## U.S. Environmental Protection Agency

# Documentation of OMB Review Under Executive Order 12866

**Title of Action:** Definition of "Waters of the United States" Under the Clean Water Act

**Docket#:** EPA-HQ-OW- 2011-0880 **FRL#:** 9901-47-OW **RIN:** 2040- AF30

This action was submitted to the Office of Management and Budget (OMB) for review under Executive Order (E.O.) 12866, titled *Regulatory Planning and Review* (58 FR 51735, October 4, 1993). Whenever EPA makes publicly available a regulatory action that was reviewed under E.O. 12866, section 6(a)(3)(E) of the E.O. directs the Agency to also:

(1) Make available to the public a copy of the information that was provided to OMB's Office of Information and Regulatory Affairs (OIRA) for review under the E.O., *i.e.*, the text of the draft regulatory action and, if applicable, an assessment of the potential costs and benefits, as well as additional information for those actions that are determined to be economically significant under the E.O. (Information requirements are described in sections 6(a)(3)(B) and (C)).
(2) Identify for the public any substantive changes between the draft submitted to OIRA and the action that was subsequently issued, using a method that is complete, clear, and simple.
(3) Identify for the public those substantive changes made at the suggestion or recommendation of OIRA.

**For this regulatory action, were substantive changes made to information reviewed under E.O. 12866?** [Please check the appropriate answer.]

☐ **No.** [In the docket, include the information identified in item (1) below.]

☒ **Yes.** [In the docket, include the information identified in items (1) – (3) below.]

**Accordingly, the Agency has included this form and the following information in the public docket for this regulatory action:** [Please check the appropriate information.]

☒ (1) A copy of the information that was provided to OIRA for review under the E.O.

☒ (2) Documentation of any substantive changes made to the draft regulatory text that was submitted to OIRA when compared with what was subsequently made publicly available. The documentation is provided on the pages following this form. Changes made at the suggestion or recommendation of OIRA, if any, are clearly identified through attribution to OIRA. EPA has used one or more of the following methods to note changes: [Select the appropriate option(s).]

- ☐ (a) **Redline-Strikeout** – A copy of the draft regulatory action submitted, using redline-strikeout to show the substantive changes that were made.
- ☐ (b) **Hand Markup** – A copy of the draft regulatory action submitted, using handwritten notes to show the substantive changes that were made.
- ☒ (c) **Note to the file** - A document that identifies the substantive changes that were made, with page and paragraph references to the draft regulatory action that was submitted.

**If you have any questions about this regulatory action or this documentation, please call the contact:**

**Name:** Donna Downing **Email:** CWAwaters@epa.gov **Phone:** 202–566–2428

Revised 05/05/2010

EO12866_CWA WUS 2040-AF30 NPRM Preamble and Rule_20130917

**ENVIRONMENTAL PROTECTION AGENCY**

**40 CFR Parts 110.1, 112.2, 116.3, 117.1, 122.2, 230.3(s), 232.2, 300.5, part 300 App. E, 302.3 and 401.11**

**DEPARTMENT OF DEFENSE**

**DEPARTMENT OF THE ARMY, CORPS OF ENGINEERS**

**33 CFR Part 328.3(a)**

**[EPA-HQ-OW- 2011-0880; FRL_XXXX-X]**

**[RIN 2040-AF30]**

# Definition of "Waters of the United States" Under the Clean Water Act

**AGENCIES:** Environmental Protection Agency (EPA); and U.S. Army Corps of Engineers, Department of the Army, Department of Defense.

**ACTION:** Proposed Rule

**SUMMARY:** The Environmental Protection Agency (EPA) and the U.S. Army Corps of Engineers (Corps) are publishing for public comment a proposed rule defining the scope of waters protected under the Clean Water Act (CWA), in light of the U.S. Supreme Court cases in *U.S. v. Riverside Bayview, Rapanos v. United States,* and *Solid Waste Agency of Northern Cook County v. U.S. Army Corps of `Engineers (SWANCC).* Today's proposal would enhance

protection for the nation's public health and aquatic resources, and increase CWA program predictability and consistency by increasing clarity on the scope of "waters of the United States" protected under the Act.

The agencies propose to define the waters of the United States for all sections of the CWA to mean: traditional navigable waters (TNWs); interstate waters, including interstate wetlands; the territorial seas; impoundments of waters otherwise defined as waters of the United States; tributaries, as defined, to traditional navigable waters, interstate waters, or the territorial seas; adjacent waters, including wetlands; and, on a case-specific basis, "other waters" that have a significant nexus to a traditional navigable water, interstate water, or the territorial seas.

The agencies also propose to exclude specified waters from the definition of "waters of the United States." The agencies are not proposing changes to the existing exclusions for waste treatment systems designed consistent with the requirements of the CWA. The agencies are not proposing any changes for prior converted cropland[1]. The agencies propose, for the first time, to exclude by regulation certain waters and features over which the agencies have as a policy matter generally not asserted CWA jurisdiction.

Finally, the agencies retain the existing regulatory definitions for the terms "adjacent" and "wetlands." The agencies propose for the first time to define the terms "neighboring," "riparian area," "floodplain," "tributary," and "significant nexus."

---

[1] "Waters of the US' does not include PCC, which is currently defined by USDA for purposes of the Food Security Act at 7 CFR 122.2. EPA and the Corps use the USDA definition for purposes of determining jurisdiction under the CWA.

Today's proposal requests public comment on issues associated with the agencies' proposed regulatory definition of "waters of the United States." This notice also solicits information and data from the general public, the scientific community, and tribal, state and local resource agencies on the aquatic resource, implementation, and economic implications of a definition of "waters of the United States" as described in the proposal. The goal of the agencies is to ensure the regulatory definition is consistent with the CWA, as interpreted by the Supreme Court, and as supported by science, as the agencies work to protect water quality, public health, and the environment.

**DATES:** Comments must be on or before ______, X days after publication in the Federal Register.

**ADDRESSES:** Submit your comments, identified by Docket ID No. EPA–HQ–OW–2011–XXXX by one of the following methods:

- *Federal eRulemaking Portal: http://www.regulations.gov*. Follow the instructions for submitting comments.
- *E-mail: ow-docket@epa.gov*. Include EPA–HQ–OW–2011–XXXX in the subject line of the message.
- *Mail:* Send the original and three copies of your comments to: Water Docket, Environmental Protection Agency, Mail Code 2822T, 1200 Pennsylvania Avenue, NW, Washington, DC 20460, Attention: Docket ID No. EPA–HQ–OW–2011–XXXX.

- *Hand Delivery/Courier:* Deliver your comments to EPA Docket Center, EPA West, Room 3334, 1301 Constitution Avenue, NW, Washington, DC 20460, Attention Docket ID No. EPA–HQ–OW–2011–XXX. Such deliveries are accepted only during the Docket's normal hours of operation, which are 8:30 a.m. to 4:30 p.m., Monday through Friday, excluding legal holidays. Special arrangements should be made for deliveries of boxed information. The telephone number for the Water Docket is 202–566–2426.

*Instructions:* Direct your comments to Docket ID No. EPA–HQ–OW–2011–XXXX. EPA's policy is that all comments received will be included in the public docket without change and may be made available on-line at http://www.regulations.gov, including any personal information provided, unless the comment includes information claimed to be Confidential Business Information (CBI) or other information whose disclosure is restricted by statute. Do not submit information that you consider to be CBI, or otherwise protected, through *http://www.regulations.gov* or e-mail. The *http://www.regulations.gov* website is an "anonymous access" system, which means EPA will not know your identity or contact information unless you provide it in the body of your comment. If you send an e-mail directly to EPA without going through *http://www.regulations.gov,* your e-mail address will be automatically captured and included as part of the comment that is placed in the public docket and made available on the Internet. If you submit an electronic comment, EPA recommends that you include your name and other contact information in the body of your comment and with any disk or CD–ROM you submit. If EPA cannot read your comment due to technical difficulties and cannot contact you for clarification, EPA might not be able to consider your comment. Avoid the use of special characters and any form of encryption, and ensure that electronic files are free of any defects or viruses. For additional information about EPA's public docket, visit the EPA

Docket Center homepage at *http://www.epa.gov/epahome/dockets.htm.*

*Docket:* All documents in the docket are listed in the *http://www.regulations.gov* index. Some information, however, is not publicly available, *e.g.*, CBI or other information whose disclosure is restricted by statute. Certain other material, such as copyrighted material, is publicly available only in hard copy. Publicly available docket materials are available electronically at *http://www.regulations.gov* or in hard copy at the Water Docket, EPA Docket Center, EPA West, Room 3334, 1301 Constitution Ave., NW, Washington, DC. The Public Reading Room is open from 8:30 a.m. to 4:30 p.m., Monday through Friday, excluding legal holidays. The telephone number for the Public Reading Room is 202–566–1744, and the telephone number for the Water Docket is 202–566–2426.

