. 77 ("Through a narrow interpretation of the definition of interstate waters the implementation of the 1965 Act was severely limited. . . . Therefore, reference to the control requirements must be made to the navigable waters, portions thereof, and their tributaries."). Thus, Congress intended the scope of the 1972 Act to include, at a minimum, the waters already subject to federal water pollution control law – both interstate waters and waters that are navigable for purposes of federal regulation under the Commerce Clause. Those statutes covered interstate waters, defined interstate waters without requiring that they be a traditional navigable water or be connected to water that is a traditional navigable water, and demonstrated that Congress knew that there are interstate waters that are not navigable for purposes of federal regulation under the Commerce Clause.

In fact, Congress amended the Federal Water Pollution Control Act in 1961 to substitute the term "interstate or navigable waters" for "interstate waters," demonstrating that Congress wanted to be very clear that it was asserting jurisdiction over both types of waters: interstate waters even if they were not navigable for purposes of federal regulation under the Commerce Clause, and traditional navigable waters even if they were not interstate waters. At no point were the interstate waters already subject to federal water pollution control authority required to be navigable or to connect to a traditional navigable water. Further, as discussed above, the legislative history clearly demonstrates that Congress was expanding jurisdiction – not narrowing it – with the 1972 amendments. Thus, it is reasonable to conclude that by defining "navigable waters" as "the waters of the United States" in the 1972 amendments, Congress included not just traditionally navigable waters, but all waters previously regulated under the Federal Water Pollution Control Act, including non-navigable interstate waters.

Based on the statutory definition of navigable waters, the requirement of section 303(a) for water quality standards for interstate waters to remain in effect, the purposes of the Act, and the more than three decades of federal water pollution control regulation that provides a context for reading those provisions of the statute, the intent of Congress is clear that the term "navigable waters" includes "interstate waters" as an independent basis for CWA jurisdiction, whether or not they themselves are traditional navigable waters or are connected to a traditional navigable water.

B. Supreme Court Precedent Supports CWA Jurisdiction over Interstate Waters Without Respect to Navigability

In two seminal decisions, the Supreme Court established that resolving interstate water pollution issues was a matter of federal law and that the CWA was the comprehensive regulatory scheme for addressing interstate water pollution. *Illinois v. Milwaukee*, 406 U.S. 91 (1972); *City of Milwaukee v. Illinois*, 451 U.S. 304 (1981). In both of these decisions, the Court held that federal law applied to interstate waters. Moreover, these cases analyzed the applicable federal statutory schemes and determined that the provisions of the Federal Water Pollution Control Act and the CWA regulating water pollution applied generally to interstate waters. The holdings of these cases recognized the federal interest in interstate water quality pollution; and *City of Milwaukee* recognized that CWA jurisdiction extends to interstate waters without regard to navigability.

In *Illinois v. Milwaukee*, the Court considered a public nuisance claim brought by the state of Illinois against the city of Milwaukee to address the adverse effects of Milwaukee's discharges of poorly treated sewage into Lake Michigan, "a body of interstate water." 406 U.S. at 93. In relevant part, the Court held that the federal common law of nuisance was an appropriate mechanism to resolve disputes involving interstate water pollution. 406 U.S. at 107 ("federal courts will be empowered to appraise the equities of suits alleging creation of a public nuisance by water pollution"). The Court further noted that in such actions the Court could consider a state's interest in protecting its high water quality standards from "the more degrading standards of a neighbor." *Id*.

In reaching this conclusion, the Court examined in detail the scope of the federal regulatory scheme as it existed prior to the October, 1972 FWPCA amendments. In its April, 1972 decision, the Court concluded that the Federal Water Pollution Control Act "makes clear that it is federal, not state, law that in the end controls the pollution of *interstate or navigable waters*." 406 U.S. at 102 (*emphasis added*). The Court, in this case, concluded that the regulatory provisions of the Federal Water Pollution Control Act did not address the right of a state to file suit to protect water quality. However, this was not because this statute did not reach interstate waters. The Court specifically noted that section 10(a) of the Federal Water Pollution Control Act "makes pollution of *interstate or navigable waters* subject 'to abatement'" 406 U.S. at 102 (*emphasis added*). Rather, the Court noted that the plaintiff in this action was seeking relief outside the scope of the Federal Water Pollution Control Act and that statute explicitly provided that independent "state and interstate action to abate pollution of interstate or navigable waters shall be encouraged and shall not ... be displaced by Federal enforcement action." 406 U.S. at 104 (*citing* section 10(b) of the Federal Water Pollution Control Act).

In addition, in *Illinois v. Milwaukee*, the Court acknowledged that it was essential for federal law to resolve interstate water pollution disputes, citing with approval the following discussion from *Texas v. Pankey*:

> Federal common law and not the varying common law of the individual states is, we think, entitled and necessary to be recognized as a basis for dealing in uniform standard with the environmental rights of a State against improper impairment by sources outside its domain.... Until the field has been made the subject of comprehensive legislation or authorized administrative standards, only a federal common law basis can provide an adequate means for dealing with such claims as alleged federal rights.

406 U.S. at 107 n. 9, *citing Texas v. Pankey*, 441 F.2d 236, 241-242.

In *City of Milwaukee*, the Court revisited this dispute and addressed the expanded statutory provisions of the CWA regulating water pollution. The scope of the CWA amendments led the Court to reverse its decision in *Illinois v. Milwaukee*.

> Congress has not left the formulation of appropriate federal standards to the courts through application of often vague and indeterminate nuisance concepts and maxims of equity jurisprudence, but rather has occupied the field through the establishment of a comprehensive regulatory program supervised by an expert administrative agency. The 1972 Amendments to the Federal Water Pollution Control Act were not merely another law "touching interstate waters".... Rather, the Amendments were viewed by Congress as a "total restructuring" and "complete rewriting" of the existing water pollution legislation considered in that case.

451 U.S. at 317.

The Court's analysis in *Illinois v. Milwaukee* made clear that federal common law was necessary to protect "the environmental rights of States against improper impairment by sources outside its domain." 406 U.S. at 107, n. 9. In the context of interstate water pollution, nothing in the Court's language or logic limits the reach of this conclusion to only navigable interstate waters. In *City of Milwaukee*, the Court found that the CWA was the "comprehensive regulatory program" that "occupied the field" (451 U.S. 317) with regard to interstate water pollution, eliminating the basis for an independent common law of nuisance to address interstate water pollution. Since the federal common law of nuisance (as well as the statutory provisions regulating water pollution in the Federal Water Pollution Control Act) applied to interstate waters whether navigable or not, the CWA could only occupy the field of interstate water pollution if it too extended to non-navigable as well as navigable interstate waters.

With regard to the specifics of interstate water pollution, the *City of Milwaukee* Court noted that, in *Illinois v. Milwaukee*, it had been concerned that Illinois did not have a forum in which it could protect its interests in abating water pollution from out of state, absent the recognition of federal common law remedies. 451 U.S. at 325. The Court then went on to analyze in detail the specific procedures created by the CWA "for a State affected by decisions of a neighboring State's permit-granting agency to seek redress." 451 U.S. at 326. The Court noted that "any State whose waters may be affected by the issuance of a permit" is to receive notice and the opportunity to comment on the permit. *Id.* (citing to CWA section 402(b)(3)(5). In addition the Court noted provisions giving EPA the authority to veto and issue its own permits "if a stalemate between an issuing and objecting state develops." *Id.* (citing to CWA sections 402(d)(2)(A),(4)). In light of these protections for states affected by interstate water pollution, the court concluded that

> [t]he statutory scheme established by Congress provides a forum for the pursuit of such claims before expert agencies by means of the permit-granting process. It would be quite inconsistent with this scheme if federal courts were in effect to "write their own ticket"

> under the guise of federal common law after permits have already been issued and permittees have been planning and operating in reliance on them.

451 U.S. at 326.

Nothing in the language or the reasoning of this discussion limits the applicability of these protections of interstate waters to navigable interstate waters or interstate waters connected to navigable waters. If these protections only applied to navigable interstate waters, a downstream state would be unable to protect many of its waters from out of state water pollution. This would hardly constitute a comprehensive regulatory scheme that occupied the field of interstate water pollution.

For these reasons, the holdings and the reasoning of these decisions establish that the regulatory reach of the CWA extends to all interstate waters without regard to navigability.[16]

C. The Supreme Court's Decisions in SWANCC and Rapanos Do Not Limit or Constrain Clean Water Act Jurisdiction Over Non-navigable Interstate Waters

As noted above, the Supreme Court recognized that Congress, in enacting the CWA, "intended to repudiate limits that had been placed on federal regulation by earlier water pollution control statutes and to exercise its powers under the Commerce Clause to regulate at least some waters that would not be deemed 'navigable' under the classical understanding of that term." *Riverside Bayview*, 474 U.S. at 133; *see also International Paper Co. v. Ouellette*, 479 U.S. 481,

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[16] Nothing in subsequent Supreme Court case law regarding interstate waters in any way conflicts with the agencies' interpretation. *See International Paper v. Ouellette*, 479 U.S. 481 (1987); *Arkansas v. Oklahoma*, 503 U.S. 91 (1992). In both of these cases, the Court detailed how the CWA had supplanted the federal common law of nuisance to establish the controlling statutory scheme for addressing interstate water pollution disputes. Nothing in either decision limits the applicability of the CWA to interstate water pollution disputes involving navigable interstate waters or interstate waters connected to navigable waters.

486 n.6, (1987). In *Riverside Bayview*, and subsequently in *SWANCC* and *Rapanos*, the Court addressed the construction of the CWA terms "navigable waters" and "the waters of the United States." In none of these cases did the Supreme Court address interstate waters, nor did it overrule prior Supreme Court precedent which addressed the interaction between the CWA and federal common law to address pollution of interstate waters. Therefore, the statute, even in light of *SWANCC* and *Rapanos*, does not impose an additional requirement that interstate waters must be water that is navigable for purposes of federal regulation under the Commerce Clause or connected to water that is navigable for purposes of federal regulation under the Commerce Clause to be jurisdictional waters for purposes of the CWA.

At the outset, it is worth noting that neither *SWANCC* nor *Rapanos* dealt with the jurisdictional status of interstate waters. Repeatedly in the *SWANCC* decision the Court emphasized that the question presented concerned the jurisdiction status of nonnavigable *intrastate* waters located in two Illinois counties. *SWANCC* 531 U.S. at 165-166, 171 ("we thus decline to... hold that isolated ponds, some only seasonal, *wholly located within two Illinois counties* fall under § 404(a) definition of navigable waters...") (*emphasis added*). Nowhere in Justice Rehnquist's majority opinion in *SWANCC* does the Court discuss the Court's interstate water case law.[17] The Court does not even discuss the fact that CWA jurisdictional regulations identify interstate waters as regulated "waters of the United States." In fact, the repeated emphasis on the intrastate nature of the waters at issue can be read as an attempt to distinguish *SWANCC* from the Court's interstate water jurisprudence.

In *Rapanos*, the properties at issue were located entirely within the State of Michigan. 547 U.S. 715, 762-764. Thus, the Court had no occasion to address the text of the CWA with

[17] It is worth noting the Justice Rehnquist was also the author of *City of Milwaukee*.

respect to interstate waters or the agencies' regulatory provisions concerning interstate waters. In addition, neither Justice Kennedy nor the plurality discusses the impact of their opinions on the Court's interstate waters jurisprudence. The plurality decision acknowledges that CWA jurisdictional regulations include interstate waters. 547 U.S. 715, 724. However, the plurality did not discuss in any detail its views as to the continued vitality of regulations concerning such waters.

Moreover, one of the analytical underpinnings of the *SWANCC* and *Rapanos* decisions is irrelevant to analysis of regulations asserting jurisdiction over interstate waters. In *SWANCC,* the Court declined to defer to agency regulations asserting jurisdiction over isolated waters because

> [w]here an administrative interpretation of a statute invokes the outer limits of Congress' power, we expect a clear indication that Congress intended that result....This requirement stems from our prudential desire not to needlessly reach constitutional issues and our assumption that Congress does not casually authorize administrative agencies to interpret a statute to push the limit of Congressional authority.... This concern is heightened where the administrative interpretation alerts the federal-state framework by permitting federal encroachment upon a traditional state power.

531 U.S. at 172-173 (citations omitted).

However, the Court's analysis in *Illinois v. Milwaukee* and *City of Milwaukee* makes clear that Congress has broad authority to create federal law to resolve interstate water pollution disputes. As discussed above, the Court in *Illinois v. Milwaukee,* invited further federal legislation to address interstate water pollution, and in so doing concluded that state law was not an appropriate basis for addressing interstate water pollution issues. 406 U.S. at 107 n. 9 (*citing*

Texas v. Pankey, 441 F.2d 236, 241-242). In *City of Milwaukee*, the Court indicated that central to its holding in *Illinois v. Milwaukee* was its concern "that Illinois did not have any forum to protect its interests [in the matters involving interstate water pollution]." 451 U.S. 325. As discussed above, the Court cited with approval the statutory provisions of the CWA regulating water pollution as an appropriate means to address that concern.

The *City of Milwaukee* and *Illinois v. Milwaukee* decisions make clear that assertion of federal authority to resolve disputes involving interstate waters does not alter "the federal-state framework by permitting federal encroachment on a traditional state power." 531 U.S. at 173. "Our decisions concerning interstate waters contain the same theme. Rights in interstate streams, like questions of boundaries, have been recognized as presenting federal questions." *Illinois v. Milwaukee,* 406 U.S. at 105 (internal quotations and citations omitted).

The Supreme Court's analysis in *SWANCC* and *Rapanos* materially altered the criteria for analyzing CWA jurisdictional issues for wholly *intrastate* waters. However, these decisions by their terms did not affect the body of case law developed to address interstate waters. The holdings in the Supreme Court's interstate waters jurisprudence, in particular *City of Milwaukee*, apply CWA jurisdiction to interstate waters without regard to, or discussion of, navigability. In *City of Milwaukee,* the Court held that the CWA provided a comprehensive statutory scheme for addressing the consequences of interstate water pollution. Based on this analysis, the Court *expressly* overruled its holding in *Illinois v. Milwaukee* that the federal common law of nuisance would apply to resolving interstate water pollution disputes. Instead, the Court held that such disputes would now be resolved through application of the statutory provisions of the CWA regulating water pollution.

It would be unreasonable to interpret *SWANCC* or *Rapanos* as overruling *City of Milwaukee* with respect to CWA jurisdiction over non-navigable interstate waters. Such an interpretation would result in no law to apply to water pollution disputes with regard to such waters, unless one were to assume that the Court intended (without discussion or analysis) to restore the federal common law of nuisance as the law to apply in such matters. Moreover, *SWANCC* and *Rapanos* acknowledge that CWA jurisdiction extends to at least some non-navigable waters. *See, e.g.*, 547 U.S. at 779 (Kennedy, J.). Neither the *SWANCC* Court nor the plurality or Kennedy opinions in *Rapanos* purports to set out the complete boundaries of CWA jurisdiction. *See, e.g.*, 547 U.S. at 731 ("[w]e need not decide the precise extent to which the qualifiers 'navigable' and 'of the United States' restrict the coverage of the Act.") (plurality opinion).

In addition, as the Supreme Court has repeatedly admonished, if a Supreme Court precedent has direct application in a case yet appears to rest on a rationale rejected in some other line of decisions, lower courts should follow the case which directly controls, leaving to the Supreme Court the prerogative of overruling its precedents. *Agostino v. Felton*, 521 U.S. 203, 237 (1997); *United States v. Hatter*, 532 U.S. 557, 566-567(1981). Moreover, when the Supreme Court overturns established precedent, it is explicit. *See, Lawrence v. Texas,* 539 U.S. 558, 578 ("*Bowers* was not correct when it was decided, and it is not correct today. It ought not to remain binding precedent. *Bowers v. Hardwick* should be and now is overruled.").

D. The Agencies' Longstanding Interpretation of the Term "Navigable Waters" to Include "Interstate Waters"

EPA, the agency charged with implementing the CWA, has always interpreted the 1972 Act to cover interstate waters. Final Rules, 38 FR 13528, May 22, 1973 (the term "waters of the

United States" includes "interstate waters and their tributaries, including adjacent wetlands"). While the Corps of Engineers initially limited the scope of coverage for purposes of section 404 of the CWA to those waters that were subject to the Rivers and Harbors Act of 1899, after a lawsuit, the Corps amended its regulations to provide for the same definition of "waters of the United States" that EPA's regulations had always established. In 1975, the Corps' revised regulations defined "navigable waters" to include "[i]nterstate waters landward to their ordinary high water mark and up to their headwaters." In their final rules promulgated in 1977, the Corps adopted EPA's definition and included within the definition of "waters of the United States" "interstate waters and their tributaries, including adjacent wetlands." The preamble provided an explanation for the inclusion of interstate waters:

> The affects [sic] of water pollution in one state can adversely affect the quality of the waters in another, particularly if the waters involved are interstate. Prior to the FWPCA amendments of 1972, most federal statutes pertaining to water quality were limited to interstate waters. We have, therefore, included this third category consistent with the Federal government's traditional role to protect these waters from the standpoint of water quality and the obvious effects on interstate commerce that will occur through pollution of interstate waters and their tributaries.

Final Rules, 42 FR 37122, July 19, 1977.

The legislative history similarly provides support for the agencies' interpretation. Congress in 1972 concluded that the mechanism for controlling discharges and, thereby abating pollution, under the FWPCA and Refuse Act "has been inadequate in every vital aspect." S. Rep. No. 414, 92d Cong., 1st Sess. 7 (1972). The Senate Committee on Public Works reported that development of water quality standards, assigned to the states under the 1965 FWPCA Amendments, "is lagging" and the "1948 abatement procedures, and the almost total lack of enforcement," prompted the search for "more direct avenues of action against water polluters and water pollution." *Id.* at 5. The Committee further concluded that although the Refuse Act permit program created in 1970 "seeks to establish this direct approach," it was too weak because it applied only to industrial polluters and too unwieldy because the authority over each permit application was divided between two Federal agencies. *See id.* at 5; *see also id.* at 70-72 (discussing inadequacies of Refuse Act program).

In light of the poor success of those programs, the Committee recommended a more direct and comprehensive approach which, after amendment in conference, was adopted in the 1972 Act. The text, legislative history and purpose of the 1972 Amendments all show an intent – through the revisions – to broaden, improve and strengthen, not to curtail, the federal water pollution control program that had existed under the Refuse Act and FWPCA.[18] The 1972 FWPCA Amendments were "not merely another law 'touching interstate waters'" but were "viewed by Congress as a 'total restructuring' and 'complete rewriting' of the existing water pollution legislation."[19]

As the legislative history of the 1972 Act confirms, Congress' use of the term "waters of the United States" was intended to repudiate earlier limits on the reach of federal water pollution

[18] *See id.* at 9 ("The scope of the 1899 Refuse Act is broadened; the administrative capability is strengthened."); *id.* at 43 ("Much of the Committee's time devoted to this Act centered on an effort to resolve the existing water quality program and the separate pollution program developing under the 1899 Refuse Act."). Congress made an effort "to weave" the Refuse Act permit program into the 1972 Amendments, *id.* at 71, as the statutory text shows. *See* 33 U.S.C. § 1342(a) (providing that each application for a permit under 33 U.S.C. § 407, pending on October 18, 1972, shall be deemed an application for a permit under 33 U.S.C. § 1342(a)).

[19] *City of Milwaukee v. Illinois*, 451 U.S. at 317; *see also id.* at 318 (holding that the CWA precluded federal common-law claims because "Congress' intent in enacting the [CWA] was clearly to establish an all-encompassing program of water pollution regulation"); *Middlesex County Sewerage Auth. v. National Sea Clammers Ass'n*, 453 U.S. 1, 22 (1981) (existing statutory scheme "was completely revised" by enactment of the CWA).

efforts: "The conferees fully intend that the term 'navigable waters' be given the broadest possible constitutional interpretation unencumbered by agency determinations which have been made or may be made for administrative purposes." *See* S. Conf. Rep. No. 1236, 92d Cong., 2d Sess. 144 (1972). The House and Senate Committee Reports further elucidate the Conference Committee's rationale for removing the word "navigable" from the definition of "navigable waters," in 33 U.S.C. § 1362(7). The Senate report stated:

> The control strategy of the Act extends to navigable waters. The definition of this term means the navigable waters of the United States, portions thereof, tributaries thereof, and includes the territorial seas and the Great Lakes. Through a narrow interpretation of the definition of interstate waters the implementation of the 1965 Act was severely limited. Water moves in hydrologic cycles and it is essential that discharge of pollutants be controlled at the source. Therefore, reference to the control requirements must be made the navigable waters, portions thereof, and their tributaries.

See S. Rep. 414, 92d Cong., 1st Sess. 77 (1971); *see also* H.R. Rep. No. 911, 92d Cong., 2d Sess. 131 (1972) ("The Committee fully intends that the term "navigable waters" be given the broadest possible constitutional interpretation unencumbered by agency determinations which have been made or may be made for administrative purposes."). These passages strongly suggest that Congress intended to expand federal protection of waters. There is no evidence that Congress intended to exclude interstate waters which were protected under federal law if they were not water that is navigable for purposes of federal regulation under the Commerce Clause or connected to water that is navigable for purposes of federal regulation under the Commerce Clause. Such an exclusion would be contrary to all the stated goals of Congress in enacting the sweeping amendments which became the CWA.

The CWA was enacted in 1972. EPA's contemporaneous regulatory definition of "waters of the United States," promulgated in 1973, included interstate waters. The definition has been EPA's interpretation of the geographic jurisdictional scope of the CWA for approximately 40 years. Congress has also been aware of and has supported the Agency's longstanding interpretation of the CWA. "Where 'an agency's statutory construction has been fully brought to the attention of the public and the Congress, and the latter has not sought to alter that interpretation although it has amended the statute in other respects, then presumably the legislative intent has been correctly discerned.'" *North Haven Board of Education v. Bell*, 102 456 U.S. 512, 535 (1982) (*quoting United States v. Rutherford*, 442 U.S. 544 n. 10 (1979) (internal quotes omitted)).

The 1977 amendments to the CWA were the result of Congress' thorough analysis of the scope of CWA jurisdiction in light of EPA and Corps regulations. The 1975 interim final regulations promulgated by the Corps in response to *NRDC v. Callaway*,[20] aroused considerable congressional interest. Hearings on the subject of section 404 jurisdiction were held in both the House and the Senate.[21] An amendment to limit the geographic reach of section 404 to waters that are navigable for purposes of federal regulation under the Commerce Clauses and their adjacent wetlands was passed by the House, 123 Cong. Rec. 10434 (1977), defeated on the floor of the Senate, 123 Cong. Rec. 26728 (1977), and eliminated by the Conference Committee, H.R. Conf. Rep. 95-830, 95th Cong., 1st Sess. 97-105 (1977). Congress rejected the proposal to limit the geographic reach of section 404 because it wanted a permit system with "no gaps" in its

[20] 40 Fed.Reg. 31320, 31324 (July 25, 1975).

[21] *Section 404 of the Federal Water Pollution Control Act Amendments of 1972: Hearings Before the Senate Comm. on Public Works*, 94th Cong., 2d Sess. (1976); *Development of New Regulations by the Corps of Engineers, Implementing Section 404 of the Federal Water Pollution Control Act Concerning Permits for Disposal of Dredge or Fill Material: Hearings Before the Subcomm. on Water Resources of the House Comm. on Public Works and Transportation*, 94th Cong., 1st Sess. (1975).

protective sweep. 123 Cong. Rec. 26707 (1977) (remarks of Sen. Randolph). Rather than alter the *geographic* reach of section 404, Congress amended the statute by exempting certain *activities* -- most notably certain agricultural and silvicultural activities -- from the permit requirements of section 404. *See* 33 U.S.C. § 1344(f).

Other evidence abounds to support the conclusion that when Congress rejected the attempt to limit the geographic reach of section 404, it was well aware of the jurisdictional scope of EPA and the Corps' definition of "waters of the United States." For example, Senator Baker stated (123 Cong. Rec. 26718 (1977)):

> Interim final regulations were promulgated by the [C]orps [on] July 25, 1975. . . . Together the regulations and [EPA] guidelines established a management program that focused the decisionmaking process on significant threats to aquatic areas while avoiding unnecessary regulation of minor activities. On July 19, 1977, the [C]orps revised its regulations to further streamline the program and correct several misunderstandings. . . .
>
> Continuation of the comprehensive coverage of this program is essential for the protection of the aquatic environment. The once seemingly separable types of aquatic systems are, we now know, interrelated and interdependent. We cannot expect to preserve the remaining qualities of our water resources without providing appropriate protection for the entire resource.
>
> Earlier jurisdictional approaches under the [Rivers and Harbors Act] established artificial and often arbitrary boundaries . . . .

This legislative history leaves no room for doubt that Congress was aware of the agencies' definition of navigable waters. While there was controversy over the assertion of jurisdiction over all adjacent wetlands and some non-adjacent wetlands, the agencies' assertion of CWA jurisdiction over interstate waters was uncontroversial.

Finally, the constitutional concerns which led the Supreme Court to decline to defer to agency regulations in *SWANCC* and *Rapanos* are not present here where the agency is asserting jurisdiction over interstate waters. In *SWANCC*, the Court declined to defer to agency regulations asserting jurisdiction over non-adjacent, non-navigable, intrastate waters because the Court felt such an interpretation of the statute invoked the outer limits of Congress' power. The Court's concern "is heightened where the administrative interpretation alters the federal-state framework by permitting federal encroachment upon a traditional state power." 531 U.S. at 172-173 (citations omitted). Authority over interstate waters is squarely within the bounds of Congress' Commerce Clause powers.[22] Further, the federal government is in the best position to address issues which may arise when waters cross state boundaries, so this interpretation does not disrupt the federal-state framework in the manner the Supreme Court feared that the assertion of jurisdiction over a non-adjacent, non-navigable, intrastate body of water based on the presence of migratory birds did. The Supreme Court's analysis in *Illinois v. Milwaukee* and *City of Milwaukee* makes clear that Congress has broad authority to create federal law to resolve interstate water pollution disputes. Therefore, as discussed in Section II.B above, it is appropriate for the agencies to adopt an interpretation of the extent of CWA jurisdiction over interstate waters that gives full effect to *City of Milwaukee* unless and until the Supreme Court elects to revisit its holding in that case.

Some commenters stated that the proposed rule accords new status to interstate waters, equating them with traditional navigable waters and allowing for features to be jurisdictional

[22] In *Illinois v. Milwaukee*, the Supreme Court noted that "Congress has enacted numerous laws touching interstate waters." 406 U.S. at 101.

based on a relationship to interstate waters. Those commenters stated that there is no support for this interpretation in *Riverside Bayview Homes*, *SWANCC*, or *Rapanos*, because those decisions did not concern interstate waters and that the significant nexus principles that originated in *SWANCC* and *Rapanos* are tied to traditional navigable waters – not interstate waters. The agencies disagree that the proposed rule accords new status to interstate waters. The final rule does not change the existing regulation's provision that defines "waters of the United States" to include "interstate waters, including interstate wetlands," and also included, for example, tributaries to interstate waters. The agencies agree that the Supreme Court did not specifically address the status of interstate waters for purposes of the CWA in *Riverside Bayview Homes*, *SWANCC*, or *Rapanos*. However, as discussed above, the agencies do conclude that the Supreme Court provided guidance on the status of interstate waters for purposes of the CWA in earlier decisions. Some commenters state that reliance on the Supreme Court's earlier decisions is insufficient because to "discern whether federal law governing interstate water pollution applies to nonnavigable waters, one must look to Congress and the language of the CWA." That is exactly what the agencies have done, and in the final rule, based on the language of the statute, the statutory history, the legislative history, and the caselaw, the agencies' continue their longstanding interpretation of "navigable waters" to include interstate waters. In addition, since the Supreme Court's decision in *SWANCC* identified a significant nexus to the waters clearly covered by the CWA – in those cases, the traditional navigable waters – as the basis for CWA jurisdiction, the agencies promulgated a rule that similarly protects the interstate waters that the agencies concluded were similarly clearly covered by the CWA.

Some commenters expressed concern that a definition had not been provided for "interstate waters" in the proposed rule. This provision remains unchanged from the existing rule which does not contain a definition of interstate waters. As discussed above, the assertion of jurisdiction over interstate waters is based on the statute and under predecessor statutes "interstate waters" were defined as all rivers, lakes, and other waters that flow across, or form a part of, state boundaries. § 10, 62 Stat. 1161 (1948). The agencies will continue to implement the provision consistent with the intent of Congress.

V. Territorial Seas

The CWA and its existing regulations include "the territorial seas" as a "water of the United States." The rule makes no changes to that provision of the regulation other than to change the ordering to earlier in the regulation. The CWA defines "navigable waters" to include the territorial seas at section 502(7). The CWA goes on to define the "territorial seas" as "the belt of the seas measured from the line of ordinary low water along that portion of the coast which is in direct contact with the open sea and the line marking the seaward limit of inland waters, and extending seaward a distance of three miles." The territorial seas establish the seaward limit of "waters of the United States." As the territorial seas are clearly covered by the CWA (they are also traditional navigable waters), it is reasonable to use Justice Kennedy's significant nexus framework to protect the integrity of the territorial seas. The rule reflects this by protecting the tributaries and adjacent waters that flow into the territorial seas.

Although some comments addressed the definition of "territorial seas" provided in the CWA suggesting that the distance thresholds be revised to reflect other resource statutes, the agencies do not have authority to revise statutory language.

VI. Impoundments of "Waters of the United States"

The final rule states that all impoundments of waters otherwise identified as "waters of the United States" are jurisdictional by rule in all cases without need to demonstrate a case-specific significant nexus. The agencies also note that an impoundment of a water that is not a "water of the United States" can become jurisdictional if, for example, the impounded waters become navigable-in-fact and covered under paragraph (a)(1) of the rule.

The existing agency regulations provide that impoundments of "waters of the United States" remain "waters of the United States" and the agencies do not propose any substantive revisions to that component of the regulation. Impoundments also may be one of the waters through which tributaries indirectly contribute flow to a traditional navigable water, interstate water, or territorial sea. As a matter of law and science, an impoundment does not cut off a connection between upstream tributaries and a downstream traditional navigable water, interstate water, or territorial sea, so covered tributaries above the impoundment are still considered tributary to a downstream traditional navigable waters, interstate waters, or the territorial seas even where the flow of water might be impeded due to the impoundment. The agencies' longstanding practice is that the lateral limits of impoundments are delineated by the ordinary high water mark. The ordinary high water mark sets the lateral limits of jurisdiction over non-tidal water bodies, including impoundments, in the absence of adjacent wetlands. U.S. Army Corps of Engineers 2005b.

A. Impoundments Have a Significant Nexus

Scientific literature, as well as the agencies' scientific and technical expertise, and practical knowledge confirm that impoundments have chemical, physical, and biological effects on downstream traditional navigable waters, interstate waters, and the territorial seas.

Impoundments do not sever the effects the impounded "waters of the United States" have on the chemical, physical, or biological integrity of (a)(1) through (a)(3) waters.

Berms, dikes, and similar features used to create impoundments typically do not block all water flow. Indeed, even dams, which are specifically designed and constructed to impound large amounts of water effectively and safely, do not prevent all water flow, but rather allow seepage under the foundation of the dam and through the dam itself. See, *e.g.*, International Atomic Energy Agency ("All dams are designed to lose some water through seepage."); U.S. Bureau of Reclamation ("All dams seep, but the key is to control the seepage through properly designed and constructed filters and drains."); Federal Energy Regulatory Commission Commission2005) ("Seepage through a dam or through the foundations or abutments of dams is a normal condition.").

As an agency with expertise and responsibilities in engineering and public works, the Corps extensively studies water retention structures like berms, levees, and earth and rock-fill dams. The agency has found that all water retention structures are subject to seepage through their foundations and abutments. See, *e.g.*, U.S. Army Corps of Engineers 1992 at 1-1; U.S. Army Corps of Engineers 1993 at 1-1; U.S. Army Corps of Engineers 2004 at 6-1. The Supreme Court has recognized that a canal and an impoundment area separated by levees were hydrologically connected (and might even be considered a single water body) because, inter alia, the "levees continually leak." *South Florida Water Mgmt. District v. Miccosukee Tribe of Indians*, 541 U.S. 95, 110 (2004).

The inevitability of seepage is a consequence not of poor design, but of physics: water will flow downward where it can and thus will seep through small spaces in the structure and in the ground beneath it. *See, e.g.*, U.S. Army Corps of Engineers 1993 at 4-1 to 4-26; U.S. Army

Corps of Engineers 2000 at Appendix B. Thus, good engineering practices do not entail the prevention of all seepage; rather, they assume seepage and entail steps to manage it so that it will not compromise the integrity of berms, levees, and dams. *See, e.g.,* U.S. Army Corps of Engineers 1993 at 7-1 to 14-3; U.S. Army Corps of Engineers 2004 at 2-1, 6-1 to 6-7; U.S. Army Corps of Engineers 2000 at 5-1 to 5-11, Appendix C; U.S. Army Corps of Engineers 1992 at 1-1; U.S. Army Corps of Engineers 2005a at 1-9; Federal Energy Regulatory Commission 2005 at 14-36 to 14-39.

Many tributary systems in the United States have impoundments located along their reach. There are more than 80,000 dams in the United States, with over 6,000 exceeding 15 meters in height. Science Report at 2-45 (citing U.S. Army Corps of Engineers 2009). The purpose of a dam is to impound (store) water for any of several reasons (*e.g.* flood control, human water supply, irrigation, livestock water supply, energy generation, containment of mine tailings, recreation or pollution control). *See* Association of State Dam Safety Officials; Field and Lichvar 2007. Many dams fulfill a combination of the above functions. Because the purpose of a dam is to retain water effectively and safely, the water retention ability of a dam is of prime importance. Water may pass from the reservoir to the downstream side of a dam by: passing through the main spillway or outlet works; passing over an auxiliary spillway; overtopping the dam; seepage through the abutments; and seepage under the dam. *Id.* All water retention structures are subject to seepage through their foundations and abutments. U.S. Army Corps of Engineers 1992. Thus waters behind a dam still maintain a hydrologic connection to downstream waters, though the presence of the dam can reduce the hydrological connectivity to downstream (a)(1) through (a)(3) waters.

Numerous studies have shown that dams impede biotic movements, reducing biological connectivity between upstream and downstream locations. Science Report at 2-45 (citing Greathouse *et al.* 2006; Hall *et al*. 2011). They also form a discontinuity in the normal stream-order-related progression in stream ecosystem structure and function. *Id.* (citing Stanford and Ward 1984). Dams, however, can have the opposite effect with respect to natural lakes: increasing their biological connectivity with respect to invasive species by adding impoundments that decrease average distances between lakes and serving as stepping stone habitat. *Id.* (citing Johnson *et al.* 2008). Dams alter but typically do not sever the hydrologic connection between upstream and downstream waters. Riparian areas are permanently inundated upstream of large dams, increasing hydrological connectivity. Downstream, peak flows decrease during normal high-runoff seasons, while minimum flows increase during normal low-flow seasons—an overall reduction of stream-flow variability. *Id.* (citing Poff *et al.* 2007). Many species that live in or near rivers are adapted (via life history, behavioral, and morphological characteristics) to the seasonality of natural flow regimes, so a reduction in flow variability can have harmful effects on the persistence of such species where dams have been built. *Id.* (citing Lytle and Poff 2004). This reduction in high flows also decreases the connectivity of riparian wetlands with the stream by reducing the potential for overbank lateral flow. Reducing overbank lateral flow can affect downstream water quality, because overbank flow deposits sediment and nutrients that otherwise remain entrained in the river. *Id.* (citing Hupp et al. 2009).

The reservoirs behind dams are very effective at retaining sediment, which can reduce the amount of sediment delivered downstream and have significant effects in downstream waters. For instance, the Mississippi River's natural sediment load has been reduced by an estimated 50% through dam construction in the Mississippi Basin. Blum and Roberts 2009. Sediment concentrations and suspended loads can be reduced for hundreds of kilometers downstream of dams, as is especially apparent in the semiarid and arid western U.S. river networks. *Id.* at 3-14 (citing Williams and Wolman 1984). As described above in section II.D.i., sediment is a necessary material needed in river networks in certain quantities. *Id.* at 3-13. Too much sediment can impact downstream water integrity, but too little sediment can also impact downstream waters. Sediment helps structure stream and river channels by slowing the flow of water through channels and providing substrate and habitat for aquatic organisms. *Id.* at ES-8. At some point in the lower portions of river networks, sediment deposition becomes the dominant process and floodplains form. *Id*. at 2-4. Sediment also helps to build wetlands in coastal areas. Mitsch and Gosselink 2007. In coastal Louisiana, an estimated 25-38 square miles of wetlands are being lost each year to open water areas on the coastline due in part to the loss of sediment upstream behind the levee systems. Mitsch and Gosselink 2007. The river is no longer able to naturally replenish the sediment that rebuilds the marsh system. The disruption of downstream sediment supply by dams alters the balance between sediment supply and transport capacity. Science Report at 3-14 (citing Williams and Wolman 1984; Kondolf 1997). In addition, water released from dams lacks sediment load and thus has excess energy. This energy often downcuts channels downstream of dams, causing channel incision and streambed coarsening as finer gravels and sands are transported downstream over time. *Id.* (citing Williams and Wolman 1984; Kondolf 1997). The elimination of floods enables the encroachment of terrestrial vegetation, resulting in channel narrowing and the conversion of complex, multithreaded channels into simple, single-thread channels.