**FOR FURTHER INFORMATION CONTACT:** Ms. Donna Downing, Office of Water (4502–T), Environmental Protection Agency, 1200 Pennsylvania Ave., NW, Washington DC 20460; telephone number 202–566–1783; e-mail address: *CWAwaters@epa.gov.* Ms. Stacey Jensen, Regulatory Community of Practice (CECW–CO–R), U.S. Army Corps of Engineers, 441 G Street, NW, Washington, DC 20314; telephone number 202–761–5856; email address: *stacey.m.jensen@usace.army.mil*.

**SUPPLEMENTARY INFORMATION:**

**Table of Contents**

C. Regulatory Flexibility Act

D. Unfunded Mandates Reform Act

E. Executive Order 13132: Federalism

F. Executive Order 13175: Consultation and Coordination with Indian Tribal Governments

G. Executive Order 13045: Protection of Children from Environmental Health and Safety Risks

H. Executive Order 13211: Actions Concerning Regulations That Significantly Affect Energy Supply, Distribution, or Use

I. National Technology Transfer and Advancement Act

J. Executive Order 12898: Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations

K. Environmental Documentation

## I. General Information (***to be added later)

### A. Does This Action Apply to Me?

### B. How Can I Get Copies of This Document and Related Information?

### C. Under What Legal Authority is this Proposed Rule Issued?

The authority for this proposed rule is the Clean Water Act, 33 U.S.C. 1251, *et seq.*

## II. Background

### A. Executive Summary

The U.S. Environmental Protection Agency (EPA) and the U.S. Army Corps of Engineers (Corps) publish for public comment a proposed rule defining the scope of waters protected under the Clean Water Act (CWA), in light of the U.S. Supreme Court cases in *U.S. v. Riverside Bayview Homes*, *Solid Waste Agency of Northern Cook County v. U.S. Army Corps of Engineers (SWANCC),* and *Rapanos v. United States.* The purposes of the proposed rule are to ensure protection of our nation's aquatic resources and make the process of identifying "waters of the United States" less complicated and more efficient. The rule achieves these goals by increasing CWA program transparency, predictability, and consistency. This rule will result in more effective and efficient CWA permit evaluations with increased certainty and less litigation. This rule provides increased clarity regarding the CWA regulatory definition of "waters of the United States" and associated definitions and concepts. EPA's Office of Research and Development developed a report that synthesizes this scientific literature (from herein, "Report"). The Report is under review by EPA's Science Advisory Board, and the agencies expect the rule will not be finalized until that review and the final Report are complete. This proposal is supported by a body of peer-reviewed scientific literature on the connectivity of tributaries, wetlands and open waters to downstream waters and the important effects of these connections on the chemical, physical, and biological integrity of those downstream waters. Appendix A summarizes and applies currently available scientific literature that is part of the administrative record for this proposal. Additional data and information likely will become available during the rulemaking process, including that provided during the public comment process, and by additional research, studies, and investigations that take place before the rulemaking process is concluded. At the conclusion of the rulemaking process, the agencies will review the entirety of the completed administrative record and determine at that time whether it supports the conclusions of this proposed rule. The agencies will make any adjustments to the final rule deemed to be appropriate at that time.

"Waters of the United States," which include wetlands, rivers, streams, lakes, and the oceans, provide many functions and services critical for our nation's economic and environmental health. In addition to providing habitat, rivers, lakes, and wetlands cleanse our drinking water, ameliorate storm surges, provide invaluable storage capacity for some flood waters, and enhance our quality of life by providing a myriad of recreational opportunities. A desire to protect these vital resources led Congress to pass the CWA in 1972 in order to restore and maintain the chemical, physical and biological integrity of our nation's waters. Based upon decades of experience implementing the CWA's programs, the lessons learned and existing science provide strong support for the regulatory and policy underpinnings of the proposed rule. The proposed rule was developed with a much greater understanding of the importance of all aspects of tributary, wetland, and lake systems and the ecological functions and services they provide.

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.

The Federal Water Pollution Control Act Amendments, now known as the Clean Water Act (CWA), were enacted in 1972. The objective of the CWA is to "…restore and maintain the chemical, physical, and biological integrity of the Nation's waters." Its specific provisions establish water quality standards as a benchmark for regulatory and non-regulatory programs to achieve that primary objective for surface waters. Prior to the CWA, the Rivers and Harbors Act of 1899 protected navigation and protected waters from pollution. The 1972 Act was an amendment to the Federal Water Pollution Control Act of 1948 with its subsequent amendments through 1970. The current jurisdictional scope of the CWA is "navigable waters," defined in the statute as "waters of the United States, including the territorial seas." The CWA leaves it to EPA and the Corps to define the term "waters of the United States." Existing regulations (last codified in 1986) define "waters of the United States" as follows:

> (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 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:
>
> > (i) which are or could be used by interstate or foreign travelers for recreational or other purposes; or
> >
> > (ii) from which fish or shellfish are or could be taken and sold in interstate or foreign commerce; or
> >
> > (iii) 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 the definition;

(5) Tributaries of waters identified in paragraphs (a) (1)–(4) of this section;

(6) The territorial seas;

(7) Wetlands adjacent to waters (other than waters that are themselves wetlands) identified in paragraphs (a) (1)–(6) of this section.

The U.S. Supreme Court addressed the scope of waters of the United States protected by the CWA in *United States v. Riverside Bayview Homes* (1985), which involved wetlands adjacent to a traditional navigable water in Michigan. In a unanimous opinion, the Court deferred to the Corps' 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." The Court observed that the broad objective of the CWA to restore 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."

The issue of "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 (SWANCC)* (2001). In *SWANCC,* the Court addressed the question of CWA jurisdiction over isolated ponds that had formed at a proposed solid waste balefill site in Illinois. The Corps had asserted jurisdiction over the ponds based solely on the presence of migratory birds. In a 5-4 opinion, the Court held that "33 C.F.R. Section 328.3(a) (3) as clarified and applied to petitioner's balefill site pursuant to the 'Migratory Bird Rule' … exceeds the authority granted to [the Corps] under 404 of the CWA." The Court noted that in the *Riverside* case 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. *SWANCC* did not directly address other parts of the regulatory definition of “waters of the United States.”

Five years after *SWANCC*, the Court addressed the scope of CWA protection for wetlands adjacent to tributaries of traditional navigable waters in *Rapanos v. United States* (2006). In June 2006, the Justices issued five decisions with no single opinion commanding a majority of the Court. The plurality opinion, authored by Justice Scalia, stated that “waters of the United States” extended beyond traditional navigable waters to include “relatively permanent, standing or flowing bodies of water.” Justice Scalia indicated that the phrase “relatively permanent” includes “seasonal rivers” but not “streams whose flow is ‘coming and going at intervals … broken, fitful … or existing only, or no longer than, a day.” The plurality also concluded that only wetlands with a continuous surface connection to other waters of the United States are protected by the CWA. Justice Kennedy’s concurring opinion took a different approach than Justice Scalia’s. Justice Kennedy concluded that “waters of the United States” includes waters “that possess a ‘significant nexus’ to waters that are or were navigable in fact or that could reasonably be so made.” He stated that wetlands have the requisite significant nexus where 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.’” Kennedy’s opinion notes that such a relationship with navigable waters must be more than “speculative or insubstantial.” Justice Kennedy’s “significant nexus” test for CWA jurisdiction that he applied to adjacent wetlands also can and should be applied to other categories of water bodies (such as tributaries to traditional navigable waters or interstate waters, or to "other waters") to determine whether they are subject to CWA jurisdiction, either by rule or on a case-specific basis. Neither the plurality nor Kennedy opinion invalidated any of the regulatory provisions defining "waters of the United States."

The proposed rule would revise the existing definition of "waters of the United States" consistent with the science and the above Supreme Court cases. The proposed rule retains much of the structure of the agencies' longstanding definition of "waters of the United States," and many of the existing provisions of that definition where revisions are not required in light of Supreme Court decisions. The agencies' propose a rule which is clear and understandable and which protects the nation's waters, consistent with the law and currently available scientific and technical expertise. Continuity with the existing regulations, where possible, will reduce confusion and will reduce transaction costs for the regulated community and the agencies. To that same end, the agencies also propose, where consistent with the law and their scientific and technical expertise, categories of waters that are and are not jurisdictional, as well as categories of waters and wetlands that require a significant nexus evaluation to determine whether they are "waters of the United States" and protected by the CWA. Finally, the agencies propose definitions for some of the terms used in the proposed regulation.

Under the proposed first section of the regulation, (a), the agencies propose to define the "waters of the United States" for all sections (in particular, sections 311, 401, 402, 404) of the CWA to mean:

(1) All waters which are currently used, 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) The territorial seas;

(4) All impoundments of waters otherwise defined as waters of the United States under this definition;

(5) All tributaries of waters identified in paragraphs (1) through (3) of this section;

(6) All waters, including wetlands, adjacent to a water identified in paragraphs (1) through (5) of this section; and

(7) On a case-specific basis, "other waters", including wetlands, provided that those waters alone, or in combination with other similarly situated waters, including wetlands, located in the same region, have a significant nexus to a water identified in paragraphs (1) through (3) of this section.