Though the man-altered nature of impoundments can change the nature of the chemical, physical, and biological connections that such waters have downstream, it does not eliminate them. Thus, impoundments continue to serve the same important functions as an integral part of the tributary system, which in turn greatly impact downstream (a)(1) through (a)(3) waters, particularly when their functional contributions to the chemical, physical, and biological conditions of downstream waters are combined at a watershed scale and considered in part with the tributaries that connect them downstream.

By their nature, impoundments of jurisdictional waters would also often meet the definition of adjacent waters, as they are typically bordering or contiguous. Impoundments of "waters of the United States" are *per se* jurisdictional under (a)(4) of the rule without the need to determine if they are also adjacent under (a)(6). However, as described in section VIII.b. below, adjacent waters, as defined, have a significant nexus to traditional navigable waters, interstate waters, or the territorial seas which bolsters the agencies' determination that impoundments of "waters of the United States" remain "waters of the United States."

Finally, as previously stated, an impoundment of a water that is not a "water of the United States" can become jurisdictional if, for example, the impounded waters become navigable-in-fact and covered as traditional navigable waters. For example, if a stream that is part of a river network located in a closed basin (*e.g.*, a watershed that does not drain to a traditional navigable water, interstate water, or the territorial seas), is impounded, and that impoundment now has the physical characteristics that it can be considered a traditional navigable water (*see, e.g.*, Traditional Navigable Waters above), that water would become jurisdictional under (a)(1).

B. Rationale for Conclusion

Impoundments are jurisdictional because as a legal matter an impoundment of a "water of the United States" remains a "water of the United States" and because scientific literature demonstrates that impoundments continue to significantly affect the chemical, physical, or biological integrity of downstream traditional navigable waters, interstate waters, or the territorial seas.

The Supreme Court has confirmed that damming or impounding a "water of the United States" does not make the water non-jurisdictional. *See S. D. Warren Co. v. Maine Bd. of Envtl. Prot.*, 547 U.S. 370, 379 n.5 (2006) ("[N]or can we agree that one can denationalize national waters by exerting private control over them."). Similarly, when presented with a tributary to the Snake River which flows only about two months per year because of an irrigation diversion structure installed upstream, the Ninth Circuit opined "it is doubtful that a mere man-made diversion would have turned what was part of the waters of the United States into something else and, thus, eliminated it from national concern." *U.S. v. Moses*, 496 F.3d 984 (9th Cir. 2007), *cert. denied*, 554 U.S. 918 (2008). As a matter of policy and law, impoundments do not denationalize a water, even where there is no longer flow below the impoundment. The agencies will analyze the stream network, above and below the impoundment, for connection to downstream traditional navigable waters, interstate waters, or the territorial seas.

Some commenters stated that "impoundment" is a broad term that should not be *per se* regulated. The proposed rule defined "waters of the United States" to include: (4) All impoundments of waters identified in paragraphs (a)(1) through (3) and (5) of this section; and (5) All tributaries of waters identified in paragraphs (a)(1) through (4) of this section. In the final rule the agencies are retaining the language of the existing rule that simply states that "waters of the United States" includes all impoundments of "waters of the United States." The existing language is straightforward and can continue to be implemented to ensure that "waters of the United States" cannot be denationalized by impounding them. As with the existing rule, the key is that to be covered under this provision the water must be an impoundment of a "water of the United States." Examples, therefore, include a lake created by the damming of a water that would otherwise meet the definition of a tributary and impoundment of a wetland that meets the definition of adjacent water under the rule.

The agencies have also addressed the confusion of commenters that interpreted the proposed rule to allow for waters to be jurisdictional based on their relationship to impoundments without requiring impoundments to have a significant nexus or any meaningful connection to traditional navigable waters. The final rule defines "waters of the United States" to include: (5) All tributaries, as defined in paragraph (c)(3) of this section, of waters identified in paragraphs (a)(1) through (3) of this section. The rule defines tributary to mean: a water that contributes flow, either directly or through another water (including an impoundment identified in paragraph (a)(4) of this section), to a water identified in paragraphs (a)(1) through (3) of this section that is characterized by the presence of the physical indicators of a bed and banks and an ordinary high water mark. Combined, these provisions make it clear that a tributary is not jurisdictional simply because it is tributary to an impoundment; rather, the tributary is a tributary to a traditional navigable water, interstate water, or the territorial seas because just as an impoundment does not denationalize a "water of the United States," it also does not denationalize the tributaries (and their adjacent waters) that would flow through to a traditional navigable water, interstate water, or the territorial seas absent the impoundment. Some commenters stated that if an impoundment cuts off a physical connection and flow is stopped, then the upstream waters lack a significant nexus and are not jurisdictional. First, Justice Kennedy did not indicate that he intended to change longstanding Supreme Court precedent that waters cannot be denationalized. Second, the science indicates that while impoundments can change the functions provided by waters that have been impounded, those impoundments (and their upstream tributaries and adjacent waters) still provide important functions that significantly affect the physical, chemical, or biological integrity of the downstream traditional navigable water, interstate water, or the territorial seas. Third, Justice Kennedy's opinion recognized that the absence of a hydrologic connection could serve as the basis for a significant nexus. As noted above, one example in the Science Report was that because dams reduce the amount of sediment delivered downstream, the reservoirs behind dams are very effective at retaining sediment, which can have significant effects in downstream waters. Science Report at 3-14. Finally, the judgment of the agencies based on their experience and the data and information available is that berms, dikes, dams, and similar features used to create impoundments typically do not block all water flow, and therefore, impoundments continue to have a significant nexus with downstream traditional navigable waters, interstate waters, or the territorial seas.

VII. Tributaries

All waters that meet the rule's definition of tributary are "waters of the United States" because they meet Justice Kennedy's test for jurisdiction under *Rapanos.* In other words, the agencies are asserting that all tributaries as defined in the rule have a significant nexus with traditional navigable waters, interstate waters, and/or the territorial seas. EPA and the Corps' longstanding definition of "waters of the United States" has included tributaries. That regulation was based on the agencies' historic view of the scope of the CWA and the general scientific understanding about the ecological and hydrological relationships between waters.

Tributaries have a substantial impact on the chemical, physical, or biological integrity of waters into which they eventually flow—including traditional navigable waters, interstate waters, and the territorial seas. The great majority of tributaries are headwater streams, and whether they are perennial, intermittent, or ephemeral, they play an important role in the transport of water, sediments, organic matter, pollutants, nutrients, and organisms to downstream environments. Tributaries serve to store water (thereby reducing flooding), provide biogeochemical functions that help maintain water quality, trap and transport sediments, transport, store and modify pollutants, provide habitat for plants and animals, and sustain the biological productivity of downstream rivers, lakes and estuaries. These conclusions are strongly supported in the scientific literature, as discussed throughout this document.

Headwater streams are the smallest channels where stream flows begin, and often occur at the outer rims of a watershed. Typically these are first-order streams (i.e., they do not have any other streams flowing into them). However, headwater streams can include streams with multiple tributaries flowing into them and can be perennial, intermittent or ephemeral, but are still located near the channel origins of the tributary system in a watershed.

Protection of tributaries under the CWA is critically important because they serve many important functions which directly influence the integrity of downstream waters. Discharges of pollutants into the tributary system adversely affect the chemical, physical, or biological integrity of traditional navigable waters, interstate waters, and the territorial seas. For example, destruction or modification of headwater streams has been shown to affect the integrity of downstream waters, in part through changes in hydrology, chemistry and stream biota. Freeman *et al.* 2007; Wipfli 2007. Additionally, activities such as discharging a pollutant into one part of the tributary system are well-documented to affect, at times, other parts of the system, even when the point of discharge is far upstream from the navigable water that experiences the effect of the discharge. *See, e.g.*, National Research Council 1997; Dunnivant and Anders 2006. In order to protect traditional navigable waters, interstate waters, and the territorial seas it is also critically important to protect tributaries as defined that are upstream from those waters.

A. Definition of Tributary

Previous definitions of "waters of the United States" regulated all tributaries without qualification. The final rule more precisely defines "tributaries" as waters that contribute flow, either directly or through another water (including an impoundment), to a traditional navigable water, interstate water, or the territorial seas, and are characterized by the presence of physical indicators of bed and banks and ordinary high water mark – and concludes that such tributaries are "waters of the United States." These physical indicators demonstrate there is volume, frequency, and duration of flow sufficient to create a bed and banks and an ordinary high water mark, and thus to qualify as a tributary. A tributary can be a natural, man-altered, or man-made water and includes waters such as rivers, streams, canals, and ditches that are not excluded under paragraph (b) of the rule. A water that otherwise qualifies as a tributary under this definition does not lose its status as a tributary if, for any length, there are one or more constructed breaks (such as bridges, culverts, pipes, or dams), or one or more natural breaks (such as wetlands along the run of a stream, debris piles, boulder fields, or a stream that flows underground) so long as a bed and banks and an ordinary high water mark can be identified upstream of the break. A water that otherwise qualifies as a tributary under this definition does not lost its status as a tributary if it contributes flow through a "water of the United States" that does not meet the definition of a tributary (*e.g.* a lake or a wetland), or through water excluded under paragraph (b) of the rule, directly or through another water, to a traditional navigable water, interstate water, or the territorial sea.

The agencies conclude that covered tributaries with a bed and banks and ordinary high water mark are similarly situated for purposes of the agencies' significant nexus analysis. The science demonstrates that covered tributaries provide many common vital functions important to the chemical, physical, and biological integrity of downstream waters, regardless of the size of the tributaries (see section VII.b.vi) or whether they are natural, man-made, or man-altered (see section VII.b.v.). Therefore, "tributaries" as defined are jurisdictional by rule.

i. Bed and Banks and Ordinary High Water Mark

The physical indicators of bed and banks and ordinary high water mark (OHWM) demonstrate that there is sufficient volume, frequency, and flow in tributaries to a traditional navigable water, interstate water, or the territorial seas to establish a significant nexus. These physical indicators can be created by perennial, intermittent, and ephemeral flows. *See, e.g.,* Lichvar and McColley 2008; Mersel and Lichvar 2014. For purposes of the rule, "bed and banks" means the substrate and sides of a channel between which flow is confined. The banks constitute a break in slope between the edge of the bed and the surrounding terrain, and may vary from steep to gradual. Existing Corps regulations define ordinary high water mark as the line on the shore established by the fluctuations of water and indicated by physical characteristics such as a clear, natural line impressed on the banks, shelving, changes in the character of soil, destruction of terrestrial vegetation, the presence of litter and debris, or other appropriate means that consider the characteristics of the surrounding areas. 33 CFR 328.3(e). That definition is not changed by the rule and is added to EPA's regulations. As noted above, the agencies' longstanding practice is that the ordinary high water mark sets the lateral limits of jurisdiction over non-tidal water bodies, including tributaries, in the absence of adjacent wetlands. U.S. Army Corps of Engineers 2005b.

The Science Report also utilized physical indicators of flow, such as bed and banks, to identify the components of the river system. *See, e.g,* Science Report at ES-15, 2-2. The term river refers to a relatively large volume of flowing water within a visible channel, including subsurface water moving in the same direction as the surface water and lateral flows exchanged with associated floodplain and riparian areas. *Id.* at 2-2 (citing Naiman and Bilby 1998). Channels are natural or constructed passageways or depressions of perceptible linear extent that convey water and associated materials downgradient. They are defined by the presence of continuous bed and bank structures, or uninterrupted (but permeable) bottom and lateral boundaries. Although bed and bank structures might in places appear to be disrupted (*e.g.*, bedrock outcrops, braided channels, flow-through wetlands), the continuation of the bed and banks downgradient from such disruptions is evidence of the surface connection with the channel that is upgradient of the perceived disruption. Such disruptions are associated with changes in the gradient and in the material over and through which the water flows. If a disruption in the bed and bank structure prevented connection, the area downgradient would lack a bed and banks, be colonized with terrestrial vegetation, and be indiscernible from the nearby land. The concentrated longitudinal movement of water and sediment through these channels lowers local elevation, prevents soil development, selectively transports and stores sediment, and hampers the colonization and persistence of terrestrial vegetation. Streams are defined in a similar manner as rivers: a relatively small volume of flowing water within a visible channel, including subsurface water moving in the same direction as the surface water and lateral flows exchanged with associated floodplain and riparian areas. *Id.* (citing Naiman and Bilby 1998).

Current Corps regulations and guidance identify bed and banks as indicators of ordinary high water mark. The definition of “tributary” in the rule also requires another indicator of ordinary high water mark such as staining, debris deposits, or other indicator identified in the rule or agency guidance. In many tributaries, the bed is that part of the channel below the ordinary high water mark, and the banks often extend above the ordinary high water mark. For other tributaries, such as those that are incised, changes in vegetation, changes in sediment characteristics, staining, or other ordinary high water mark indicators may be found within the banks. *See, e.g.,* Lichvar and McColley 2008. In concrete-lined channels, the concrete serves as the bed and banks and can have other ordinary high water mark indicators such as staining and debris deposits. Indicators of an ordinary high water mark may vary from region to region across the country. To address the variability, the Corps has released several regional manuals for areas where identification of ordinary high water mark is technically complex. *See, e.g.,* Lichvar and McColley 2008; Mersel and Lichvar 2014.

Other evidence, besides direct field observation, may establish the presence of bed and banks and another indicator of ordinary high water mark, which are discussed in detail in the preamble. The agencies currently use many tools in identifying tributaries and will continue to rely on their experience and technical expertise in identifying the presence of a bed and banks and ordinary high water mark. Among the types of data and remote sensing or mapping information that can assist in establishing the presence of a tributary with bed and banks and an ordinary high water mark are USGS topographic data, the USGS National Hydrography Dataset (NHD), Natural Resources Conservation Service (NRCS) Soil Surveys, and State or local stream maps which are mapped independently of the USGS, as well as the analysis of aerial photographs, and light detection and ranging (also known as LIDAR) data, gage data, flood predictions, historic records of water flow, and desktop tools that provide for the hydrologic estimation of a discharge sufficient to create an ordinary high water mark, such as a regional regression analysis or hydrologic modeling. *See, e.g.*, U.S. Army Corps of Engineers 2005b; U.S. Army Corps of Engineers 2007a; Lichvar and McColley 2008; Mersel and Lichvar 2014. These sources of information can sometimes be used independently to infer the presence of a bed and banks and another indicator of ordinary high water mark, or where they correlate, can be used to reasonably conclude the presence of a bed and banks and ordinary high water mark. Both the USGS topographic data and the NHD data assist to delineate tributaries to traditional navigable waters, interstate waters, or the territorial seas. Corps of Engineers 2007a. Where one or both of these sources have indicated a "blue line stream," there is an indication that the tributary could exhibit a bed and banks and another indicator of ordinary high water mark. Where this information is combined with stream order,[23] more certainty can result. For example, a water that is a second-order stream will be more likely to exhibit a bed and banks and another indicator of ordinary high water mark as compared to a first-order stream. Similarly, the indicators gleaned from aerial photography interpretation, as discussed in more detail in the preamble, can be correlated with the presence of USGS streams data in reasonably concluding that a bed and banks and another indicator of ordinary high water mark are present. As discussed in the preamble, LIDAR-indicated tributaries can be correlated with aerial photography interpretation and USGS stream data, to reasonably conclude the presence of a bed and banks and another indicator of an ordinary high water mark in the absence of a field visit. The agencies have been using such remote sensing and desktop tools to delineate tributaries for many years where data from the field are unavailable or a field visit is not possible. The agencies' experience and

[23] Stream order is a method for stream classification based on relative position within a river network, when streams lacking upstream tributaries (*i.e.*, headwater streams) are first-order streams and the junction of two streams of the same order results in an increase in stream order (i.e., two first-order streams join to form a second-order stream, and so on). When streams of different orders join, the order of the larger stream is retained. *See* Science Report at 2-2, A-12 (citing Strahler 1957).

technical expertise in using such tools to detect the presence of tributaries over the past 30 years of Clean Water Act implementation provide support that when used in combination, such tools and data can appropriately demonstrate the presence of a bed and banks and another indicator of ordinary high water mark.

The term "ordinary high water mark" reflects that the presence of an OHWM is indicative of regularity of flow. Mersel and Lichvar 2014. For instance, the word "ordinary" can be interpreted to exclude extremes on either end of the stream flow spectrum (*i.e*., very low or very high flows), while the term "high" is in contrast to low or moderate stream flow levels. Together, "ordinary high water" indicates stream flow levels that are greater than average, but less than extreme, and that occur with some regularity. *Id.* A common and reasonable interpretation of this term is that ordinary high water refers to the ordinary or normal water levels that occur during the high water season. However, this reasoning is used only to help narrow the concept of the OHWM, and does not strictly define it. *Id*. Existing Corps guidance on OHWM supports that the OHWM forms due to some regularity of flow and does not occur due to extraordinary events. The guidance states, "[w]hen making OHWM determinations, districts should be careful to look at characteristics associated with ordinary high water events, which occur on a *regular or frequent basis*. Evidence resulting from extraordinary events, including major flooding and storm surges, is not indicative of the OHWM. For instance, a litter or wrack line resulting from a 200-year flood event would in most cases not be considered evidence of an OHWM." U.S. Army Corps of Engineers 2005b.

In 2005, the Corps issued a regulatory guidance letter (RGL 05-05) to Corps districts on OHWM identification that was designed to ensure more consistent practice. U.S. Army Corps of Engineers 2005b. As noted above, the Corps has also issued regional manuals to provide additional technical assistance for technically complex OHWM delineations. *See, e.g.*, Lichvar and McColley 2008; Mersel and Lichvar 2014.

This regulation clearly provides that a water that otherwise meets the definition of tributary remains a jurisdictional tributary even if there are natural or man-made breaks in the OHWM. The definition of tributary also provides a non-exclusive list of examples of natural or man-made breaks in the bed and banks or OHWM (*e.g.* culverts, dams, wetlands) to assist in clearly and consistently determining what meets the definition of tributary. As described above and in section VII.B.v., breaks in the bed and banks or OHWM sever neither the connectivity nor the significant nexus that a tributary has with downstream (a)(1) through (a)(3) waters. While science does not set a threshold distance that a break in the bed and banks or OHWM must be in order to maintain connectivity with the upstream portion of the tributary, the Science Report is clear that the continuation of bed and banks downstream from disruptions is evidence of the surface connection with the channel that is upstream of the perceived disruption. Science Report at ES-15. Where breaks in the bed and banks or the OHWM occur due to natural causes, such disruptions are associated with changes in the gradient and in the material over and through which the water flows. *Id.* at 2-2. If a disruption in the bed and banks or the OHWM prevented connection, the area downstream would lack a bed and banks or OHWM, be colonized with terrestrial vegetation, and be indiscernible from the nearby land. *Id.* The concentrated longitudinal movement of water and sediment through these channels lowers local elevation, prevents soil development, selectively transports and stores sediment, and hampers the colonization and persistence of terrestrial vegetation. *Id.*

The upper limit of the tributary is the point where a bed and banks and another indicator of ordinary high water mark cease to be identifiable. The ordinary high water mark establishes the lateral limits of a water, and its absence generally determines when a tributary's channel or bed and banks has ended, representing the upper limit of the tributary. However, a natural or constructed break in bed and banks or other indicator of ordinary high water mark does not constitute the upper limit of a tributary where bed and banks or other indicator ordinary high water mark can be found farther upstream. Note that waters, including wetlands, which are adjacent to a tributary at the upper limit of the channel are jurisdictional as adjacent waters.

ii. Rationale for Conclusion

The identification of tributaries by the presence of physical indicators of flow - bed and banks and another indicator of high water mark - is supported by the scientific literature which utilizes the presence of physical channels as a compelling line of evidence for surface-water connections from tributaries to downstream traditional navigable waters, interstate waters, and the territorial seas. Science Report at ES-15. In addition, the definition states that a tributary does not lose its status as a tributary even if there are constructed or natural breaks and that is again supported by the scientific literature. Physical channels are defined by continuous bed-and-bank structures, which can include apparent disruptions (such as by bedrock outcrops, braided channels, flow-through wetlands) associated with changes in the material and gradient over and through which water flows. *Id.* at ES-15 and 2-2. The continuation of bed and banks downgradient from such disruptions is evidence of the surface connection with the channel that is upgradient of the perceived disruption. *Id.* The agencies note that the definition of tributary focuses on the appearance of physical indicators of flow upstream of the break because the definition is designed to indicate the extent of jurisdiction upstream as a tributary based on the presence of bed and banks and another indicator of ordinary high water mark. The water is a tributary until those indicators cease rather than are simply disrupted.

Justice Kennedy opined that the requirement of a perceptible ordinary high water mark for tributaries "may well provide a reasonable measure of whether specific minor tributaries bear a sufficient nexus with other regulated waters to constitute navigable waters under the Act." 547 U.S. at 781, *see also id.* at 761. The science supports Justice Kennedy's perception.

Some commenters stated that the proposed rule was problematic because it determines that tributaries regardless of size or significance have a significant nexus. To the contrary, the rule limits the definition of tributaries that are "waters of the United States" to those that have two indicators of ordinary high water mark, physical indicators which demonstrate duration and frequency of flow that excludes some waters because of their lack of size and significance. In fact, the SAB expressed the view that from a scientific perspective there are tributaries that do not have an ordinary high water mark but still affect downstream waters. The SAB also advised EPA to consider changing the wording in the definition to "bed, bank, and other evidence of flow." SAB 2014b at 2. The agencies have made a determination about which tributaries to assess in combination and those tributaries have a significant nexus under Justice Kennedy's test. Further, by defining tributaries for purposes of the rule based on their physical indicators of flow, the agencies have identified those tributaries to which waters defined as adjacent will also have a significant nexus to downstream traditional navigable water, interstate waters, or the territorial seas. The agencies exercised their judgment to conclude that the limitations that they established in the definition of tributary were reasonable and appropriate to ensure that they were identifying as categorically jurisdictional those waters that were similarly situated and therefore appropriate to assess in combination, and that those waters in combination had a significant nexus. This careful line drawing, and the scientific support for those waters to be included within the definition of tributary, demonstrate that the agencies' definition is not overbroad or unsupported by the science. This definition of tributaries is thus reasonable and based on significance. In addition, the SAB suggested that EPA reconsider whether flow-through lentic systems should be included as adjacent waters and wetlands, rather than as tributaries. As discussed in the preamble, the agencies made this change suggested by the SAB and have not defined tributaries to include lotic systems such as wetlands.

B. The Agencies Have Concluded that Tributaries, as Defined, Have a Significant Nexus

The scientific literature documents that tributary streams, including perennial, intermittent, and ephemeral streams, and certain categories of ditches are integral parts of river networks because they are directly connected to rivers via permanent surface features (channels and associated alluvial deposits) that concentrate, mix, transform, and transport water and other materials, including food resources, downstream. Alluvial deposits, or alluvium, are deposits of clay, silt, sand, gravel, or other particulate materials that have been deposited by a stream or other body of running water in a streambed, on a flood plain, on a delta, or at the base of a mountain. Science Report at A-1. Tributaries transport, and often transform, chemical elements and compounds, such as nutrients, ions, dissolved and particulate organic matter and contaminants, influencing water quality, sediment deposition, nutrient availability, and biotic functions in rivers. Streams also are biologically connected to downstream waters by dispersal and migration, processes which have critical implications for aquatic populations of organisms that use both headwater and river or open water habitats to complete their life cycles or maintain viable populations. The scientific literature clearly demonstrates that cumulatively, streams exert strong influence on the character and functioning of rivers. In light of these well documented connections and functions, the agencies concluded that tributaries, as defined, alone or in combination with other tributaries in a watershed, significantly affect the chemical, physical, or biological integrity of a traditional navigable water, interstate water, or the territorial seas. The scientific literature supports this conclusion for ephemeral tributaries, as well as for intermittent and perennial tributaries; for tributaries both near to and far from the downstream traditional navigable water, interstate water, or the territorial seas; and for natural tributaries, man-altered, or man-made tributaries, which may include certain ditches and canals.

The discussion below summarizes the key points in the literature regarding the chemical, physical, and biological connections and functions of tributaries that significantly affect downstream waters. In addition, the evidence regarding man-altered and man-made tributaries and headwater streams and non-perennial streams, types of tributaries whose important functional relationships to downstream traditional navigable waters and interstate waters might not be obvious, is summarized. The scientific literature does not use legal terms like "traditional navigable water," "interstate water," or "the territorial seas." Rather, the literature assesses tributaries in terms of their connections to and effects on larger downstream waters in a watershed. Traditional navigable waters, interstate waters, and the territorial seas are simply a subset of downstream waters and their distinction is a legal, not scientific, one; the strength of the connections and effects does not change because a river does not meet the legal standards for being traditionally navigable. While the rule, consistent with Supreme Court case law, addresses only those tributaries, as defined, that drain to a traditional navigable water, interstate water, or the territorial seas, the conclusions of the scientific literature with respect to the effects of tributaries on downstream waters are applicable to the subset of downstream waters that are traditional navigable waters, interstate waters, or the territorial seas.

i. Tributaries as Defined Are "Similarly Situated"

The agencies determine based on their scientific and technical expertise that waters meeting the definition of "tributary" in a single point of entry watershed are similarly situated and have a significant nexus because they significantly affect the chemical, physical, and biological integrity of traditional navigable waters, interstate waters, and the territorial seas. As such, it is appropriate to conclude covered tributaries as a category are "waters of the United States." As discussed above, the agencies limited the tributaries that are "waters of the United States" to those that have both a bed and banks and another indicator of ordinary high water mark. The agencies reasonably concluded that covered tributaries are similarly situated because those physical characteristics indicate sufficient flow such that the covered tributaries are performing similar functions and tributaries located in the single point of entry watershed are working together in the region to provide those functions to the nearest traditional navigable water, interstate water, or the territorial seas.

Science demonstrates that tributaries within a single point of entry watershed act together as a system in affecting downstream waters. Structurally and functionally, tributary networks and the watersheds they drain are fundamentally cumulative in how they are formed and maintained. Science Report at ES-13. Downstream traditional navigable waters, interstate waters, or the territorial seas are the time-integrated result of all tributaries contributing to them. *Id.* at ES-5. The incremental effects of individual streams are cumulative across entire watersheds and therefore must be evaluated in context with other streams in the watershed. *Id*. Thus, science supports that tributaries within a point of entry watershed are similarly situated.

ii. Tributaries Significantly Affect the Physical Integrity of (a)(1) through (a)(3) Waters

The scientific literature unequivocally demonstrates that tributaries exert a strong influence on the physical integrity of downstream waters. Tributaries, even when seasonal, are the dominant source of water in most rivers, rather than direct precipitation or groundwater input to main stem river segments. *See, e.g.,* Science Report at 3-5 (citing Winter 2007; Bukaveckas 2009). Distant headwaters with stronger connections to groundwater or consistently higher precipitation levels than downstream reaches contribute more water to downstream rivers. *Id.* In the northeastern United States headwater streams contribute greater than 60% of the water volume in larger tributaries, including navigable rivers. *See, e.g., id.* (citing Alexander *et. al.* 2007). The contributions of tributaries to river flows are often readily measured or observed, especially immediately below confluences, where tributary flows increase the flow volume and alter physical conditions, such as water temperature, in the main stream. The physical effects of tributaries are particularly clear after intense rainfall occurs over only the upper tributary reaches of a river network. For example, a study of ephemeral tributaries to the Río Grande in New Mexico found that after a storm event contributions of the stormflow from ephemeral tributaries accounted for 76% of the flow of the Río Grande. *Id.* at 3-7 to 3-8 (citing Vivoni *et. al.* 2006). A key effect of tributaries on the hydrologic response of river networks to storm events is dispersion, or the spreading of water output from a drainage basin over time. Geomorphic dispersion of connected tributaries influences the timing and volume of water reaching a river network outlet. *See, e.g., id.* at 3-10 (citing Saco and Kumar 2002). Tributaries also can reduce the amount of water that reaches downstream rivers and minimize downstream flooding, often through infiltration or seepage through channel beds and banks or through evapotranspiration. *See, e.g., id.* at 3-11 (citing Hamilton *et al*. 2005; Costelloe *et.al.* 2007).

One of the primary functions of tributaries is transporting sediment to downstream waters. Tributaries, particularly headwaters, shape and maintain river channels by accumulating and gradually or episodically releasing sediment and large woody debris into river channels. Sediment transport is also clearly provided by ephemeral streams. Effects of the releases of sediment and large woody debris are especially evident at tributary-river confluences, where discontinuities in flow regime and temperature clearly demonstrate physical alteration of river structure and function by headwater streams. Science Report at 3-14, 3-16, 3-18, 3-20 to 3-21. Sediment movement is critical for maintaining the river network, including rivers that are considered to be traditional navigable waters, as fluvial (produced by the action of a river or stream) sediments are eroded from some channel segments, and deposited in others downstream to form channel features, stream and riparian habitat which supports the biological communities resident downstream, and influence the river hydrodynamics. *See, e.g.,* Florsheim *et al.* 2008; Science Report at 3-13 (citing Church 2006). While essential to river systems, too much sediment can impair ecological integrity by filling interstitial spaces, blocking sunlight transmission through the water column, and increasing contaminant and nutrient concentrations. *Id.* (citing Wood and Armitage 1997). Over-sedimentation thus can reduce photosynthesis and primary productivity within the stream network and otherwise have harmful effects on downstream biota, including on the health and abundance of fish, aquatic macrophytes (plants), and aquatic macroinvertebrates (insects) that inhabit downstream waters. *See, e.g.,* Wood and Armitage 1997. Headwater streams tend to trap and store sediments behind large structures, such as boulders and trees, that are transported downstream only during infrequent large storm events and that are the dominant means for downstream sediment transport. Science Report at 3-15 (citing Gomi and Sidle 2003; Gooderham *et al.* 2007). Similarly, large, infrequent disturbance events are the primary drivers for wood movement from headwater streams to downstream waters. *Id.* at 3-17 (citing Benda and Cundy 1990; Benda *et al.* 2005; Bigelow *et al*. 2007).

Tributaries can greatly influence water temperatures in tributary networks. This is important because water temperature is a critical factor governing the distribution and growth of aquatic life, both directly (through its effects on organisms) and indirectly (through its effects on other physiochemical properties, such as dissolved oxygen and suspended solids). *Id.* at 3-19 (citing Allan 1995). For instance, water temperature controls metabolism and level of activity in cold-blooded species like fish, amphibians, and aquatic invertebrates. *See, e.g.,* Ice 2008. Temperature can also control the amount of dissolved oxygen in streams, as colder water holds more dissolved oxygen, which fish and other fauna need to breathe. Connections between tributaries and downstream rivers can affect water temperature in river networks. *See, e.g.,* Science Report at 3-19 (citing Knispel and Castella 2003; Rice *et al*.2008). In particular, tributaries provide both cold and warm water refuge habitats that are critical for protecting aquatic life. *Id.* at 3-42. Because headwater tributaries often depend on groundwater inputs, temperatures in these systems tend to be warmer in the winter (when groundwater is warmer than ambient temperatures) and colder in the summer (when groundwater is colder than ambient temperatures) relative to downstream waters. *Id*. (citing Power *et al*. 1999). Thus tributaries provide organisms with both warm water and coldwater refuges at different times of the year. *Id*. (citing Curry *et al*. 1997; Baxter and Hauer 2000; Labbe and Fausch 2000; Bradford *et al*. 2001). For example, when temperature conditions in downstream waters are adverse, fish can travel upstream and use tributaries as refuge habitat. *Id.* (citing Curry *et al*. 1997; Cairns *et al*. 2005).

Tributaries also help buffer temperatures in downstream waters. *Id.* at 3-19 (citing Caissie 2006). Temperatures in tributaries affect downstream water temperature many kilometers away. *Id.* at 3-20 (citing Gardner and Sullivan 2004; Johnson *et al*. 2010).

iii. Tributaries Significantly Affect the Chemical Integrity of (a)(1) through (a)(3) Waters

The scientific literature unequivocally demonstrates that tributaries exert a strong influence on the chemical integrity of downstream waters. Tributaries transform and export significant amounts of nutrients and carbon to downstream waters, serving important source functions that greatly influence the chemical integrity of downstream waters. Organic carbon, in both dissolved and particulate forms, exported from tributaries is consumed by downstream organisms. The organic carbon that is exported downstream thus supports biological activity (including metabolism) throughout the river network. *See, e.g.*, Science Report at 3-30 (citing Fisher and Likens 1973; Meyer 1994; Wallace *et al.* 1997; Hall and Meyer 1998; Hall *et al*. 2000; Augspurger *et al*. 2008). Much or most of the organic carbon that is exported from tributaries has been altered either physically or chemically by ecosystem processes within the tributary streams, particularly by headwater streams. In addition to transformations associated with microbial and invertebrate activity, organic matter in streams can be transformed through other processes such as immersion and abrasion; photodegradation also can be important in ephemeral and intermittent streams where leaves accumulate in dry channels exposed to sunlight. *Id.* (citing Paul *et al.* 2006; Corti *et al.* 2011; Dieter *et al.* 2011; Fellman *et al.* 2013).

Nutrient export from tributaries has a large effect on downstream water quality, as excess nutrients from surface runoff from lawns and agricultural fields can cause algal blooms that reduce dissolved oxygen levels and increase turbidity in rivers, lakes, estuaries, and territorial seas. Water low in dissolved oxygen cannot support aquatic life; this widely-recognized phenomenon, known as hypoxia or "dead zones," occurs along coasts throughout the country, including the northern Gulf of Mexico and the Chesapeake Bay. Committee on Environment and Natural Resources 2000; Díaz and Rosenberg 2011; Murphy *et al.* 2011. Hypoxia threatens valuable commercial and recreational fisheries, including in the northern Gulf of Mexico, and reduces aquatic habitat quality and quantity. Committee on Environment and Natural Resources 2000; Freeman *et al.* 2007; Díaz and Rosenberg 2011; O'Connor and Whitall 2007; He and Xu 2015. The amount of nitrogen that is exported downstream varies depending on stream size, and how much nitrogen is present in the system. Nitrogen loss is greater in smaller, shallow streams, most likely because denitrification and settling of nitrogen particles occur at slower rates in deeper channels. Science Report at 3-23 (citing Alexander *et al.* 2000). At low loading rates, the biotic removal of dissolved nitrogen from water is high and occurs primarily in small tributaries, reducing the loading to larger tributaries and rivers downstream. At high nitrogen loading rates, tributaries become nitrogen saturated and are not effectively able to remove nitrogen, resulting in high nitrogen export to rivers. *Id.* at 3-25 to 3-26 (citing Mulholland *et al*. 2008). The transport of nitrogen and phosphorus downstream has also been well-documented, particularly in the cases of the Gulf of Mexico and the Chesapeake Bay. Tributary streams in the uppermost portions of the Gulf and Bay watersheds transport the majority of nutrients to the downstream waters; an estimated 85% of nitrogen arriving at the hypoxic zone in the Gulf originates in the upper Mississippi (north of Cairo, Illinois) and the Ohio River Basins. Goolsby et al. 1999. The export of nutrients from streams in the Mississippi River Basin has an effect on anoxia, or low oxygen levels, in the Gulf. Science Report at 3-24 (citing Rabalais *et al*. 2002). Similarly, nutrient loads from virtually the entire 64,000 square mile watershed affect water quality in the Chesapeake

Bay. Simulation tools have been used to determine the nutrient and sediment load reductions that must be made at many different points throughout the entire watershed in order to achieve acceptable water quality in the mainstem of the Bay. These reductions included specific annual nitrogen caps on the upper reaches of the Susquehanna River in New York State, more than 400 miles from the mouth of the Chesapeake Bay. *See e.g.*, U.S. Environmental Protection Agency 2003; Rabalais *et al*. 2002.

Although tributaries export nutrients, carbon, and contaminants downstream, they also transform these substances. Phosphorous and nitrogen arrive at downstream waters having already been cycled, or taken up and transformed by living organisms, many times in headwater and smaller tributaries. Science Report at 1-3, 3-26 to 3-27 (citing Webster and Patten 1979; Newbold *et al*. 1981; Elwood *et al.* 1983; Ensign and Doyle 2006). In addition, some of the nutrients taken up as readily available inorganic forms are released back to the water as organic forms that are less available for biotic uptake. *Id*. at 3-27 (citing Mulholland *et al*. 1988; Seitzinger *et al*. 2002). Similarly, nutrients incorporated into particulates are not entirely regenerated, but accumulate in longitudinally increasing particulate loads (i.e. increases moving downstream). *Id*. (citing Merriam *et al.* 2002; Whiles and Dodds 2002; Hall, *et al*. 2009). Headwater streams have seasonal cycles in the concentrations of phosphorous and nitrogen that are delivered downstream by accumulating nutrient derived from temporarily growing streambed biomass. *Id*. (citing Mulholland and Hill 1997; Mulholland 2004). Such variations have been demonstrated to affect downstream productivity. *Id*. (citing Mulholland *et al*. 1995). Nitrification, the microbial transformation of ammonium to nitrate, affects the form of downstream nutrient delivery. Nitrification occurs naturally in undisturbed headwater streams, but increases sharply in response to ammonium inputs, thereby reducing potential ammonium toxicity from pollutant inputs. *Id*. at 3-28 (citing Newbold *et al*. 1983; Chapra 1996; Bernhardt, *et al*. 2002). Denitrification, the removal of nitrate from streamwater through transformation to atmospheric nitrogen, is widespread among headwater streams; research indicates that small, tributaries free from agricultural or urban impacts can reduce up to 40% of downstream nitrogen delivery through denitrification. *Id.* at 3-28 (citing Mulholland *et al*. 2008). Small tributaries also affect the downstream delivery of nutrients through abiotic processes. Streams can reduce phosphorus concentrations through sorption (i.e., "sticking") to stream sediments. *Id.* (citing Meyer and Likens 1979). This is particularly beneficial to downstream chemical integrity where phosphorus sorbs to contaminants such as metal hydroxide precipitates. *Id.* (citing Simmons 2010).