As discussed in further detail below, the rule would not change the following provisions (although some provisions have been renumbered): traditional navigable waters; interstate waters; the territorial seas; and impoundments of waters of the United States. In paragraph (a)(5) of the proposed rule, the agencies propose that all tributaries as defined in the proposed rule are waters of the United States, except for ditches under paragraph (b)(4) and (b)(5) of the proposed rule. As discussed further below, while tributaries are waters of the United States under the existing regulation, the rule would include a regulatory definition of "tributary" and the agencies propose that only those waters that meet the new definition are waters of the United States.

In paragraph (a)(6) of the proposed rule, the rule would clarify that adjacent waters, rather than simply adjacent wetlands, are waters of the United States. The rule would further clarify the meaning of "adjacent" by defining one of its elements, "neighboring." The related terms of "riparian area" and "floodplain" are also defined in the proposed rule.

The rule states that on a case-specific basis “other waters” that have a significant nexus to a traditional navigable water, interstate water or the territorial seas are “waters of the United States.” Unlike the categories of waters in paragraphs (a)(1) through (a)(6), which would be jurisdictional by definition, these “other waters” would not be waters of the United States by definition; rather, these “other waters” would only be jurisdictional provided that they have a significant nexus to paragraphs (a)(1) through (a)(3) waters. Therefore, the rule also includes a definition of "significant nexus."

In the proposed regulation the rule defines the following terms:

(1) Adjacent,

(2) Neighboring,

(3) Riparian area,

(4) Floodplain,

(5) Tributary,

(6) Wetlands, and

(7) Significant nexus.

Under the 2008 guidance (and the Kennedy standard) the agencies use the significant nexus analysis for non-relatively permanent waters (generally ephemeral and non-relatively permanent intermittent streams), wetlands adjacent to non-relatively permanent waters and wetlands that do not abut relatively permanent waters. With this proposed rule, the agencies conclude, based on existing science and the law, that a significant nexus exists between tributaries (as defined in the proposed rule) of traditional navigable waters and of interstate waters, and between adjacent water bodies (as defined in the proposed rule) and downstream traditional navigable waters and interstate waters, respectively. Consequently, this rule establishes as "waters of the United States," all tributaries (as defined in the proposal), of the traditional navigable waters, interstate waters, and the territorial seas, as well as all adjacent waters (including wetlands). This will eliminate the need to make a case-specific significant nexus determination for tributaries or for their adjacent waters because it has been determined that as a category, these waters have a significant nexus.

The proposed paragraph (b) excludes specified waters from the definition of "waters of the United States." Those waters and features that are not "waters of the United States" would be:

(1) Waste treatment systems, including treatment ponds or lagoons, designed to meet the requirements of the Clean Water Act.

(2) 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;

(3) Artificially irrigated areas that would revert to upland should application of irrigation water to that area cease; artificial lakes or ponds created by excavating and/or diking dry land and used exclusively for such purposes as stock watering, irrigation, settling basins, or rice growing; artificial reflecting pools or swimming pools created by excavating and/or diking dry land; small ornamental waters created by excavating and/or diking dry land for primarily aesthetic reasons; water-filled depressions created incidental to construction activity; groundwater drained through subsurface drainage systems; gullies and rills; non-wetland swales; and puddles;

(4) Ditches that are excavated wholly in uplands, drain only uplands or non-jurisdictional waters, and have no more than ephemeral flow; and

(5) Ditches that do not contribute flow, either directly or through other waterbodies, to a water identified in paragraphs (a)(1) through (a)(3) of this section.

The rule does not affect longstanding exemptions in the CWA for agriculture, silviculture, ranching and other activities and does not change existing regulatory exclusions for waste treatment systems designed consistent with the requirements of the CWA pertaining to prior converted cropland. Where waters are not jurisdictional, clearly no CWA regulatory provisions apply to them. Where waters would be determined jurisdictional under the proposed rule, applicable exemptions of the CWA would continue to preclude any application of CWA permitting requirements. For example, if "other waters" are aggregated and determined to be jurisdictional as similarly situated in the region, as described by Justice Kennedy, any exempt actions that could affect those waters would remain outside the regulatory requirements of the CWA. Most of these exempted actions relate to agriculture and include: agricultural stormwater discharges, return flows from irrigated agriculture, normal farming, silvicultural, and ranching activities, upland soil and water conservation practices, construction and maintenance of farm or stock ponds or irrigation ditches, maintenance of drainage ditches, and construction or maintenance of farm, forest, and temporary mining roads.

The proposed rule is expected to reduce documentation requirements and the time it takes to make approved jurisdictional determinations, by decreasing the number of jurisdictional determinations that require case-specific significant analysis evaluations. It will improve clarity for regulators, stakeholders and the regulated public by defining certain categories of waters as "waters of the United States" that previously required case-specific analyses prior to establishing CWA jurisdiction through the approved jurisdictional determination procedures. A comprehensive review of a growing body of scientific literature as well as the agencies' growing body of scientific and technical knowledge and field expertise lead the agencies to conclude that it is reasonable to establish certain categories of waters that are jurisdictional by rule as they have a significant nexus to an (a)(1) through (a)(3) water, specifically tributaries to traditional navigable waters, interstate waters, or the territorial seas, and their adjacent waters and wetlands. Case-specific jurisdictional determinations will still be required for the "other waters" category in paragraph (a)(7) of the proposed rule, because that category of waters requires a site-specific significant nexus analysis to determine whether or not those waters are subject to CWA jurisdiction. Science indicates that there is not enough information at this time to determine that the majority of "other waters" have a significant nexus to traditional navigable waters, interstate waters, or the territorial seas.

A review of the scientific literature, including EPA's draft synthesis Report of the peer-reviewed science, shows that tributaries and their adjacent waters play an important role in maintaining the chemical, physical, and biological integrity of traditional navigable waters, interstate waters, and the territorial seas and other jurisdictional waters because of their hydrological and ecological connections to and interactions with those waters. Therefore, it is appropriate to protect all tributaries and adjacent waters, because the tributaries, their adjacent waters, and the downstream traditional navigable waters, interstate waters, and the territorial seas function as an integrated system. Water flows through tributaries to downstream traditional navigable waters, interstate waters, and the territorial seas, and that water carries pollutants that affect the chemical, physical, or biological integrity of the (a)(1) through (a)(3) waters, including water quality, fisheries, recreation, and other ecological services that are important to citizens. Waters adjacent to tributaries also provide ecological functions that, in conjunction with the functions provided by the tributaries they are adjacent to, have a significant influence on the chemical, physical, or biological integrity of downstream traditional navigable waters, interstate waters, and the territorial seas. Examples of the important functions provided by adjacent waters are the sequestering or transformation of pollutants to reduce inputs to tributaries and subsequently to downstream (a)(1) through (a)(3) waters, water storage, and sediment trapping. Given the large scale systematic interactions that occur, and the substantial effects that result, between tributaries, their adjacent waters, and the downstream traditional navigable waters, interstate waters, or the territorial seas, a significant nexus exists that warrants making those categories of waters jurisdictional by rule.

States and Tribes play a vital role in the implementation and enforcement of the CWA. Section 101(b) of the CWA states: “It is the policy of the Congress to recognize, preserve, and protect the primary responsibilities and rights of States to prevent, reduce, and eliminate pollution, to plan the development and use (including restoration, preservation, and enhancement) of land and water resources, and to consult with the Administrator in the exercise of his authority under this Act.” The definition of “waters of the United States” applies to decisions concerning whether a waterbody is subject to any of the programs authorized under the CWA. Of particular importance, States and Tribes may be authorized by the EPA to administer the permitting programs of Section 402 and 404. Forty-six States and the Virgin Islands have been authorized to administer the NPDES program under Section 402, while two States administer the Section 404 program. Additional CWA programs that utilize the definition of “waters of the United States” and are of importance to the States and Tribes include the Section 311 oil spill program, the water quality standards and total maximum daily load programs under Section 303, and the Section 401 State water quality certification process. Under the CWA, States and Tribes retain full authority to implement their own programs to more broadly or more fully protect the waters in their State. Under Section 510 of the Act, unless expressly stated in the CWA, nothing in the Act precludes or denies the right of any State or Tribe to establish more protective standards or limits than the federal CWA. Many States and Tribes, for example, protect groundwater; some others may protect wetlands that are vital to their environment and economy but which are outside the jurisdiction of the CWA. Nothing in this proposed rule would limit or impede any existing or future State or Tribal efforts to further protect their waters. In fact, providing greater clarity regarding what waters are subject to CWA jurisdiction will reduce the need for permitting authorities, including the States and Tribes, to make jurisdictional determinations on a case-by-case basis, leaving them with more resources to protect their waters.

While the principal goal of this rulemaking is to improve clarity for determining jurisdiction under the CWA with the dual benefits of improving certainty and greater efficiency for determining whether waters are covered, there are other tools and approaches underway to increase efficiency as well. For example, EPA and the Corps are working in partnership with states to develop new tools and resources that have the potential to improve precision of desk based jurisdictional determinations at lower cost and improved speed than the existing primarily field-based approaches. EPA and the Corps are very interested in identifying other emerging technologies or approaches that would save time and money and improve efficiency for regulators and the regulated community in determining which waters are subject to CWA jurisdiction. The agencies specifically invite comment on this topic.

The proposed rule will benefit the nation by helping to protect the services and functions these important waterbodies provide consistent with the overarching objective of the CWA.

## IIB. The Clean Water Act and Regulatory Definition of Waters of the United States

The Federal Water Pollution Control Act Amendments, now known as the Clean Water Act (CWA), were enacted in 1972. The objective of the CWA is to "restore and maintain the chemical, physical, and biological integrity of the Nation's waters." 33 U.S.C. 1251(a). Its specific provisions were designed to improve the protection of the nation's waters provided under earlier statutory schemes such as the Rivers and Harbors Act of 1899 ("RHA") (33 U.S.C. 403, 407, 411) and the Federal Water Pollution Control Act of 1948 (62 Stat. 1155) and its subsequent amendments through 1970. The jurisdictional scope of the CWA is "navigable waters," defined in the statute as "waters of the United States, including the territorial seas." CWA section 502(7), 33 U.S.C. 1362(7). The CWA leaves it to the agencies to define the term "waters of the United States." Existing agency regulations define "waters of the United States" as follows:

> (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 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: (i) which are or could be used by interstate or foreign travelers for recreational or other purposes; or (ii) from which fish or shellfish are or could be taken and sold in interstate or foreign commerce; or (iii)

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 the definition;

(5) Tributaries of waters identified in paragraphs (a) (1)–(4) of this section;

(6) The territorial seas;

(7) Wetlands adjacent to waters (other than waters that are themselves wetlands) identified in paragraphs (a) (1)–(6) of this section. 33 CFR 328.3(a), 40 CFR 230.3(s). Counterpart and substantively similar regulatory definitions appear at 40 CFR 110.1, 112.2, 116.3, 117.1, 122.2, 232.2, 300.5, part 300 App. E, 302.3 and 401.11.

The regulatory definition of "waters of the United States" provides two exclusions from waters of the United States. Waste treatment systems designed to meet the requirements of the CWA and prior converted cropland are not "waters of the United States" under the agencies' regulations. Under the regulations, "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." 33 CFR 328.3(a)(8).

## II.C. Background on Scientific Review and Significant Nexus Analysis

### A. Scientific Synthesis

EPA's Office of Research and Development prepared a draft peer-reviewed synthesis of published peer-reviewed scientific literature discussing the nature of connectivity and effects of streams and wetlands on downstream waters (U.S. Environmental Protection Agency, *Connectivity of Streams and Wetlands to Downstream Waters: A Review and Synthesis of the Scientific Evidence*, (Washington, D.C.: U.S. Environmental Protection Agency, 2013), from herein, "Report"). The draft Report provides a review and synthesis of the scientific information pertaining to chemical, physical, and biological connections from streams, wetlands, and open-waters such as oxbow lakes, to downstream larger water bodies such as rivers, lakes, and estuaries in watersheds across the United States and the strength of those connections. While the scientific literature does not use the term "significant nexus," there is a substantial body of scientific literature on the chemical, physical, and biological connections between tributaries and adjacent waters and other waters and the downstream larger water bodies, and on the strength and the effect of these connections. Based on the literature, the Office of Research and Development was able to assess the types of connections between the tributaries and adjacent waters and the chemical, physical, and biological integrity of downstream traditional navigable waters or interstate waters. This proposed rule uses the information in the Report, other relevant literature, and the agencies' technical expertise to make judgments about the nexus, or connections between the relevant waters, and the significance of the nexus for purposes of concluding that tributaries and adjacent waters, each as defined by the proposed rule, have a significant nexus as Justice Kennedy described such that they are appropriately jurisdictional by rule.

The Office of Research and Development's review and synthesis of more than a thousand publications from peer-reviewed scientific literature focuses on evidence of those connections from various categories of waters, evaluated singly or in aggregate, which affect downstream waters and the strength of that effect. The scientific literature does not use the terms traditional navigable waters or interstate waters. However, evidence of strong chemical, physical, and biological connections to larger rivers, estuaries and lakes applies to that subset of river, estuaries and lakes that are traditional navigable waters or interstate waters. The objectives of the Report are (1) to provide a context for considering the evidence of connections between rivers and their tributary waters, and (2) to summarize current understanding about these connections, the factors that influence them, and the mechanisms by which the connections affect the function or condition of downstream waters. The connections and mechanisms discussed in the Report include transport of physical materials and chemicals such as water, wood, sediment, nutrients, pesticides, and mercury; movement of organisms or their seeds and eggs; and hydrologic and biogeochemical interactions occurring in surface and groundwater flows, including hyporheic zones and alluvial aquifers.

The EPA report concludes that the scientific literature clearly demonstrates that streams, regardless of their size or how frequently they flow, strongly influence how downstream waters function. Streams supply most of the water in rivers, transport sediment and organic matter, provide habitat for many species, and take up or change nutrients that could otherwise impair downstream waters. The Report also concludes that wetlands and open-waters in floodplains of streams and rivers and in riparian areas (transition areas between terrestrial and aquatic ecosystems) have a strong influence on downstream waters. The wetlands 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. Regarding wetlands and open-waters located outside of floodplains and riparian areas, the Report finds that they provide many benefits to rivers, lakes, and other downstream waters. If the wetland or open-water has a surface or shallow subsurface water connection to the river network, it affects the condition of downstream waters. Where the wetland or open water is not connected to the river network through surface or shallow subsurface water, the type and degree of connectivity varies geographically, topographically, and ecologically, such that the significance of the connection is difficult to generalize across the group of waters.. Lastly, the Report concludes that to understand the health, behavior, and sustainability of downstream waters, the effects of small water bodies in a watershed need to be considered in aggregate. The contribution of material by a particular stream and wetland might be small, but the aggregate contribution by an entire class of streams and wetlands (e.g., all ephemeral streams in the river network) can be substantial. The Report's conclusions, based on an examination of over a thousand peer-reviewed publications, provide support for policies in the proposed rule.

The Report is currently undergoing peer review by EPA's Scientific Advisory Board (SAB) and is available at http://yosemite.epa.gov/sab/sabproduct.nsf/fedrgstr_activites/Watershed%20Connectivity%20Report?OpenDocument. The agencies have identified key aspects of the Report throughout this preamble and in Appendix A. The Report summarizes and assesses much of the currently available scientific literature that is part of the administrative record for this proposal, and informs the agencies during this rulemaking. Additional data and information will become available during the rulemaking process, including that provided during the public comment process, and by additional research, studies, and investigations that take place before the rulemaking process is concluded. At the conclusion of the rulemaking process, the agencies will review the entirety of the completed administrative record, including the final Report reflecting

SAB review, to ensure that the administrative report supports conclusions of the final rule by making any adjustments that are necessary.

### B. Summary of Significant Nexus Conclusions

As the agencies developed this proposed definition of "waters of the United States," the agencies carefully considered available scientific literature and propose a rule consistent with their conclusions that a particular category of waters either alone or in combination with similarly situated waters in the region, significantly affects the chemical, physical, and biological integrity of the traditional navigable waters, interstate waters, or the territorial seas.

As discussed in this preamble and Appendix A, all tributaries as proposed to be defined perform the requisite functions identified by Justice Kennedy for them to be considered, by rule, to be "waters of the United States." Tributary streams exert a strong influence on the character and functioning of downstream traditional navigable waters and interstate waters, either individually or cumulatively. All tributary streams, including perennial, intermittent, and ephemeral streams, are physically and chemically connected to downstream traditional navigable waters and interstate waters via channels and associated alluvial deposits where water and other materials are concentrated, mixed, transformed, and transported. Headwater streams supply most of the water to downstream traditional navigable waters and interstate waters, and are the most abundant stream-type in most river networks. In addition to water, tributary streams supply sediment, wood, organic matter, nutrients, chemical contaminants, and many of the organisms found in downstream traditional navigable waters and interstate waters. Tributary streams are biologically connected to downstream traditional navigable waters and interstate waters by dispersal and migration of aquatic and semi-aquatic organisms, including fish, amphibians, plants, and invertebrates, that use both up- and downstream habitats during one or more stages of their life cycles, or provide food resources to downstream communities. Chemical, physical, and biological connections between tributary streams and downstream traditional navigable waters and interstate waters interact via processes such as nutrient spiraling, in which tributary stream communities assimilate and chemically transform large quantities of nitrogen that would otherwise increase nutrient loading downstream.