Tributaries also store significant amounts of nutrients and carbon, functioning as important sinksfor river networks so that they do not reach downstream traditional navigable waters, interstate waters, or the territorial seas. Small tributary streams in particular often have the greatest effect on downstream water quality, in terms of storage and reducing inputs to downstream waters. For instance, uptake and transformation of inorganic nitrogen often occurs most rapidly in the smallest tributaries. *See, e.g., id.* at 3-25 (citing Peterson *et al.* 2001). Small tributaries affect the downstream delivery of nutrients such as phosphorus through abiotic processes; such streams can reduce phosphorus concentrations by sorption to stream sediments.

Tributaries can also serve as a temporary or permanent source or sink for contaminants that adversely affect organisms when occurring at excessive or elevated concentrations, reducing the amounts of such pollutants that reach downstream traditional navigable waters, interstate waters, or the territorial seas. The transport of contaminants to downstream waters can impact water quality downstream, if they are not stored in tributaries. *See, e.g., id.* at 3-34 (citing Wang *et al*. 2007). Tributaries can also serve as at least a temporary sink for contaminants that would otherwise impair downstream water quality. *See, e.g., id.* at 3-36 to 3-37 (citing Graf 1994).

The distances and extent of metal contaminant transport was shown in separate studies in the upper Arkansas River in Colorado, and Clark Fork River in Montana, where past mining activities impacted the headwater tributaries. River bed sediments showed that metals originating from the mining and smelting areas in the headwaters were reaching water bodies up to 550 km downstream. *Id.* at 3-34 (citing Axtmann and Luoma 1991; Kimball *et al*. 1995).

Military studies of the distribution, transport, and storage of radionuclides (*e.g.*, plutonium, thorium, uranium) have provided convincing evidence for distant chemical connectivity in river networks because the natural occurrence of radionuclides is extremely rare. From 1942 to 1952, prior to the full understanding of the risks of radionuclides to human health and the environment, plutonium dissolved in acid was discharged untreated into several intermittent headwater streams that flow into the Rio Grande at the Los Alamos National Laboratory, New Mexico. *Id.* at 3-36 (citing Graf 1994; Reneau *et al.* 2004). Also during this time, nuclear weapons testing occurred west of the upper Rio Grande near Socorro, New Mexico (Trinity blast site) and in Nevada, where fallout occurred on mountainous areas with thin soils that are readily transported to headwater streams in the upper Rio Grande basin. The distribution of plutonium within the Rio Grande illustrates how headwater streams transport and store contaminated sediment that has entered the basin through fallout and from direct discharge. Los Alamos Canyon, while only representing 0.4% of the drainage area at its confluence with the Rio Grande, had a mean annual bedload contribution of plutonium almost seven times that of the mainstem. *Id.* (citing Graf 1994). Much of the bedload contribution occurred sporadically during intense storms that were out of phase with flooding on the upper Rio Grande. Total estimated contributions of plutonium between the two sources to the Rio Grande were approximately 90% from fallout to the landscape and 10% from direct effluent discharge at Los Alamos National Laboratory. *Id.* at 3-36 to 3-37 (citing Graf 1994).

iv. Tributaries Significantly Affect the Biological Integrity of (a)(1) through (a)(3) Waters

Tributaries are biologically linked to downstream waters through the movement of living organisms or their reproductive propagules, such as eggs or seeds. For organisms that drift with water flow, biological connections depend on hydrological connections. However, many aquatic organisms are capable of active movement with or against water flow, and others disperse actively or passively over land by walking, flying, drifting, or "hitchhiking." All of these different types of movement form the basis of biological connectivity between headwater tributaries and downstream waters.

Headwater tributaries increase the amount and quality of habitat available to aquatic organisms. Under adverse conditions, small tributaries provide safe refuge, allowing organisms to persist and recolonize downstream areas once adverse conditions have abated. *See, e.g.,* Science Report at 3-38 (citing Meyer and Wallace 2001; Meyer *et al*. 2004; Huryn *et al*. 2005). Use of tributaries by salmon and other anadromous fish for spawning is well-documented, but even non-migratory species can travel great distances within the river and tributary networks. *See, e.g., id.* at 3-40 (citing Gorman 1988; Hitt and Angermeier 2008). Tributaries also serve as an important source of food for biota in downstream rivers. Tributaries export plankton, vegetation, fish eggs, insects, invertebrates like worms or crayfish, smaller fish that originate in upstream tributaries and other food sources that drift downstream to be consumed by other animals. *See, e.g., id.* at 3-38 (citing Progar and Modenke 2002). For example, many fish feed on drifting insects, and numerous studies document the downstream drift of stream invertebrates that then are eaten by fish in larger rivers. *See, e.g., id.* at 4-29 to 4-30 (citing Nakano and Murakami 2001;Wipfli and Gregovich 2002).

Biological connectivity also allows gene flow, or genetic connectivity, among tributary and river populations. Gene flow is needed to maintain genetic diversity in a species, a basic requirement for that species to be able to adapt to environmental change. Populations connected by gene flow have a larger breeding population size, making them less prone to the deleterious effects of inbreeding and more likely to retain genetic diversity or variation. *Id*. at 3-43 (citing Lande and Shannon 1996). Genetic connectivity exists at multiple scales and can extend beyond one a single river watershed, and for species capable of long distance movement (such as salmon), reveals complex interactions among spatially distant populations of aquatic organisms *Id.* (citing Hughes *et al.* 2009; Anderson 2010; Bohonak and Jenkins 2003).

Headwater streams provide unique habitat and protection for amphibians, fish, and other aquatic or semi-aquatic species living in and near the stream that may use the downstream waters for other portions of their life stages. *See, e.g.,* Report at ES-8; Meyer *et al*. 2007. They also serve as migratory corridors for fish. Tributaries can improve or maintain biological integrity and can control water temperatures in the downstream waters. *See, e.g.,* Report at 3-20 (citing Ebersole *et. al.* 2003; Gardner and Sullivan 2004; Johnson *et al.* 2010). Headwater streams also provide refuge habitat for riverine organisms seeking protection from temperature extremes, flow extremes, low dissolved oxygen, high sediment levels, or the presence of predators, parasites, and competitors. *See, e.g., id.* at 3-42 (citing Scrivener *et al.* 1994; Fraser *et al.* 1995; Curry 1997; Pires *et al.* 1999; Bradford *et al.* 2001; Cairns *et al.* 2005; Wigington *et al.* 2006; Woodford and McIntosh 2010). Headwater streams serve as a source of food materials such as insects, larvae, and organic matter to nourish the fish, mammals, amphibians, and other organisms in downstream streams, rivers, and lakes. *See, e.g.*, *id.* at 4-22, 3-30, 3-31 (citing Fisher and Likens 1973; Meyer 1994; Wallace *et al.* 1997; Hall and Meyer 1998; Hall *et al.* 2000; Gomi *et al.* 2002; Augspurger *et al.* 2008). Disruptions in these biological processes affect the ecological functions of the entire downstream system. *See, e.g.,* Kaplan *et al.* 1980; Vannote *et. al.* 1980. Headwater streams can help to maintain base flow in the larger rivers downstream, which is particularly important in times of drought. *See, e.g.,* Science Report at 3-6, B-42, B-48 (citing Brooks and Lemon 2007; Tetzlaff and Soulsby 2008). At the same time, the network of headwater streams can regulate the flow of water into downstream waters, mitigating low flow and high flow extremes, reducing local and downstream flooding, and preventing excess erosion caused by flooding. *See, e.g.*, Levick *et al.* 2008.

v. Man-made or Man-altered Tributaries Significantly Affect the Physical, Chemical and Biological Integrity of (a)(1) through (a)(3) Waters

The agencies' rule clarifies that man-made and man-altered tributaries as defined in the rule are "waters of the United States" because the significant nexus between a tributary and a traditional navigable water or interstate water is not broken where the tributary flows through a culvert or other structure. The scientific literature indicates that structures that convey water do not affect the connectivity between streams and downstream rivers. Indeed, because such structures can reduce water losses from evapotranspiration and seepage, such structures likely enhance the extent of connectivity by more completely conveying the water downstream.

Man-made and man-altered tributaries include impoundments, ditches, canals, channelized streams, piped streams, and the like. Ditches and canals are wide-spread across the

United States. Where ditches are streams that have been channelized, they are tributaries if the otherwise meet the definition of "tributary." Preamble, IV. Ditches are also purposely constructed to allow the hydrologic flow of the tributary to continue downstream. Man-made and man-altered tributaries, despite human manipulation, usually continue to have chemical, physical, or biological connections downstream and to serve important functions downstream. Because these tributaries are hydrologically connected to downstream waters, the chemical and some biological connections to downstream waters that are supported by this hydrologic connection are still intact. Often-times man-made tributaries create connections where they did not previously exist, such as canals that connect two rivers in different watersheds. Science Report at 1-11.

Tributary ditches and other man-made or man-altered waters that meet the definition of "tributary" have a significant nexus to (a)(1) through (a)(3) waters due to their impact, either individually or with other tributaries, on the chemical, physical, or biological integrity of those downstream waters. Tributary ditches and the like, as with other tributaries, have chemical, physical, and biological connections with downstream waters that substantially impact those waters. Tributary ditches and canals can have perennial, intermittent, or ephemeral flow. Due to the often straightened and channelized nature of ditches, these tributaries quickly move water downstream to (a)(1) through (a)(3) waters. Ditches and canals, like other tributaries, export sediment, nutrients, and other materials downstream and are effective at transporting water and these materials, including nitrogen, downstream. *See, e.g.*, Schmidt *et al.* 2007; Strock *et al*. 2007. Ditches provide habitat for fish and other aquatic organisms. *See, e.g.*, Smiley Jr. *et al*. 2008. Fish and other aquatic organisms utilize canals and ditches to move to different habitats, sometimes over long distances. Rahel 2007.

These significant connections and functions continue even where the tributary has a natural or man-made break in its channel, bed and banks, or OHWM. The presence of a channel, bed and banks, and OHWM upstream or downstream of the break is an indication that connections still exist. *See, e.g., id.* at 2-2 and section VII.A.i. above. The significant nexus between a tributary and a downstream water is not broken where the tributary flows underground for a portion of its length, such as in karst topography. The hydrologic connection still exists, meaning that the chemical and biological connections that are mediated by the hydrologic connection also still exist. Similarly, flow through boulder fields does not sever the hydrologic connection. When a tributary flows through a wetland enroute to another or the same tributary, the significant nexus still exists even though the bed and banks or ordinary high water mark is broken for the length of the wetland. In-stream adjacent wetlands provide numerous benefits downstream, and the presence of the wetland in stream can provide additional water quality benefits to the receiving waters. Flow in flat areas with very low gradients may temporarily break the tributary's bed and banks or OHWM, but these systems continue to have a significant nexus downstream. These are just illustrative examples of break in ordinary high water mark; there are several other types, all of which do not break the significant nexus between a tributary and the downstream (a)(1) through (a)(3) water.

Man-made or man-altered tributaries continue to have chemical, physical, and biological connections that significantly affect the integrity of (a)(1) through (a)(3) waters. Though the man-made or man-altered nature of such tributaries can change the nature of the connections, it does not eliminate them. Thus, man-made and man-altered tributaries continue to serve the same important functions as "natural" tributaries, which in turn greatly impact downstream (a)(1) through (a)(3) waters, particularly when their functional contributions to the chemical, physical, and biological conditions of downstream waters are combined at a watershed scale.

vi. Ephemeral and Intermittent Tributaries Significantly Affect the Chemical, Physical, or Biological Integrity of (a)(1) through (a)(3) Waters

Tributaries do not need to flow perennially to have a significant nexus to downstream waters. As described above in section II.A.i., approximately 59% of streams across the United States (excluding Alaska) flow intermittently or ephemerally; ephemeral and intermittent streams are particularly prevalent in the arid and semi-arid Southwest, where they account for over 81% of streams. Levick *et al.* 2008. Despite their intermittent or ephemeral flow, these streams nonetheless perform the same important ecological and hydrological functions documented in the scientific literature as perennial streams, through their movement of water, nutrients, and sediment to downstream waters. *Id.* The importance of intermittent and ephemeral streams is documented in a 2008 peer-reviewed report by EPA's Office of Research and Development and the U.S. Department of Agriculture's Agricultural Research Service, which addresses the hydrological and ecological significance of ephemeral and intermittent streams in the arid and semi-arid Southwestern United States and their connections to downstream waters; the report is a state-of-the-art synthesis of current knowledge of the ecology and hydrology in these systems. *Id*.

Intermittent and ephemeral streams are chemically, physically, and biologically connected to downstream waters, and these connections have effects downstream. *See, e.g., id*. In some areas, stormflows channeled into alluvial floodplain aquifers by intermittent and ephemeral streams are the major source of annual streamflow in rivers. Perennial flows are not necessary for chemical connections. Periodic flows in ephemeral or intermittent tributaries can have a strong influence on biogeochemistry by connecting the channel and other landscape elements. *See, e.g.,* Report at 3-22 (citing Valett *et. al.* 2005). This episodic connection can be very important for transmitting a substantial amount of material into downstream rivers. *See, e.g., id.* (citing Nadeau and Rains 2007). Ephemeral desert streams have been shown to export particularly high sediment loadings. *See, e.g., id.* at 3-15 (citing Hassan 1990). Ephemeral streams can also temporarily and effectively store large amounts of sediment that would otherwise wash downstream, contributing to the maintenance of downstream water quality and productive fish habitat. *See, e.g., id.* at 3-15 to 3-16 (citing Duncan *et al.* 1987; Trimble 1999; May and Gresswell 2003). This temporary storage of sediment thus helps maintain the chemical and biologic integrity of downstream waters.

Tributaries also need not be large rivers to have a significant nexus. As discussed above, the scientific literature supports the conclusion that tributaries, including headwater streams, have a significant nexus to downstream waters based on their contribution to the chemical, physical, or biological integrity of (a)(1) through (a)(3) waters. Headwater tributaries, the small streams at the uppermost reaches of the tributary network, are the most abundant streams in the United States. *See, e.g., id.* at 3-4 (citing Nadeau and Rains 2007). Collectively, they help shape the chemical, physical, and biological integrity of downstream waters, and provide many of the same functions as non-headwater streams. *See, e.g., id.* at ES-2, ES-7 to ES-9, 3-1. For example, headwater streams reduce the amount of sediment delivered to downstream waters by trapping sediment from water and runoff. *See, e.g.,* Dieterich and Anderson 1998. Headwater streams shape river channels by accumulating and gradually or episodically releasing sediment and large woody debris into river channels. They are also responsible for most nutrient cycling and removal, and thus transforming and changing the amount of nutrients delivered to downstream waters. *See, e.g.,* Science Report at 3-25 (citing Peterson *et al.* 2001). A close connection exists between the water quality of these streams and the water quality of traditional navigable waters, interstate waters, and the territorial seas. *See, e.g.*, *id.*; State of Ohio Environmental Protection Agency 2003. Activities such as discharging a pollutant into one part of the tributary system are well-documented to affect other parts of the system, even when the point of discharge is far upstream from the navigable water that experiences the effect of the discharge. *See, e.g.,* National Research Council 1997; Dunnivant and Anders 2006.

The Science Report provides case studies of prairie streams and Southwest intermittent and ephemeral streams, two stream types whose jurisdictional status has been called into question post-*Rapanos*. These case studies highlight the importance of these streams to downstream waters, despite their small size and ephemeral or intermittent flow regime.

For example, the Science Report assessed the connectivity of prairie streams that drain temperate grasslands in the Great Plains physiographic region of the central United States and Canada. *Id.* at B-22 to B-37. Eventually, these streams drain into the Mississippi River or flow directly into the Gulf of Mexico or the Hudson Bay. *Id.* at 5-6, B-23. Climate in the Great Plains region ranges from semiarid to moist subhumid and intra- and interannual variation in precipitation and evapotranspiration is high. *Id.* at 5-6, B-23 to B-24 (Borchert 1950; Lauenroth et al. 1999; Boughton et al. 2010). This variation is reflected in the hydrology of prairie streams, which include ephemeral, intermittent, and perennial streamflows. *Id.* at 5-6, B-24 (citing Matthews et al. 1985; Matthews 1988; Brown and Matthews 1995; Sawin *et al.* 1999; Dodds *et al.* 2004; Bergey *et al.* 2008). Prairie streams are frequently subjected to the extremes of drying and flooding, and intermittent or flashy hydrology is prevalent in river networks throughout most of the Great Plains. *Id.* at B-24 (citing Matthews 1988; Zale *et al*. 1989; Poff 1996; Dodds *et al*. 2004). Prairie streams typically represent a collection of spring-fed, perennial pools and reaches, embedded within larger, intermittently flowing segments. *Id.* at B-36 (citing Labbe and Fausch 2000). Row cropping and livestock agriculture are the dominant land uses in the region, resulting in the withdrawal of water from stream channels and regional aquifers and its storage in reservoirs to support agriculture. *Id.* at 5-6, B-27 to B-28 (citing Cross and Moss, 1987; Ferrington, 1993; Galat *et al.* 2005; Matthews *et al.* 2005; Sophocleous 2010; Falke *et al.* 2011).

Prairie streams typically are connected to downstream waters. Like other types of streams, prairie streams present strong fluvial geomorphic evidence for connectivity to downstream waters, in that they have continuous channels (bed and banks) that make them physically contiguous with downstream waters. *Id.* at 5-6. Prairie river networks are dendritic and generally have a high drainage density, so they are particularly efficient at transferring water and materials to downstream waters. *Id.* Their pool-riffle morphology, high sinuosity, and seasonal drying, however, also enhance material storage and transformation. *Id.* The timing of connections between prairie streams and downstream waters is seasonal and therefore relatively predictable. *Id.* For example, high-magnitude floods tend to occur in late fall into later spring, although they also occur at other times during the year; this observation indicates that the magnitude of connections to downstream also varies seasonally. *Id.* at 5-6 and B-28 (citing Fausch and Bramblett 1991; Hill *et al.* 1992; Fritz and Dodds 2005).

The frequent and predictable connections between prairie streams and downstream waters have multiple physical, chemical, and biological consequences for downstream waters. Dissolved solids, sediment, and nutrients are exported from the prairie river network to downstream waters. *Id.* at 5-6. Ultimately, the expansion of the hypoxic zone in the Gulf of

Mexico is a downstream consequence of cumulative nutrient loading to the Mississippi River network. *Id.* Relative to small streams and large rivers draining the moist eastern parts of the Mississippi River basin, small to midsized prairie streams deliver less than 25–50% of their nutrient load to the Gulf of Mexico. *Id.* at 5-6, B-32 (citing Alexander *et al.* 2008). Nonetheless, given the large number and spatial extent of headwater prairie streams connected to the Mississippi River, their cumulative effect likely contributes substantially to downstream nutrient loading. *Id.* at 5-6, B-32.

Organisms inhabiting prairie streams have adapted to their variable hydrologic regimes and harsh physicochemical conditions via evolutionary strategies that include rapid growth, high dispersal ability, resistant life stages, fractional reproduction (*i.e.*, spawn multiple times during a reproductive season), and life cycles timed to avoid predictably harsh periods. *Id.* at 5-6, B-26 (citing Matthews 1988; Dodds *et al*. 1996b; Fausch and Bestgen 1997). Alterations in the frequency, duration, magnitude, and timing of flows —and thus hydrologic connectivity—are associated with the extinction or extirpation of species in downstream systems. *Id.* at 5-6, 3-41 (citing Morita and Yamamoto 2002; Letcher *et al.* 2007). Moreover, many fish species (*e.g.*, Arkansas River shiner, speckled chub, flathead chub) in prairie river networks require sufficient unfragmented (*i.e.*, connected) channel length with adequate discharge to keep their nonadhesive, semibuoyant eggs in suspension for incubation and early development. *Id.* at 5-6 to 5-7, B-35 (citing Cross and Moss 1987; Fausch and Bestgen 1997; Platania and Altenbach 1998; Durham and Wilde 2006; Perkin and Gido 2011). When these conditions are not met, the biological integrity of downstream waters is impaired. *Id.* at 5-7.

Human alteration of prairie river networks has affected the physical, chemical, and biological connectivity to and their consequences for downstream waters. Impoundments and water removal, through both surface flow diversions and pumping of ground-water aquifers, are common in this region. *Id.* at 5-7, B-27 to B-28 (citing Smith *et al.* 2002; Galat *et al.* 2005; Matthews *et al.* 2005; Sophocleous 2010). These activities have reduced flood magnitude and variability, altered timing, and increased predictability of flows to downstream waters. *Id.* As a result, physical, chemical, and biological connections to downstream waters have been altered. *Id.* at B-28 (citing Cross and Moss 1987; Hadley *et al.* 1987; Galat and Lipkin, 2000). In addition to the altered land uses and application of nutrients and pesticides for agriculture, human alteration of the river network itself, through channelization, levee construction, desnagging, dredging, and ditching, has enhanced longitudinal connectivity while reducing lateral and vertical connectivity with the floodplain and hyporheic zone, respectively. *Id.* at 5-7. Pumping from streams and ground water has caused historically perennial river segments to regularly dry during summer months. *Id.* at 5-7, B-27 to B-28 (citing Cross and Moss 1987; Ferrington 1993; Falke *et al.* 2011). Changes to the prairie's grazing (from bison to cattle) and burning regimes increase nutrient and suspended sediment loading to downstream waters. *Id.* at 5-7. Introduced species have extirpated endemic species and altered food web structure and processes in prairie streams, thereby affecting the biological integrity of downstream waters. *Id.*

Prairie streams have significant chemical, physical, and biological connections to downstream waters, despite extensive alteration of historical prairie regions by agriculture, water impoundment, water withdrawals, and other human activities, and the challenges these alterations create for assessing connectivity. *Id.* at B-36 to B-37 (citing Matthews and Robinson 1998; Dodds *et al*. 2004). The most notable connections are via flood propagation, contaminated sediment transport, nutrient retention and transformation, the extensive transport and movement of fish species (including eggs and larvae) throughout these networks, and refuges for prairie fishes. *Id.* at B-37 (citing Matthai 1969; Horowitz *et al*. 1988; Marron 1989; Dodds *et al*. 1996a; Fausch and Bestgen 1997; Platania and Altenbach 1998; Fritz and Dodds 2004; Fritz and Dodds 2005; Franssen *et al*. 2006; Alexander *et al*. 2008; Perkin and Gido 2011).

Similarly, southwestern intermittent and ephemeral streams exert strong influences on the structure and function of downstream waters, and the case study (included in the Science Report) echoes many of the findings of the functions of intermittent and ephemeral tributaries generally, which are described above. The case study focuses on the heavily studied San Pedro River, located in southeast Arizona, in particular, as a representative example of the hydrological behavior and the connectivity of rivers in the Southwest, but also examines evidence relevant to other Southwestern streams. *See, id.* at B-37 to B-60.

Southwestern streams are predominantly ephemeral and intermittent (nonperennial) systems located in the southwestern United States. *Id.* at 5-7, B-37. Based on the National Hydrography Dataset, 94%, 89%, 88%, and 79% of the streams in Arizona, Nevada, New Mexico, and Utah, respectively, are nonperennial. *Id.* (citing NHD 2008). Most of these streams connect to downstream waters, although 66% and 20% of the drainage basins in Nevada and New Mexico, respectively, are closed and drain into playas (dry lakes). *Id.* at 5-7. Southwestern streams generally are steep and can be divided into two main types: (1) mountainous streams that drain higher portions of basins and receive higher rates of precipitation, often as snow, compared to lower elevations; and (2) streams located in valley or plateau regions that generally flow in response to high-intensity thunderstorms. *Id.* at 5-7, B-39 (citing Blinn and Poff 2005). Headwater streams are common in both types of southwestern streams.

Nonperennial southwestern streams, excluding those that drain into playas, are periodically connected to downstream waters by low-duration, high-magnitude flows. *Id.* at 5-7.

In contrast to streams in humid regions where discharge is typically supplemented by ground water as drainage area increases, many southwestern streams lose streamflow to channel transmission losses as runoff travels downstream. *Id.* Connection of runoff and associated materials in ephemeral and intermittent streams to downstream waters is therefore a function of distance, the relative magnitude of the runoff event, and transmission losses. *Id.*

Spatial and temporal variation in frequency, duration, and timing of southwestern stream runoff is largely explained by elevation, climate, channel substrate, geology, and the presence of shallow groundwater. *Id.* at 5-8. In nonconstraining substrate, southwestern rivers are dendritic and their watersheds tend to have a high drainage density. *Id.* When high flows are present, southwestern streams are efficient at transferring water, sediment, and nutrients to downstream reaches. *Id.* Due to the episodic nature of flow in ephemeral and intermittent channels, sediment and organic matter can be deposited some distance downstream, and then moved farther downstream by subsequent precipitation events. *Id.* Over time, sediment and organic matter continue to move downstream and affect downstream waters. *Id.*

The southwestern streams case study describes the substantial connection and important consequences of runoff, nutrients, and particulate matter originating from ephemeral tributaries on the integrity and sustainability of downstream perennial streams. Channel transmission losses can be an important source of ground-water recharge that sustains downstream perennial stream and riparian systems. *Id.* For example, isotopic studies indicate that runoff from ephemeral tributaries like Walnut Gulch, Arizona supplies roughly half the San Pedro River's baseflow through shallow alluvial aquifer recharge. *Id.* Important cumulative effects of tributaries – that is the incremental contributions of individual streams in combination with similarly situated tributaries – are exemplified by ephemeral stream flows in arid landscapes, which are key sources of baseflow for downgradient waters. Science Report at 1-10 (citing Schlesinger and Jones 1984; Baillie *et al*. 2007; Izbicki 2007).

Human alterations to southwestern river networks affect the physical, chemical, and biological connectivity to downstream waters. Impoundments trap water, sediment, and particulate nutrients and result in downstream impacts on channel morphology and aquatic function. *Id.* at 5-8. Diversion of water for consumptive can decrease downstream baseflows but typically does not affect the magnitude of peak flows. *Id.* Excessive ground-water pumping can lower ground-water tables, thereby diminishing or eliminating baseflows. *Id.* Urbanization increases runoff volume and flow velocity, resulting in more erosive energy that can cause bank erosion, streambed down-cutting, and reduced infiltration to ground water. *Id.*

Flows from ephemeral streams are one of the major drivers of the dynamic hydrology of Southwest rivers (particularly of floods during monsoon seasons). *Id.* at B-42, B-49 (citing Goodrich *et al*. 1997; Yuan and Miyamoto 2008). Downstream river fishes and invertebrates are adapted to the variable flow regimes that are influenced strongly by ephemeral tributary systems, which provide isolated pools as refuges for fish during dry periods. *Id.* at B-57 to B-58 (citing John 1964; Meffe 1984; Labbe and Fausch 2000; Rinne and Miller 2006; Lytle *et al*. 2008). Ephemeral tributaries in the Southwest also supply water to mainstem river alluvial aquifers, which aids in the sustaining river baseflows downstream. *Id*. at B-46 (citing Goodrich *et al*. 1997; Callegary *et al*. 2007). Ephemeral tributaries export sediment downstream during major hydrologic events; the sediment, in turn, influences the character of river floodplains and alluvial aquifers of downstream waters. *Id.* at B-47 (citing Nanson and Croke 1992; Shaw and Cooper 2008). The nutrient and biogeochemical integrity of downstream Southwestern rivers, such as the San Pedro River, is heavily influenced by nutrient export from ephemeral tributaries after storm flow events. *Id.* at 3-25, B-48 (citing Brooks and Lemon 2007; Fisher *et al*. 2001). Extensive downstream river riparian communities are supported by water, sediment and nutrients exported to the river from ephemeral tributaries; these riparian communities have a profound influence on the river attributes through shading, allochthonous (originating from outside of the channel) inputs of organic matter, detritus, wood, and invertebrates to the river. *Id.* at B-47 to B-48 (citing Gregory *et al*. 1991; National Research Council 2002; Naiman *et al*. 2005; Stromberg *et al*. 2005; Baillie *et al*. 2007).

As described in section VII.A.i., ephemeral streams can have a bed and banks and an ordinary high water mark. *See, e.g.*, Lichvar and McColley 2008; Mersel and Lichvar 2014. Even discontinuous ephemeral streams, or streams characterized by alternating erosional and depositional reaches (*e..g.* channelized flow interspersed with channel fans or other depositional areas) can exhibit OHWMs, and the Corps has developed field indicators to help field staff identify OHWM in these and other common stream types in the arid West. Lichvar and McColley 2008. In addition to discontinuous ephemeral streams, the Arid West OHWM manual also looks at alluvial fans, compound channels (streams characterized by a mosaic of terraces within a wide, active floodplain and frequently shifting low-flow channel(s)), and single-thread channels with adjacent floodplains. Lichvar and McColley 2008. These arid West stream types can exhibit an OHWM. *Id.*; Lefebvre *et al.* 2013. In arid non-perennial streams, the active floodplain represents a zone that most closely fits the concept of “ordinary” stream flow for use in delineating the OHWM. Lichvar and McColley 2008; Lichvar *et al*. 2009. Where ephemeral streams have a bed and banks and ordinary high water mark and otherwise meet the definition of tributary in the rule, they are “waters of the United States.”

Intermittent and ephemeral tributaries are distinct erosional features like rills and gullies that typically lack a bed and banks or an ordinary high water mark. Gullies are small, relatively deep channels that are ordinarily formed on valley sides and floors where no channel previously existed. They are commonly found in areas with low-density vegetative cover or with soils that are highly erodible. See, *e.g.*, Brady and Weil 2002. Rills are very small incisions formed by overland water flows eroding the soil surface during rain storms. See, *e.g.*, Leopold 1994; Osterkamp 2008. Rills are less permanent on the landscape than streams and typically lack an ordinary high water mark, whereas gullies are younger than streams in geologic age, smaller than streams in size, and also typically lack an ordinary high water mark; time has shaped streams into geographic features distinct from gullies and rills. See, *e.g.*, American Society of Civil Engineers 1996; Osterkamp 2008. A rill is it is one of the first and smallest incisions to be formed as a result of concentrated flow eroding the land surface. *Id*. The two main processes that result in the formation of gullies are downcutting and headcutting, which are forms of longitudinal (incising) erosion. These actions ordinarily result in erosional cuts that are often deeper than they are wide, with very steep banks, often small beds, and typically only carry water during precipitation events. The principal erosional processes that modify streams are also downcutting and headcutting. In streams, however, lateral erosion is also very important. The result is that streams, except on steep slopes or where soils are highly erodible, are typically characterized by the presence of bed and banks and an ordinary high water mark as compared to typical erosional features that are more deeply incised. It should be noted that some ephemeral streams are called “gullies” or the like when they are not “gullies” in the technical sense; such streams where they are tributaries under the rule’s definition would be considered “waters of the United States,” regardless of the name they are given locally. Similarly, a swale is a shallow trough-like depression that carries water mainly during rainstorms or snowmelt. Science Report at A-12. A swale might or might not be considered a wetland depending on whether it meets the three-parameter wetland criteria, and only wetlands that meet the definition of "waters of the United States" are considered jurisdictional. A swale does not have the defined channel, including bed and banks and an ordinary high water mark that a stream exhibits.

Commenters asserted that the science does not demonstrate that treating ephemeral waters as "waters of the United States" will have benefits for downstream waters. To the contrary, the SAB noted that although water bodies differ in degree of connectivity that affects the extent of influence they exert on downstream waters (*i.e*., they exist on a "connectivity gradient"), the available science supports the conclusion that the types of water bodies identified as "waters of the United States" in the proposed rule exert strong influence on the chemical, physical, and biological integrity of downstream waters. In particular, the SAB expressed support for the proposed rule's inclusion of tributaries and adjacent waters as categorical waters of the United States. Regarding tributaries, the SAB found, "[t]here is strong scientific evidence to support the EPA's proposal to include all tributaries within the jurisdiction of the Clean Water Act. Tributaries, as a group, exert strong influence on the physical, chemical, and biological integrity of downstream waters, even though the degree of connectivity is a function of variation in the frequency, duration, magnitude, predictability, and consequences of physical, chemical, and biological process." SAB 2014b. The SAB advised the agencies to reconsider the definition of tributaries because not all tributaries have ordinary high water marks (*e.g.*, ephemeral streams with arid and semi-arid environments or in low gradient landscapes where the flow of water is unlikely to cause an ordinary high water mark). As noted previously, only those ephemeral streams that contribute flow to traditional navigable waters, interstate waters, and the territorial seas and that have a bed and bank and ordinary high water mark are considered tributaries.

Though the two case studies focus on intermittent and ephemeral prairie streams and arid Southwestern streams, the science is clear that intermittent and ephemeral streams have important connections and impacts on downstream waters, regardless of where they are located geographically. The functions and effects of intermittent and ephemeral streams are discussed throughout the Science Report and this document. The agencies have concluded that all tributaries as defined in the rule, including those that are intermittent and ephemeral, when considered individually or in combination with other tributaries in the same point of entry watershed, have a significant effect on the chemical, physical, and biological integrity of downstream traditional navigable waters, interstate waters, and territorial seas.

C. Rationale for Conclusions

In *Rapanos*, Justice Kennedy reasoned that *Riverside Bayview* and *SWANCC* "establish the framework for" determining whether an assertion of regulatory jurisdiction constitutes a reasonable interpretation of "navigable waters" - "the connection between a non-navigable water or wetland and a navigable water may be so close, or potentially so close, that the Corps may deem the water or wetland a 'navigable water' under the Act;" and "[a]bsent a significant nexus, jurisdiction under the Act is lacking." 547 U.S. at 767. "The required nexus must be assessed in terms of the statute's goals and purposes. Congress enacted the law to 'restore and maintain the chemical, physical, and biological integrity of the Nation's waters,' 33 U.S.C. § 1251(a), and it pursued that objective by restricting dumping and filling in 'navigable waters,' §§ 1311(a), 1362(12)." *Id.* at 779. "Justice Kennedy concluded that the term "waters of the United States" encompasses wetlands and other waters that "possess a 'significant nexus' to waters that are or were navigable in fact or that could reasonably be so made." *Id.* at 759. He further concluded that wetlands possess the requisite significant nexus: "if the wetlands, either alone or in combination with similarly situated [wetlands] in the region, significantly affect the chemical, physical, and biological integrity of other covered waters more readily understood as 'navigable.'" *Id.* at 780.

While Justice Kennedy's opinion focused on adjacent wetlands in light of the facts of the cases before him, the agencies determined it was reasonable and appropriate to undertake a detailed examination of the scientific literature to determine whether tributaries, as a category and as the agencies propose to define them, significantly affect the chemical, physical, or biological integrity of downstream navigable waters, interstate waters, or territorial seas into which they flow. Based on this extensive analysis, the agencies concluded that tributaries with bed and banks, and ordinary high water marks, alone or in combination with other tributaries, as defined by the regulation, in the watershed perform these functions and should be considered, as a category, to be "waters of the United States."

The assertion of jurisdiction over this category of waters is consistent with Justice Kennedy's opinion in *Rapanos*. "Justice Kennedy concluded that the term "waters of the United States" encompasses wetlands and other waters that "possess a 'significant nexus' to waters that are or were navigable in fact or that could reasonably be so made." *Id.* at 759. With respect to tributaries, Justice Kennedy rejected the plurality's approach that only "relatively permanent" tributaries are within the scope of CWA jurisdiction. He stated that the plurality's requirement of "permanent standing water or continuous flow, at least for a period of 'some months' . . . makes little practical sense in a statute concerned with downstream water quality." *Id.* at 769. Instead, Justice Kennedy concluded that "Congress could draw a line to exclude irregular waterways, but nothing in the statute suggests it has done so;" in fact, he stated that Congress has done "[q]uite the opposite . . . ." *Id.* at 769. Further, Justice Kennedy concluded, based on "a full reading of the dictionary definition" of "waters," that "*the Corps can reasonably interpret the Act to cover the paths of such impermanent streams*." *Id.* at 770 (emphasis added).

Moreover, Justice Kennedy's opinion did not reject the agencies' existing regulations governing tributaries. The consolidated cases in *Rapanos* involved discharges into *wetlands* adjacent to non-navigable tributaries and, therefore, Justice Kennedy's analysis focused on the requisite showing for *wetlands.* Justice Kennedy described the Corps' standard for asserting jurisdiction over tributaries: "the Corps deems a water a tributary if it feeds into a traditional navigable water (or a tributary thereof) and possesses an ordinary high water mark . . . ." *Id.* at 781, *see also id* at 761. He acknowledged that this requirement of a perceptible ordinary high water mark for ephemeral streams, 65 FR 12828, March 9, 2000, "[a]ssuming it is subject to reasonably consistent application, . . . may well provide a reasonable measure of whether specific minor tributaries bear a sufficient nexus with other regulated waters to constitute navigable waters under the Act." 547 U.S. at 781, *see also id.* at 761. With respect to wetlands, Justice Kennedy concluded that the breadth of this standard for tributaries precluded use of adjacency to such tributaries as the determinative measure of whether *wetlands* adjacent to such tributaries "are likely to play an important role in the integrity of an aquatic system comprising navigable waters as traditionally understood." *Id.* at 781. He did not, however, reject the Corps' use of "ordinary high water mark" to assert regulatory jurisdiction over tributaries themselves. *Id.*

In the foregoing passage regarding the existing regulatory standard for ephemeral streams, Justice Kennedy also provided a "but see" citation to a 2004 U.S. General Accounting

Office (now the U.S. Government Accountability Office) (GAO) report "noting variation in results among Corps district offices." *Id*.