Adjacent waters, as defined in this proposal, are chemically, physically, and biologically connected with the downstream traditional navigable waters and interstate waters they are adjacent to, or they are connected to traditional navigable waters or interstate waters through tributaries. These chemical, physical, and biological connections affect the integrity of downstream traditional navigable waters and interstate waters through the export of channel-forming sediment and woody debris, storage of local groundwater sources of baseflow for downstream waters and their tributaries, and transport of organic matter. Wetlands and open waters located in riparian and floodplain areas remove and transform nutrients such as nitrogen and phosphorus. They provide nursery habitat for fish, and colonization opportunities for stream invertebrates. Adjacent waters, including those located in riparian and floodplain areas, serve an important role in the integrity of downstream traditional navigable waters and interstate waters because they also act as sinks for water, sediment, nutrients, and contaminants that could otherwise negatively impact downstream traditional navigable waters and interstate waters .

Finally, some non-adjacent waters may have, in certain circumstances, a significant nexus, but at this time the agencies are not proposing that a category of such waters is jurisdictional by rule. These "other waters" may provide numerous functions of potential benefit to downstream traditional navigable waters and interstate waters, including storage of floodwater; retention of nutrients, metals, and pesticides; and re-charge of groundwater sources of river baseflow. The functions of these "other waters" may affect downstream traditional navigable waters and interstate waters, depending on the characteristics of the connection to the river network. For "other waters," connectivity varies within a watershed and over time, making it difficult to generalize about their connections to, or isolation from, downstream traditional navigable waters and interstate waters. The literature reviewed did not provide sufficient information to evaluate the degree of connectivity of non-adjacent "other waters," and therefore they will have to be evaluated on a case-specific basis under the proposed rule.

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. Jurisdictional decisions for these waters were made on a case-by-case basis. As a practical matter, the agencies generally relied on the presence of migratory birds to indicate an effect on interstate commerce. In 2001, the Supreme Court in *SWANCC* rejected the use of migratory birds to establish jurisdiction over such intrastate waters.

The proposed rule provides that "other waters" can be jurisdictional where there is a case specific showing of a significant nexus to traditional navigable waters, interstate waters, or the territorial seas. The concept of "significant nexus" is not a scientific term, and relies upon an analysis of the facts and circumstances of the waters being considered.

As a general matter, all waters have a nexus to each other through the hydrologic cycle. However, as Justice Kennedy clearly stated, to establish jurisdiction under the CWA, there must be a "significant nexus" to traditional navigable waters. Justice Kennedy described that significance as something more than speculative or insubstantial. The support for a determination that the nexus is significant will be reasonable and based on a sufficient record that documents the scientific basis for concluding which functions are provided by the waters and why their effects on a navigable water, interstate water, or the territorial seas are more than speculative or insubstantial.

The agencies considered multiple options for determining how best to balance the science and the policy options available to address "other waters." Those options ranged from establishing jurisdiction over all "other waters" with a nexus to traditionally navigable waters, interstate waters, or the territorial seas, because the agencies determined categorically the nexus to be significant, to declining to assert jurisdiction over any "other waters." While proposing that all "other waters" are jurisdictional is not supported by the CWA as interpreted by the Supreme Court, a proposal that none of these "other waters" possess a "significant nexus" is not supported by the science, the CWA, or the Supreme Court. Scientific literature indicates that waters can have a relationship to each other that affects their chemical, physical, and biological integrity. This relationship is not an all or nothing situation. There is a gradient in the relation of waters to each other. The agencies propose a case specific analysis in establishing jurisdiction over these "other waters" as consistent with the current science, the CWA and the Supreme Court decisions, and it allows for a determination of jurisdiction where the gradient in the relationship becomes significant.

The agencies also considered identifying subcategories of "other waters" that have a significant nexus to navigable waters and could be jurisdictional by rule. The Report indicates that there is evidence of very strong connections in some subcategories. The agencies solicit comment on making such subcategories of waters with very strong connections jurisdictional as a part of this rule. Such comment should explain with supporting documentation why a particular subcategory of “other waters” might have a significant nexus to traditional navigable waters, interstate waters, or territorial seas.

Using absolute standards such as flow rates, surface acres, or a minimum number of functions to establish a significant nexus over “other waters” is not supported by the science and is inappropriate for a national rule addressing these “other waters.” A determination of the relationship of “other waters” to traditionally navigable waters, interstate waters, and the territorial seas across the nation, and consequently the significance to other waters, requires sufficient flexibility to account for the variability of conditions across the country and the varied functions that different waters provide. The case specific analysis called for in the proposed rule recognizes geographic and hydrologic variability in determining whether an “other water” or group of “other waters” possesses a “significant nexus” with traditional navigable waters, interstate waters, or territorial seas.

## III. Proposed Definition of Waters of the United States

### A. Summary of Proposed Rule

Today’s proposed rule retains much of the structure of the agencies’ longstanding definition of “waters of the United States,” and many of the existing provisions of that definition where revisions are not required in light of Supreme Court decisions. The agencies’ goal is to promulgate a rule that is clear and understandable and protects the nation’s waters, consistent with the law and supported by science. Continuity with the existing regulations, where possible, will minimize confusion and will reduce transaction costs for the regulated community and the agencies. To that same end, the agencies also propose, where consistent with the law and supported by scientific literature, bright line categories of waters that are and are not jurisdictional. Waters in the “other waters” category are not a *per se* jurisdictional category because current science does not support a conclusion that all “other waters” have a significant nexus to an (a)(1) to (a)(3) water or the identification of subcategories of “other waters” that would be jurisdictional by rule at this time. Therefore, the proposed rule requires a case-specific significant nexus evaluation to determine if such “other waters” are subject to CWA jurisdiction. Finally, the agencies are for the first time proposing definitions for some of the terms used in the proposed regulation.

Under the proposed paragraph (a) the agencies proposed to define the waters of the United States for all sections of the CWA to mean:

(1) All waters which are currently used, 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) The territorial seas;

(4) All impoundments of waters otherwise defined as waters of the United States under this definition;

(5) All tributaries of waters identified in paragraphs (1) through (3) of this section;

(6) All waters, including wetlands, adjacent to a water identified in paragraphs (1) through (5) of this section; and

(7) On a case-specific basis, other waters, including wetlands, provided that those waters alone, or in combination with other similarly situated waters, including wetlands, located in the same region, have a significant nexus to a water identified in paragraphs (1) through (3) of this section.

As discussed in further detail below, the agencies do not propose to change the following provisions (although some provisions have been renumbered): traditional navigable waters ((a)(1), see Section III.B of this preamble); interstate waters ((a)(2), see Section III.C of this preamble); the territorial seas ((a)(3), see Section III.D of this preamble); and impoundments of waters of the United States ((a)(4), see Section III.E of this preamble). In paragraph (a)(5), the agencies are proposing that tributaries to waters identified in paragraphs (a)(1) to (a)(3) are waters of the United States. As discussed further below, while tributaries are "waters of the United States" under the existing regulation, the agencies propose for the first time a regulatory definition of "tributary" and propose that only those waters that meet the definition and flow directly, or indirectly through "other waters," to an (a)(1) through (a)(3) water are "waters of the United States" (see Section III.F of this preamble). In paragraph (a)(6), the agencies propose that adjacent waters, rather than simply adjacent wetlands, are waters of the United States. The agencies also propose for the first time to define an aspect of adjacency – "neighboring" – and related terms (see Section III.G of this preamble). Finally, the agencies propose to define "waters of the United States" to include "on a case-specific basis, "other waters," including wetlands, provided that those waters alone, or in combination with other similarly situated waters, located in the same region, have a significant nexus to a water identified in paragraphs (1) through (3)." Unlike the *per se* jurisdictional categories in paragraphs (a)(1) through (a)(3) of this section of the proposed regulation, such "other waters" are not *per se* jurisdictional under (a)(7); rather, these "other waters" are only jurisdictional provided that they have a significant nexus to (a)(1) through (a)(3) waters. Therefore, the agencies are providing a definition of "significant nexus" (see Section III.H of this preamble).

The second section of the proposed regulation, section (b), excludes specified waters from the definition of "waters of the United States." Those waters and features that are not "waters of the United States" are:

(1) Waste treatment systems, including treatment ponds or lagoons, designed to meet the requirements of the Clean Water Act.