Most fundamentally, the agencies have determined that the scientific literature demonstrates that tributaries, as a category and as the agencies define them, play a critical role in the integrity of aquatic systems comprising traditional navigable waters and interstate waters, and therefore are "waters of the United States" within the meaning of the Clean Water Act. As summarized above, the agencies analyzed the Science Report and other scientific literature to determine whether tributaries to traditional navigable waters, interstate waters, or the territorial seas have a significant nexus to constitute "waters of the United States" under the Act such that it is reasonable to assert CWA jurisdiction over all such tributaries by rule. Covered tributaries have a significant impact on the chemical, physical, and biological integrity of waters into which they eventually flow— for CWA purposes, traditional navigable waters, interstate waters, and the territorial seas. The great majority of covered tributaries are headwater streams, and whether they are perennial, intermittent, or ephemeral, they play an important role in the transport of water, sediments, organic matter, nutrients, and organisms to downstream waters. Covered tributaries serve to store water, thereby reducing flooding; provide biogeochemical functions that help maintain water quality; trap and transport sediments; transport, store and modify pollutants; provide habitat for plants and animals; and sustain the biological productivity of downstream rivers, lakes, and estuaries. Such waters have these significant effects whether they are natural, modified, or constructed.

The Science Report concludes, "[a]lthough less abundant, the available evidence for connectivity and downstream effects of ephemeral streams was strong and compelling, particularly in context with the large body of evidence supporting the physical connectivity and cumulative effects of channelized flows that form and maintain stream networks." Science Report at 6-13. The agencies' conclusions are bolstered not only by the major conclusions of the Science Report, but also by the specific case studies for southwestern and prairie streams in the Science Report, as highlighted in section VII.B.vi. above.

VIII. Adjacent Waters

Adjacent waters, including adjacent wetlands, alone or in combination with other adjacent waters in the watershed, have a significant impact on the chemical, physical, or biological integrity of traditional navigable waters, interstate waters, and the territorial seas. In addition, waters adjacent to tributaries serve many important functions that directly influence the integrity of downstream waters including traditional navigable waters, interstate waters, and the territorial seas. Adjacent waters store water, which can reduce flooding of downstream waters, and the loss of adjacent waters has been shown, in some circumstances, to increase downstream flooding. Adjacent waters maintain water quality and quantity, trap sediments, store and modify potential pollutants, and provide habitat for plants and animals, thereby sustaining the biological productivity of downstream rivers, lakes and estuaries, which may be traditional navigable waters, interstate waters, or the territorial seas. The scientific literature and Science Report support these conclusions, as discussed in greater detail below.

A. Definition of "Adjacent Waters"

Under the final rule, "adjacent" means bordering, contiguous, or neighboring, including waters separated from other "waters of the United States" by constructed dikes or barriers, natural river berms, beach dunes and the like. Further, waters that connect segments of, or are at the head of, a stream or river are "adjacent" to that stream or river. "Adjacent" waters include wetlands, ponds, lakes, oxbows, impoundments, and similar water features. Under the rule, "adjacent" waters do not include waters in which established, normal farming, silviculture, and ranching activities under Section 404(f) of the CWA occur. The agencies determined that "adjacent" waters, as defined in the rule, have a significant nexus to traditional navigable waters, interstate waters, and the territorial seas based upon their chemical, physical, and biological connections to, and interactions with, those waters, and the effects of those connections and interactions. The term adjacent is a policy term and is not one that is used in the scientific literature. The terms bordering, contiguous, and neighboring are discussed further below.

For purposes of adjacency, including all three provisions of the definition of "neighboring," the entire water is adjacent if any part of the water is bordering, contiguous or neighboring. For example, the entire wetland or open water is "adjacent" if any part of it is within the distance thresholds established in the definition of "neighboring." The agencies' determination that an entire water is adjacent if any part of the water meets the definition of adjacent is informed by science and the agencies technical expertise and experience. It would be artificial to separate a single water body into an adjacent and non-adjacent portion, as the entire water body is a single functional unit, and the agencies' current practice is to treat an entire adjacent water as one entity.

Note that there are adjacent waters that meet the definition of "neighboring" that are also "bordering" or "contiguous" (for example, a wetland that directly abuts a tributary, is in within the 100-year floodplain, and is well within 1,500 feet of the ordinary high water mark). Such waters are, of course, adjacent waters under the regulation even if they fall within one, two, or all three of the "types" of adjacent waters – the fact that a wetland happens to be both bordering and meet the definition of neighboring does not change the fact that it is a "water of the United States" under the regulation.

The ordinary high water mark sets the boundaries of adjacent non-wetland waters (open waters such as lakes, oxbow lakes, and ponds), while adjacent wetlands have long been delineated using the 1987 Corps Delineation Manual and its regional supplements. U.S. Army Corps of Engineers; U.S. Army Corps of Engineers 1987; U.S. Corps of Engineers 2005.

i. Bordering and Contiguous Waters

Within the definition of "adjacent," the terms bordering and contiguous are well understood, and for continuity and clarity the agencies continue to interpret and implement those terms consistent with the current policy and practice. Waters that are bordering or contiguous are often located within the floodplain or riparian area of the waters to which they are adjacent. Bordering or contiguous waters include those that are directly abutting the water to which they are adjacent (*e.g.* the wetland is not separated from the tributary by uplands, a berm, dike, or similar feature). *See, e.g.*, U.S. Army Corps of Engineers 2007a. Waters that are bordering and contiguous also typically include in-stream wetlands, lakes, and ponds, as well as wetlands, lakes, and ponds that are at the head of the tributary network.

As discussed further below, wetlands, ponds, lakes, oxbows, impoundments, and similar water features that are bordering or contiguous perform a myriad of critical chemical and biological functions associated with the downstream traditional navigable waters, interstate waters, or the territorial seas. Such waters are integrally linked with the jurisdictional waters to which they are adjacent. Because of their close physical proximity to nearby jurisdictional waters, bordering or contiguous waters readily exchange their waters through the saturated soils surrounding the (a)(1) through (a)(5) water or through surface exchange. This commingling of waters allows bordering or contiguous waters to both provide chemically transformed waters to streams and to absorb excess stream flow, which in turn can significantly affect downstream traditional navigable waters, interstate waters, or the territorial seas. The close proximity also allows for the direct exchange of biological materials, including organic matter that serves as part of the food web of downstream traditional navigable waters, interstate waters, or the territorial seas.

As previously discussed, “adjacent” is a policy term and not one found in the scientific literature. Similarly, “bordering, contiguous, and neighboring” are not terms found readily in the scientific literature regarding the relationship of a wetland or open water to the tributary system. However, the agencies’ technical expertise and experience support that bordering and contiguous waters are generally but not always found with the riparian area or floodplain. In addition, neighboring waters can also be located within the floodplain or a riparian area, as indicated in the sections below. Though this section addresses how bordering and contiguous waters affect the chemical, physical, and biological integrity of traditional navigable waters, interstate waters, and the territorial seas, largely drawing from the scientific literature regarding waters in the floodplain or riparian area, that same literature on floodplain and riparian waters is used throughout this document, where appropriate and applicable, to support the agencies’ conclusion regarding neighboring waters.

The science demonstrates that bordering and contiguous waters are physically, chemically, and biologically integrated with downstream traditional navigable waters, interstate waters, or the territorial seas and significantly affect their integrity. Bordering and contiguous waters can include waters in the floodplain or the riparian area, run-of-the-stream wetlands and open waters, and headwater wetlands and open waters, amongst others.

As discussed below in section VIII.B., floodplain and riparian waters that meet the definition of adjacent have a significant nexus to downstream waters, and bordering and contiguous wetlands are often a subset of such wetlands. The scientific literature supports that wetlands and open waters in riparian areas and floodplains are physically, chemically, and biologically connected to downstream traditional navigable waters, interstate waters, or the territorial seas and significantly affect the integrity of such waters. The Science Report concludes that wetlands and open waters located in "riparian areas and floodplains are physically, chemically and biologically integrated with rivers via functions that improve downstream water quality, including the temporary storage and deposition of channeling-forming sediment and woody debris, temporary storage of local ground water that supports baseflow in rivers, and transformation and transport of stored organic matter." Science Report at ES-2 to ES-3. Such waters act as the most effective buffer to protect downstream waters from nonpoint source pollution (such as nitrogen and phosphorus), provide habitat for breeding fish and aquatic insects that also live in streams, and retain floodwaters, sediment, nutrients, and contaminants that could otherwise negatively impact the condition or function of downstream waters.

Bordering or contiguous waters, including wetlands, that are in the riparian area or floodplain lie within landscape settings that have bidirectional hydrological exchange with (a)(1) through (a)(5) waters. Science Report at 2-7. Such waters play an integral role in the chemical, physical, and biological integrity of the waters to which they are adjacent and to downstream (a)(1) through (a)(3) waters. Riparian areas and floodplains often describe the same geographic region. Science Report at 2-5. Therefore, the discussion of the functions of waters, including wetlands, in riparian areas will typically apply to floodplains unless otherwise noted. Where connections arise specifically from the act of inundation of adjacent land during times of higher-than-normal water, the term “floodplain” is solely used to describe the area.

Riparian areas are transition zones between terrestrial and aquatic ecosystems that are distinguished by gradients in biophysical conditions, ecological processes, and biota. *Id*. at 2-4. Like riparian areas, wetlands are also transitional areas between terrestrial and aquatic ecosystems. Wetlands are often but not always found in riparian areas, but not all of the riparian area is a wetland. As noted in section II.A. above and in paragraph (c)(4) of the rule, from a Clean Water Act regulatory perspective, wetlands are those areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Only those wetlands that meet the provisions of paragraphs (a)(1) through (a)(8) of this rule are considered “waters of the United States.” Waters including wetlands in riparian areas significantly influence exchanges of energy and matter with aquatic ecosystems. *See, e.g.*, *id*. (citing National Research Council 2002).

As discussed in section II.A.i., floodplains are low areas bordering streams, rivers, lakes, and impoundments and are inundated during moderate to high water events. *Id*. (citing Leopold 1994; Osterkamp 2008). Floodplains are also considered riparian areas, but not all riparian areas have floodplains. *Id*. at 2-5. All rivers and streams within river networks have riparian areas, but small streams in constrained valleys are less likely to have floodplains than larger streams and rivers in unconstrained valleys. *Id*. Riparian and floodplain waters take many different forms. Some may be wetlands, while others may be ponds, oxbow lakes, or other types of open waters.

Waters are considered in-stream or “run-of-the-stream” where they are directly part of the tributary system. For example, an in-stream wetland or open water can be part of the headwaters (*e.g.*, a headwater wetland or pond that is directly connected to the headwater stream) or can be further downstream where, for example, a tributary flows into a lake that the flows into another tributary. Under the proposed rule, such waters would have been considered in the definition of tributary, but after consideration of public comments, in the final rule, the agencies have defined adjacent waters to include these open waters and wetlands. The SAB also suggested that lotic systems such as wetlands should not be defined as tributaries but should be included instead in the adjacent waters category. For bordering and contiguous waters that are run-of-the-stream wetlands, the fact that such wetlands are in-stream often enhances their ability to filter pollutants and contaminants that would otherwise make it downstream; in-stream wetlands also attenuate floodwaters during wet periods and provide important sources of baseflow downstream during dry periods. *See, e.g.*, *id.* at 4-21 (citing Morley *et al.* 2011). Similarly, headwater and run-of-the-stream lakes and ponds serve many important functions that affect the chemical, physical, and biological conditions downstream. Such open waters can act as sinks, storing floodwaters, sediment, and nutrients, as these materials have the opportunity to settle out, at least temporarily, as water moves through the lake to downstream waters. *See, e.g.*, Phillips *et al.* 2011. The attenuation of floodwaters can also maintain stream flows downstream. *Id.* In-stream lakes, as with other bordering and contiguous waters, can also act as sources, contributing flow, nutrients, sediment, and other materials downstream. Total Maximum Daily Loads (TMDLs) for nutrients have been established for many in-stream lakes across the country in recognition of the ability of lakes to transport nutrients downstream, contributing to downstream impairments. *See, e.g.*, Maine Department of Environmental Protection 2006; U.S. Environmental Protection Agency 2012. In-stream lakes can also serve as habitat for species that then move downstream. For instance, brook trout that are stocked in headwater lakes in Idaho and Montana are capable of invading most downstream habitat, including through very steep channel slopes and waterfalls. Adams *et al*. 2001. These non-native species can then affect the biological integrity of downstream waters by impacting populations of native fish species, such as cutthroat trout, downstream. *See, e.g.*, Dunham *et al.* 2002. For example, non-native trout were introduced in headwater lakes to the Little Kern River in the southern Sierra Nevada and dispersed downstream, causing the near-extinction of the native Little Kern golden trout. Knapp and Matthews 2000. These studies demonstrate the ability of organisms to travel from bordering and contiguous lakes to downstream waters, which is not limited to just non-native species; many other species can also move downstream and back again.

One type of wetland often located in-stream are wetlands that are connected to the river network through a channel (*e.g.*, wetlands that serve as stream origins). These are wetlands from which a stream channel originates. Science Report at 4-2. Where these wetlands directly flow into jurisdictional waters, they are bordering and contiguous. Because these wetlands are often located at the headwaters, the stream to which they are bordering or contiguous may not be large enough to have a floodplain (*e.g.* they lie at the hillslope or in high gradient areas), and thus they are generally non-floodplain waters (however, some waters stream-origin wetlands can be located within the floodplain). They are part of the stream network itself, and along with first- and second-order streams, form the headwaters of the river network. Such bordering and contiguous wetlands have a direct hydrologic connection to the tributary network via unidirectional flow from the wetland to the headwater stream.

Wetlands that serve as stream origins connect via perennial, intermittent, or ephemeral drainages to river networks. *Id.* at 4-21 (citing Rains *et al*. 2006; Rains *et al*. 2008; Morley *et al*. 2011; McDonough *et al.* 2015). Regardless of the permanence of flow, such wetlands have an impact on downstream water. *Id.* at 4-2, 4-40. Wetland seeps, for example, can form where groundwater discharges from breaks in slope. *Id.* at 4-20 (citing Hall *et al*. 2001; O'Driscoll and DeWalle 2010). They often have perennial connections to the stream, providing important sources of water downstream, particularly during summer baseflow. *Id.* at 4-21 (citing Morley *et al*. 2011). In Maine, for example, seeps were found to provide 40 to 80% of stream water during baseflow periods. *Id*. In other cases, surface connections between channel origin wetlands and streams are intermittent or ephemeral. In addition to surface water connections, groundwater flow can hydrologically connect wetlands that serve as stream origins with the stream network. *Id.* at 4-22.

Wetlands and open waters at the channel origin generally have important chemical, physical, and biological effects on (a)(1) through (a)(3) waters, including hydrologic, water quality, and habitat functions, regardless if the outflow from the wetland or open water to the stream is perennial, intermittent, or ephemeral. *Id.* Like other wetlands, wetlands that serve as stream origins can transport channel-forming sediment and woody debris, transport stored organic matter, remove and transform pollutants and excess nutrients such as nitrogen and phosphorus, attenuate and store floodwaters, contribute to stream baseflow through groundwater recharge, and provide habitat for breeding fish, amphibians, reptiles, birds, and other aquatic and semi-aquatic species that move from the wetlands to the river network. *Id.* at 4-40, 4-42. These overall conclusions also apply to adjacent open waters (*e.g.*, ponds and lakes) because the same principles govern hydrologic connectivity between these water bodies and downstream waters. *See, e.g., id.* at 4-41.

Bordering and contiguous lakes, ponds, and wetlands, including wetlands that serve as stream origins, have important chemical, physical, and biological connections downstream that affect (a)(1) through (a)(3) waters. Their direct hydrologic connection to the stream network facilitates the significant impact they have downstream. This impact on downstream waters occurs regardless of whether their connection to the tributary network is perennial, intermittent, or ephemeral. Thus, bordering and contiguous lakes, ponds, and wetlands serve important functions, which in turn greatly impact downstream (a)(1) through (a)(3) waters, particularly when their functional contributions to the chemical, physical, and biological conditions of downstream waters are combined at a watershed scale.

The agencies determine that waters that are bordering or contiguous to an (a)(1) through (a)(5) water have a significant nexus with the downstream traditional navigable waters, interstate waters, or the territorial seas, and these aquatic resources are critical to protect as "waters of the United States." Based on a review of the scientific literature and the agencies' technical expertise and experience, the rule continues the longstanding interpretation in prior regulations that waters that are "bordering" or "contiguous" to (a)(1) through (a)(5) waters meet the definition of "adjacent" and thus are "waters of the United States" by rule.

ii. Waters Separated by a Berm

As previously mentioned, waters separated from other "waters of the United States" by constructed dikes or barriers, natural river berms, beach dunes and the like are adjacent. This has been a longstanding part of the concept of adjacency under the agencies' regulations implementing the CWA, and the final rule does not change this. Waters separated by constructed dikes or barriers, natural river berms, beach dunes, and the like are considered bordering, contiguous, or neighboring, and the presence of the artificial or natural barrier does not affect their adjacency. The scientific literature demonstrates that waters separated by constructed dikes or barriers, natural river berms, beach dunes and the like have a significant effect on the chemical, physical, and biological integrity of downstream (a)(1) through (a)(3) waters.

The terms earthen dam, dike, berm, and levee are used to describe similar structures whose primary purpose is to help control flood waters. Such structures vary in scale and size. A levee is an embankment whose primary purpose is to furnish flood protection from seasonal high water and which is therefore subject to water loading for periods of only a few days or weeks a year. Earthen embankments that are subject to water loading for prolonged periods (longer than normal flood protection requirements) are called earth dams. There are a wide variety of types of structures and an even wider set of construction methods. These range from a poorly constructed, low earthen berm pushed up by a backhoe to a well-constructed, impervious core, riprap lined levee that protects houses and cropland. Generally, levees are built to detach the floodplain from the channel, decreasing overbank flood events. Franklin *et al*. 2009. The investigation methods to determine the presence or absence of the hydrologic connection depend on the type of structure, the underlying soils, the presence of groundwater, and the depth of the water table. U.S. Army Corps of Engineers 2000 at 1-1.

Man-made berms and the like are fairly common along streams and rivers across the United States and often accompany stream channelization. Franklin *et al*. 2009. One study conducted in Portland, Oregon found that 42% of surveyed wetlands had dams, dikes, or berms. Kentula *et al*. 2004. Likewise, over 90% of the tidal freshwater wetlands of the Sacramento-San Joaquin Delta have been diked or leveed. Simenstad *et al*. 1999. At least 40,000 kilometers of levees, floodwalls, embankments, and dikes are estimated across the United States, with approximately 17,000 kilometers of levees in the Upper Mississippi Valley alone. Gergel *et al*. 2002.

Adjacent waters separated from the tributary network by dikes, levees, berms and the like continue to have a hydrologic connection to downstream waters. This is because berms and similar features typically do not block all water flow. Indeed, even dams, which are specifically designed and constructed to impound large amounts of water effectively and safely, do not prevent all water flow, but rather allow seepage under the foundation of the dam and through the dam itself. *See, e.g.*, International Atomic Energy Agency 2003; U.S. Bureau of Reclamation; Federal Energy Regulatory Commission 2005 at 14-36 to 14-39.

Seepage is the flow of a fluid through the soil pores. Seepage through a dam, through the embankments, foundations or abutments, or through a berm is a normal condition. Kovacic *et al*. 2000; Federal Energy Regulatory Commission 2005 at 14-36 to 14-39. This is because water seeks paths of least resistance through the berm or dam and its foundation. Michigan Department of Environmental Quality. All earth and rock-fill dams are subject to seepage through the embankment, foundation, and abutments. U.S. Army Corps of Engineers 1993 at 1-1; U.S. Army Corps of Engineers 2004 at 6-1 to 6-7. Concrete gravity and arch dams similarly are subject to seepage through the foundation and abutments. U.S. Army Corps of Engineers 1993 at 1-1. Levees and the like are subject to breaches and breaks during times of floods. Nilsson *et al*. 2005. Levees are similarly subject to failure in the case of extreme events, such as the extensive levee failures caused by Hurricanes Katrina and Rita. Day *et al*. In designing levees and similar structures, seepage control is necessary to prevent possible failure caused by excessive uplift pressures, instability of the downstream slope, piping through the embankment and/or foundation, and erosion of material by migration into open joints in the foundation and abutments. *Id.*; Kovacic *et al*. 2000; U.S. Bureau of Reclamation; International Atomic Energy Agency 2003; California Division of Safety of Dams 1993.

The rate at which water moves through the embankment depends on the type of soil in the embankment, how well it is compacted, the foundation and abutment preparation, and the number and size of cracks and voids within the embankment. All but the smallest earthen dams are commonly built with internal subsurface drains to intercept water seeping from the reservoir (i.e., upstream side) to the downstream side. U.S. Army Corps of Engineers 1995 at 1-1. Where it is not intercepted by a subsurface drain, the seepage will emerge downstream from or at the toe of the embankment. Michigan Department of Environmental Quality. Seepage may vary in appearance from a “soft,” wet area to a flowing “spring.” It may show up first as an area where the vegetation is lush and darker green. Cattails, reeds, mosses, and other marsh vegetation may grow in a seepage area. *Id*.

Engineered berms are typically designed to interfere with the seasonal pattern of water level (hydroperiod) of the area behind the berm, reducing the frequency and severity of inundation. Berms are not designed to eliminate all hydrologic connection between the channel on one side and the area behind the berm on the other. It is almost always impracticable to build a berm that will not be overtopped by a flood of maximum severity, and most berms are not designed to withstand severe floods. *See, e.g.*, U.S. Army Corps of Engineers 1993 at 1-1. Levees are designed to allow seepage and are frequently situated on foundations having natural covers of relatively fine-grain impervious to semipervious soils overlying pervious sands and gravels. U.S. Army Corps of Engineers 2005a at 1-9. These surface strata constitute impervious or semipervious blankets when considered in connection with seepage. Principal seepage control measures for foundation underseepage are (a) cutoff trenches, (b) riverside impervious blankets, (c) landslide berms, (d) pervious toe trenches, and (e) pressure relief wells. U.S. Army Corps of Engineers 2000 at 1-1. Overtopping of an embankment dam is very undesirable because the embankment materials may be eroded away. Additionally, only a small number of concrete dams have been designed to be overtopped. Water normally passes through the main spillway or outlet works; it should pass over an auxiliary spillway only during periods of high reservoir levels and high water inflow. All embankment and most concrete dams have some seepage. *See, e.g.,* Association of State Dam Safety Officials. However, it is important to control the seepage to prevent internal erosion and instability. Proper dam construction, and maintenance and monitoring of seepage provide control.

Berm-like landforms known as natural levees occur naturally and do not isolate adjacent wetlands from the streams that form them. Hydrologic connections can be bidirectional across berms or other similar features when integrated over time during and after floods when the hydraulic or hydrostatic gradient changes direction. Natural levees and the wetlands and waters behind them are part of the floodplain, including along some small streams and streams in the Arid West. Johnston *et al.* 2001. Every flowing watercourse transports not only water, but sediment—eroding and rebuilding its banks and floodplains continually. Federal Interagency Stream Restoration Working Group 1998. Different deposition patterns occur under varying levels of streamflow, with higher flows having the most influence on the resulting shape of streambanks and floodplains. *Id*. In relatively flat landscapes drained by low-gradient streams, this natural process deposits the most sediment on the bank immediately next to the stream channel while floodplains farther from the channel are usually lower-lying wetlands ("backswamps" or "backwater wetlands") that receive less sediment. *See, e.g.,* Johnston *et al*. 1997. The somewhat elevated land thus built up at streamside is called a natural levee, and this entirely natural landform is physically and hydrologically similar to narrow, man-made berms. *See, e.g.,* Leopold *et al*. 1964. Natural levees are discontinuous, which allows for a hydrologic connection to the stream or river via openings in the levees and thus the periodic mixing of river water and backwater. Johnston *et al*. 2001. In addition, streams with natural levees, in settings with no human interference whatsoever, retain hydrologic connection with their wetlands behind the levees by periodic flooding during high water and via seepage through and under the levee. Similarly, man-made berms are typically periodically overtopped with water from the near-by stream, and as previously mentioned, are connected via seepage.

Waters, including wetlands, separated from a stream by a natural or man-made berm serve many of the same functions as those discussed above on other adjacent waters. Furthermore, even in cases where a hydrologic connection may not exist, there are other important considerations, such as chemical and biological factors, that result in a significant nexus between the adjacent wetlands or waters and the nearby "waters of the United States," and (a)(1) through (a)(3) waters.

The movement of surface and subsurface water both over berms and through soils and berms adjacent to rivers and streams is a hydrologic connection between wetlands and flowing watercourses. The intermittent connection of surface waters over the top of, or around, natural and manmade berms further strengthens the evidence of hydrologic connection between wetlands and flowing watercourses. Both natural and man-made barriers can be topped by occasional floods or storm events. *See, e.g.*, Turner *et al.* 2006; Keddy *et al*. 2007. When berms are periodically overtopped by water, wetlands and waters behind the barriers are directly connected to and interacting with the nearby stream and its downstream waters. In addition, surface waters move to and from adjacent soils (including adjacent wetland soils) continually. Along their entire length, streams alternate between effluent (water-gaining) and influent (water-losing) zones as the direction of water exchange with the streambed and banks varies. Federal

Interagency Stream Restoration Working Group 1998. The adjacent areas involved in this surface water exchange with a stream or river are known as the hyporheic zone. Hyporheic zone waters are part of total surface waters temporarily moving through soil or sediment. Like within-channel waters, these waters are oxygenated and support living communities of organisms in the hyporheic zone.

Because a hydrologic connection between adjacent wetlands and waters and downstream waters still exists despite the presence of a berm or the like, the chemical and biological connections that rely on a hydrologic connection also exist. For instance, adjacent waters behind berms can still serve important water quality functions, serving to filter pollutants and sediment before they reach downstream waters. Wetlands behind berms can function to filter pollutants before they enter the nearby tributary, with the water slowly released to the stream through seepage or other hydrological connections. *See, e.g.*, Osborne and Kovacic 1993; Kovacic 2000. Their ability to retain sediment and floodwaters may be enhanced by the presence of the berm. For instance, some backwater wetlands in floodplain/riparian areas exhibit higher sedimentation rates than streamside locations. Kuenzler *et al*. 1980; Johnston *et al*. 2001. The presence of manmade levees can actually increase denitrification rates, meaning that the adjacent waters can more quickly transform nitrogen. Gergel *et al*. 2005. However, the presence of manmade berms does limit the ability of the river to connect with its adjacent wetlands through overbank flooding and thus limits sediment, water and nutrients transported from the river to the adjacent waters. *Id.*; Florsheim and Mount 2003. However, the presence of a berm does not completely eliminate the transport of sediments and water from the river to the nearby adjacent wetland, as suspended sediments and water can overflow both natural and man-made levees, though the transport is usually more pronounced in settings with natural levees. *See, e.g.*, Turner *et al*. 2006; Keddy *et* *al*. 2007. Sediment deposition over levees is particularly enhanced by extreme events like hurricanes. *Id.*; Reed *et al*. 2006. Wetlands behind berms, where the system is extensive, can help reduce the impacts of storm surges caused by hurricanes. Day *et al*. 2007.

Adjacent waters, including wetlands, separated from water bodies by berms and the like maintain ecological connection with those water bodies. Though a berm may reduce habitat functional value and may prevent some species from moving back and forth from the wetland to the river, many major species that prefer habitats at the interface of wetland and stream ecosystems remain able to utilize both habitats despite the presence of such a berm. Additional species that are physically isolated in either stream or wetlands habitat still interact ecologically with species from the other component. Thus, adjacent wetlands with or without small berms can retain numerous similarities in ecological function. For example: wetland bird species such as wading birds are able to utilize both wetland and adjacent stream/ditch habitats; wetland amphibians would be able to bypass the berm in their adult stage; aquatic invertebrates and fish would still interact with terrestrial/wetland predators and prey in common food web relationships despite the presence of a berm. *See, e.g.,* Butcher and Zimpel 1991; Willson and Halupka 1995; Cederholm *et al*. 1999; Schwartz and Jenkins 2000; Bilton *et al*. 2001.

One example of adjacent waters behind berms and the like are interdunal wetlands located in coastal areas, including some areas of the Great Lakes and along barrier islands. Interdunal wetlands form in swales or depressions within open dunes or between beach ridges along the coast and experience a fluctuating water table seasonally and yearly in synchrony with sea or lake level changes. Odum 1988; Albert 2000; Albert 2003; Albert 2007. For those along the ocean coast, they are typically formed as a result of oceanic processes where the wetlands establish behind relict dune ridges (dunes that were formed along a previously existing coast line). Wetlands in the interdunal system are in close proximity to each other and to the surrounding (a)(1) through (a)(3) waters. Their proximity to one another and to the (a)(1) through (a)(3) waters indicates a close physical relationship between interdunal wetland systems and the traditional navigable waters, interstate waters, or the territorial seas. Despite the presence of the beach dunes, interdunal wetlands have chemical, physical, or biological connections that greatly influence the integrity of the nearby (a)(1) through (a)(3) waters. The wetlands are hydrologically connected to these (a)(1) through (a)(3) waters through unconfined, directional flow and shallow subsurface flow during normal precipitation events and extreme events. As previously noted, they are linked to the rise and fall of the surrounding tides—the water-level fluctuations of the nearby a)(1) through (a)(3) waters are important for the dynamics of the wetlands. Albert 2003. The wetlands provide floodwater storage and attenuation, retaining and slowly releasing floodwaters before they reach the nearby (a)(1) through (a)(3) waters. Like other adjacent wetlands, interdunal wetlands also have important chemical connections to the nearby (a)(1) through (a)(3) waters, as they serve important water quality benefits. The wetlands store sediment and pollutants that would otherwise reach the surrounding (a)(1) through (a)(3) waters. The wetlands are biologically connected to the surrounding (a)(1) through (a)(3) waters. For instance, they provide critical habitats for species that utilize both the wetlands and the nearby (a)(1) through (a)(3) waters, supporting high diversity and structure. Habitat uses include basic food, shelter, and reproductive requirements. Aquatic insects, amphibians, and resident and migratory birds all use interdunal wetlands as critical habitat, and the wetlands provide better shelter than the nearby exposed beach. Albert 2000; Smith *et al*. 2008. In marine coastal areas, the wetlands are often the only freshwater system in the immediate landscape, thus providing critical drinking water for the species that utilize both the wetlands and the nearby (a)(1) through (a)(3) waters, although some interdunal wetlands are brackish in nature. *See, e.g.,* Heckscher and Bartlett 2004.

Wetlands behind the extensive levee system in the Yazoo Basin are an example of adjacent waters behind man-made barriers. A regional hydrogeomorphic approach guidebook for the Yazoo Basin of the Lower Mississippi River Alluvial Valley assesses the functions of these wetlands. Smith and Klimas 2002. An extensive levee system was built along the river system to prevent flooding of the Mississippi River, resulting in drastic effects to the hydrology of the basin. *Id.* Despite the alteration of hydrology in the basin, extensive wetlands systems still exist behind the man-made and natural levees and maintain a hydrologic connection to the river system. These wetlands detain floodwater, detain precipitation, cycle nutrients, export organic carbon, remove elements and compounds, maintain plant communities, and provide fish and wildlife habitat. *Id*. The functions in turn provide numerous and substantial benefits to the nearby river.

iii. Neighboring Waters

The rule establishes a definition of "neighboring" for purposes of determining adjacency. In the rule, the agencies identify three circumstances, which are discussed in detail below, under which waters would be "neighboring" and therefore "waters of the United States":

(1) Waters located in whole or in part within 100 feet of the ordinary high water mark of a traditional navigable water, interstate water, the territorial seas, an impoundment, or a tributary (discussed in section VIII.A.iii.1. below).

(2) Waters located in whole or in part in the 100-year floodplain that are within 1,500 feet of the ordinary high water mark of a traditional navigable water, interstate water, the

territorial seas, an impoundment, or a tributary ("floodplain waters") (discussed in section VIII.A.iii.2. below).

(3) Waters located in whole or in part within 1,500 feet of the high tide line of a traditional navigable water or the territorial seas and waters located within 1,500 feet of the ordinary high water mark of the Great Lakes (discussed in section VIII.A.iii.3. below).

As noted above, the rule provides that with respect to the boundaries for adjacent waters the entire water is jurisdictional as long as the water is at least partially located within the distance threshold, and the agencies interpret the rule to apply to any single water body or wetland that may straddle a distance threshold. Low-centered polygonal tundra and patterned ground bogs (also called strangmoor, string bogs, or patterned ground fens) are considered a single water for purposes of the rule because their small, intermingled wetland and non-wetland components are physically and functionally integrated. *See, e.g.,* U.S. Army Corps of Engineers 2007b. These areas, like other wetland/non-wetland mosaics often have complex micro-topography with repeated small changes in elevation occurring over short distances. Barrett 1979; U.S. Army Corps of Engineers 2007b; Michigan Natural Features Inventory 2010; Liljedahl *et al*. 2012; Lara *et al*. 2015. Science demonstrates that these wetlands function as a single wetland matrix and ecological unit having clearly hydrophytic vegetation, hydric soils, and wetland hydrology. Corps regional wetland delineation manuals address how to address wetland/non-wetland mosaics, that is a landscape where wetland and non-wetland components are too closely associated to be easily delineated or mapped separately. U.S. Army Corps of Engineers 2007b; U.S. Army Corps of Engineers 2012. For example, at Klatt Bog, one of the prominent patterned ground bogs in Anchorage, Alaska, the plant communities (and thus the wetland and non-wetland areas) intersperse more than can be mapped. Hogan and Tande 1983.

Ridges and hummocks are often non-wetland but are interspersed throughout a wetland matrix having clearly hydrophytic vegetation, hydric soils, and wetland hydrology. *Id.* Longstanding practice is that wetlands in the mosaic are not individually delineated, but that the Corps considered the entire mosaic and estimates percent wetland in the mosaic. *See, e.g., id.*. As a result, the agencies will continue to evaluate these wetlands as a single water under the rule.

1. Waters within 100 Feet of the Ordinary High Water Mark

Waters located in whole or in part within 100 feet of the ordinary high water mark of a traditional navigable water, interstate water, the territorial seas, an impoundment of a jurisdictional water, or a tributary are considered neighboring waters under the rule and are thus adjacent and "waters of the United States." Based on a review of the scientific literature and the agencies' expertise and experience, the agencies determined that such neighboring waters are integrally linked to the chemical, physical, or biological functions of waters to which they are adjacent and downstream to the traditional navigable waters, interstate waters or the territorial seas.

All wetlands, ponds, lakes, oxbows, impoundments, and similar water features that are located in whole or in part within 100 feet of the ordinary high water mark of a jurisdictional water perform a myriad of critical chemical, physical, and biological functions associated with the downstream traditional navigable water, interstate water or the territorial seas and therefore the agencies have determined that they are "neighboring" and thus "waters of the United States." Waters within 100 feet of a jurisdictional water are often located within the riparian area or floodplain and are often connected via surface and shallow subsurface hydrology to the water to which they are adjacent. While the SAB was clear that distance is not the only factor that influences connections and their effects downstream, due to their close proximity to jurisdictional waters, waters within 100 feet are often located within a landscape position that allows for them to receive and process surface and shallow subsurface flows before they reach streams and rivers. These waters individually and collectively affect the integrity of downstream waters by acting primarily as sinks that retain floodwaters, sediments, nutrients, and contaminants that could otherwise negatively impact the condition or function of downstream waters. Wetlands and open waters within close proximity of jurisdictional waters improve water quality through assimilation, transformation, or sequestration of nutrients, sediment, and other pollutants that can affect the integrity of downstream traditional navigable waters, interstate waters, or the territorial seas. These waters, including wetlands, also provide important habitat for aquatic-associated species to forage, breed, and rest.

As noted above, waters within 100 feet may be within the riparian area even if the floodplain is limited. Riparian waters within and outside of floodplains are an important part of the overall riverine landscape. Science Report at 4-7 (citing Ward 1998). Waters within riparian areas are also connected to streams and rivers by a diverse set of hydrologic inputs and outputs. *Id.* (citing Junk *et al.* 1989; Winter and Rosenberry 1998; Benke *et al.* 2000; Tockner *et al.* 2000; Bunn *et al.* 2006). Waters in stream and river channels can readily reach wetlands and open waters in riparian areas via overbank flow, which occurs when floodwaters flow over stream and river channels. *Id.* at 2-12 (citing Mertes 1997).