(2) 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; and,

(3) Artificially irrigated areas that would revert to upland should application of irrigation water to that area cease; artificial lakes or ponds created by excavating and/or diking dry land and used exclusively for such purposes as stock watering, irrigation, settling basins, or rice growing; artificial reflecting pools or swimming pools created by excavating and/or diking dry land; small ornamental waters created by excavating and/or diking dry land for primarily aesthetic reasons; water-filled depressions created incidental to construction activity; groundwater drained through subsurface drainage systems; gullies and rills; non-wetland swales; and puddles;

(4) Ditches that are excavated wholly in uplands, drain only uplands or non-jurisdictional waters, and have no more than ephemeral flow; and

(5) Ditches that do not contribute flow, either directly or through other waterbodies, to a water identified in paragraphs (a)(1) through (a)(3) of this section.

With this section, the agencies are not proposing any changes to the existing exclusions for waste treatment systems designed consistent with the requirements of the CWA and for prior converted cropland. The CWA and current regulations also provide a number of exemptions from permitting for specific activities. The rule does not affect any of the exemptions from CWA section 404 permitting requirements provided by CWA section 404(f), including those for normal agriculture, forestry and ranching practices. CWA section 404(f); 40 C.F.R. § 232.3; 33 C.F.R. § 323.4. "Normal" agricultural activity is defined at 40 CFR § 232.3(c) and 33 C.F.R. § 323.4. The rule also does not address the statutory and regulatory exemptions from NPDES permitting requirements for agricultural stormwater discharges and return flows from irrigated agriculture. CWA section 402(l)(1); CWA section 402(l)(2); CWA section 502(14); 40 C.F.R. § 122.3(f); 40 C.F.R. § 122.2 . The agencies are for the first time proposing to exclude by regulation in paragraph (b) certain waters and features over which the agencies have as a policy matter generally not asserted jurisdiction (see Section III.I of this preamble).

Finally, in section (c) of the proposed regulation the agencies define the following terms, of which "adjacent" "wetlands" are unchanged from existing definitions:

(1) **Adjacent***:* The term *adjacent* means bordering, contiguous or neighboring. Waters, including 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 waters."

(2) **Neighboring**: The term *neighboring*, for purposes of the term "adjacent" in this section, includes waters located within the riparian area or floodplain of a water identified in paragraphs (a)(1) through (a)(5) of this section, or waters with a surface or shallow subsurface hydrologic connection to such a jurisdictional water.

(3) **Riparian area***:* The term *riparian area* means an area bordering a water where surface or subsurface hydrology influence the ecological processes and plant and animal community

structure in that area. Riparian areas are transitional areas between aquatic and terrestrial ecosystems that influence the exchange of energy and materials between those ecosystems.

(4) **Floodplain***:* The term *floodplain* means an area bordering inland or coastal waters that was formed by sediment deposition from such water under present climatic conditions and is inundated during periods of moderate to high water flows.

(5) **Tributary**: The term tributary means a waterbody physically characterized by the presence of a bed and banks and ordinary high water mark, which contributes flow, either directly or through other waterbodies, to a water identified in paragraphs (a)(1) through (a)(3) of this section. A waterbody 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 man-made breaks (such as bridges, culverts, pipes, or dams), or one or more natural breaks (such as wetlands at the head of or 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 or downstream of the break. In addition, wetlands are tributaries (even if they lack a bed and banks and ordinary high water mark) if they contribute flow, either directly or through other waterbodies to a water identified in paragraphs (a)(1) through (a)(3) of this section. A tributary, including wetlands, can be a natural, man-altered, or man-made water body and includes waters such as rivers, streams, lakes, impoundments, canals, and ditches not excluded in paragraph (b)(4) and b(5) of this section.

(6) **Wetlands***:* The term *wetlands* means 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. Wetlands generally include swamps, marshes, bogs and similar areas.

(7) **Significant nexus***:* The term *significant nexus* means a more than speculative or insubstantial effect that a water, including wetlands, either alone or in combination with other similarly situated waters in the region (i.e., the watershed that drains to a water identified in paragraphs (a) (1) through (3) of this section), has on the chemical, physical or biological integrity of a water identified in paragraphs (a) (1) through (3) of this section. "Other waters," including wetlands, are similarly situated when they perform similar functions and are located sufficiently close together or close to a water of the United States so that they can be evaluated as a single landscape unit with regard to their effect on the chemical, physical, or biological integrity of a water identified in paragraphs (a) (1) through (a) (3) of this section.

### IIIB. Traditional Navigable Waters

EPA and the Corps' existing regulations include within the definition of "waters of the U.S." "[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." *See*, *e.g.*, 33 C.F.R. § 328.3(a) (1); 40 C.F.R. § 230.3(s) (1); 40 C.F.R. § 122.2 ("waters of the U.S."(a)); 40 C.F.R. § 110.1(a) ("navigable waters"). The agencies do not propose to change this section of the regulation. These waters are often referred to as "traditional navigable waters." The traditional navigable waters include all of the "navigable waters of the United States," as 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 (for example, the Great Salt Lake, Utah, and Lake Minnetonka, Minnesota). Thus, the traditional navigable waters include, <u>but are not limited to</u>, the "navigable waters of the United States" within the meaning of section 10 of the Rivers and Harbors Act of 1899 (also known as "Section 10 waters"). *See*, Appendix B, Legal Analysis .

For purposes of CWA jurisdiction, waters will be considered traditional navigable waters if:

- They are subject to section 9 or 10 of the Rivers and Harbors Act;
- A federal court has determined that the water body is navigable-in-fact under federal law;
- They are waters currently being used for commercial navigation, including commercial waterborne recreation (for example, boat rentals, guided fishing trips, or water ski tournaments);
- They have historically been used for commercial navigation, including commercial waterborne recreation; or
- They are susceptible to being used in the future for commercial navigation, including commercial waterborne recreation. Susceptibility for future use may be determined by examining a number of factors, including the physical characteristics and the capacity of the water to be used in commercial navigation, including commercial recreational navigation (for example, size, depth, and flow velocity), and the likelihood of future commercial navigation, including commercial waterborne recreation. While a traditional navigable water need not be capable of supporting navigation at all times, the frequency, volume, and duration of flow are relevant considerations for determining if a waterbody has the physical characteristics suitable for navigation. A likelihood of future commercial navigation, including commercial waterborne recreation, can be demonstrated by current boating or canoe trips for recreation or other purposes. A determination that a water is susceptible to future commercial navigation, including commercial waterborne recreation, should be supported by evidence.

### IIIC. Interstate Waters

The existing EPA and Corps regulations define “waters of the United States” to include “interstate waters, including interstate wetlands” and the agencies’ proposal today does not change that provision of the regulations. Interstate waters would continue to be “waters of the United States” even if they are not navigable for purposes of federal regulation under (a)(1) and do not connect to such waters. Moreover, because interstate waters are “waters of the United States” under the CWA, the agencies are proposing to continue to include tributaries to interstate waters, waters adjacent to interstate waters, waters adjacent to tributaries of interstate waters, and “other waters” that have a significant nexus to interstate waters.

As discussed in more detail in Appendix B to this preamble, the language of the CWA indicates that Congress intended the term “navigable waters” to include interstate waters without imposing a requirement that they be traditional navigable waters themselves or be connected to traditional navigable waters. The precursor statutes to the CWA always subjected interstate waters and their tributaries to federal jurisdiction. The text of the CWA, specifically CWA section 303 that establishes ongoing requirements for interstate waters, in conjunction with the definition of navigable waters, provides clear indication of Congress’ intent to protect interstate waters that were previously subject to federal regulation. Other provisions of the statute provide additional textual evidence of the scope of the primary jurisdictional term of the Act.

While congressional intent is clear, the agencies also have a longstanding regulatory interpretation that interstate waters fall within the scope of CWA jurisdiction. The agencies’ interpretation was promulgated contemporaneously with the passage of the CWA and is consistent with the statutory and legislative history of the Act. Furthermore, the Supreme Court has never addressed the CWA’s coverage of interstate waters, and its decisions in *SWANCC* and

*Rapanos* cannot be read to question the jurisdictional status of interstate waters or to impose additional jurisdictional requirements on interstate waters.

The precursor statutes to the CWA always subjected interstate waters and their tributaries to federal jurisdiction. While Congress intended tributaries to interstate waters to be subject to the CWA, the statute does not define the extent of tributaries that are covered. In light of Justice Kennedy's opinion, it is reasonable to assert jurisdiction over tributaries, adjacent wetlands and other waters that have a significant nexus to interstate waters consistent with the framework established by Justice Kennedy in *Rapanos* for establishing jurisdiction over waters with a significant nexus to traditional navigable waters. Justice Kennedy's standard seeks to ensure that waters Congress intended to subject to federal jurisdiction are indeed protected, both by recognizing that waters and wetlands with a significant nexus to traditional navigable waters and interstate waters have important beneficial effects on those waters, and by recognizing that polluting or destroying waters with a significant nexus can harm downstream jurisdictional waters. As Congress intended to protect interstate waters, the agencies propose to protect interstate waters by defining "waters of the U.S." to include tributaries to interstate waters, waters adjacent to interstate waters, waters adjacent to tributaries of interstate waters, and "other waters" that have a significant nexus to interstate waters. For additional discussion of the agencies' interpretation of the CWA with respect to interstate waters, see Appendix B to this preamble.