Riparian areas can have a diverse array of hydrologic inputs and outputs, which, in turn influence riparian wetlands. *Id.* at 2-14. Riparian areas receive water from precipitation; overland flow from upland areas; local, intermediate, regional ground water; and hyporheic flows. *Id.* (citing National Research Council 2002; Richardson *et al*. 2005; Vidon *et al*. 2010). Water flowing over the land surface in many situations can infiltrate soils in riparian areas. If low permeability subsoils or impervious clay layers are present, water contact with the plant root zone is increased and the water is subject to ecological functions such as denitrification before it reaches the stream channel. *Id.* (citing National Research Council 2002; Naiman *et al*. 2005; Vidon *et al.* 2010). Riparian wetlands can have bidirectional, lateral hydrologic connections to the river network, either through overbank flooding (i.e., lateral expansion of the network) or hyporheic flow, in addition to unidirectional flows from upland and ground-water sources. *Id.* at 2-20.

In order to provide greater clarity and consistency and based on a review of the science and the agencies' expertise and experience, the agencies identified a 100-foot threshold for neighboring waters to a traditional navigable water, interstate water, territorial sea, tributary or impoundment. Further, the agencies determined that there is a significant nexus with the downstream traditional navigable waters, interstate waters, or the territorial seas, and these adjacent waters are "waters of the United States."

All factors being equal, wetlands closer to the tributary network will have greater hydrologic and biological connectivity than wetlands located farther from the same network. *Id.* at 2-40. Distance is a factor that is well known to have various effects on physical and biological processes within and between system components. *Id.* at 4-44. Sometimes this is due to the direct effect of distance. In some cases there is an indirect effect due to distance controlling how long transport of a material will take. This fact is embedded in the time of concentration concept in hydrology, whereby under similar slope and velocities, water traveling from more distant points and with a longer flowpath will – because of the length of time in transit – have greater potential for evapotranspiration and soil infiltration losses before reaching a stream. *Id.* at 2-39; Blanco-Canqui and Lal 2008. There are many examples in the scientific literature of distance effects from various factors with respect to physical, chemical, and biological processes. Graf 1984; Marron 1989; Leigh 1997; King *et al*. 2005; Alexander *et al.* 2007; Attum *et al.* 2007; Subalusky, 2007; Van Sickle and Johnson, 2008; Colvin *et al.* 2009; Flitcroft *et al.* 2012; Greathouse *et al.* 2014. While these distance effects occur as a continuous function, it is a common scientific practice to use such variables to define discrete bins, which can then serve as a basis for a boundary. *See, e.g.*, Dent and Grimm 1999; Johnson *et al*. 2010.

With respect to provision of water quality benefits downstream, non-floodplain waters within close proximity of the stream network often are able to have more water quality benefits than those located at a distance from the stream. Many studies indicate that the primary water quality and habitat benefits will generally occur within a several hundred foot zone of a water. *See, e.g.*, Peterjohn and Correll 1984; Hawes and Smith 2005. In addition, the scientific literature indicates that to be effective, contaminant removal needs to occur at a reasonable distance prior to entry into the downstream traditional navigable waters, interstate waters, or the territorial seas. Some studies also indicate that fish, amphibians (*e.g.*, frogs, toads), reptiles (*e.g.*, turtles), and small mammals (*e.g.*, otters, beavers, etc.) will use at least a 100-foot zone for foraging, breeding, nesting, and other life cycle needs. Dole 1965; Smith and Green 2005; Semlitsch 2008; Steen *et al*. 2012.

Based on a review of the scientific literature and the agencies' expertise and experience, there is clear evidence that the identified waters within 100 feet of the ordinary high water mark of a jurisdictional water, even when located outside the floodplain, perform critical processes and functions discussed in section III above. All waters within 100 feet of a jurisdictional water significantly affect the chemical, physical, or biological integrity of the waters to which they are adjacent, and those waters in turn significantly affect the chemical, physical, or biological integrity of the downstream traditional navigable waters, interstate waters, or the territorial seas. The agencies established a 100-foot threshold from the water's lateral limit in the definition of neighboring because, based on the agencies' expertise and experience implementing the CWA and in light of the science, the agencies concluded this was a reasonable and practical boundary within which to conclude the waters clearly significantly affecting the integrity of the (a)(1) through (a)(5) waters, and these adjacent waters are "waters of the United States."

2. Waters in the Floodplain within 1,500 Feet of the Ordinary High Water Mark

Waters located in whole or in part in the 100-year floodplain (*i.e.*, the area with a one percent annual chance of flooding) that are within 1,500 feet of the ordinary high water mark of a traditional navigable water, interstate water, the territorial seas, an impoundment, or a tributary ("floodplain waters") are considered neighboring waters under the rule. Such neighboring wetlands and open waters perform a myriad of critical chemical and biological functions associated with the downstream traditional navigable waters, interstate waters, or the territorial seas. As stated in section VII.A.i. above, the scientific literature, including the Science Report, supports that wetlands and open waters in floodplains are physically, chemically, and biologically connected to downstream traditional navigable waters, interstate waters, or the territorial seas and significantly affect the integrity of such waters. Unlike bordering or contiguous waters, neighboring waters within the floodplain are typically not directly abutting (a)(1) through (a)(5) waters, but science still demonstrates that they individually or cumulatively have a significant impact on the chemical, physical, and biological integrity of traditional navigable waters, interstate waters, and the territorial seas due to their location within the floodplain. They perform the same important functions that improve downstream water quality as bordering or contiguous floodplain waters, including the temporary storage and deposition of channeling-forming sediment and woody debris, temporary storage of local ground water that supports baseflow in rivers, and transformation and transport of stored organic matter. Science Report at ES-2 to ES-3. Floodplain waters improve water quality through the assimilation, transformation, or sequestration of pollutants, including excess nutrients and chemical contaminants such as pesticides and metals, that can degrade downstream water integrity. *Id.* at ES-3. In addition to providing effective buffers to protect downstream waters from point source and nonpoint source pollution, these systems form integral components of river food webs, providing nursery habitat for breeding fish and amphibians, colonization opportunities for stream invertebrates, and maturation habitat for stream insects. *Id.* Lateral expansion and contraction of the river in its floodplain result in an exchange of organic matter and organisms, including fish populations that are adapted to use floodplain habitats for feeding and spawning during high water, that are critical to river ecosystem function. *Id.* Floodplain wetlands and open waters also affect the integrity of downstream waters by subsequently releasing (desynchronizing) floodwaters and retaining large volumes of stormwater, sediment, and contaminants in runoff that could otherwise negatively affect the condition or function of downstream waters. *Id.*

Due to their location within the 100-year floodplain, neighboring waters, including wetlands, that are in the 100-year floodplain and within 1,500 feet of the ordinary high water mark lie within landscape settings that have bidirectional hydrological exchange with (a)(1) through (a)(5) waters. *See, e.g.*, Science Report at 2-7. As described earlier, the "100-year floodplain" is the area with a one percent annual chance of flooding.

In order to add the clarity and predictability that some commenters requested, the agencies have decide that 100-year floodplain is the appropriate floodplain for determining the adjacency limits of (c)(2)(B) neighboring waters. Flood insurance rate maps are based on the probability of a flood event occurring (*e.g.*, 100-year floods have a 1% probability of occurring in a given year or 500 year-floods have a 0.2% probability of occurring in a particular year). Federal Emergency Management Agency. Flood insurance rate maps are developed by applying models and other information to identify areas that would be inundated by a flood event of a particular probability of recurring. *See, e.g.*, Federal Emergency Management Agency 1995.

Oxbow lakes and ponds (hereafter referred to as oxbow lakes), commonly found in floodplains of large rivers, are formed when river meanders (curves) are cutoff from the rest of the river, and are an example of neighboring floodplain waters where they are located within the 100-year floodplain and within 1,500 feet of the OHWM. *Id.* at 5-3. The Science Report presents a case study of these floodplain waters, and concludes that the scientific evidence supports that oxbow lakes periodically connect to the active river channel and the connection between oxbow lakes and the active river channel provides for several ecological effects on the river ecosystem. *Id.* at B-8.

For waters in the 100-year floodplain within 1,500 feet of the ordinary high water mark of an (a)(1) through (a)(5) water, the agencies determine there is a significant nexus with the downstream traditional navigable waters, interstate waters, or the territorial seas and these areas are critical to protect "waters of the United States." Based on a review of the scientific literature, the agencies' technical expertise and experience, and the implementation value of drawing clear lines, the rule establishes a distance limit for floodplain waters to meet the definition of "neighboring" and thus to be "waters of the United States" by rule. This distance limitation was established in order to protect vitally important waters within a watershed while at the same time providing a practical and implementable rule. The agencies are not determining that waters in the floodplain farther than 1,500 feet from the ordinary high water mark never have a significant nexus. Rather, the agencies are using their technical expertise to promulgate a practical rule that draws reasonable boundaries in order to protect the waters that clearly have a significant nexus while minimizing uncertainty about the scope of "waters of the United States." Because waters beyond these limits may have a significant nexus, the rule also establishes areas in which a case-specific significant nexus determination must be made (see section IX.B.).

3. Waters within 1,500 Feet of the High Tide Line

Waters located in whole or in part within 1,500 feet of the high tide line of a tidally-influenced traditional navigable water or territorial sea or within 1,500 feet of the ordinary high water mark of the Great Lakes, are considered neighboring under the rule. Many tidally-influenced waters do not have floodplains, so the agencies include a separate provision within the definition of "neighboring" to protect the adjacent waters that have a significant nexus to tidally-influenced traditional navigable waters, the Great Lakes, or the territorial seas. Under *Riverside Bayview* and Justice Kennedy's opinion in *Rapanos*, waters adjacent to traditional navigable waters, including the territorial seas, are "waters of the United States." Because the connection to a tidally-influenced traditional navigable water or a Great Lake is so close, the 100-year floodplain is not as relevant to identifying connections to those traditional navigable waters, so the rule defines "neighboring" to include waters within 1,500 feet of the high tide line of a tidal (a)(1) water or an (a)(3) or the ordinary high water mark of a Great Lake. Wetlands, ponds, lakes, oxbows, impoundments, and similar water features within 1,500 feet of a tidal (a)(1) or (a)(3) water or a Great Lake are physically-connected to such waters by surface and shallow subsurface connections. These waters perform a myriad of critical chemical and biological functions associated with the nearby (a)(1) and (a)(3) waters to which they are adjacent.

These neighboring waters in combination with other adjacent waters significantly affect the integrity of the connected (a)(1) and (a)(3) waters (for example, the Great Lakes or territorial seas, respectively) by acting primarily as sinks that retain floodwaters, sediments, nutrients, and contaminants that could otherwise negatively impact the condition or function of those waters. Like floodplain waters, the scientific literature supports that wetlands and other similar waters within close proximity to tidal waters or the Great Lakes improve water quality through assimilation, transformation, or sequestration of nutrients, sediment, and other pollutants that can affect downstream water quality. These waters also provide important habitat for aquatic-associated species to forage, breed, and rest in.

For example, wetlands dominated by grass-like vegetation that occur in depressional areas between sand dunes or beach ridges along the territorial seas and other waters such as the Great Lakes are dependent upon these waters for their water source (intradunal and interdunal wetlands). The waters, including wetlands, generally form when water levels of the territorial seas fall or the Great Lakes drop, creating swales that support a diverse mix of wetland vegetation and many endangered and threatened species. Odum 1988; Albert 2000; Albert 2003; Tiner 2003c; Albert 2007. Many studies demonstrate that these waters have been shown to act in concert with the rising and lowering of the tide or water levels in the case of the Great Lakes and that the critical functions provided by these waters are similar and play an important role in maintaining the chemical, physical, or biological integrity of the nearby traditional navigable waters or the territorial seas because of the hydrological and ecological connections to and interactions with those waters. *See, e.g., id.* (See also VIII. A.ii. for additional information about this wetland type.).

Science demonstrates that distance is a factor in the connectivity and the strength of connectivity of wetlands and open waters to downstream waters. Science Report at ES-4, 4-2. 5-6-5. Thus, waters that are more distant generally have less opportunity to be connected to downstream waters. Wetlands and open waters closer to the stream network or coastline generally will have greater hydrologic and biological connectivity than waters located farther from the same network. *See, e.g., id.* at 2-38. For instance, waters that are more closely proximate have a greater opportunity to contribute flow, as water is likely to be lost from the channel through evaporation or transpiration. *Id.* Via their hydrologic connectivity, proximate wetlands and open waters also have chemical connectivity to and effects on downstream (a)(1) and (a)(3) waters and are more likely to impact water quality due to their close distance. Waters more closely located to (a)(1) and (a)(3) waters are also more likely to be biologically connected to such waters more frequently and by more species, including amphibians and other aquatic animals. To protect tidal traditional navigable waters, the territorial seas, and the Great Lakes, the 1,500-foot threshold is a reasonable distance to capture most wetlands and open waters that are so closely linked to the (a)(1) and (a)(3) waters that they can properly be considered adjacent as neighboring waters.

Based on a review of the scientific literature and the agencies' expertise and experience, there is clear evidence these waters, even when located outside the floodplain, perform critical processes and functions discussed in section III above. The agencies established a 1,500-foot threshold from the water's lateral limit, which would be either the high tide line (for tidally-influenced (a)(1) waters or the territorial seas) or the ordinary high water mark (for the Great

Lakes), in the definition of neighboring because, based on the agencies' expertise and experience implementing the CWA and in light of the science, the agencies concluded this was a reasonable and practical boundary within which to conclude the waters clearly significantly affected the integrity of the (a)(1) or (a)(3) waters, and these adjacent waters are "waters of the United States." Waters located within the 100-year floodplain of a traditional navigable water, interstate water, or the territorial seas and waters located more than 1,500 feet and less than 4,000 feet from the lateral limit of an (a)(1) or (a)(3) water may still be determined to have a significant nexus on a case-specific basis under paragraph (a)(8) of the rule and, thus, be a "water of the United States" (see section IX).

B. Adjacent Waters, As Defined, Have a Significant Nexus

The discussion below summarizes the key points made in the Science Report and explains the technical basis for supporting a conclusion that adjacent waters, as defined in this rule, have a significant nexus to waters identified in paragraphs (a)(1) through (a)(3) of the rule. The geographic position of an "adjacent" water relative to the (a)(1) through (a)(5) water in to which it is adjacent is indicative of the relationship they share, with many of its defining characteristics resulting from the movement of materials and energy between the two. A review and analysis of the scientific literature supports the conclusion that individually or in combination with similarly situated waters in a watershed, adjacent waters have a significant effect on the chemical, physical, and biological integrity of downstream traditionally navigable waters, interstate waters, and the territorial seas.

i. Adjacent Waters as Defined are "Similarly Situated"

The agencies conclude that all waters meeting the definition of "adjacent" in the rule are similarly situated for purposes of analyzing whether they have a significant nexus to a traditional navigable water, interstate water, or the territorial sea. Based on a review of the scientific literature, the agencies conclude that these bordering, contiguous, or neighboring waters provide similar functions and work together to significantly affect the chemical, physical, or biological integrity of traditional navigable waters, interstate waters, or the territorial seas. Further, because the definition of "adjacent" focuses on the proximity of the waters (i.e., those that are located near traditional navigable waters, interstate waters, the territorial seas, impoundments, and covered tributaries), interpreting the term "similarly situated" to include all covered adjacent waters, as defined in the rule, is reasonable and consistent with the science. The geographic proximity of an "adjacent" water relative to the traditional navigable waters, interstate waters, the territorial seas, impoundments, and covered tributaries is indicative of the relationship to it, with many of its defining characteristics resulting from the movement of materials and energy between the categories of waters. The scientific literature supports that waters, including wetlands, ponds, lakes, oxbow lakes, and similar waters, that are "adjacent," as defined in the rule, to traditional navigable waters, interstate waters, the territorial seas, impoundments, and covered tributaries, are integral parts of stream networks because of their ecological functions and how they interact with each other, and with downstream traditional navigable waters, interstate waters, or the territorial seas.

ii. Adjacent Waters Significantly Affect the Physical Integrity of (a)(1) through (a)(3) Waters

Scientific research shows waters and wetlands in riparian areas and floodplains to be important in protecting the physical integrity of aquatic resources. Because riparian and floodplain waters exhibit bidirectional exchange of water with the waters to which they are adjacent, they play an important role in determining the volume and duration of stream flow.

Riparian and floodplain waters also have an essential role in regulating and stabilizing sediment transport to downstream waters. These characteristics are fundamental to the physical integrity of streams as well as downstream traditional navigable waters, interstate waters, and the territorial seas.

Riparian and floodplain wetlands are important for the reduction or delay of floods. *Id.*at 2-21, 4-7 (citing Mertes *et al.* 1995; Walton *et al.* 1996; Bullock and Acreman 2003; Poole *et al*. 2006; Rassam *et al*. 2006). Waters in riparian areas control flooding during times of high precipitation or snowmelt by capturing water from overbank flow and storing excess stream water. *Id.* at 4-7. One study found that peak flows in the Cache River in Arkansas decreased by 10-20% mainly because of floodplain water storage. *Id.* (citing Walton *et al*. 1996). Research has shown that floodplain wetlands in Ohio store about 40% of the flow of small streams. *Id.* (citing Gamble *et al.* 2007). These and similar findings point to the close hydrological influence that waters in riparian and floodplain areas have on streams.

Some adjacent waters are bordering or contiguous with (a)(1) through (a)(5) waters. Because of their close physical proximity to nearby water bodies, they readily exchange their waters through the saturated soils surrounding the stream or through surface exchange. This commingling of waters allows bordering or contiguous waters to both provide chemically transformed waters to streams and to absorb excess stream flow.

Flow between neighboring waters and streams is more longitudinal (downslope) at headwaters and more lateral further downstream. *Id.* at 4-40, Table 4-3. These connections in part determine stream flow volume and duration. Waters, including wetlands, in riparian areas connect to nearby water bodies through various surface and subsurface connections. See, *e.g.*, *id.* at 2-4 (citing National Research Council 2002). Floodplains, similarly, are closely associated with the groundwater found beneath and beside river channels (which are considered shallow aquifers), and waters in floodplains readily exchange water with such aquifers. *Id.* at 2-12 (citing Stanford and Ward 1993; Amoros and Bornette 2002; Poole *et al.* 2006). Riparian and floodplain waters are frequently contiguous with streams and other water bodies and significantly influence the physical form, hydrology, chemistry, and biology of such water bodies. *Id.* at 4-6 (citing Junk *et al*. 1989; Abbott *et al*. 2000; Tockner *et al*. 2000; Woessner 2000; Amoros and Bornette 2002; Ward *et al*. 2002; King *et al*. 2003; Naiman *et al*. 2005; Church 2006; Kondolf *et al*. 2006; Poole *et al*. 2006; Poole 2010; Tockner *et al*. 2010; Vidon *et al*. 2010; Helton *et al*. 2011; McLaughlin *et al*. 2011; Humphries *et al*. 2015). Floodplain wetlands are important for the reduction or delay of floods by capturing water from overbank flow and by storing excess water from the streams to which they are adjacent. *Id.* at 4-7 (citing Bullock and Acreman 2003). Oxbow lakes also retain flood waters. *Id.* at B-10. Adjacent ponds generally function similarly to oxbow lakes.

Waters in riparian areas and floodplains filter sediment washed down from uplands and collect sediment from overbank flow as the river or stream floods. *Id.* at 4-8 (citing Boto and Patrick 1979; Whigham *et al*. 1988). For example, riparian areas were observed to collect 80-90% of the sediment from farmlands in a study in North Carolina. *Id.* (citing Cooper *et al*. 1987; Daniels and Gilliam 1996; Naiman and Decamps 1997). Maintaining the equilibrium between sediment deposition and sediment transport is important to maintain the physical shape and structure of stream channels. Significant changes to upstream channels can affect the chemical, physical, and biological condition of downstream (a)(1) through (a)(3) waters.

The physical effects of excess sediment can impair chemical and ecological integrity in a variety of ways. *Id.* at 5-9 (citing Wood and Armitage 1997). Excess sediment is linked to increasing contaminant and nutrient concentrations, all of which tributaries can transmit downstream, affecting water quality. Excess sediment may block and absorb sunlight transmission through the water column, inhibiting plant photosynthesis and warming the water in the stream. Sediment may fill the interstitial spaces between rocks in a streambed, which many fish and aquatic species use for mating, reproduction, and shelter from predators. This kind of physical degradation of tributary streambeds results in less suitable habitat available for animals and fish that move between upstream and downstream waters. Riparian waters that retain sediments thus protect downstream waters from the effects of excess sediment.

Oxbow lakes play similar roles in the floodplain as they are an integral part of alluvial floodplains of meandering rivers. *Id.* at B-8 (citing Winemiller *et al*. 2000; Glinska-Lewczuk 2009). They connect to rivers by periodic overland flow, typically from the river during flooding events, and bidirectional shallow subsurface flow through fine river soils (bidirectional means flow occurs both from the river to oxbow lake when the river has a high water stage and from the oxbow lake to the river at low water stage). *Id.* at B-9 to B-10. Oxbow lakes generally have an important influence on the chemical, physical, and biological condition and function of rivers. *Id.* at B-13 to B-14. That influence can vary with the distance from the river and the age of the oxbow, reflecting the frequency and nature of the exchange of materials that takes place between the two water bodies.

Because adjacent waters support riparian vegetation, they affect the capacity of riparian vegetation to influence stream flow, morphology, and habitat provided in the nearby water body. Vegetation in riparian waters influences the amount of water in the stream by capturing and transpiring stream flow and intercepting groundwater and overland flow. *Id.* at 2-21, 4-8 (citing Meyboom 1964). Riparian vegetation in adjacent waters also reduces stream bank erosion, serving to maintain the physical integrity of the channel. See, *e.g.*, *id.* at 4-8 to 4-9 (citing Beeson and Doyle 1995; Naiman and Decamps 1997; Burt et al. 2002; Zaimes *et al*. 2004). In addition, inputs of woody debris from aquatic vegetation or logs into waters make important contributions to the channel's geomorphology and the stream's aquatic habitat value. *Id.* at 4-9 (citing Anderson and Sedell 1979; Harmon *et al.* 1986; Nakamura and Swanson 1993; Abbe and Montgomery 1996; Naiman and Decamps 1997; Gurnell *et al.* 2002; Brummer *et al*. 2006; Sear *et al*. 2010; Collins *et al*. 2012). Also, the riparian vegetation that overhangs streams provides shade, providing a critically important function of reducing fluctuations in water temperature helping to reduce excessive algal production and to maintain life-supporting oxygen levels in streams and other waters. *Id.* at 4-9 to 4-10 (citing Gregory *et al*. 1991; Volkmar and Dahlgren 2006). Even small changes in water temperature can have significant impacts on the type and number of species present in waters, with higher temperatures generally associated with degraded habitat which supports only those species that can tolerate higher temperatures and reduced levels of dissolved oxygen. Higher water temperatures are associated with streams and rivers with less valuable recreational and commercial fisheries. As discussed below, these physical characteristics of headwater streams influence what types of organisms live in the region.

Headwaters and nearby wetlands supply downstream waters with dissolved organic carbon as a result of decomposition processes from dead organic matter such as plants. Both production and consumption of organic and inorganic carbon occur in adjacent wetlands. *Id.* at 4-13. Adjacent waters are an important sources of dissolved organic carbon (DOC) to downstream waters. Allochthonous inputs from adjacent wetlands to streams are important to aquatic food webs, particular in headwaters. *Id.* (citing Tank *et al.* 2010). Allochthonous inputs are terrestrial organic materials that enter the stream through vegetation litter (*i.e.*, woody debris, leaves, and partially decomposed plant parts), erosion, and hydrologic flows. *Id.* (citing Wetzel 1992). These inputs of organic matter are the primary source of energy flow into the food webs of streams. *Id.* Organic matter inputs are important because they affect food availability to aquatic organisms by releasing organic carbon and nitrogen into streams. *Id.* (citing Wetzel and Manny 1972; Mulholland and Hill 1997). This organic carbon contributes to the downstream foodweb and ultimately supports downstream fisheries. *See, e.g., id.* at 4-16. Export of DOC to downstream waters supports primary productivity, effects pH and buffering capacity, and can protect aquatic organisms from the harmful effects of UV-B radiation. *Id.* at 4-28 (citing Eshelman and Hemond 1985; Hobbie and Wetzel 1992; Hedin *et al*. 1995; Schindler and Curtis 1997; Nuff and Asner 2001; Reddy and DeLaune 2008). However, too much organic matter downstream can have negative effects because contaminants, such as methylmercury and other trace metals, can be adsorbed to it. *Id.* (citing Thurman 1985; Driscoll *et al.* 1995).

iii. Adjacent Waters Significantly Affect the Chemical Integrity of (a)(1) through (a)(3) Waters

As stated above in the section on tributaries, pollutants such as petroleum waste products and other harmful pollutants dumped into any part of the tributary system are likely to flow downstream, or to be washed downstream, and thereby pollute traditional navigable waters, interstate waters, and the territorial seas from which American citizens take their drinking water, shellfish, fin fish, water-based recreation, and many other uses. Some wetlands perform the valuable function of trapping or filtering out some pollutants (such as fertilizers, silt, and some pesticides), thereby reducing the likelihood that those pollutants will reach and pollute the tributaries of the downstream navigable or interstate waters (and eventually pollute those downstream waters themselves). However, many other pollutants (such as petroleum wastes and toxic chemical wastes), if dumped into wetlands or other waters that are adjacent to tributary streams, may reach those tributaries themselves, and thereafter flow downstream to pollute the nation's drinking water supply, fisheries, and recreation areas.

Riparian and floodplain waters play a critical role in controlling the chemicals that enter streams and other "waters of the United States" and as a result are vital in protecting the chemical, physical, and biological integrity of downstream (a)(1) through (a)(3) waters. Runoff (the water that has not evaporated or infiltrated into the groundwater) from uplands is a large source of pollution, but research has shown that wetlands and other riparian waters trap and chemically transform a substantial amount of the nutrients, pesticides, and other pollutants before they enter streams, river, lakes and other waters.

Chemicals and other pollutants enter waters from point sources such as outfalls and pipes, non-point sources (*e.g.*, runoff from agricultural and urban fields and lawns), dry and wet (*e.g.*, rain, snow) atmospheric deposition, upstream reaches, and through the hyporheic zone, a region beneath and alongside a stream bed where surface water and shallow groundwater mix. *Id.* at 4-10 (citing Nixon and Lee 1986; Tiner 2003c; Whigham and Jordan 2003; Comer *et al.* 2005; Whitmire and Hamilton 2008). Throughout the stream network, but especially in headwater streams and their adjacent wetlands, chemicals are sequestered via sorption (adsorption and absorption) or sedimentation processes, assimilated into the flora and fauna, transformed into other compounds, or lost to the atmosphere through transformational processes performed by microbes, fungi, algae, and macrophytes present in riparian waters and soils. *Id.* (citing Nixon and Lee 1986; Johnston 1991; Boon 2006; Mitsch and Gosselink 2007; Reddy and DeLaune 2008). These chemical processes reduce or eliminate pollution that would otherwise enter streams, rivers, lakes and other waters and subsequently downstream traditional navigable waters, interstate waters, or the territorial seas.

The removal of the nutrients nitrogen and phosphorus is a particularly important role for riparian and floodplain waters. As described previously, nutrients are necessary to support aquatic life, but the presence of excess nutrients can lead to eutrophication and the depletion of oxygen (hypoxia) in nearby waters and in waters far downstream. See, *e.g.*, *id.* at ES-8. Eutrophication is a large problem in waters across the United States including such important ecosystems as the Chesapeake Bay and Lake Spokane in Washington. Kemp *et al* 2005; Moore and Ross 2010; Murphy *et al.* 2011. Eutrophication is the natural or artificial enrichment of a water body by nutrients, typically phosphates and nitrates. Science Report at A-4. It can occur when plants and algae grow in waters to such an extent that the abundance of vegetation monopolizes the available oxygen, detrimentally affecting other aquatic organisms. Oxbow lakes also have high mineralization rates, suggesting that similar to adjacent wetlands they process and trap nutrients in runoff before the runoff reaches the river channel. Science Report at B-11 (citing Winemiller *et al*. 2000). Protection of these waters therefore helps maintain the chemical integrity of the nation's waters.

The removal of nitrogen is an important function of all waters, including wetlands, in the riparian areas. Riparian areas regularly remove more than half of dissolved nitrogen found in surface and subsurface water by plant uptake and microbial transformation. *Id.* at 4-11 (citing Vidon *et al*. 2010). Denitrification potential in surface and subsurface flows is highest where there is high organic matter and/or anoxic conditions. *Id.* at 4-12 (citing McClain *et al.* 2003; Orr *et al.* 2014). The highest denitrification potentials occur in floodplain and riparian waters where high organic matter, denitrifying microbes, and saturated soil conditions are present, and rates increase with proximity to streams. *Id.* (citing Gregory *et al*. 1991; Vidon *et al*. 2010). Riparian waters are therefore important in maintaining the conditions important for denitrification, which in turn protects streams, rivers, lakes and other waters from nitrogen pollution.

Plant uptake of dissolved nitrogen in subsurface flows through riparian areas also accounts for large quantities of nitrogen removal. *Id.* (citing Vidon *et al.* 2010). Riparian forests have been found to remove 75% of dissolved nitrate transported from agricultural fields to a Maryland river. *Id.* (citing Vidon *et al.* 2010). Likewise, riparian forests in Georgia remove 65% of nitrogen and 30% of phosphorus from agricultural sources. *Id.* (citing Vidon, *et al.* 2010). A Pennsylvania forested riparian area removed 26% of the total nitrate input from the subsurface. *Id.* (citing Newbold *et al*. 2010). The vegetation associated with riparian waters also removes nitrogen from subsurface flows. Therefore, the conservation of riparian waters helps protect downstream waters from influxes of dissolved nitrogen.

Phosphorus is another potentially harmful nutrient that is captured and processed in riparian waters. *Id.* at 4-12 to 4-13 (citing Dillaha and Inamdar 1997; Sharpley and Rekolainen 1997; Carlyle and Hill 2001). Biogeochemical processes, sedimentation, and plant uptake account for high rates of removal of particulate phosphorus in riparian areas. *Id.* at 4-12 (citing Hoffmann *et al*. 2009). The amount of contact the water has with nearby soils and the characteristics of that soil determine the ability of the riparian area to remove phosphorus. *Id.* Riparian areas are phosphorus sinks in oxic soils (containing oxygen), while riparian soils generally can serve as sources of phosphorus when soils are anoxic (lacking oxygen) or when mineral dissolution releases phosphorus. *Id.* at 4-12 (citing Baldwin and Mitchell 2000; Carlyle and Hill 2001; Chacon *et al*. 2008). Portions of riparian areas where agricultural sediments are deposited are phosphorus sources to streams if the phosphorus is desorbed and leached but can be sinks by adsorbing dissolved phosphorus if sediment phosphorus concentrations are low. *Id.* at 4-12 to 4-13 (citing Dillaha and Inamdar 1997; Sharpley and Rekolainen 1997). Riparian areas also serve as phosphorus sinks when upland surface runoff travels through the riparian area or when fine-grained sediment containing phosphorus is deposited overbank onto the riparian area. *Id* at 4-13 (citing Dillaha and Inamdar 1997). These sediments, however, can become sources of phosphorus if they are later saturated with water and iron and manganese are reductively dissolved during anoxic conditions, thus causing them to desorb phosphorus. *Id.* (citing Reddy and DeLaune 2008). The function of riparian waters to move and uptake phosphorus is crucial for maintaining the chemical and biological integrity of the waters to which they are adjacent, and for preventing eutrophication in downstream traditional navigable waters, interstate waters, and the territorial seas. In the case where riparian waters are acting as a source of phosphorus for (a)(1) through (a)(3) waters, this also can significantly affect the chemical and biological integrity of these downstream waters.

iv. Adjacent Waters Significantly Affect the Biological Integrity of (a)(1) through (a)(3) Waters

Adjacent waters support the biological integrity of downstream (a)(1) through (a)(3) waters in a variety of ways. They provide habitat for aquatic and water-tolerant plants, invertebrates (aquatic insects), and vertebrates, and provide feeding, refuge, and breeding areas for invertebrates and fish. Seeds, plants, and animals move between adjacent waters and the nearby streams, and from there colonize or utilize downstream waters, including traditional navigable waters, interstate waters, and the territorial seas.

Organic matter from adjacent wetlands is critical to aquatic food webs, particularly in headwaters, where it is the primary source of energy flow due to low light conditions that inhibit photosynthesis. *See, e.g., id.* at 4-13 (citing Tank *et al*. 2010). Headwater streams tend to be located in heavily vegetated areas compared to larger waters, so they are more likely to contain leaf litter, dead and decaying plants, and other organic matter that forms the basis of headwater food webs. The organic matter is processed by microbes and insects that make the energy available to higher levels of stream life such as amphibians and fish. Studies have shown that aquatic insects rely on leaf inputs in headwater streams and that excluding organic litter from a stream resulted in significant changes to the food web at multiple levels. *Id.* (citing Minshall 1967; Wallace and Webster 1996; Wallace *et al*. 1997; Meyer *et al*. 1998). Fish and amphibian species found in headwaters travel downstream and in turn become part of the food web for larger aquatic organisms in rivers and other waters. Organic material provided by riparian waters to small, headwater streams is therefore important not only to the small streams that directly utilize this source of energy to support their biological populations but also to the overall biological integrity of downstream waters that benefit from the movement of fish and other species that contribute to the food web of larger streams and rivers.

Floodplain waters, including oxbow lakes, accumulate organic carbon and nitrogen, an important function influenced by the size and frequency of floods from rivers to which they are adjacent. *See, e.g., id.* at B-11 (citing Cabezas *et al*. 2009). These stored chemicals are available for exchange with river water when hydrological connections are present. Organic materials are the basis for the food web in stream reaches where photosynthetic production of energy is absent or limited, particularly in headwater systems where vegetative litter alone makes up the base of the aquatic food web. The maintenance of floodplain waters is therefore an important component of protecting the biological integrity of downstream (a)(1), (a)(2), and (a)(3) waters into which the headwaters flow.

The waters, including wetlands, in the riparian area play an important role in the removal of pesticides. *Id.* at 4-14 (citing Vidon *et al*. 2010). Microbes near plant roots break down these pesticides. *See, e.g., id.* (citing Voos and Groffman 1996). Uptake by aquatic plants has also been shown to be an important mechanism of removal of the pesticides alachlor and atrazine. *Id.* (citing Paterson and Schnoor 1992). Riparian waters also trap and hold pesticide contaminated runoff preventing it from harming neighboring waters.

Riparian areas and floodplains are dynamic places that support a diversity of aquatic, amphibious, and terrestrial species adapted to the unique habitat created by periodic or episodic flooding or inundation events. *Id.* at 4-15 (citing Power et al. 1995a; Power et al. 1995b; Galat et al. 1998; Robinson *et al*. 2002; Toth and van der Valk 2012; Rooney et al. 2013; Granado and Henry 2014). Plants, aquatic insects, and vertebrates use waters, including wetlands, in riparian areas and floodplains for habitat, nutrients, and breeding. As a result, the waters, including wetlands, in riparian areas and floodplains act as sources of organisms, particularly during inundation events, replenishing neighboring waters with organisms, seeds, and organic matter. Inundation and hydrological connectivity of riparian areas and floodplains to the tributary network greatly increase the area of aquatic habitats and species diversity. *Id.* at 4-15, 4-16 (citing Junk *et al*. 1989; Tockner *et al*. 2000; Jansson *et al*. 2005; Brooks and Serfass 2013). Aquatic animals, including amphibians and fish, take advantage of the riparian and floodplain waters, either inhabiting them or moving between the riparian or floodplain water and neighboring waters. *Id.* at 4-15, 4-17 through 4-19 (citing Copp 1989; Smock *et al.* 1992; Smock 1994; Robinson *et al.* 2002; Richardson *et al*. 2005; Ilg *et al.* 2008; Shoup and Wahl 2009).

Likewise, seeds, plant fragments, and whole plants move between riparian and floodplain waters and the river network. *Id.* at 4-15 (citing Schneider and Sharitz 1988; Middleton 2000; Nilsson *et al*. 2010).

Hydrological connections are often drivers of biological connections, and flooding events enhance the existing connections between riparian and floodplain waters and the river network. As a result, waters within floodplains have important functions for aquatic health. Many species have cycles timed to flooding events, particularly in circumstances where flooding is associated with annual spring snowmelt or high precipitation. *Id.* at 4-15 to 4-16, 4-19 (citing Thomas *et al.* 2006; Tronstad *et al*. 2007; Gurnell *et al*. 2008). Waters within floodplains act as sinks of seeds, plant fragments, and invertebrate eggs and as sources of such biological material during times of periodic flooding, allowing for cross-breeding and resulting gene flow across time. *Id.* at 4-16, 4-19 to 4-20 (citing Middleton, 2000; Jenkins and Boulton 2003; Frisch and Threlkeld 2005; Gurnell *et al*. 2008; Vanschoenwinkel *et al*. 2009). Stream macroinvertebrates (*e.g.*, insects, crayfish, and mollusks) and microinvertebrates (*e.g.* zooplankton such as cladocerans, copepods, rotifers, and gastropods) colonize nutrient rich waters within riparian areas and floodplains in large numbers during periods of seasonal or episodic inundation, facilitating an increase in population and sustaining them though times of limited resources and population decline. *Id.* at 4-19 to 4-20 (citing Fisher and Willis 2000; Frisch and Threlkeld 2005; Junk *et al*. 1989; Malmqvist 2002; Ilg *et al.* 2008). Such animals are adapted to high floods, desiccation (drying out), or other stresses that come with these regular, systemic fluctuations. *Id.* at 4-19. Riparian and floodplain waters therefore maintain various biological populations, which periodically replenish jurisdictional waters to which they adjacent and the downstream (a)(1) through (a)(3) waters they flow into, serving to maintain their biological integrity.