## IIID. Territorial Seas

The CWA and its existing regulations include "the territorial seas" as a "water of the U.S." The agencies propose to make no changes to that provision of the regulation other than to move the provision to earlier in the regulation. The CWA defines "navigable waters" to include the territorial seas at § 502(7). The Act 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 also clearly protected by the CWA, it is reasonable to use for protecting the territorial seas Justice Kennedy's significant nexus framework that protects traditional navigable waters. The proposed rule reflects that.

### IIIE. Impoundments

The agencies do not propose to make any changes to the existing regulatory language with respect to impoundments, "[i]Impoundments of waters otherwise defined as waters of the United States under this definition." 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 has 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 de-federalize a water, even where there is no longer flow below the impoundment. Where flow continues below the impoundment, it is straightforward to analyze the stream network, above and below the impoundment, for connection to downstream traditionally navigable waters, interstate waters or the territorial seas.

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 for purposes of federal regulation under the Commerce Clause. Such a water would then be jurisdictional under paragraph (a)(1) of the regulation.

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 paragraph of the regulation. In addition, tributaries to an impoundment are waters of the United States under today's proposed rule if the impoundment itself is a traditional navigable water or if the impoundment is of a water that is a tributary of a traditional navigable water, interstate water or the territorial seas. As a matter of law and science, an impoundment does not cut off a connection between upstream tributaries and a downstream (a)(1) through (a)(3) water, so tributaries above the impoundment are still considered tributary to a downstream (a)(1) through (a)(3) water even where the flow of water is impeded due to the impoundment. 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 waters (see Appendix A, Scientific Analysis).

Appendix A discusses the conclusion that it is reasonable to maintain jurisdiction over impoundments of "waters of the United States" not only as a legal matter, but because impoundments do not sever the connections the impounded "waters of the United States" have to the physical, chemical and biological integrity of (a)(1) through (a)(3) waters.

## IIIF. Tributaries

Under today's proposal, the agencies provide a definition of "tributary" supported by the scientific literature .The agencies also propose that all waters that meet the proposed definition of tributary are "waters of the United States" by rule, because tributaries and the ecological functions they provide significantly affect the chemical, physical, and biological integrity of traditional navigable waters, interstate waters, and the territorial seas.

With today's proposed regulation, the agencies confirm that these waters have a significant nexus to a traditional navigable water, interstate water, or territorial sea such that they are "waters of the United States" without the need for a separate, case-specific significant nexus analysis. Thus, in practice, under this proposal any water that meets the definition of tributary (and is not excluded under section (b)) of the proposed regulation) is a water of the United States. , and the agencies would only need to determine that a water meets the definition of "tributary." *See*, Appendix A, Scientific Evidence and Appendix B, Legal Analysis.

Tributaries have a substantial impact on the chemical, physical, and biological integrity of waters into which they eventually flow—including traditional navigable waters, interstate waters, and the territorial seas --and they have a significant nexus and thus are jurisdictional as a category. 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, 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.

### 1. What is a "tributary" for purposes of the proposed regulation?

The proposed rule defines "tributary" as:

> **Tributary**: The term *tributary* means a waterbody physically characterized by the presence of bed and banks and ordinary high water mark, which contributes flow, either directly or through other waterbodies, to a water identified in paragraphs (a)(1) through (a)(3) of this section. A waterbody 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 man-made breaks (such as bridges, culverts, pipes, or dams), or one or more natural breaks (such as wetlands at the head of or 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 or downstream of the break. In addition, wetlands are tributaries (even if they lack a bed and banks and ordinary high water mark) if they contribute flow, either directly or through other waterbodies to a water identified in paragraphs (a)(1) through (a)(3) of this section. A tributary, including wetlands, can be a natural, man-altered, or man-made water body and includes waters such as rivers, streams, lakes, impoundments, canals, and ditches not excluded in paragraphs (b)(4) and (b)(5) of this section.

While the EPA and the Corps have not defined tributary in any previous regulation or preamble, this proposed definition is consistent with long-standing practice and historical implementation of CWA programs. It is important to note that today's proposed definition also is based on best available science and the intent of the CWA.

To meet this definition, a waterbody need not contribute flow directly to an (a)(1) through (a)(3) water. As the definition makes clear, the waterbody may contribute flow directly or may contribute flow to another waterbody or waterbodies which eventually flow into an (a)(1) through (a)(3) water. Essentially, the waterbody must be part of a tributary system that drains to an (a)(1) through (a)(3) water. Under the proposed definition, to be "tributary," in addition to requiring that a waterbody contribute flow to a traditional navigable water, interstate water or territorial sea, the waterbody must also have a bed and banks and ordinary high water mark (except where a wetland is a tributary), because these features generally are physical indicators of flow. The agencies identified these tributary characteristics as indicative that the waterbody is the type of hydrologic feature Congress intended to protect under the CWA because, for example, of its ability to transport pollutants to downstream traditional navigable waters, interstate waters, or the territorial seas, and thereby have a significant effect on the chemical, physical or biological integrity of a water identified in paragraph (a)(1) through (a)(3).

The flow in the tributary may be ephemeral, intermittent or perennial, but the tributary must drain, or be part of a network of tributaries that drain, into an (a)(1) through (a)(3) water under today's proposed rule. When considering whether the tributary being evaluated eventually flows to an (a)(1) through (a)(3) water, the tributary connection can be traced using direct observation or U.S. Geological Survey maps, aerial photography or other reliable remote sensing information, soil survey maps, or other appropriate information. A bed and banks and ordinary high water mark (OHWM) generally are physical indicators of water flow. These physical indicators can be created by ephemeral, intermittent or perennial flows.

The agencies' proposed definition of "tributary" includes waters such as rivers, streams, lakes, impoundments, wetlands, canals and ditches not excluded in paragraph (b)(4) or (b)(5) that, either directly or through other tributaries, convey water to traditional navigable waters, interstate waters, or territorial seas. A tributary is a longitudinal surface feature that results from directional surface water movement and sediment dynamics demonstrated by the presence of bed and banks structures, bottom and lateral boundaries, or other indicators of OHWM. The movement of water through a tributary can transport pollutants to downstream (a)(1) through (a)(3) waters, as either chemicals dissolved or suspended in the water column or adsorbed to sediment particles. The existing Corps regulations define OHWM as "that 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 C.F.R. § 328.3(e). This definition is not changed by today's proposed rule. An OHWM may form in waterbodies, but the presence of an OHWM does not automatically identify waterbodies as "waters of the U.S." In many tributaries, the bed is that part of the channel below the OHWM, and the banks often extend above the OHWM. Indicators of an OHWM may vary from region to region across the country.

Under this proposed definition of tributary, the upper limit of a tributary is established where the channel begins, unless a wetland tributary is providing flow into the tributary at the upper limit of the channel. While the OHWM generally defines the lateral limits of a water, its absence can be a factor in determining whether a tributary's channel or bed and banks has ended such that the upper limit of the jurisdictional tributary is identified. However, a natural or man-made break in bed and banks or OHWM does not constitute the upper limit of a tributary where bed and banks or OHWM can be found farther upstream, as discussed below.

In many tributaries, there are often natural or man-made breaks in the presence of a bed and banks, or ordinary high water mark, while hydrologic connectivity remains. In some regions of the country, for example where there is a very low gradient, the banks of a tributary may be very low or may even disappear at times. Also, in many intermittent and ephemeral tributaries, including dry-land systems in the arid and semi-arid west, OHWM indicators can be discontinuous within an individual tributary due to the variability in hydrologic and climatic influences. The agencies proposed definition of “tributary” addresses these circumstances and states that waters that meet the definition of tributary remain tributaries even if such breaks occur. A waterbody that otherwise qualifies as a tributary under the proposed definition does not lose its status as a tributary if, for any length, there are one or more man-made breaks (such as bridges, culverts, pipes, or dams), or one or more natural breaks (such as debris piles, boulder fields, or a stream segment that flows underground) so long as a bed and banks and an ordinary high water mark can be identified upstream or downstream of the break. The presence of a bed and banks and an ordinary high water mark upstream or downstream of the break generally demonstrates continuity of flow. A water remains a tributary even if the channel, bed and banks, or OHWM disappears for a portion of the tributary provided a bed and banks, and OHWM can be found upstream or downstream of the break.

Waters that meet the definition of tributary under the proposed rule are jurisdictional even if there is an impoundment at some point along the connection from the tributary to the (a)(1) through (a)(3) water.