Plants and animals use waters, including wetlands, in riparian areas and floodplains for habitat, food, and breeding. Oxbow lakes in the floodplain provide critical fish habitat needed for feeding and rearing, leading researchers to conclude that the entire floodplain should be considered a single functional unit, essential to the river's biological integrity. *Id.* at 4-17 (citing Shoup and Wahl 2009). Since adjacent ponds are structurally and biologically similar to oxbow lakes they serve similar functions relative to the nearby river or stream. Waters, including wetlands, in the riparian areas also provide food sources for stream invertebrates, which colonize during inundation events. *Id.* at 4-19 (citing Junk *et al*. 1989; Ilg *et al*. 2008). Riparian and floodplain waters also form an integral part of the river food web, linking primary producers and plants to higher animals. *Id.* (citing Malmqvist 2002; Woodward and Hildrew 2002; Stead *et al*. 2005; Woodford and McIntosh 2010). Likewise, floodplains are important foraging, hunting, and breeding sites for fish, amphibians, and aquatic macroinvertebrates. *Id.* at 4-15 (citing Copp 1989; Smock *et al*. 1992; Smock, 1994; Bestgen *et al*. 2000; Richardson *et al*. 2005; Schramm and Eggleton 2006; Sullivan and Watzin 2009; Alford and Walker 2013; Magana 2013).

Plants and animals move back and forth between adjacent waters and the river network. This movement is assisted in some cases when flooding events create hydrological connections. For instance, these floodplain and riparian wetlands provide refuge, feeding, and rearing habitat for many fish species. *Id.* at 4-17 (citing Wharton *et al*. 1982; Boltz and Stauffer 1989; Matheney and 1995; Pease *et al*. 2006; Henning *et al.* 2007; Jeffres *et al*. 2008). Seeds of aquatic and riparian plants ingested by animals such as carp are dispersed in stream channels and associated waters. See, *e.g.*, *id.* at 4-16 (citing King *et al.* 2003; Pollux *et al*. 2007). Also, phytoplankton move between floodplain wetlands and the river network. *Id.* at 4-16 (citing Angeler *et al*. 2010). In turn, the primary productivity conditions in the floodplain results in large populations of phytoplankton that enrich river networks when hydrological connections form. *Id.* at 4-16 to 4-17 (citing Lehman *et al*. 2008). This influx of carbon into the river system nourishes the aquatic food webs of downstream waters, for example, supporting fisheries.

However, even when hydrological connections are absent, some organisms can move between adjacent waters and their nearby tributaries by overland movement in order to complete their life cycle. River-dwelling mammals, such as river otters, move from the river to riparian/floodplain wetlands. *Id.* at 4-17 (citing Newman and Griffin 1994). In addition, both river otters and beavers have a strong preference for riparian areas that are pond- and lake-dominated (Swimley *et al*. 1999). Several species of amphibians and reptiles including frogs, snakes and turtles use both streams and neighboring waters. *Id.* at ES-10, 3-47 (Table 3-1), 4-15 (citing Richardson *et al*. 2005). Movement between wetlands and the river network also occurs by the dispersal of seed and plant fragments and the wind dispersal of invertebrates. *Id.* at 4-15 to 4-16, 4-20 (citing Schneider and Sharitz 1988; Middleton 2000; Gurnell 2007; Gurnell *et al*. 2008; Nilsson *et al*. 2010; Tronstad *et al*. 2007; Vanschoenwinkel *et al*. 2009). Animals, particularly migratory fish, can thus move between adjacent waters and (a)(1) through (a)(3) waters. And even when some species do not traverse the entire distance from adjacent waters to downstream waters, the downstream waters still benefit from the ecological integrity that persists because of the close relationship that adjacent waters have with nearby waters. This is because the chemical and biological properties that arise from interactions between adjacent waters and tributaries move downstream and support the integrity of (a)(1) through (a)(3) waters.

Biological connections between adjacent waters and river systems do not always increase with hydrologic connections. In some cases, the lack of connection improves the biological contribution provided by riparian waters towards nearby streams, rivers, and lakes. For instance, the periodic hydrologic disconnectedness of oxbow lakes is *necessary* for the accumulation of plankton, an important source of carbon more easily assimilated by the aquatic food chain than terrestrial forms of carbon. *Id.* at B-11 to B-12 (citing Baranyi *et al*. 2002; Keckeis *et al.* 2003). Similarly, some degree of hydrological disconnectedness is important in increasing the number of mollusk species and macroinvertebrate diversity in oxbow lakes, which in turn support the diversity of mollusks throughout the aquatic system. *Id.* at B-12 (citing Reckendorfer *et al*. 2006; Obolewski *et al.* 2009).

C. Rationale for Conclusions

The scientific literature supports that waters which are adjacent to (a)(1) through (a)(5) waters, including wetlands, lakes, oxbow lakes, and adjacent ponds, are integral parts of tributary networks to (a)(1) through (a)(3) waters because they are directly connected to streams via surface and shallow subsurface connections that concentrate, mix, transform, and transport water and other materials, including food resources, downstream to larger rivers. Adjacent wetlands and other adjacent waters filter pollutants before they enter the tributary system, they attenuate flow during flood events, they regulate flow rate and timing, they trap sediment, and they input organic material into rivers and streams, providing the basic building blocks for their healthy functioning. These waters also are biologically connected to downstream waters by providing habitat and refuge to many species, and storing and releasing food sources. The scientific literature demonstrates that adjacent waters in a watershed together exert a strong influence on the character and functioning of rivers, streams and lakes. Note that non-jurisdictional surface (*e.g.* non-wetland swales) and shallow subsurface connections that serve as a hydrologic connection between an adjacent water and the jurisdictional water to which it is adjacent, or are a consideration for a case-specific significant nexus determination, do not become "waters of the

United States" themselves. As stated throughout the preamble of the rule, only waters that meet the provisions in (a)(1) through (a)(8) are considered "waters of the United States." Groundwater is explicitly excluded from the definition of "waters of the United States" under paragraph (b)(5).

Adjacent waters, as defined, alone or in combination with other adjacent waters in a point of entry watershed, significantly affect the chemical, physical, or biological integrity of traditional navigable waters, interstate waters, and the territorial seas. Based on studies of waters the agencies identify as bordering, contiguous, or neighboring, including floodplain wetlands, and their hydrologic connections through the tributary system there is sufficient scientific evidence regarding the important functions of these adjacent wetlands to demonstrate that, alone or in combination with similarly situated waters in the region, wetlands and open waters adjacent to any tributary have a significant effect on the chemical, physical, or biological integrity of traditional navigable waters, interstate waters, or the territorial seas. The reviewed scientific literature supports the conclusion that adjacent waters generally play a larger role in the ecological condition of smaller tributary systems, which, in turn, determines the effects on the chemical, physical, and biological health of larger downstream waters. *See, e.g.,* Science Report at 1-14.

The CWA explicitly establishes authority over adjacent wetlands. Under section 404(g), states are authorized to assume responsibility for administration of the section 404 permitting program with respect to "navigable waters (other than those waters which are presently used, or are susceptible to use in their natural condition or by reasonable improvement as a means to transport interstate or foreign commerce shoreward to their ordinary high water mark, including all waters which are subject to the ebb and flow of the tide shoreward to their mean high water mark, or mean higher high water mark on the west coast, *including wetlands adjacent thereto*)."

33 U.S.C. § 1344(g)(1) (emphasis added). While this provision mainly serves as a limitation on the scope of waters for which states may be authorized to issue permits, it also shows that Congress was concerned with the protection of adjacent wetlands and recognized their important role in protecting downstream traditional navigable waters. Indeed, the existing definition of adjacency was developed in recognition of the integral role wetlands play in broader aquatic ecosystems:

> The regulation of activities that cause water pollution cannot rely on . . . artificial lines . . . but must focus on all waters that together form the entire aquatic system. Water moves in hydrologic cycles, and the pollution of this part of the aquatic system, regardless of whether it is above or below an ordinary high water mark, or mean high tide line, will affect the water quality of the other waters within that aquatic system. For this reason, the landward limit of Federal jurisdiction under Section 404 must include any adjacent wetlands that form the border of or are in reasonable proximity to other waters of the United States, as these wetlands are part of this aquatic system.

42 FR 37128, July 19, 1977.

As the Supreme Court found in *United States v. Riverside Bayview Homes, Inc.*, "the evident breadth of congressional concern for protection of water quality and aquatic ecosystems suggests that it is reasonable for the Corps to interpret the term 'waters' to encompass wetlands adjacent to waters as more conventionally defined." 474 U.S. at 133.

In upholding the Corps' judgment about the relationship between waters and their adjacent wetlands, the Supreme Court in *Riverside Bayview* acknowledged that the agencies' regulations take into account functions provided by wetlands in support of this relationship. "[A]djacent wetlands may 'serve significant natural biological functions, including food chain production, general habitat, and nesting, spawning, rearing and resting sites for aquatic . . . species.'" *Id*. at 133 (*citing* § 320.4(b)(2)(i)). The Court further stated that the Corps had reasonably concluded that "wetlands adjacent to lakes, rivers, streams, and other bodies of water may function as integral parts of the aquatic environment even when the moisture creating the wetlands does not find its source in the adjacent bodies of water." 474 U.S. at 135.

Two decades later, in *Rapanos* Justice Kennedy stated:

> As the Court noted in *Riverside Bayview*, 'the Corps has concluded that wetlands may serve to filter and purify water draining into adjacent bodies of water, 33 CFR §320.4(b)(2)(vii)(1985), and to slow the flow of surface runoff into lakes, rivers, and streams and thus prevent flooding and erosion, see §§320.4(b)(2)(iv) and (v).' Where wetlands perform these filtering and runoff-control functions, filling them may increase downstream pollution, much as a discharge of toxic pollutants would. . . . In many cases, moreover, filling in wetlands separated from another water by a berm can mean that flood water, impurities, or runoff that would have been stored or contained in the wetlands will instead flow out to major waterways. With these concerns in mind, the Corps' definition of adjacency is a reasonable one, for it may be the absence of an interchange of waters prior to the dredge and fill activity that makes protection of the wetlands critical to the statutory scheme.

547 U.S. at 775 (citations omitted).

The four dissenting justices in *Rapanos* similarly concluded:

> The Army Corps has determined that wetlands adjacent to tributaries of traditionally navigable waters preserve the quality of our Nation's waters by, among other things, providing habitat for aquatic animals, keeping excessive sediment and toxic pollutants out of adjacent waters, and reducing downstream flooding by absorbing water at times of high flow. The Corps' resulting decision to treat these wetlands as encompassed within the term 'waters of the United States' is a quintessential example of the Executive's reasonable interpretation of a statutory provision.

Id. at 778 (*citing Chevron U.S.A. Inc.* v. *Natural Resources Defense Council, Inc.,* 467 U.S. 837, 842-845 (1984)).

For those wetlands adjacent to traditional navigable waters, Justice Kennedy concluded in *Rapanos* that the agencies' existing regulation "rests upon a reasonable inference of ecologic interconnection, and the assertion of jurisdiction for those wetlands is sustainable under the Act by showing adjacency alone." 547 U.S. at 780. For other adjacent waters, including adjacent wetlands, Justice Kennedy's significant nexus standard provides a framework for establishing categories of waters which are *per se* "waters of the United States." First, he provided that wetlands are jurisdictional if they "either alone or in combination with similarly situated lands in the region, significantly affect the chemical, physical, and biological integrity of other covered waters more readily understood as 'navigable.'" *Id.* at 780. Next, Justice Kennedy stated that "[t]hrough regulation or adjudication, the Corps may choose to identify categories of tributaries that, due to their volume of flow (either annually or on average), their proximity to navigable waters, or other relevant considerations, are significant enough that wetlands adjacent to them are likely, in the majority of cases, to perform important functions for an aquatic system incorporating navigable waters." *Id.* at 780-81.

With this regulation, the agencies have identified those tributaries that are significant enough that wetlands adjacent to them are likely in the majority of cases to perform important functions for an aquatic system incorporating navigable waters. Tributaries are defined as waters "that contribute[s] flow, either directly or through another water (including an impoundment identified in paragraph (a)(4) of this section), to a water identified in paragraphs (a)(1) through (3) of this section that is characterized by the presence of the physical indicators of a bed and banks and an ordinary high water mark. These physical indicators demonstrate there is volume, frequency and duration of flow sufficient to create a bed and banks and an ordinary high water mark, and thus to qualify as a tributary." As discussed above in section VII, the scientific literature unequivocally demonstrates that streams, individually or cumulatively, exert a strong influence on the integrity of downstream waters.

While the issue was not before the Supreme Court, it is reasonable to also assess whether non-wetland waters have a significant nexus, as Justice Kennedy's opinion makes clear that a significant nexus is a touchstone for CWA jurisdiction. The agencies have determined that adjacent waters as defined in today's rule, alone or in combination with other adjacent waters in the region that drains to a traditional navigable water, interstate water or the territorial seas, significantly affect the chemical, physical, and biological integrity of those waters. The science supports the agencies' inclusion of adjacent open waters – like ponds, oxbow lakes, and other lakes – as waters that have a significant nexus. As mentioned in section II.B., open waters perform many of the same important functions as wetlands that impact downstream waters, including contribution of flow, water retention, and nutrient processing and retention.

The agencies have concluded that all waters that meet the definition of "adjacent" are similarly situated for purposes of analyzing whether they, in the majority of cases, have a significant nexus to an (a)(1) through (a)(3) water. Based on the agencies' review of the scientific literature, we have concluded that these waters provide many similar functions that significantly affect the chemical, physical, or biological integrity of traditional navigable waters, interstate waters, or the territorial seas. The scientific literature documents that waters that are adjacent to (a)(1) through (a)(5) waters, including wetlands, oxbow lakes and adjacent ponds, are integral parts of stream networks because of their ecological functions and how they interact with each other, and with downstream traditional navigable waters, interstate waters, or the territorial seas. In other words, tributaries and their adjacent waters, and the downstream traditional navigable waters, interstate waters, and territorial seas into which those waters flow, are an integrated ecological system, and discharges of pollutants, including discharges of dredged or fill material, into any component of that ecological system, must be regulated under the CWA to restore and maintain the chemical, physical, or biological integrity of these waters.

Based on the science, the agencies have concluded that waters, including wetlands, adjacent to all (a)(1) through (a)(5) waters provide vital functions for downstream traditional navigable waters, interstate waters, or the territorial seas and therefore have a significant nexus.

IX. Case-Specific Significant Nexus Determinations

The rule establishes two exclusive circumstances under which case-specific determinations will be made for whether the water has a "significant nexus" and is therefore a "water of the United States." First, the rule identifies at paragraph (a)(7) five subcategories of waters (prairie potholes, Carolina and Delmarva bays, pocosins, western vernal pools in California, and Texas coastal prairie wetlands) that the agencies have determined are "similarly situated" for purposes of the significant nexus determination. Second, the rule identifies at paragraph (a)(8) circumstances under which waters will be subject to a case-specific significant nexus determination but for which the agencies have not made a "similarly situated" determination: waters within the 100-year floodplain of a traditional navigable water, interstate water, or the territorial seas, and waters within 4,000 feet of the high tide line or the ordinary high water mark of a traditional navigable water, interstate water, the territorial seas, impoundments, or tributaries, as defined.

When selecting the circumstances under which a case-specific significant nexus determination could be made, the agencies considered their expertise and experience and available scientific literature and data. For example, the Science Report includes a focused evaluation of the connections and effects to downstream waters for several regional types of wetlands, including Carolina and Delmarva bays, prairie potholes, and vernal pools. Science Report at Appendix B. These regional types were chosen for evaluation in the Science Report because they represent a broad geographic area as well as a diversity of water types based on their origin, landscape setting, hydrology, and other factors. Individual Carolina and Delmarva bays, prairie potholes, and Western vernal pools in California may or may not be considered adjacent to (a)(1) through (a)(5) waters. Similarly, though not specifically analyzed in a case study in the Science Report, individual pocosins and Texas coastal prairie wetlands may or may not be considered adjacent to (a)(1) through (a)(5) waters. Where such waters do not meet the regulatory requirements under (a)(1) through (a)(6) to be considered a “water of the United States,” these five subcategories of waters must be evaluated to determine whether they have a significant nexus under (a)(7) in combination with other waters of the same type in the same point of entry watershed.

Case-specific determinations are made under (a)(7) and (a)(8) for waters that cannot be considered “waters of the United States” under (a)(1) through (a)(6) and that meet the criteria set out in (a)(7) and (a)(8). Case-specific determinations must be made for waters that are either in the five subcategories specified in (a)(7), or are located within the 100-year floodplain of a traditional navigable water, interstate water, or the territorial seas or located within 4,000 feet of the high tide line or the OHWM of an (a)(1) through (a)(5) water, as specified at (a)(8). Waters located within the 100-year floodplain of a traditional navigable water, interstate water, or the territorial seas beyond the 1,500 boundary for “neighboring” individually span the gradient of connectivity identified in the Science Report; they are in the floodplain of the foundational waters of the CWA, but may also may be fairly distant, and a case-specific significant nexus analysis will enable the agencies to properly consider the strength of connectivity for these particular waters. Waters within the 4,000 foot boundary are typically located outside of the floodplain, but can be connected to downstream (a)(1) through (a)(3) waters via confined surface connections, unconfined surface connections, shallow subsurface connections, deeper groundwater connections, biological connections, spillage, or by providing additional functions such as storage and mitigating peak flows. The degree of connectivity of such wetlands will vary depending on landscape features such as distance from downstream waters and proximity to other wetlands of similar nature that as a group connect to jurisdictional downstream waters. Science Report at ES-4, 4-2, 6-5.

These waters, primarily depressional wetlands, small open waters, and peatlands, are known to have important hydrologic, water quality, and habitat functions which vary as a result of the diverse settings in which they exist across the country. For example, a report that reviewed the results of multiple scientific studies concluded that depressional wetlands lacking a surface outlet functioned together to significantly reduce or attenuate flooding. Science Report at 4-25 (citing Bullock and Acreman 2003). Some of the important factors which influence the variability of their functions and connectivity include the wetland type, topography, geology, soil features, antecedent moisture conditions, available storage capacity, and seasonal position of the water table relative to the wetland. *Id*. at 4-23 and 4-25.

If a water is a great distance from a group of case-specific waters in the same point of entry watershed, it may be performing some of the same functions as those in the group, but their distance from each other or from downstream (a)(1) through (a)(3) waters will decrease the probability that it has some kind of chemical, physical, or biological connectivity to the downstream water, assuming that conditions governing the type and quantity of flows (*e.g.* slope, soil, and aquifer permeability, etc.) are similar. *Id.* at ES-4, 4-2, 6-5.

Assessing whether a particular water is a "water of the United States" because it, alone or in combination with other similarly situated waters, has a significant nexus to an (a)(1) through (a)(3) water will be determined on a case-specific basis. The science supports the agencies' determination that waters that do not otherwise meet the definition of "waters of the United States" under paragraphs (a)(1) through (a)(6) of the rule can on a case-specific basis have a significant nexus to downstream traditional navigable waters, interstate waters, or the territorial seas. For instance, the SAB in its review of the technical basis of the rule concluded, "[t]he scientific literature has established that 'other waters' can influence downstream waters, particularly when considered in aggregate. Thus, it is appropriate to define 'other waters' as waters of the United States on a case-by-case basis, either alone or in combination with similarly situated waters in the same region." SAB 2014b at 3. In the final rule, the agencies have amended the "other waters" category into the two case-specific categories at (a)(7) and (a)(8).

As with other non-tidal open waters (*e.g.* ponds and lakes), case-specific waters that have a significant nexus are delineated using the ordinary high water mark, while such case-specific waters that are wetlands are delineated using the 1987 Corps Delineation Manual and its ten regional supplements.

A. Five Subcategories of Waters are "Similarly Situated"

The agencies have determined by rule that prairie potholes, Carolina and Delmarva bays, pocosins, Texas coastal prairie wetlands, and western vernal pools in California are similarly situated. *See, e.g.*, Tiner 2003c; Forbes et al. 2012. These waters, where they do not meet the provisions of other parts of the rule, are to be evaluated in combination with other waters of the same subcategory located in the same watershed that drains to the nearest traditional navigable water, interstate water, or the territorial seas (point of entry watershed) for a case-specific significant nexus analysis.

The agencies' determination that the five subcategories of waters specified in (a)(7) are similarly situated is informed by science and the agencies' experience and technical expertise. Specifically, the SAB stated there is "also adequate scientific evidence to support a determination that certain subcategories and types of 'other waters' in particular regions of the

United States (e.g., Carolina and Delmarva Bays, Texas coastal prairie wetlands, prairie potholes, pocosins, western vernal pools) are similarly situated (i.e., they have a similar influence on the physical, chemical, and biological integrity of downstream waters and are similarly situated on the landscape) and thus could be considered waters of the United States." SAB 2014b. In addition, as described in more detail in sections IX.A.i. through IX.A.v. below, the agencies have determined that waters in each of the five subcategories function alike and are sufficiently close to function together in affecting downstream waters when in the same point of entry watershed.

The agencies at this time are not able to determine that the available science supports that the five subcategories of waters as a class have a significant nexus to traditional navigable waters, interstate waters, or the territorial seas. This is because individual waters of the class vary in the level of connectivity and the effects of that connectivity to downstream waters. However, the agencies conclude that the science supports that such waters, particularly when considered in combination with similarly situated waters, can on a case-specific basis have a significant nexus to (a)(1) through (a)(3) waters in light of their numerous functions that can impact downstream water integrity of (a)(1) through (a)(3) waters. The Science Report concludes, "current science does not support evaluations of the degree of connectivity for specific groups or classes of wetlands (*e.g.*, prairie potholes or vernal pools). Evaluations of individual wetlands or groups of wetlands, however, could be possible through case-by-case analysis." Science Report at ES-4.

The specific subcategories of similarly situated waters under (a)(7) – prairie potholes, Carolina and Delmarva bays, pocosins, western vernal pools in California, and Texas coastal prairie potholes – are discussed below.

i. Prairie Potholes

Prairie potholes are a complex of glacially formed wetlands, usually occurring in depressions that lack permanent natural outlets, found in the central United States and Canada. Science Report at B-14; Tiner 2003c. In the United States, they are found from central Iowa through western Minnesota, eastern South Dakota, and North Dakota. van der Valk and Pederson 2003. The vast area they occupy is variable in many aspects, including climatically, topographically, geologically, and in terms of land use and alteration, which imparts variation on the prairie potholes themselves. Science Report at B-14 to B-15 (citing van der Valk and Pederson 2003; Kahara *et al*. 2009). Prairie potholes demonstrate a wide range of hydrologic permanence; some hold permanent standing water and others are wet only in years with high precipitation. This in turn influences the diversity and structure of their biological communities. *Id.* at B-14.

Prairie potholes generally accumulate and retain water effectively due to the low permeability of their underlying soil, which can modulate flow characteristics of nearby streams and rivers and reduce flooding downstream. *Id.* One of the most noted hydrologic functions of prairie potholes is water storage. Because most of the water outflow in prairie potholes is via evapotranspiration, prairie potholes can become water sinks, preventing flow to downstream waters. *Id.* at B-15 (citing Carroll *et al*. 2005; van der Kamp and Hayashi 2009); Tiner 2003c. When considered in combination with other prairie potholes in the watershed, these wetlands provide considerable surface-water capacity. Tiner 2003c. For example, in various subbasins across the Prairie Pothole Region, including those that feed Devils Lake and the Red River of the North, both of which have a long history of flooding, potholes have consistently been estimated to hold tens of millions of cubic meters of water. Science Report at B-17 (citing Hubbard and

Linder 1986; Vining 2002; Gleason *et al*. 2007). Prairie potholes in North Dakota's Devils Lake Basin can store as much as 72% of the total runoff from a two-year frequency storm and about 41% from a 100-year storm. Tiner 2003c. This water storage controls seasonal flooding. *Id*. Another study involving prairie potholes draining to Devils Lake indicated that streamflow declines substantially with increased wetland storage capacity. Science Report at 6-6. Increasing the volume of pothole storage across the subbasin by approximately 60% caused simulated total annual streamflow to decrease by 50% during a series of dry years and by 20% during wet years. *Id.* Similarly, studies of the Red River of the North in North Dakota and Minnesota suggest the ability of prairie potholes to control streamflow could be widespread across eastern portions of the Prairie Pothole Region. *Id.* Reducing water storage capacity of wetlands by connecting formerly isolated potholes through ditching or drainage to the Devils Lake and Red River basins could increase stormflow and contribute to downstream flooding. *Id.* The impacts of changing streamflow are numerous, including altered flow regime, stream geomorphology, habitat, and ecology.

Prairie potholes also can accumulate and transform various pollutants, including nutrients and chemicals in overland flow, thereby reducing chemical loading and pollution to other bodies of water. *Id.* at B-14; 6-6. Denitrification that takes place in the anaerobic zone of these wetlands can make them effective nitrogen sinks. *Id.* at B-16 (citing van der Valk 2006).When prairie potholes are artificially connected to streams and lakes through drainage, they become sources of water and chemicals to downstream waters. *Id.*

Prairie potholes also support a community of highly mobile organisms, from plants to invertebrates that move among prairie potholes and that can biologically connect the entire complex to the river network. *Id.* at B-14. These mobile organisms can move from prairie potholes to the river network and vice versa via wind, water, or land, by either self-propelling or hitchhiking on other mobile organisms, similar to the ability of organisms to move to and from adjacent waters and throughout the tributary network. *Id.* at B-20 (citing Keiper *et al*. 2002; Soons 2006). Plants and invertebrates can also travel by becoming attached to or consumed and excreted by waterfowl. *Id.* (citing Amezaga *et al*. 2002). Dispersal via waterfowl can occur over long distances. *Id.* (citing Mueller and van der Valk 2002). Perhaps the best-known and most well-studied attribute of prairie potholes is their role as productive feeding and nesting habitat for waterfowl. *Id.* at B-17. Waterfowl often move between prairie wetlands during the breeding season in search of food and cover, and some species also use habitats within the river network as wetlands dry or freeze. *Id* (citing Pattenden and Boag 1989; Murkin and Caldwell 2000). In addition, a diverse assemblage of microorganisms, invertebrates, amphibians, reptiles, and sometimes fish, use potholes to feed or reproduce. *Id.* at B-14 (citing Hentges and Stewart 2010). Fish and other organisms that can be suspended in water (*e.g*., floating insect larvae or seeds) and can also move through manmade waterways that connect prairie potholes to stream networks. *Id.* at B-20 (citing Zimmer *et al*. 2001; van der Valk and Pederson 2003; Hanson *et al*. 2005; Hentges and Stewart 2010; Herwig *et al*. 2010). Overland movement of amphibians and mammals can connect potholes to each other and to lakes and streams, and some species can disperse over long distances to feed and breed. *Id.* at B-21 (citing Clark 2000; Lehtinen and Galatowitsch 2001; Winter and LaBaugh 2003).

Prairie potholes can be highly connected to other prairie potholes or to the stream network via surface hydrologic connections during the wet season. Temporary hydrologic connectivity between prairie potholes and from prairie potholes to the tributary system can periodically occur via “fill-and-spill” events. *Id.* at B-12 (citing Winter and Rosenberry 1998;

Leibowitz and Vining 2003). “Fill-and-spill” describes situations where wetlands or open waters fill to capacity during intense precipitation events or high cumulative precipitation over time and then spill to another water, such as another wetland in the same wetland complex or to a downstream stream or lake. *See, e.g., id.*; Tromp-van Meerveld and McDonnell 2006. In essence, water fills in one aquatic research and spills downstream to another. Water connected through such flows originates from the wetland or open water, travels to the downstream water, and is connected to the downstream water or waters by swales or other directional flowpaths on the surface. A directional flowpath is a path where water flows repeatedly from the wetland or open water to another water, and that at times contains water originating in the wetland or open water as opposed to just directly from precipitation. Factors such as climate, local topography, and stream density can impact the likelihood and frequency surface hydrologic connections. Science Report at B-18. For instance, the relatively wet and topographically low Red River Valley zone of the prairie pothole region should display greater surface-water connectivity of prairie potholes than either the Draft Prairie or Missouri Coteau zones, while the higher stream density in the Red River Valley or Drift Prairie should increase the chance that prairie pothole spillage connects to the larger river network. *Id.* (citing Leibowitz and Vining 2003).

Shallow subsurface connections and deeper regional groundwater flows can also highly connect prairie potholes to other prairie potholes and to the river network. A high water table and soil pocketed with root pores or fractures from wet-dry cycles promote water movement between wetlands via shallow groundwater aquifers. *Id.* In these cases, water moves most often from topographically high, recharge wetlands to low, discharge wetlands, although a single wetland can shift from recharge to discharge in years where the water table is high. *Id.* (citing Carroll *et al*. 2005; van der Kamp and Hayashi 2009). Other wetlands shift multiple times from recharge to discharge conditions during a single year, which can either facilitate or prevent ground-water connections to nearby wetlands. *Id.* at B-18 to B-19 (citing Rosenberry and Winter 1997). Prairie potholes can also connect to the river network via groundwater if both are located within the zone of shallow local aquifer flows. *Id.* at B-19. For instance, prairie pothole wetlands and lakes can serve as waters sources to the downstream James River via shallow subsurface connections. *Id.* (citing Swanson *et al*. 1988).

Prairie pothole density across the landscape varies from region to region as the result of several factors, including patterns of glacial movement, topography, and climate. *Id.* at B-14 to B-15 (citing van der Valk and Pederson 2003; Kahara *et al*. 2009). In some parts of the region, prairie pothole density is very high. Though their density varies across the landscape, prairie potholes often act as a complex. *Id.* at B-14. They have similar functions that can collectively impact downstream waters.

Prairie potholes have been determined to be similarly situated based on the characteristics of this resource type, including their density on the landscape, their interaction and formation as a complex of wetlands and open waters, their connections to each other and the tributary network, and their similar functions. In addition, their chemical, physical, and biological connections to downstream waters and the strength of their effects on the chemical, physical, or biological integrity of a traditional navigable water, interstate water, or the territorial seas support this determination that prairie potholes are similarly situated by rule.

ii. Carolina and Delmarva Bays

Carolina and Delmarva bays are elliptical, ponded, depressional wetlands that occur along the Atlantic coastal plain from northern Florida to New Jersey. *Id.* at 5-2, B-1 (citing Prouty 1952; Williams 1996; Hunsinger and Lannoo 2005; Tiner 2003c. They typically are oriented in a northwest-southwest direction, with a sand rim to the southeast. Sharitz 2003. Though Carolina and Delmarva bays are from the same category of wetland and perform similar functions, they are located in different parts of the Atlantic coastal plain and thus have unique names. Carolina bays are most abundant in North Carolina and South Carolina, while Carolina bays found in the Delmarva Peninsula are commonly referred to as Delmarva bays or Delmarva potholes. Science Report at 5-2, B-1 (citing Sharitz and Gibbons 1982; Sharitz 2003); Tiner 2003c. Delmarva bays frequently have the same elliptical shape and orientation as other Carolina bays, but some lack the shape or rim. *Id.* at B-1 (citing Stolt and Rabenhorst 1987a; Sharitz 2003).

Most bays receive water through precipitation, lose water through evapotranspiration, and lack natural surface outlets. *Id.* at B-1, B-3 (citing Sharitz 2003). Though the name "bay" suggests the presence of water, these shallow basin wetlands in fact range from permanently inundated to frequently dry. *Id*. at B-1 (citing (Sharitz 2003). The water levels of bays fluctuate in response to seasonal rainfall, snowmelt, and temperature, and bays are often wetter in winiter and early spring and tend to dry down in the summer. *Id.* at B-3. Both mineral-based and peat-based bays have shown connections to shallow groundwater, via both nearly continuous shallow groundwater recharge and periodic shallow groundwater discharge. *Id.* at 5-2, B-1. Some recharge water eventually discharges into local streams and contributes to their base flows. Tiner 2003c. Due to their abundance on the landscape, they can provide temporary storage of surface water during storm events and periods of heavy rainfall, helping to reduce local flooding. Sharitz 2003; Tiner 2003c. Bays typically are in proximity to each other or to streams, providing for hydrologic connections to each other and to downstream waters in large rain events via overland flow or shallow subsurface connections. Science Report at B-3. Some Delmarva bays are intersected by natural stream channels and thus have surface water connections to the Chesapeake Bay. *Id.* at B-3 (citing Lang *et al*. 2012). Some Carolina bays are directly connected to flatwood wetlands that drain into coastal streams and rivers, while others have small creeks flowing into them or form the headwaters of perennial streams. Sharitz 2003; Tiner 2003c. In addition, human channeling and ditching of the bays are widespread and create surface connections to other waters, including the tributary system and estuaries. These ditches commonly connect the surface water of bays to other bays that are lower on the landscape, and ultimately, to streams. Some bays, particularly those along the coast, can be flooded by high tides and thus are connected to coastal waters. Science Report at B-3 (citing Bliley and Pettry 1979; Sharitz 2003).

Where they occur, hydrologic connections are likely to result in effects on downstream waters. *Id.* at 5-2. The hydrology in bays (periodic wetting and drying) allows for denitrification, which can reduce the amount of nitrate in both groundwater and downstream surface waters. *Id.* A study of a Carolina bay used long-term for agriculture suggests that the wetlands can be effective at retaining excess nutrients and heavy metals. Ewing *et al.* 2012. Seasonal connections of Delmarva bays to stream networks export accumulated organic matter from wetlands into tributaries of Chesapeake Bay. *Id.* Because bays are frequently connected chemically to downstream waters through ditches, they can be sources of sediment and nutrients to downstream waters. Where they are not connected via confined surface connections, bays can act as sediment and nutrient sinks.

Carolina and Delmarva bays provide valuable habitat and food web support for numerous plant and animal species that can move between bays and other water bodies. *Id.* at 5-2. Fish are reported in bays that are known to dry out, indirectly demonstrating surficial connections through either overland flow during periods of high water or via ditches. *Id.* at B-1; Sharitz 2003. Amphibians and reptiles use bays extensively for breeding and for rearing young. Science Report at B-1. In bays that lack fish, the absence of predators allows abundant amphibian populations to thrive. *Id.* at 5-2. These animals can then disperse many feet on the landscape and can colonize, or serve as a food source to, downstream waters. *Id.* at B-1. Similarly, bays foster abundant aquatic insects that have the potential to become part of the downstream food chain. *Id.* at B-1. As mentioned above, humans have ditched and channelized a high percentage of bays for agricultural or logging purposes, creating new surface connections to downstream waters and allowing transfer of nutrients, sediment, and other pollutants such as methylmercury. *Id.* ab B-1 (citing Bennett and Nelson 1991; Sharitz 2003).

Carolina and Delmarva bays are densely concentrated in many areas and can act as a wetlands complex. *See, e.g.,* Science Report at 5-2. Bays have similar functions to other bays and cumulatively these functions can impact downstream waters.

The agencies conclude that Carolina and Delmarva bays are similarly situated based on their close proximity to each other and the tributary network, their hydrologic connections to each other and the tributary network, their density on the landscape, and their similar functions.

iii. Pocosins

The word pocosin comes from the Algonquin Native American word for “swamp on a hill,” and these evergreen shrub and tree-dominated wetlands are found from Virginia to northern Florida, but mainly in North Carolina. Richardson 2003; Tiner 2003c. Bay, bayland, bayhead, xeric shrub bog, and evergreen shrub bog are common synonyms for pocosin, but generally only bays in the lower Coastal Plain have vegetation similar to pocosins. *Id.* In addition, pocosin and Carolina bays differ in size and geologic origin. *Id.* Their hydrogeomorphic classification would be "wet flats" on organic soils. *Id.;* Rheinhardt *et al.* 2002. They range in size from less than an acre to several thousand acres.

Pocosins are generally located on interfluves, or the area of higher land between ancient rivers and coastal sounds on the South Atlantic Coastal Plain. Richardson 2003; Tiner 2003c; Osterkamp 2008. They are found on flat, clay-based soils, in shallow basins and have water poor in nutrients (oligotrophic). Richardson 2003. The pocosins landscape undergoes a succession that is hypothesized to be from marsh to swamp forest to bay forest to tall pocosin to short pocosins. *Id.* Tall pocosins typically occur over shallower peat deposits, have higher soil nutrient content, and have taller and more trees and shrubs than short pocosins.

Pocosins receive most or all of their water from precipitation. Richardson 1983; Tiner 2003c. These wetlands have long hydroperiods, temporary surface water, periodic burning, and soils of sandy humus, muck, or peat. Richardson 2003. Usually, there is no standing water present in these peat-accumulating wetlands, but a shallow water table leaves the soil saturated for much of the year. Tiner 2003c. High evapotranspiration during the summer can lower the water table and gives pocosins extensive capacity to store stormwater. Richardson 1983. Pocosins temporarily hold water and then slowly release it to downstream waters. Tiner 2003c. The slow movement of water through the dense organic matter in pocosins removes excess nutrients deposited by rainwater. The same organic matter also acidifies the water. This pocosin-purified water is slowly released to downstream waters and estuaries, where it helps to maintain the proper salinity, nutrients, and acidity. Richardson 2003. Given their proximity to estuaries, the ability to retain floodwaters is particularly important because it gives estuaries time to absorb and process the freshwater runoff without rapid and drastic fluxes in water quality. Tiner 2003c.

Because pocosins are the topographic high areas on the regional landscape, they serve as the source of water for downstream waters. Rheinhardt *et al.* 2002; Richardson 2003. They often are hydrologically connected to the stream network via confined surface flow, sheetflow, or shallow subsurface flows. Richardson 2003. For example, some pocosins are located at the headwaters, while other pocosins occur in swales and in seasonally saturated interfluves. Rheinhardt *et al.* 2002; Tiner 2003c. Pocosins often have seasonal connections to drainageways leading to estuaries or are adjoining other wetlands draining into perennial streams or estuaries. Tiner 2003c. Other pocosins have been ditched and are directly connected to streams. *Id.* Pocosins are the main sources of fresh water on the coastal landscape where the cover a large expanse. Richardson 2003. The amount and timing of the runoff from these wetlands is critical to downstream flows and water quality, particularly in the estuaries. *Id.*; Richardson 1983; Richardson 2012.

The largest area of the wetland complex is the short pocosin, which has the deepest peat. Richardson 2003; Richardson 2012. Runoff drains slowly from short pocosins to shallow dystrophic lakes (brown- or tea-colored lakes that are colored as the result of high concentrations of humic substances and organic acids suspended in the water) or the surrounding tall pocosins. *Id.* Water flows laterally into either shallow lakes or into small streams, and then flows into the bay forest communities at the downstream end of the pocosin systesm. *Id.* The components of the pocosin complex are also likely connected by shallow subsurface connections. *Id.*

Pocosins provide habitat for many species that utilize both the wetlands and nearby streams for different life cycle needs. This includes the pine barrens tree frog and the American alligator. Richardson 2003.

Ditching and conversion of pocosins can have major detrimental effects on the quality of coastal waters. When pocosins are artificially drained via ditches, the value of their buffering capacity is lost, and the ditched pocosins may contribute possibly enriched water downstream via their direct hydrologic connection. *Id.* Many pocosins have been converted for forestry and agricultural purposes. Conversion of pocosins to agriculture has lowered salinity in nearby estuaries, particularly during periods of heavy precipitation due to introduction of more fresh water from cropland drainage, increased peak flow rates (up to three to four times that of undrained pocosins, increased turbidity, and increased concentration of nutrients such as phosphate, nitrate, and ammonia in streams and nearby estuaries. *Id.* The draining of pocosins and decreased the associated salinity in estuaries may be having a negative effect on brown shrimp in North Carolina. *Id.*

The agencies conclude that pocosins are similarly situated based on their close proximity to each other and the tributary network, their hydrologic connections to each other and the tributary network, their density on the landscape, and their similar functions. Based on these connections and the strength of their effects, in combination with other pocosins in the watershed, on the chemical, physical, or biological integrity of an (a)(1) through (a)(3) water, the agencies will determine on a case-specific basis if such waters have a significant nexus and are jurisdictional.

iv. Western Vernal Pools in California

Vernal pools are shallow, seasonal wetlands that accumulate water during colder, wetter months and gradually dry up during warmer, drier months. Science Report at B-60; Tiner 2003c. Western vernal pools are seasonal wetlands in western North America from Washington and Oregon to northern Baja California, Mexico associated with topographic depressions, soils with poor drainage, mild, wet winters and hot, dry summers. Science Report at B-60 (citing Bauder and McMillan 1998); Tiner 2003c. For purposes of this rule, the agencies have determined that western vernal pools in California are "similarly situated."

Western vernal pools in California have formed in mound and swale topography and located primarily in parts of the California steppe (Central Valley) and coastal terraces and level terraces of California's coastal mountains. Zedler 1987; Tiner 2003c. Western vernal pools in California occur on impermeable or slowly permeable soils or bedrock that limit percolation and thus produce surficial aquifers that perch above regional ground-water aquifers. *Id.* at B-61 (citing Smith and Verrill 1998). Pool-forming soil layers in this region include clay-rich soils, silica-cemented hardpans (duripans), volcanic mudflows, or bedrock. *Id.* (citing Weitkamp *et al*. 1996; Hobson and Dahlgren 1998; Smith and Verrill 1998; Rains *et al*. 2006). Clay-rich and hardpan vernal pool complexes are particularly common in California's Central Valley. *Id.* at B-63 (citing Smith and Verrill 1998).

Western vernal pools are cyclical wetlands with very different seasonal vegetative cover and water levels. Tiner 2003c. Western vernal complexes saturate and begin to pool during winter rains, reach maximum depth by early spring, and lose all standing water by late spring. Science Report at B-62 (citing Zedler 1987). Zedler (1987) described western vernal pools as generally having four distinct phases or stages in the annual hydrologic cycle that highlight their cyclic seasonality:

- Wetting or newly flooded phase: The first fall rains stimulate the germination of dormant seeds and the growth of perennial plants. Typically seedlings and resprouts densely develop before the pools hold water for any prolonged period. Rainwater, snow, runoff, or snowmelt infiltrate upper layers of permeable soil and, when topsoils are saturated, collect in pool basins formed by impervious rock, clay, or till layers (aquitards or aquicludes). Science Report at B-61; Zedler 1987; Rains *et al.* 2008.

- Aquatic phase: Soils are saturated when the cumulative rainfall is sufficient and pools hold standing water, in many locations filled to capacity. In some western vernal pools, surface and subsurface flows from upland pools through swales feed downgradient pools, connecting pools at a site and extending the aquatic phase of the pool complex. Science Report at B-61 to B-52 (citing Weitkamp *et al*. 1996; Hanes and Stromberg 1998); Zedler 1987. Pools are colonized by dispersing aquatic insects and breeding amphibians.
- Drying phase: Evapotranspiration rates increase and pool water recedes, although soils remain saturated. Plant growth continues after the standing water disappears due to high soil moisture. Aquatic plants flower and seed. Aquatic animals disperse or become dormant. Terrestrial plant communities persist. Science Report at B-52; Zedler 1987.
- Drought phase: Pools and soils dry out, and many plants dry out or die. Some plants able to access deeper moisture may continue to grow and flower even into early fall. Drying cracks materialize. Even if summer rains occur, generally no new ponding or plant growth occurs. Science Report at B-52; Zedler 1987.

As suggested above, the wetlands are primarily precipitation fed. Science Report at B-62. Though they typically lack permanent inflows from or outflows to streams and other water bodies, western vernal pools, they can be connected temporarily to such waters via surface or shallow subsurface flow (flow through) or groundwater exchange (recharge). Hydrologic connectivity is typically limited to flow through in western vernal pools formed by perching layers; groundwater exchange can occur in western vernal pool systems without perching layers (Brooks 2005).

Because their hydrology and ecology are so tightly coupled with the local and regional geological processes that formed them, western vernal pools typically occur within "vernal pool landscapes," or complexes of pools in which swales connect pools to each other and to seasonal streams. *Id.* at B-61 (citing Weitkamp *et al.* 1996; Smith and Verrill 1998; Rains *et al.* 2006; Rains *et al.* 2008). Weitkamp *et al*. 1996; Brooks 2005; Rains *et al*. 2008). The winter rains characteristic of the region's Mediterranean climate fill the depressional wetlands and swales, and they may remain flooded for weeks or months in certain years. Tiner 2003. Temporary storage of heavy rainfall and snowmelt in individually small vernal pool systems (pools plus soils) can attenuate flooding that would otherwise reach downstream waters. Science Report 5-9. Some common findings about the hydrologic connectivity of western vernal pools include evidence for temporary or permanent outlets, frequent filling and spilling of higher pools into lower elevation pools, swales, and stream channels, and conditions supporting subsurface flows through pools without perched aquifers to nearby streams. *Id.* at 5-9, B-63 (citing Hanes and Stromberg 1998; Pyke 2004; Bauder 2005; Rains *et al.* 2006; Rains *et al.* 2008). For example, California vernal pools spill water a great number of days during the years via channels, providing water downstream. *Id*. at 4-21 (citing Rains *et al*. 2006; Rains *et al*. 2008). Western vernal pool basins, swales, and seasonal streams were shown to be part of a single surface-water and shallow subsurface system connected to the river network when precipitation exceeds storage capacity of the wetland system. *Id.* at B-63 (citing Rains *et al*. 2006; Rains *et al*. 2008). In extremely wet years, individual vernal pools coalesce to form large inundated complexes that can drain to the tributary system. Zedler 1987; Tiner 2003. Other studies showed that direct precipitation could fill pools to or beyond capacity in most years, creating conditions under which water flows from pools into swales and stream channels. Science Report at B-63, B-66 (citing Hanes and Stromberg 1998; Pyke 2004). Collectively, these findings suggest that filling and overflow of western vernal pools are not rare phenomena. *Id.*

The timing of seasonal inundation and lack of permanent surface connections make vernal pools important biological refuges, which has consequences on the biological health of downstream waters. *Id.* at 5-9. Western vernal pools support large breeding populations of amphibians, aquatic invertebrates, and aquatic or semi-aquatic plants, including many that are rare or endemic. *Id.* at B-62. Non-glaciated vernal pools in western states are reservoirs of biodiversity and can be connected genetically to other locations and aquatic habitats through wind- and animal-mediated dispersal. The annual four phases play an important role in structuring biological communities in western vernal pools. The wetting phase prevents establishment of upland plant species in vernal pool basins, while the drought phase limits colonization by aquatic and semiaquatic plant and animal species that occur in permanent wetlands, ponds, or streams. *Id.* (citing Keeley and Zedler 1998; Bauder 2000). Despite their cyclical nature, western vernal pool habitats are species rich and highly productive, in part because they provide relatively predator-free breeding habitat for aquatic invertebrates and amphibians. *Id.* (citing Keeley and Zedler 1998; Calhoun *et al*. 2003). Many resident species are locally adapted to the timing and duration of inundation, soil properties, and spatial distribution of western vernal pools in a specific geographic subregion. *Id.* Other species that are widespread across regions and aquatic habitat types (including streams or lakes) use inundated pools periodically for refuge, reproduction, or feeding. *Id.* (citing King *et al*. 1996; Williams 1996; Colburn 2004). Western vernal pools can play an important role in the food web and other lifecycle needs of species that utilize both the vernal pools and waters in the tributary network. In addition, aquatic and semi-aquatic animals and other organisms, like the Pacific tree frog and the western spadefoot toad, can move between western vernal pool complexes and streams. Insects and zooplankton can be flushed from vernal pools into streams and other water bodies during periods of overflow, carried by animal vectors (including humans), or dispersed by wind. Plant seeds and invertebrate eggs and larvae can also disperse into streams and other water bodies via birds, and this dispersal can be critical to maintaining the species diversity of both western vernal pools and streams and other waters in the tributary network. Zedler 1987. The effects of dispersal on community structure and diversity—including metapopulation effects of wetland-to-wetland connectivity—have been well documented, especially for amphibians. Science Report at 4-31 (citing, *e.g.*, Wellborn *et al.* 1996; Snodgrass *et al.* 2000; Julian *et al*. 2013).

As mentioned previously, western vernal pools provide an example of cumulative effects over time. *Id.* at 1-11. They typically occur as complexes in which the hydrology and ecology are tightly coupled with the local and regional geological processes that formed them. When seasonal precipitation exceeds wetland storage capacity and wetlands overflow into the river network and generate stream discharge, the vernal pool basins, swales, and seasonal streams function as a single surface-water and shallow ground-water system connected to the river network.

The agencies conclude that western vernal pools are similarly situated based on their close proximity to each other and the tributary network, their interaction and arrangement as a complex of wetlands, their hydrologic connections to each other and the tributary network, their density on the landscape, and their similar functions.

v. Texas Coastal Prairie Wetlands

Along the Gulf of Mexico from western Louisiana to south Texas, freshwater wetlands occur as a mosaic of depressions, ridges, swales, intermound flats, and mima mounds. Comer *et al.* 2008 (Appendix III); Forbes *et al.* 2012. These coastal prairie wetlands were formed thousands of years ago by ancient rivers and bayous and once occupied almost a third of the landscape around Galveston Bay, Texas. The mosaic of Texas coastal prairie wetlands typically are located on a flat landscape with microtopography that gently slopes toward the Gulf of Mexico. Enwright *et al.* 2011. The term Texas coastal prairie wetlands is not used uniformly in the scientific literature but encompasses Texas prairie pothole (freshwater depressional wetlands) and marsh wetlands that are described in some studies that occur on the Lissie and Beaumont Geological Formations, and the Ingleside Sand. Enwright *et al.* 2011; Moulton and Jacob 2000. The extensive coverage and distribution of this wetland type through the Gulf coastal plain demonstrates that they form an integral component of the regional landscape. Enwright *et al.* 2011.

Texas coastal prairie wetlands are locally abundant and in close proximity to other coastal prairie wetlands and function together cumulatively. *See, e.g.,* Enwright *et al.* 2011. Collectively as a complex, Texas coastal prairie wetlands can be geographically and hydrologically connected to each other via swales and connected to downstream waters, contributing flow to those downstream waters. Wilcox *et al*. 2011. Even where not connected by swales, during some rainfall events, individual wetlands can fill and spill into down-gradient wetlands. Sipocz 2002; Sipocz 2005; Enwright *et al.* 2011; Wilcox *et al.* 2011. One study found that in a study area near Galveston Bay, over one-third of the precipitation that fell within the study area was captured within Texas coastal prairie wetland drainage basins and thus have the potential for the wetlands to provide floodwater storage and water quality benefits to downstream waters. Enwright *et al.* 2011. In other study, during a study period of almost four years, nearly 20% of the precipitation that fell on a Texas coastal prairie wetland complex flowed as surface runoff through an intermittent stream to the nearby Armand Bayou, a traditional navigable water. Science Report at 4-22 (citing Wilcox *et al*. 2011). Intermittent drawdown due to evapotranspiration is a natural feature of this wetland type that increases their flood storage capacity. *Id.* Another study found that Texas coastal prairie wetlands intercept runoff before it enters large water bodies and thus have the opportunity to filter pollutants before they reach downstream (a)(1) through (a)(3) waters, such as Galveston Bay. Sipocz 2002; Sipocz 2005. Cumulatively, these wetlands can control nutrient release levels and rates to downstream waters, as they capture, store, transform and pulse releases of nutrients to those waters. Enwright *et al.* 2011; Forbes *et al.* 2012.

The agencies conclude that Texas coastal prairie wetlands are similarly situated based on their close proximity to each other and the tributary network, their hydrologic connections to each other and the tributary network, their interaction and formation as a complex of wetlands, their density on the landscape, and their similar functions.

B. Waters within the 100-Year Floodplain of a Traditional Navigable Water, Interstate Water, or the Territorial Sea and Waters within 4,000 Feet of the High Tide Line or Ordinary High Water Mark

Paragraph (a)(8) in the rule specifies that a water that does not otherwise meet the definition of adjacency is evaluated on a case-specific basis for significant nexus where it is located within the 100-year floodplain of a traditional navigable water, interstate water, or the territorial seas or located within 4,000 feet of the high tide line or the ordinary high water mark of a traditional navigable water, interstate water, the territorial seas, impoundment, or covered tributary. Although these waters are not considered similarly situated by rule, waters under this paragraph can be determined on a case-specific basis to be similarly situated. If a portion of the water is located within the 100-year floodplain of a traditional navigable water, interstate water, or the territorial seas or 4,000 feet of the high tide-line or ordinary high water mark of a traditional navigable water, interstate water, the territorial seas, impoundment, or covered tributary, the entire water will be considered to be within the boundaries for (a)(8) and will undergo a case-specific significant nexus determination.

i. Waters within the 100-Year Floodplain of a Traditional Navigable Water, Interstate Water, or the Territorial Sea

The agencies have determined that on a case-specific basis, waters located within the 100-year floodplain of a traditional navigable water, interstate water, or the territorial sea can have significant nexus with that (a)(1) through (a)(3) water, when considered individually or in combination with similarly situated waters. As discussed in sections III and VIII of this document, the scientific literature, including the Science Report, supports that wetlands and open waters in floodplains are physically, chemically, and biologically connected to downstream traditional navigable waters, interstate waters, or the territorial seas and significantly affect the integrity of such waters. As noted above, the Science Report concludes that wetlands and open waters located in "floodplains are physically, chemically and biologically integrated with rivers via functions that improve downstream water quality, including the temporary storage and deposition of channel-forming sediment and woody debris, temporary storage of local ground water that supports baseflow in rivers, and transformation and transport of stored organic matter." Science Report at ES-2 to ES-3. Such waters act as the most effective buffer to protect downstream waters from nonpoint source pollution (such as nitrogen and phosphorus), provide habitat for breeding fish and aquatic insects that also live in streams, and retain floodwaters, sediment, nutrients, and contaminants that could otherwise negatively impact the condition or function of downstream waters. As discussed above and in the preamble, in defining waters as adjacent, and therefore categorically jurisdictional, the agencies established a 1,500 foot boundary for waters located within the 100-year floodplain of an (a)(1) through (a)(5) water in order to protect vitally important waters while at the same time providing a practical and implementable rule. In light of the science on the functions provided by floodplain waters and wetlands, open waters and wetlands within the 100-year floodplain of traditional navigable waters, interstate waters, or the territorial seas are likely to provide those functions for traditional navigable waters, interstate waters, or the territorial seas. Moreover, because of the unique status under the CWA of traditional navigable waters, interstate waters, and the territorial seas, the 100-year floodplain boundary for these waters provides a means of identifying on a case-specific basis those waters that significantly affect traditional navigable waters, interstate waters or the territorial seas. However, because the 100-year floodplain of a traditional navigable water can, in some case be quite large, the agencies concluded it was reasonable to subject waters and wetlands in the 100-year floodplain that are beyond 1,500 feet of the ordinary high water mark, and therefore do not meet the definition of "neighboring," to a case-specific significant nexus analysis rather than concluding that such waters are categorically jurisdictional.

This inclusion of a case-specific analysis for such floodplain waters is supported by the SAB. The SAB concluded that "distance should not be the sole indicator used to evaluate the connection of 'other waters' to jurisdictional waters." SAB 2014b at 3. In allowing the case-specific evaluation of waters within the 100-year floodplain of (a)(1) through (a)(3) waters that do not meet the definition of adjacency, the agencies are allowing for the functional relationship of those floodplain waters to be considered regardless of distance. The SAB also supported the Science Report's conclusion that "the scientific literature strongly supports the conclusions that streams and 'bidirectional' floodplain wetlands are physically, chemically, and/or biologically connected to downstream navigable waters; however, these connections should be considered in terms of a connectivity gradient." SAB 2014a at 1. In addition, the SAB noted, "the literature review does substantiate the conclusion that floodplains and waters and wetlands in floodplain settings support the physical, chemical, and biological integrity of downstream waters." *Id*. at 3. By allowing for waters, including wetlands, that are outside the distance limitations set under neighboring but still within the 100-year floodplain of an (a)(1) through (a)(3) water, the agencies are recognizing the science supporting the important effects that floodplain waters have on the chemical, physical, and biological integrity of traditional navigable waters, interstate waters, and the territorial seas.

The agencies do not anticipate that there will be numerous circumstances in which this provision will be utilized because relatively few traditional navigable waters will have floodplains that span more than 4,000 feet from the high tide line or the ordinary high water mark (the other threshold in (a)(8) for waters regardless of floodplain). Further, the agencies recognize that extensive areas of the nation's floodplains have been affected by levees and dikes which reduce the scope of flooding. In these circumstances, the scope of the 100-year floodplain is also reduced and is reflected in FEMA mapping. In circumstances where there is little or no alteration of the floodplain of an (a)(1) through (a)(3) water and it remains relatively broad, the agencies will explicitly consider distance between the water being evaluated and the TNW, interstate water, or territorial seas when making a case-specific significant nexus determination.

Based on the science concerning the important functions provided by floodplain waters and wetlands, the agencies established this provision to ensure that truly important waters may still be protected on a case-specific basis. By using the 100-year floodplain and limiting the provision to traditional navigable waters, interstate waters, or the territorial seas, the agencies are reasonably balancing the protection of waters that may have a significant nexus with the goal of providing additional certainty.

ii. Waters within 4,000 Foot of the High Tide Line or Ordinary High Water Mark of a Traditional Navigable Water, Interstate Water, the Territorial Sea, Impoundment, or Covered Tributary

For the other category of case-specific waters under (a)(8), waters within 4,000 feet of the OHWM of a traditional navigable water, interstate water, the territorial sea, impoundment, or covered tributary, the science available today does not establish that waters as a group should be determined to be jurisdictional by rule under the CWA, but the agencies' experience and expertise indicate that there are individual waters out to 4,000 feet where the science demonstrates that they, either alone or in combination with similarly situated waters, often have a significant effect on downstream waters. As stated above, the agencies establish a provision in the rule for case-specific significant nexus determinations because the agencies concluded that some waters located beyond the distance limitations established for "adjacent waters" can have significant chemical, physical, and biological connections to and effects on traditional navigable waters, interstate waters, or the territorial seas. The agencies reasonably identified the 4,000 foot boundary for these case-specific significant nexus determinations by balancing consideration of the science and the agencies' technical expertise and experience in making significant nexus determinations with the goal of providing clarity to the public while protecting the environment and public health. The agencies' experience has shown that the vast majority of waters where a significant nexus has been found, and which are therefore important to protect to achieve the goals of the Act, are located within the 4,000 foot boundary. The agencies' balancing of these considerations is consistent with the statute and the Supreme Court opinions. The agencies decided that it is important to promulgate a rule that not only protects the most vital of our Nation's waters, but one that is practical and provides sufficient boundaries so that the public reasonably understands where CWA jurisdiction ends.

In circumstances where waters within 4,000 feet of the high tide line or ordinary high water mark are subject to a case-specific significant nexus analysis and such waters may be evaluated as "similarly situated," it must be first demonstrated that these waters perform similar functions and are located sufficiently close to each other to function together in affecting the integrity of the downstream waters. The significant nexus analysis must then be conducted based on consideration of the functions provided by those waters in combination in the point of entry watershed. A "similarly situated" analysis is conducted where it is determined that there is a likelihood that there are waters that function as a system to affect downstream water integrity. To provide greater clarity and transparency in determining what functions will be considered in determining what constitutes a significant nexus, the final rule lists specific functions that the agencies will consider.

The agencies recognize that in establishing the 4,000-foot "bright line" threshold for these case-specific significant nexus determinations in the rule, the agencies are carefully applying the available science. The science itself does not establish bright lines for establishing where waters do not have a significant nexus to downstream (a)(1) through (a)(3) waters. For instance, as noted above, the SAB concluded that distance should not be a sole factor used to evaluate the connection of waters to jurisdictional waters. SAB 2014b at 3. In setting a limit of 4,000 feet for case-specific determinations under (a)(8), the agencies have made a decision based on public input for clarity regarding other waters, as well as based on expertise and experience with implementing the significant nexus standard in light of the *SWANCC* and *Rapanos* decisions.

The agencies establish a provision in the rule for case-specific significant nexus determinations because the agencies concluded that waters located within 4,000 feet of the ordinary high water mark of a traditional navigable water, an interstate water, the territorial seas, an impoundment, or a covered tributary can have significant chemical, physical, and biological connections to and effects on traditional navigable waters, interstate waters, or the territorial seas, either alone or in combination with similarly situated waters. The agencies establish a distance limit on case-specific significant nexus determinations because the Supreme Court has been clear that CWA jurisdiction is not without limit. Based on the agencies' extensive experience, and applying the best available science, the agencies conclude that the 4,000 foot distance limit reasonably identifies the areas in which waters have been determined to have a significant nexus (outside of those that are within the 100-year floodplain of an (a)(1) through (a)(3) water) and appropriately establishes the limits of CWA jurisdiction under this case-specific provision. This approach also supports the goal of providing greater clarity to the public. The agencies decided that it is important to promulgate a rule that not only protects the most vital of our Nation's waters, but one that is practical and provides sufficient limits so that the public reasonably understands where CWA jurisdiction ends.

The agencies emphasize that they fully support efforts by states and tribes to protect under their own laws any additional waters, including locally important waters that may not be within the federal interests of the CWA as the agencies have interpreted its scope in this rule. Indeed, the promulgation of this 4,000-foot limit for purposes of a case-specific analysis of significant nexus does not foreclose states from acting consistent with their state authorities to establish protection for waters that fall outside of the protection of the CWA. In promulgating the 4,000-foot limit, the agencies have balanced protection and clarity, scientific uncertainties and regulatory experience, and established a line that is, in their judgment, reasonable and consistent with the statute and its goals and objectives.

As noted above in section II.D., since the *Rapanos* decision, the agencies have developed extensive experience making significant nexus determinations, and that experience and expertise has informed the judgment of the agencies in establishing the 4,000 foot boundary. The agencies have made determinations in every state in the country, for a wide range of waters in a wide range of conditions. The vast majority of the waters that the Corps has determined have a significant nexus are located within 4,000 feet of a jurisdictional tributary, traditional navigable or interstate water, or the territorial seas. Based on this experience, and informed by the science that acknowledges the connectivity of waters lies on a continuum, the agencies have concluded that the 4,000-foot limitation will protect the types of waters that have in practice been determined to have a significant nexus on a case-specific basis. Based on this experience, the agencies have concluded that the 4,000 foot limitation will enable the agencies to make case-specific significant nexus determinations for waters located within a zone that represents a key section of the watershed in terms of influence on downstream waters. While the science does not provide for a precise line in the landscape, it is important to note that this provision is not purporting to draw a categorical line between waters that meet the definition of "water of the United States" and those that do not. Rather, the provision reflects the agencies' acknowledgment that there are waters for which an absolute, precise categorization is not possible based on the available science and that it is therefore reasonable to establish an area within which case-specific analysis will occur. Faced with this lack of precision in the science, the agencies proposed a rule that set no limitations on where case-specific significant nexus analyses could occur and sought comment from the public on this approach and a combination of other approaches that could provide more certainty. In response to the many concerns raised by the uncertainty of an unconstrained approach to case-specific significant nexus analysis, the agencies have responded by establishing this 4,000 foot limit. Therefore, the agencies conclude that the 4,000 foot boundary in the rule, along with the 100-year floodplain boundary discussed above, will sufficiently capture for analysis those waters that are important to protect to achieve the goals of the Clean Water Act.

The agencies decision to establish a provision that authorizes a case-specific significant nexus analysis for waters within 4,000 feet is based on a number of factors. These waters may be located within the floodplain of a traditional navigable water, interstate water, the territorial seas, impoundment, or covered tributary. This Technical Support Document and the Science Report have demonstrated the importance of floodplain waters on the chemical, physical, and biological integrity of downstream traditional navigable waters, interstate waters, or the territorial seas. For purposes of clarity and to provide regulatory certainty, the agencies decided to use distance boundaries within the 100-year floodplain to define adjacency for floodplain waters. Under the rule, the only floodplain waters that are specifically identified as being jurisdictional as adjacent are those located in whole or in part within the 100-year floodplain and not more than 1,500 feet of the ordinary high water mark of jurisdictional waters. In addition, as described above, waters within the 100-year floodplain of an (a)(1) through (a)(3) water that do not meet the definition of adjacent are to be considered under a case-specific analysis under the other provision of (a)(8). However, there may be some waters located in the floodplains of jurisdictional impoundments or jurisdictional tributaries that fall outside of the 1,500-foot limitation for adjacency. Due to the many functions that floodplain wetlands and open waters provide to downstream water integrity, and based on the scientific literature, agency expertise and experience, and applicable case law, the rule calls for waters to be considered on a case-specific basis, either alone or in combination with other waters, where they are located within 4,000 feet of the high tide line or the ordinary high water mark of a water jurisdictional under (a)(1) through (a)(5), in part because such waters may be located within the floodplain.

Similarly, due to the many functions that waters located within 4,000 feet of the high tide line of a traditional navigable water or the territorial seas provide and their often close connections to the surrounding navigable in fact waters, science supports the agencies' determination that such waters are rightfully evaluated on a case-specific basis for significant nexus to a traditional navigable water or the territorial seas. Waters within 4,000 feet of the ordinary high water mark of a traditional navigable water, interstate water, the territorial seas, impoundment, or covered tributary may fall within the riparian areas of such waters. These waters may not have a 100-year floodplain associated with them, as described in section VIII.A.vi. above, so the other provision of (a)(8) may or may not apply to such waters. As discussed in the preamble, in response to comments regarding the uncertainty of the term "riparian area," the agencies removed the term from the definition of neighboring. However, the agencies continue to recognize that science is clear that wetlands and open waters in riparian areas individually and cumulatively can have a significant effect on the chemical, physical, and biological integrity of downstream waters. *See, e.g.*, ES-2 to ES-3. Thus, the rule allows for a case-specific determination of significant nexus for waters located within 4,000 feet of the high tide line or the ordinary high water mark of a traditional navigable water, interstate water, the territorial seas, impoundment, or covered tributary.

The agencies have always recognized that adjacency is bounded by proximity, and the rule adds additional clarity to adjacency by bounding what can be considered neighboring. The science is clear that a water's proximity to downstream waters influences its impact on those waters. The Science Report states, "[s]patial proximity is one important determinant of the magnitude, frequency and duration of connections between wetlands and streams that will ultimately influence the fluxes of water, materials and biota between wetlands and downstream waters." Science Report at ES-11. Generally, waters that are closer to a jurisdictional water are more likely to be connected to that water than waters that are farther away. A case-specific analysis for waters located within 4,000 feet of the high tide line or the ordinary high water mark of a traditional navigable water, interstate water, the territorial seas, impoundment, or covered tributary allows such waters to be considered jurisdictional only where they meet the significant nexus requirements. Even where not within a 100-year floodplain, waters within 4,000 feet of the high tide line or the ordinary high water mark of a traditional navigable water, interstate water, the territorial seas, impoundment, or covered tributary can have significant chemical, physical, and biological connections with traditional navigable waters, interstate waters, or the territorial seas.

As noted previously, in response to comments concerned that there were no bounds in the proposed rule on how far a surface hydrologic connection could be for purposes of adjacency, the agencies did not include surface hydrologic connections as its own factor for determining adjacency in the final rule. Such connections, however, are relevant in a case-specific significant nexus determination under (a)(8). For example, waters located within 4,000 feet of the high tide line or the ordinary high water mark of a traditional navigable water, interstate water, the territorial seas, impoundment, or covered tributary that contribute confined surface flow to a downstream water can have important hydrologic connections to and effects on that downstream water such as the attenuation and cycling of nutrients that would otherwise effect downstream water quality.

The agencies' decision to establish the case-specific provision at (a)(8), including the distance limitation, was also informed by the knowledge that waters located within 4,000 feet of the high tide line or the ordinary high water mark of a traditional navigable water, interstate water, the territorial seas, impoundment, or covered tributary can have a confined surface or shallow subsurface connection to such a water. In order to provide the clarity and certainty that many commenters requested regarding adjacent waters, the rule does not define "neighboring" to include all waters with confined surface or shallow subsurface connections.

However, the agencies recognize that the science demonstrates that waters with a confined surface or shallow subsurface connection to jurisdictional waters can have important effects on downstream waters. For purposes of a case-specific significant nexus analysis under the rule, a shallow subsurface hydrologic connection is lateral water flow over a restricting layer in the top soil horizons, or a shallow water table which fluctuates within the soil profile, sometimes rising to or near the ground surface. In addition, water can move within confined man-made subsurface conveyance systems such as drain tiles and storm sewers, and in karst typography. O'Driscoll and Parizek 2003. Confined subsurface systems can move water, and potential contaminants, directly to surface waters rapidly without the opportunity for nutrient or sediment reduction along the pathway. Science Report at 3-28; 4-24 (citing Royer *et al.* 2004).

The proposed rule did not set a distance threshold for case-specific waters to be evaluated for a significant nexus. Some commenters argued that there should be a limitation on areas subject to case-specific analysis while others contended that the agencies lack discretion to set regulatory limits that would exclude from jurisdiction *any* water meeting the significant nexus test. The agencies disagree that the agencies lack the authority to establish reasonable boundaries to determine what areas are subject to case-specific significant nexus analysis. Nothing in the CWA or case law mandates that the agencies require every water feature in the nation be subject to analysis for significant nexus. The Supreme Court has made clear that the agencies have the authority and responsibility to determine the limits of CWA jurisdiction, and establishing boundaries based on agency judgment, expertise and experience in administering the statute is at the core of the agencies authority and discretion.

Wetlands and open waters, including those outside the riparian zone and floodplain, can be connected downstream through unidirectional flow from the wetland or open water to a nearby tributary. Such connections can occur through a surface or a shallow subsurface hydrologic connection. Science Report at 2-7, 4-1 to 4-2, 4-22. Outside of the riparian zone and floodplain, surface hydrologic connections between adjacent waters and jurisdictional waters can occur via confined flows (*e.g.* a swale, gully, ditch, or other discrete feature). In some cases, these connections will be a result of "fill and spill" hydrology. A directional flowpath is a path where water flows repeatedly from the wetland or open water to the nearby jurisdictional water that at times contains water originating in the wetland or open water as opposed to just directly from precipitation. *Id.* at B-12 (citing Winter and Rosenberry 1998; Leibowitz and Vining 2003). Water connected through such flows originate from the adjacent wetland or open water, travel to the downstream jurisdictional water, and are connected to those downstream waters by swales or other directional flowpaths on the surface. Surface connections can also be unconfined (non-channelized flow), such as overland flow. *Id.* at 2-14.

A confined surface hydrologic connection, which may be perennial, intermittent or ephemeral, supports periodic flows between the adjacent water and the jurisdictional water. For example, wetland seeps are likely to have perennial connections to streams that provide important sources of baseflow, particularly during summer. *Id.* at 4-21 (citing Morley *et al.* 2011). Other wetlands are connected to streams via intermittent or ephemeral conveyances and can contribute flow to downstream waters via their surface hydrologic connection. *Id.* (citing Rains *et al.* 2006; Rains *et al.* 2008; McDonough *et al.* 2015). The surface hydrologic connection of the neighboring water to the jurisdictional water and the close proximity of the waters enhance the neighboring waters substantial effects the waters have on downstream (a)(1) through (a)(3) waters. Wetlands and open waters that are connected to (a)(1) through (a)(5) waters through a confined surface hydrologic connection will have an impact on downstream (a)(1) through (a)(3) waters, regardless of whether the outflow is permanent, intermittent, or ephemeral. *See, e.g., id.* at 4-40.

Wetlands and open waters with confined surface connections can affect the physical integrity of waters to which they connect. Such waters can provide an important source of baseflow to the streams to which they are adjacent, helping to sustain the water levels in the nearby streams. *Id.* at 4-21 to 4-22 (citing Morley *et al.* 2011; Rains *et al.* 2006; Rains *et al.* 2008; Wilcox *et al.* 2011; McDonough *et al.* 2015); Lee *et al*. 2010. Waters with a confined surface connection to downstream jurisdictional waters can affect streamflow by altering baseflow or stormflow through several mechanisms, including surface storage and groundwater recharge. Science Report at 4-24. Wetlands and open waters with confined surface connections can affect water quality of jurisdictional waters through source and sink functions, often mediated by transformation of chemical constituents. The surface hydrologic connections to nearby jurisdictional waters provide pathways for materials transformed in the wetlands and open waters (such as methylmercury or degraded organic matter) to reach and affect the nearby waters and the downstream (a)(1) through (a)(3). *Id.* at 4-26 to 4-27. Wetlands and open waters with confined surface connections also can affect the biological integrity of waters to which they connect. Movement of organisms between these adjacent waters and the nearby jurisdictional water is governed by many of the same factors that affect movement of organisms between riparian/floodplain waters and the river network. *Id.* at 4-30. Because such waters are at least periodically hydrologically connected to the nearby jurisdictional tributary network on the surface, dispersal of organisms can occur actively through the surface connection or via wind dispersal, hitchhiking, walking, crawling, or flying. *See, e.g.*, *id.* at 4-30 to 4-31.

Shallow subsurface connections move quickly through the soil and impact surface water directly within hours or days rather than the years it may take long pathways to reach surface waters. The Science Report refers to local groundwater flow or shallow groundwater flow, which is a type of shallow subsurface connections. *Id.* at 2-11. Such shallow subsurface connections flow from the highest elevations of the water tables to nearby lowlands or surface waters. *Id.* (citing Winter and LaBaugh 2003). These are dynamic hydrologic connections that have the greatest interchange with surface waters. *Id.* The presence of a confining layer near the surface also leads to shallow subsurface flows through the soil. *Id.* at 2-34.

Tools to assess shallow subsurface flow include reviewing the soils information from the Natural Resources Conservation Service Soil Survey, which is available for nearly every county in the United States. *See* Natural Resources Conservation Service. The soil survey will have information on hydric soils, the hydrologic class of the soil, and the occurrence of a high or seasonal water table. Other indicators of a shallow subsurface connection include slope soil permeability, saturated hydraulic conductivity, the presence of an aquitard (confining layer), and permafrost. *See*, *e.g.*, Science Report at 2-34. Direct visual observations on the ground, such as noting a change in vegetation or evidence of hillslope springs or seeps can be indicators, as can direct measurements of the water table. Location with a floodplain or riparian area is also an indicator of shallow subsurface connection, as wetlands and open waters located within a floodplain or riparian area of a water often have shallow subsurface flows to that water that contribute to connectivity and function. Science Report at ES-9.

When assessing whether a water within 4,000 foot boundary performs any of the functions identified in the rule's definition of significant nexus, the significant nexus determination can consider whether shallow subsurface connections contribute to the type and strength of functions provided by a water or similarly situated waters. The SAB as noted the importance of shallow subsurface connections and stated, "[t]he available science…shows that groundwater connections, particularly vial shallow flow paths in unconfined aquifers, can be critical in support the hydrology and biogeochemical functions of wetlands and other waters." SAB 2014b. However, neither shallow subsurface connections nor any type of groundwater, shallow or deep, are themselves "waters of the United States."

Waters within 4,000 feet of the ordinary high water mark or the high tide line would include non-floodplain wetlands and open waters. Non-floodplain waters perform many of the same functions as floodplain waters, but as discussed above, their connectivity to downstream waters varies. Generalizations about their effects on downstream waters are difficult to ascertain from the available scientific literature. Therefore, the agencies have determined it is appropriate to consider such waters within 4,000 feet of the ordinary high water mark or high tide line on a case-specific basis. A significant nexus evaluation would evaluate waters within the 4,000 feet of the ordinary high water mark or high tide line of an (a)(1) through (a)(5) water, either alone or in combination with any similarly situated water, and would consider the functions performed by the water or waters. The functions of non-floodplain waters are discussed below.

Non-floodplain waters can affect streamflow by altering baseflow or storm flow through several mechanisms, including surface storage and groundwater recharge. Science Report at 4-24. Studies at the larger scale have shown that wetlands, by storing water, reduce peak streamflows and, thus, downstream flooding. *Id.* at 4-25 (citing Jacques and Lorenz 1988; Vining 2002; McEachern *et al*. 2006; Gleason *et al*. 2007). In some cases, however, where wetlands that serve as stream origins are already saturated prior to rainfall, they can convey stormwater quickly downstream and thus actually increase flood peaks. *Id.* (citing Bullock and Acreman 2003). This is because the wetland soil, if completely saturated, cannot store any additional water, making the wetland unable to store floodwater. *Id.*

Non-floodplain waters wetlands contain diverse microbial populations that perform various chemical transformations, acting as source of compounds and potentially influencing the water quality downstream. *Id.* at 4-27 (citing Reddy and DeLaune 2008). Sulfate-reducing bacteria found in some non-floodplain wetlands produce methylated mercury, which is then transported downstream by surface flows. *Id.* (citing Linqvist *et al.* 1991; Mierle and Ingram 1991; Driscoll *et al.* 1995; Branfireun *et al*. 1999). Wetlands, including those that are non-floodplain, are the principle sources of dissolved organic carbon (DOC) in forests to downstream waters. *Id.* at 4-28 (citing Mulholland and Kuenzler 1979; Urban *et al.* 1989; Eckhardt and Moore 1990; Koprivnjak and Moore 1992; Kortelainen 1993; Clair *et al*. 1994; Hope *et al*. 1994;

Dillon and Molot 1997; Gergel *et al*. 1999). Export of DOC to downstream waters from non-floodplain wetlands can support primary productivity, affect pH and buffering capacity, and regulate exposure to UV-B radiation. *Id.* (citing Eshelman and Hemond 1985; Hedin *et al*. 1995; Schindler and Curtis 1997; Nuff and Asner 2001).

Non-floodplain wetlands also act as sinks and transformers for pollutants, including excess nutrients, through such processes as denitrification, ammonia volatilization, microbial and plant biomass assimilation, sedimentation, sorption and precipitation, biological uptake, and long-term storage of plant detritus. *Id.* at 4-29 (citing Ewel and Odum 1984; Nixon and Lee 1986; Johnston 1991; Detenbeck *et al*. 1993; Reddy *et al*. 1999; Mitsch and Gosselink 2007; Reddy and DeLaune 2008; Kadlec and Wallace 2009). Specifically, non-floodplian waters can reduce phosphorus, nitrate, and ammonium by large percentages. *Id.* (citing Dierberg and Brezonik 1984; Dunne *et al*. 2006; Jordan *et al*. 2007; Cheesman *et al.* 2010). Wetland microbial processes reduce other pollutants, such as pesticides, hydrocarbons, heavy metals, and chlorinated solvents. *Id.* at 4-30 (citing Brooks *et al*. 1977; Kao *et al*. 2002; Boon 2006).

Non-floodplain waters can have biological connections downstream that have the potential to impact the integrity of (a)(1) through (a)(3) waters. Emergent and aquatic vegetation found in non-floodplain wetlands disperse downstream by water, wind, and hitchhiking on migratory animals. *Id.* at 4-31 (citing Soons and Heil 2002; Soons 2006; Nilsson *et al*. 2010). Similarly, fish move between the river network and non-floodplain wetlands during times of surface water connections. *Id.* at 4-34 (citing Snodgrass *et al*. 1996; Zimmer *et al*. 2001; Baber *et al*. 2002; Hanson *et al*. 2005; Herwig *et al*. 2010). Mammals that can disperse overland can also contribute to connectivity. *Id.* (citing Shanks and Arthur 1952; Roscher 1967; Serfass *et al.* 1999; Clark 2000; Spinola *et al.* 2008). Insects also hitchhike on birds and mammals from non-floodplain wetlands to the stream network, which can then serve as a food source for downstream waters. *Id*. at 4-31 (citing Figuerola and Green 2002; Figuerola *et al*. 2005). Insects that are flight-capable also use both the stream and non-floodplain wetlands, moving from the stream to the wetland to find suitable habitat for overwintering, refuge from adverse conditions, hunting, foraging, or breeding. *Id*. at 4-34 (citing Williams 1996; Bohonak and Jenkins 2003). Amphibians and reptiles, including frogs, toads, and newts, also move between streams or rivers and non-floodplain wetlands to satisfy part of their life history requirements, feed on aquatic insects, and avoid predators. *Id*. at 4-34 to 4-35 (citing Lamoureux and Madison 1999; Babbitt *et al*. 2003; Adams *et al.* 2005; Green 2005; Hunsinger and Lannoo 2005; Petranka and Holbrook 2006; Attum *et al*. 2007; Subalusky *et al*. 2009a; Subalusky *et al*. 2009).

The proposed rule did not set a distance threshold for case-specific waters to be evaluated for a significant nexus. Some commenters argued that there should be a limitation on areas subject to case-specific analysis while others contended that the agencies lack discretion to set regulatory limits that would exclude from jurisdiction any water meeting the significant nexus test. The agencies disagree that the agencies lack the authority to establish reasonable boundaries to determine what areas are subject to case-specific significant nexus analysis. Nothing in the CWA or case law mandates that the agencies require every water feature in the nation be subject to analysis for significant nexus. The Supreme Court has made clear that the agencies have the authority and responsibility to determine the limits of CWA jurisdiction, and establishing boundaries based on agency judgment, expertise, and experience in administering the statute is at the core of the agencies' authority and discretion.

After weighing the scientific information about these waters' connectivity and importance to protecting downstream waters, the agencies' considerable experience making jurisdictional determinations, the objective of enhancing regulatory clarity and consistent with the statute and the caselaw, the agencies decided to set a boundary of 4,000 feet for case-specific significant nexus analysis for waters that do not otherwise meet the requirements of (a)(1) through (a)(7). Tying this provision for case-specific significant nexus analysis to distance informed by the science and the agencies' experience and expertise, as spatial proximity is a key contributor to connectivity among waters. *Id.* at ES-11. Distance is by no means the sole factor, and aquatic functions will play a prominent role in determining whether specific waters covered under this aspect of paragraph (a)(8) have a significant nexus. In light of the role spatial proximity plays in connectivity and the objective of enhancing regulatory clarity, predictability, and consistency, the agencies conclude that establishing a boundary for this aspect of waters subject to case-specific significant nexus analysis based on distance is reasonable.

While, for purposes of this national rule, distance is a reasonable and appropriate measure for identifying where this case-specific significant nexus analysis will be conducted, the science does not point to any particular bright line delineating waters that have a significant nexus from those that do not. The Science Report concluded that connectivity of streams and wetlands to downstream waters occurs along a gradient. *Id.* at ES-4. The evidence unequivocally demonstrates that the stream channels and floodplain wetlands or open waters that together form river networks are clearly connected to downstream waters in ways that profoundly influence downstream water integrity. *Id.* at ES-5. The connectivity and effects of non-floodplain wetlands and open waters are more variable and thus more difficult to address solely from evidence available in peer-reviewed studies. *Id.*. Because of this variability, with respect to waters that are not covered by (a)(1) through (a)(7) of the rule, the science does not provide a precise point along the continuum at which waters provide only speculative or insubstantial functions to downstream waters.

Like connectivity itself, there is also a continuum of outcomes associated with picking a distance threshold. A smaller threshold increases the likelihood that waters that could have a significant nexus will not be analyzed and therefore not subject to the Act; a larger threshold reduces that possibility, but also means that agency and the public's resources are expended conducting significant nexus analyses on waters that have a lower likelihood of meriting the Act's protection.

For these reasons, the agencies decided to allow case-specific determinations of significant nexus for waters located within 4,000 feet of the high tide line or the ordinary high water mark of a traditional navigable water, an interstate water, the territorial seas, an impoundment, or a covered tributary.

C. Rationale for Conclusions

The scientific literature regarding the two categories of waters for which case-specific determinations will be made documents their functions, including the chemical, physical, and biological impact they can have downstream. Available literature indicates that case-specific waters have important hydrologic, water quality, and habitat functions that have the ability to affect downstream waters if and when a connection exists between the water and downstream waters. Science Report at 6-5. Connectivity of case-specific waters to downstream waters will vary within a watershed and over time, which is why a case-specific significant nexus determination is necessary under (a)(7) and (a)(8). *See, e.g., id*. The types of chemical, physical, and biological connections between case-specific waters and downstream waters are described below for illustrative purposes. As described in the rule's preamble, when the agencies are conducting a case-specific determination for significant nexus under (a)(7) or (a)(8), they examine the connections between the water (including any similarly situated waters in the region) and downstream waters and determine if those connections significantly affect the chemical, physical, or biological integrity of the downstream (a)(1) through (a)(3) water, using any available site-information and field observations where available, relevant scientific studies or data, or other relevant jurisdictional determinations that have been made on similar resources in the region.

The hydrologic connectivity of case-specific waters to downstream waters occurs on a gradient and can include waters in the floodplain, waters that have groundwater or occasional surface water connections (through overland flow) to the tributary network, and waters that have no hydrologic connection to the tributary network. *Id.* at 4-2. The connectivity of case-specific waters to downstream waters will vary within a watershed as a function of local factors (*e.g.* position, topography, and soil characteristics). *Id.* at 4-41. Connectivity also varies over time, as the tributary network and water table expand and contract in response to local climate. *Id*. Lack of connection does not necessarily translate to lack of impact; even when lacking connectivity, waters can still impact chemical, physical, and biological conditions downstream. *Id.* at 4-42 to 4-43.

The physical effect that case-specific waters have downstream is less obvious than the physical connections of waters that are adjacent or waters that are tributary, due to the physical distance of (a)(7) and (a)(8) waters from the stream network. Despite this physical distance, they are frequently connected in some degree through either surface water or groundwater systems; over time, impacts in one part of the hydrologic system will be felt in other parts. Winter and LaBaugh 2003. For example, case-specific waters that overspill into downstream water bodies during times of abundant precipitation are connected over the long term. *Id*. Wetlands that lack surface connectivity in a particular season or year can, nonetheless, be highly connected in wetter seasons or years. Science Report at 4-24. Floodplain waters beyond the 1,500 foot boundary are connected to the nearby traditional navigable water, interstate water, or the territorial seas via both surface and subsurface hydrologic flowpaths and can reduce flood peaks by storing floodwaters. *Id.* at ES-9. Many case-specific waters interact with groundwater, either by receiving groundwater discharge (flow of groundwater to the case-specific water), contributing to groundwater recharge (flow of water from the case-specific water to groundwater), or both. *Id.* at 4-22 (citing Lide *et al.* 1995; Devito *et al*. 1996; Matheney and Gerla 1996; Rosenberry and Winter 1997; Pyzoha *et al.* 2008). Factors that determine whether a water recharges groundwater or is a site of groundwater discharge include topography, geology, soil features, and seasonal position of the water table relative to the water. *Id*. at 4-23 (citing Phillips and Shedlock 1993; Shedlock *et al*. 1993; Lide *et al*. 1995; Sun *et al.* 1995; Rosenberry and Winter 1997; Pyzoha *et al.* 2008; McLaughlin *et al*. 2014). Similarly, the magnitude and transit time of groundwater flow from an "other water" to downstream waters depend on several factors, including the intervening distance and the properties of the rock or unconsolidated sediments between the water bodies (*i.e.*, the hydraulic conductivity of the material). *Id.* at 4-23. Surface and groundwater hydrological connections are those generating the capacity for case-specific waters to affect downstream waters, as water from the case-specific water may contribute to baseflow or stormflow through groundwater recharge. *Id*. at 4-24. Contributions to baseflow are important for maintaining conditions that support aquatic life in downstream waters. As discussed further below, even in cases where waters lack a connection to downstream waters, they can influence downstream water through water storage and mitigation of peak flows. *Id*. at 4-2, 4-42, 4-43.

The chemical effects that case-specific waters have on downstream waters are linked to their hydrologic connection downstream, though a surface connection is not needed for a water to influence the chemical integrity of the downstream water. Because the majority of case-specific waters are hydrologically connected to downstream waters via surface or groundwater connections, most case-specific waters can affect water quality downstream (although these connections do not meet the definition of adjacency). Whigham and Jordan 2003. Case-specific waters can act as sinks and transformers for nitrogen and phosphorus, metals, pesticides, and other contaminants that could otherwise negatively impact downstream waters. Science Report at 4-29 to 4-30 (citing Brooks *et al.* 1977; Hemond 1980; Davis *et al*. 1981; Hemond 1983; Ewel and Odum 1984; Moraghan 1993; Craft and Chiang 2002; Kao *et al*. 2002; Boon 2006; Dunne *et al*. 2006; Cohen *et al*. 2007; Jordan *et al*. 2007; Whitmire and Hamilton 2008; Bhadha *et al*. 2011; Marton *et al*. 2014). Also *see, e.g.*, Isenhart 1992. The body of published scientific literature and the Science Report indicate that sink removal of nutrients and other pollutants by case-specific waters is significant and geographically widespread. Science Report at 4-30. Floodplain waters beyond the 1,500 foot boundary provide water quality benefits for the nearby traditional navigable waters, interstate waters, and territorial seas, including retention of sediment and organic matter and retention, cycling, and transformation of pollutants like nutrients. *Id.* at ES-9. Water quality characteristics of case-specific waters are highly variable, depending primarily on the sources of water, characteristics of the substrate, and land uses within the watershed. Whigham and Jordan 2003. These variables inform whether a case-specific water has a significant nexus to an (a)(1) through (a)(3) water. For instance, some prairie potholes may improve water quality and may efficiently retain nutrients that might otherwise cause water quality problems downstream; in such systems it may be their lack of a direct hydrologic connection that enables the prairie potholes to more effectively retain nutrients. *Id.*

Case-specific waters can be biologically connected to each other and to downstream waters through the movement of seeds, macroinvertebrates, amphibians, reptiles, birds, and mammals. Science Report at 4-30 to 4-35; Leibowitz 2003. The movement of organisms between case-specific waters and downstream waters is governed by many of the same factors that affect movement of organisms between adjacent wetlands and downstream waters (*See* section VIII). Science Report at 4-30. For example, like other floodplain waters, floodplain waters beyond the 1,500 foot boundary are hydrologically connected to the traditional navigable water, interstate water, or the territorial seas by lateral expansion and contraction of the (a)(1) through (a)(3) water in its floodplain, resulting in an exchange of matter and organisms, including fish populations that are adapted to use floodplain wetlands and open waters for feeding and spawning during high water. *Id.* at ES-9 to ES-10. Generally, case-specific waters are further away from stream channels than adjacent waters, making hydrologic connectivity less frequent, and increasing the number and variety of landscape barriers over which organisms must disperse. *Id*. Plants, though non-mobile, have evolved many adaptations to achieve dispersal over a variety of distances, including water-borne dispersal during periodic hydrologic connections, "hitchhiking" on or inside highly mobile animals, and more typically via wind dispersal of seeds and/or pollen. *Id*. at 4-31 (citing Galatowitsch and van der Valk 1996; Murkin and Caldwell 2000; Amezaga 2002; Figuerola and Green 2002; Soons and Heil 2002; Soons 2006; Haukos *et al.* 2006 and references therein; Nilsson *et al.* 2010). Mammals that disperse overland can also contribute to connectivity and can act as transport vectors for hitchhikers such as algae. *Id.* at 4-34 (citing Shanks and Arthur 1952; Roscher 1967; Serfass *et al.* 1999; Clark 2000; Spinola *et al.*

2008). Invertebrates also utilize birds and mamals to hitchhike, and these hitchhikers can be an important factor structuring invertebrate metapopulations in case-specific waters and in aquatic habitats separated by hundreds of kilometers. *Id.* at 4-31 through 4-32 (Figuerola and Green 2002; Figuerola *et al*. 2005; Allen 2007; Frisch 2007). Numerous flight-capable insects use both "other waters" and downstream waters; these insects move outside the tributary network to find suitable habitat for overwintering, refuge from adverse conditions, hunting, foraging, or breeding, and then can return back to the tributary network for other lifecycle needs. *Id.* at 4-34 (citing Williams 1996; Bohonak and Jenkins 2003). Amphibians and reptiles also move between case-specific waters and downstream waters to satisfy part of their life history requirements. *Id*. at 4-34. Alligators in the Southeast, for instance, can move from tributaries to shallow, seasonal limesink wetlands for nesting, and also use these wetlands as nurseries for juveniles; sub-adults then shift back to the tributary network through overland movements. *Id*. (citing Subalusky *et al*. 2009a; Subalusky *et al*. 2009b). Similarly, amphibians and small reptile species, such as frogs, toads, and newts, commonly use both tributaries and "other waters," during one or more stages of their life cycle, and can at times disperse over long distances. *Id.* at 4-34 to 4-35 (citing Knutson *et al*. 1999; Lamoureux and Madison 1999; Babbitt *et al*. 2003; Adams *et al*. 2005; Green 2005; Hunsinger and Lannoo 2005; Petranka and Holbrook 2006; Attum *et al*. 2007).

Even when a surface or groundwater hydrologic connection between a water and a downstream water is visibly absent, many waters still have the ability to substantially influence the integrity of downstream waters. However, such circumstances would be uncommon, but can occur, for instance, where a wetland recharges a deep groundwater aquifer that does not feed surface waters, or it is located in a basin where evapotranspiration is the dominant form of water loss. *Id.* at 4-21 to 4-24. Aquatic systems that may seem disconnected hydrologically are often connected but at irregular timeframes or through subsurface flow, and perform important functions that can be vital to the chemical, physical, or biological integrity of downstream waters. Some wetlands that may be hydrologically disconnected most of the time but connected to the stream network during rare high-flow events or during wetter seasons or years. Although the Science Report focuses primarily on the benefits that connectivity can have on downstream systems, isolation also can have important positive effects on the condition and function of downstream waters. *Id.* at 2-28. For instance, the lack of a hydrologic connection allows for water storage in such waters, attenuating peak streamflows, and, thus, downstream flooding, and also reducing nutrient and soil pollution in downstream waters. *Id.* at 2-28 to 2-29, 4-2, 4-38. Prairie potholes a great distance from any tributary, for example, are thought to store significant amounts of runoff. *Id.* at 4-38 (citing Novitzki 1979; Hubbard and Linder 1986; Vining 2002; Bullock and Acreman 2003; McEachern *et al.* 2006; Gleason *et al*. 2007). Filling wetlands reduces water storage capacity in the landscape and causes runoff from rainstorms to overwhelm the remaining available water conveyance system. *See, e.g.,* Johnston *et al*. 1990; Moscrip and Montgomery 1997; Detenbeck *et al*. 1999; Detenbeck *et al.* 2005. Wetlands, even when lacking a hydrologic connection downstream, improve downstream water quality by accumulating nutrients, trapping sediments, and transforming a variety of substances. *See, e.g.*, National Research Council 1995.

The structure and function of a river are highly dependent on the constituent materials that are stored in, or transported through the river. Most of the materials found in rivers originate outside of them. Thus, the fundamental way that “other waters” are able to affect river structure and function is by providing or altering the materials delivered to the river. Science Report at 1-13. Since the alteration of material fluxes depends on the functions within these waters and the degree of connectivity, it is appropriate to consider both these factors for purposes of significant nexus under this provision

Under the rule, on a case-specific basis, waters that have a significant nexus to an (a)(1) through (a)(3) water are "waters of the United States" under (a)(7) or (a)(8) where the meet the requirements set out in those paragraphs of the rule. The scientific literature and data in the Science Report and elsewhere support that some waters (including some of those in the case studies), along with other similarly situated waters in the region, do greatly affect the chemical, physical, or biological integrity of (a)(1) through (a)(3) waters, and thus would be jurisdictional under (a)(7) or (a)(8).

Though much of the literature cited in the Science Report relates to case-specific waters that are wetlands, the Science Report indicates that non-wetland waters that are not (a)(1) through (a)(6) waters also can have chemical, physical, or biological connections that significantly impact downstream waters. For instance, non-adjacent ponds or lakes that are not part of the tributary network can still be connected to downstream waters through chemical, physical, and biological connections. Lake storage has been found to attenuate peak streamflows in Minnesota. *Id.* at 4-25 (citing Jacques and Lorenz 1988; Lorenz *et al*. 2010). Similar to wetlands, ponds are often used by invertebrate, reptile, and amphibian species that also utilized downstream waters for various life history requirements, particularly because many ponds, particularly temporary ponds, are free of predators, such as fish, that prey on larvae. The American toad and Eastern newt are widespread habitat generalists that can move among streams, wetlands, and ponds to take advantage of each aquatic habitat, feeding on aquatic invertebrate prey, and avoiding predators. *See, e.g., Id.* at 4-35 (citing Babbitt *et al*. 2003; Green 2005; Hunsinger and Lannoo 2005; Petranka and Holbrook 2006). Additionally, stream networks that are not part of the tributary system (*e.g.*, streams in closed basins without an (a)(1) through (a)(3) water or losing streams and other streams that cease to flow before reaching downstream (a)(1) through (a)(3) waters) may likewise have a significant impact on the chemical, physical, or biological integrity of downstream waters. Non-tributary streams may be connected via groundwater to downstream waters. Such streams may also provide habitat to insect, amphibian, and reptile species that also use the tributary network.

In *Rapanos*, Justice Kennedy provides an approach for determining what constitutes a "significant nexus" that can serve as a basis for defining "waters of the United States" through regulation. Justice Kennedy concluded that "to constitute 'navigable waters' under the Act, a water or wetland must possess a 'significant nexus' to waters that are or were navigable in fact or that could reasonably be so made." *Id.* at 759 (*citing SWANCC*, 531 U.S. at 167, 172). Again, the four justices who signed on to Justice Stevens' opinion would have upheld jurisdiction under the agencies' existing regulations and stated that they would uphold jurisdiction under either the plurality or Justice Kennedy's opinion. Justice Kennedy stated that wetlands should be considered to possess the requisite nexus in the context of assessing whether wetlands are jurisdictional: "if the wetlands, either alone or in combination with similarly situated [wetlands] in the region, significantly affect the chemical, physical, and biological integrity of other covered waters more readily understood as 'navigable.'" *Id.* at 780. In light of *Rapanos* and *SWANCC*, the "significant nexus" standard for CWA jurisdiction that Justice Kennedy's opinion applied to adjacent wetlands also can reasonably be applied to other waters such as ponds, lakes, and non-adjacent wetlands that may have a significant nexus to a traditional navigable water, an interstate water, or the territorial seas.

The rule includes a definition of significant nexus that is consistent with Justice Kennedy's significant nexus standard. In characterizing the significant nexus standard, Justice Kennedy stated: "The required nexus must be assessed in terms of the statute's goals and purposes. Congress enacted the [CWA] to 'restore and maintain the chemical, physical, and biological integrity of the Nation's waters' . . . ." 547 U.S. at 779. It clear that Congress intended the CWA to "restore and maintain" all three forms of "integrity," 33 U.S.C. § 1251(a), so if any one form is compromised then that is contrary to the statute's stated objective. It would subvert the intent if the CWA only protected waters upon a showing that they had effects on every attribute of a traditional navigable water, interstate water, or territorial sea. Therefore, a showing of a significant chemical, physical, or biological affect should satisfy the significant nexus standard.

Justice Kennedy's opinion provides guidance pointing to many functions of waters that might demonstrate a significant nexus, such as sediment trapping, nutrient recycling, pollutant trapping and filtering, retention or attenuation of flood waters, and runoff storage. *See* 547 U.S. at 775, 779-80. Furthermore, Justice Kennedy recognized that a hydrologic connection is not necessary to establish a significant nexus, because in some cases the absence of a hydrologic connection would show the significance of a water to the aquatic system, such as retention of flood waters or pollutants that would otherwise flow downstream to the traditional navigable water or interstate water. *Id.* at 775. Finally, Justice Kennedy was clear that the requisite nexus must be more than "speculative or insubstantial" in order to be significant. *Id.* at 780. Justice Kennedy's standard is consistent with basic scientific principles about how to restore and maintain the integrity of aquatic ecosystems and the final rule is consistent with both.

Recognizing that there is no optimal line for setting a distance threshold, in selecting both the 100-year floodplain for traditional navigable waters, interstate waters, and the territorial seas and the 4,000 foot boundaries the agencies looked principally to the extensive experience the Corps has gained in making significant nexus determinations since the *Rapanos* decision. As noted in section II.D. above, since the *Rapanos* decision, the agencies have developed extensive experience making significant nexus determinations, and that experience and expertise informed the judgment of the agencies in establishing both the 100-year floodplain boundary and the 4,000 foot boundary. The agencies have made determinations in every state in the country, for a wide range of waters in a wide range of conditions. The vast majority of the waters that the Corps has determined have a significant nexus are located within 4,000 feet of a jurisdictional tributary, traditional navigable or interstate water, or the territorial seas. In addition, the science supports that floodplain waters influence downstream water integrity. Therefore, the agencies conclude that the 100-year floodplain and 4,000 foot boundaries in the rule will sufficiently capture for analysis those waters that are important to protect to achieve the goals of the Clean Water Act.

The agencies acknowledge that, as with any meaningful boundary, some waters that could be found jurisdictional lie beyond the 4,000 foot boundary and will not be analyzed for significant nexus. The agencies minimize that risk by also establishing a provision in (a)(8) for case-specific significant nexus analysis of waters located within the 100-year floodplain of a traditional navigable water, interstate water, or the territorial seas. While in the agencies' experience the vast majority of wetlands with a significant nexus are located within the 4,000 foot boundary, it is the agencies' experience that there are a few waters that have been determined to be jurisdictional that are located beyond this boundary, typically due to a surface or shallow subsurface hydrologic connections. Nonetheless, the agencies have weighed these considerations and concluded that the value of enhancing regulatory clarity, predictability and consistency through a distance limit outweigh the likelihood that a distinct minority of waters that might be shown to meet the significant nexus test will not be subject to analysis. In the agencies' experience, requiring an evaluation of significant nexus for waters covered by paragraph (a)(8) should capture the vast majority of waters having a significant nexus to the downstream waters. The agencies therefore conclude that that adoption of the 4,000 foot boundary is reasonable when coupled with the 100-year floodplain provision in paragraph (a)(8).

The rule's requirements for these waters, coupled with those for "adjacent waters," create an integrated approach that tailors the regulatory regime based on the science and the agencies' policy objectives. Determining by rule that covered adjacent waters have a significant nexus follows the science, achieves regulatory clarity and predictability, and avoids expenditure of agency and public resources on case-specific significant nexus analysis. Similarly, providing for case-specific significant nexus analysis for waters that are not adjacent but within the 4,000 foot distance limit, as well as those within the 100-year floodplain of a traditional navigable water, interstate water, or the territorial seas, is consistent with science and agency experience, will ensure protection of the important waters whose protection will advance the goals of the Clean Water Act, and will greatly enhance regulatory clarity for agency staff, regulated parties, and the public.

For these reasons, the agencies decided to allow case-specific determinations of significant nexus for waters located within the 100-year floodplain of a traditional navigable water, interstate water, or the territorial seas and for waters located within 4,000 feet of the high tide line or the ordinary high water mark of a traditional navigable water, an interstate water, the territorial seas, an impoundment, or a covered tributary. Under the rule, these waters are jurisdictional only where they individually or cumulatively (if it is determined that there are other similarly situated waters) have a significant nexus to traditional navigable waters, interstate waters, or the territorial seas.

Appendix 1: References

Note that the below references are only those that were cited in this technical support document. In addition, EPA's Office of Research and Development considered additional peer-reviewed literature for the completion of the Science Report. The references for the Science Report are available in that Report, which is available in the Docket for the rule and on EPA's website at http://cfpub.epa.gov/ncea/cfm/recordisplay.cfm?deid=296414.

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Appendix 2: Traditional Navigable Waters ("Appendix D")

Legal Definition of "Traditional Navigable Waters"
(Appendix D from the Corps Jurisdictional Determination Form Instructional Guidebook, available at http://www.usace.army.mil/Portals/2/docs/civilworks/regulatory/cwa_guide/app_d_traditional_navigable_waters.pdf)

Waters that Qualify as Waters of the United States
Under Section (a)(1) of the Agencies' Regulations

The Environmental Protection Agency (EPA) and United States Army Corps of Engineers (Corps) "Clean Water Act Jurisdiction Following the U.S. Supreme Court's Decision in Rapanos v. United States and Carabell v. United States" guidance (Rapanos guidance) affirms that EPA and the Corps will continue to assert jurisdiction over "[a]ll waters which are currently used, or were used in the past, or may be susceptible to use in interstate or foreign commerce, including all waters which are subject to the ebb and flow of the tide." 33 C.F.R. § 328.3(a)(1); 40 C.F.R. § 230.3(s)(1). The guidance also states that, for purposes of the guidance, these "(a)(1) waters" are the "traditional navigable waters." These (a)(1) waters include all of the "navigable waters of the United States," defined in 33 C.F.R. Part 329 and by numerous decisions of the federal courts, plus all other waters that are navigable-in-fact (e.g., the Great Salt Lake, UT and Lake Minnetonka, MN).

EPA and the Corps are providing this guidance on determining whether a water is a "traditional navigable water" for purposes of the Rapanos guidance, the Clean Water Act (CWA), and the agencies' CWA implementing regulations. This guidance is not intended to be used for any other purpose. To determine whether a water body constitutes an (a)(1) water under the regulations, relevant considerations include Corps regulations, prior determinations by the Corps and by the federal courts, and case law. Corps districts and EPA regions should determine whether a particular waterbody is a traditional navigable water based on application of those considerations to the specific facts in each case.

As noted above, the (a)(1) waters include, but are not limited to, the "navigable waters of the United States." A water body qualifies as a "navigable water of the United States" if it meets any of the tests set forth in 33 C.F.R. Part 329 (e.g., the water body is (a) subject to the ebb and flow of the tide, and/or (b) the water body is presently used, or has been used in the past, or may be susceptible for use (with or without reasonable improvements) to transport interstate or foreign commerce). The Corps districts have made determinations in the past regarding whether particular water bodies qualify as "navigable waters of the United States" for purposes of asserting jurisdiction under Sections 9 and 10 of the Rivers and Harbors Act of 1899 (33 USC Sections 401 and 403). Pursuant to 33 C.F.R. § 329.16, the Corps should maintain lists of final determinations of navigability for purposes of Corps jurisdiction under the Rivers and Harbors Act of 1899. While absence from the list should not be taken as an indication that the water is not navigable (329.16(b)), Corps districts and EPA regions should rely on any final Corps determination that a water body is a navigable water of the United States.

If the federal courts have determined that a water body is navigable-in-fact under federal law for any purpose, that water body qualifies as a "traditional navigable water" subject to CWA jurisdiction under 33 C.F.R. § 328.3(a)(1) and 40 C.F.R. § 230.3(s)(1).

Corps districts and EPA regions should be guided by the relevant opinions of the federal courts in determining whether waterbodies are "currently used, or were used in the past, or may be susceptible to use in interstate or foreign commerce" (33 C.F.R. § 328.3(a)(1); 40 C.F.R. § 230.3(s)(1)) or "navigable-in-fact."

This definition of "navigable-in-fact" comes from a long line of cases originating with The Daniel Ball, 77 U.S. 557 (1870). The Supreme Court stated:

> Those rivers must be regarded as public navigable rivers in law which are navigable in fact. And they are navigable in fact when they are used, or are susceptible of being used, in their ordinary condition, as highways for commerce, over which trade and travel are or may be conducted in the customary modes of trade and travel on water.

The Daniel Ball, 77 U.S. at 563.

In The Montello, the Supreme Court clarified that "customary modes of trade and travel on water" encompasses more than just navigation by larger vessels:

> The capability of use by the public for purposes of transportation and commerce affords the true criterion of the navigability of a river, rather than the extent and manner of that use. If it be capable in its natural state of being used for purposes of commerce, no matter in what mode the commerce may be conducted, it is navigable in fact, and becomes in law a public river or highway.

The Montello, 87 U.S. 430, 441-42 (1874). In that case, the Court held that early fur trading using canoes sufficiently showed that the Fox River was a navigable water of the United States. The Court was careful to note that the bare fact of a water's capacity for navigation alone is not sufficient; that capacity must be indicative of the water's being "generally and commonly useful to some purpose of trade or agriculture." Id. at 442.

In Economy Light & Power, the Supreme Court held that a waterway need not be continuously navigable; it is navigable even if it has "occasional natural obstructions or portages" and even if it is not navigable "at all seasons . . . or at all stages of the water." Economy Light & Power Co. v. U.S., 256 U.S. 113, 122 (1921).

In United States v. Holt State Bank, 270 U.S. 49 (1926), the Supreme Court summarized the law on navigability as of 1926 as follows:

> The rule long since approved by this court in applying the Constitution and laws of the United States is that streams or lakes which are navigable in fact must be regarded as navigable in law; that they are navigable in fact when they are used, or are susceptible of being used, in their natural and ordinary condition, as highways for commerce, over which trade and travel are or may be conducted in the customary modes of trade and travel on water; and further that navigability

> does not depend on the particular mode in which such use is or may be had - whether by steamboats, sailing vessels or flatboats- nor on an absence of occasional difficulties in navigation, but on the fact, if it be a fact, that the stream in its natural and ordinary condition affords a channel for useful commerce.

Holt State Bank, 270 U.S. at 56.

In U. S. v. Utah, 283 U.S. 64, (1931) and U.S. v. Appalachian Elec. Power Co, 311 U.S. 377 (1940), the Supreme Court held that so long as a water is susceptible to use as a highway of commerce, it is navigable-in-fact, even if the water has never been used for any commercial purpose. U.S. v. Utah, at 81-83 ("The question of that susceptibility in the ordinary condition of the rivers, rather than of the mere manner or extent of actual use, is the crucial question."); U.S. v. Appalachian Elec. Power Co., 311 U.S. 377, 416 (1940) ("Nor is lack of commercial traffic a bar to a conclusion of navigability where personal or private use by boats demonstrates the availability of the stream for the simpler types of commercial navigation.").

In 1971, in Utah v. United States, 403 U.S. 9 (1971), the Supreme Court held that the Great Salt Lake, an intrastate water body, was navigable under federal law even though it "is not part of a navigable interstate or international commercial highway." Id. at 10. In doing so, the Supreme Court stated that the fact that the Lake was used for hauling of animals by ranchers rather than for the transportation of "water-borne freight" was an "irrelevant detail." Id. at 11. "The lake was used as a highway and that is the gist of the federal test." Ibid.[1]

[1]Also of note are two decisions from the courts of appeals. In FPL Energy Marine Hydro, a case involving the Federal Power Act, the D.C. Circuit reiterated the fact that "*actual use* is not necessary for a navigability determination" and repeated earlier Supreme Court holdings that navigability and capacity of a water to carry commerce could be shown through "physical characteristics and experimentation." FPL Energy Marine Hydro LLC v. FERC, 287 F.3d 1151, 1157 (D.C. Cir. 2002). In that case, the D.C. Circuit upheld a FERC navigability determination that was based upon three experimental canoe trips taken specifically to demonstrate the river's navigability. Id. at 1158-59.

The 9th Circuit has also implemented the Supreme Court's holding that a water need only be susceptible to being used for waterborne commerce to be navigable-in-fact. Alaska v. Ahtna, Inc., 891 F.2d 1404 (9th Cir. 1989). In Ahtna, the 9th Circuit held that current use of an Alaskan river for commercial recreational boating is sufficient evidence of the water's capacity to carry waterborne commerce at the time that Alaska became a state. Id. at 1405. It was found to be irrelevant whether or not the river was actually being navigated or being used for commerce at the time, because current navigation showed that the river always had the capacity to support such navigation. Id. at 1404.

In summary, when determining whether a water body qualifies as a "traditional navigable water" (i.e., an (a)(1) water), relevant considerations include whether a Corps District has determined that the water body is a navigable water of the United States pursuant to 33 C.F.R § 329.14, or the water body qualifies as a navigable water of the United States under any of the tests set forth in 33 C.F.R. § 329, or a federal court has determined that the water body is navigable-in-fact under federal law for any purpose, or the water body is "navigable-in-fact" under the standards that have been used by the federal courts.