The proposed definition at (c)(5) provides that a tributary does not lose its status as a tributary if, for any length, there are one or more man-made breaks, such as dams. The existing regulation defines tributaries to impoundments and tributaries to the current (a)(3) “other waters” (i.e., "…intrastate lakes, rivers, streams (including intermittent streams), mudflats, sandflats, wetlands, sloughs…" 33 CFR 328.3 (a)(3)) as "waters of the United States" as well as tributaries to traditional navigable waters, interstate waters, and the territorial seas as "waters of the United States." The proposed regulation clarifies that tributaries must be tributaries of an (a)(1) through (a)(3) water. However, a water would not be considered tributary under this proposal if it only were a tributary to an impounded "other water" as defined under proposed new section (a)(7) (see Section III.I of this preamble). Such a water could be jurisdictional under (a)(7) of today's proposal, but it would not be jurisdictional by rule as a tributary. Similarly, not all ditches are jurisdictional. Ditches that do not contribute flow, either directly or through other waterbodies, to a water identified in paragraphs (a)(1) through (a)(3) of this section are excluded from jurisdiction as "waters of the U.S."

Longstanding agency practice has identified tributaries as including "natural, man-altered or manmade" waterbodies. Natural, man-altered, or manmade tributaries provide many of the same functions, especially as conduits for the movement of water and pollutants to other tributaries or directly to traditional navigable waters, interstate waters, or territorial seas. As conduits for water flow, they can help transport organisms, pollutants, and other substances, to the tributary system to traditional navigable waters, interstate waters, or territorial seas. The discharge of a pollutant into a tributary generally has the same effect downstream whether the tributary waterway is natural or manmade (see further discussion below and Appendix A). Indeed, given the extensive human modification of watercourses and hydrologic systems throughout the country, it is often difficult to distinguish between natural watercourses and watercourses that are wholly or partly manmade or man-altered. For example, tributaries that have been channelized in concrete or otherwise have been human-altered, may still meet the definition of tributaries under the agencies' proposed regulation so long as they still contribute flow to an (a)(1) through (a)(3) water. The agencies' proposed definition of tributary provides a non-exclusive list of the types of waters, natural, man-altered or man-made that may be tributaries: wetlands, rivers, streams, lakes, impoundments, canals, and ditches not excluded in paragraphs (b)(4) and b(5) of the proposed rule.

Under the agencies' proposal, when a tributary flows through a wetland into another tributary (e.g., a run-of-stream wetland), losing its OHWM through the wetland, it remains a tributary, and the wetland itself is considered a tributary. Wetlands may contribute flow to a stream or river through channelized flow or diffuse flow, and sometimes both. Wetlands may also serve as water sources at the upper limit of headwater streams, where the channel begins. In light of their potential to be important contributors of flow to tributaries to traditional navigable waters, interstate waters or territorial seas, the agencies propose a definition of tributary which includes such wetlands. In other instances, wetlands may serve as the connection between a tributary and another tributary or even a traditional navigable water, interstate water or the territorial seas. For wetland tributaries, water may flow through braided channels that also include wetlands or through a run-of-stream wetland that does not have a bed and banks and OHWM.

Tidal ditches are subject to the ebb and flow of the tide and thus jurisdictional under section (a) (1) of the existing and the proposed regulation. The agencies are proposing to clearly exempt from the definition of waters of the United States two types of ditches: "ditches that are excavated wholly in uplands, drain only uplands or non-jurisdictional waters, and have no more than ephemeral flow; and ditches that do not contribute flow, either directly or through other waterbodies, to a water identified in paragraphs (a) (1) through (a) (3) of this section." This proposal generally does not change the agencies' current practice with respect to ditches, but does for the first time codify these practices in regulation. In a 1986 Corps preamble and a 1988 EPA preamble, the agencies each stated that they generally do not consider the following to be waters of the United States: "Non-tidal drainage and irrigation ditches excavated on dry land." 51 FR 41217 (1986), 53 FR 20764 (1988). In the existing 2008 *Rapanos* guidance, the agencies stated that they generally would not assert jurisdiction over "Ditches (including roadside ditches) excavated wholly in and draining only uplands and that do not carry a relatively permanent flow of water." 2008 Guidance at 1, 12. The agencies' proposed rule uses the term "ephemeral flow" rather than the term "non-relatively permanent flow" used in the 2008 *Rapanos* guidance because "ephemeral flow" is a commonly used technical and scientific term defined as flowing briefly in direct response to precipitation. The use of the term "ephemeral flow" will be clearer and therefore lead to more consistent jurisdictional determinations while reasonably identifying those ditches excavated wholly in and draining only uplands or non-jurisdictional wetlands or waters and have no more than ephemeral flow which should be excluded from the definition of "waters of the United States." Note that the agencies consider ephemeral flows to be those with no identifiable groundwater contribution.

Only those ditches not excluded by the proposed regulation and that meet the proposed definition of tributary are waters of the United States. Ditches may be determined to be waters of the United States if they are wetlands and are adjacent to another water of the United States such as a traditional navigable water or a tributary. Ditches not excluded under paragraphs (b)(4) or (b)(5) of the proposed regulation meet the definition of tributary where they have a bed and banks and ordinary high water mark; they contribute flow directly or indirectly through other waterbodies to a traditional navigable water, interstate water, or the territorial seas. Non-tidal ditches are waters of the United States in the proposed rule when they meet the definition of "tributary" and are any of the following:

- natural streams that have been altered (e.g., channelized, straightened or relocated);
- ditches that have been excavated in waters of the United States, including jurisdictional wetlands;
- ditches that have more than ephemeral flow; or
- ditches that connect two or more waters of the United States.

Under paragraphs (b)(4) and (b)(5), there are two categories of ditches that are not considered "waters of the United States" under the proposed rule:

- Ditches that are excavated wholly in uplands, drain only uplands or non-jurisdictional waters, and have no more than ephemeral flow ; and
- Ditches that do not contribute flow, either directly or through other waterbodies, to a water identified in paragraphs (a)(1) through (a)(3) of this section.

In an effort to clarify non-jurisdictional ditches from those that are "waters of the U.S.", the proposal states that ditches with no more than ephemeral flow that are excavated in uplands, rather than in wetlands or other types of waters, for their entire length and that do not drain a jurisdictional wetland or other type of water are not tributaries and are not waters of the United States under the proposed rule. Similarly, ditches that do not drain into the tributary system of a traditional navigable water, interstate water or the territorial seas are not "waters of the United States," even if, for example, the ditch has perennial flow.

Historical evidence, such as historical photographs, prior delineations, or topographic maps, may be used to determine whether a waterbody was excavated wholly in uplands and drains only uplands or non-jurisdictional waters, and has no more than ephemeral flow. Site characteristics may also be present to inform the determination of whether the waterbody is a ditch, such as shape, sinuosity, flow indications, etc. as, ditches are often created in a linear fashion with little sinuosity and may not connect to another "water of the U.S." Ditches created by altering natural waters would be considered to be "waters of the U.S.", so long as it contributes flow to another jurisdictional water. Ditches may have been created for a number of purposes, such as irrigation, water management or treatment, irrigation canals and roadside ditches and drains. In order to be non-jurisdictional, however, the ditch must still demonstrate that it was excavated wholly in uplands, drains only uplands or non-jurisdictional waters, and has no more than ephemeral flow, and/or does not contribute flow, either directly or through other waterbodies, to a water identified in paragraphs (a)(1) through (a)(3) of this section.

### 2. What is not a tributary for purposes of this proposal?

Waters that do not contribute flow, either directly or through other waterbodies, to a water identified in paragraphs (a)(1) through (a)(3) of the regulation are not considered jurisdictional as tributaries under the CWA. However, they may be themselves (a)(1) or (a)(2) waters, or they may be jurisdictional if they fall under the "other waters" category (i.e., they have a significant nexus to an (a)(1) through (a)(3) water under (a)(7) of the proposed regulation). Note waters listed under the proposed (b), including ditches as defined under proposed (b)(4) and (b)(5), would not be considered waters of the United States in any case.

Section J below discusses in more detail the agencies proposed regulation excluding specific waters and features from the definition of waters of the United States. Of importance with respect to tributaries are the exclusion of gullies, rills, non-wetland swales, and certain ditches. These features are not considered tributaries under this proposed rule, even though rills and gullies (as described in Section J), may contribute flow into a tributary in systems with steep side slopes.

Non-jurisdictional geographic features (*e.g.*, non-wetland swales, ephemeral upland ditches) may still serve as a surface hydrologic connection between an adjacent wetland or water and a traditional navigable water, interstate water or a territorial sea, provided there is an actual exchange of water between those waterbodies, and the water is not lost to deep groundwater through infiltration (i.e., transmission losses). In addition, these geographic features may function as “point sources” (i.e., “discernible, confined and discrete conveyance[s]” under CWA section 502(14)), such that discharges of pollutants to waters through these features could be subject to other CWA authorities (*e.g.*, CWA section 402 and its implementing regulations).

### 3. Why Do the Agencies Conclude All Tributaries Are “Waters of the United States”?

Assertion of jurisdiction over tributaries as defined in this proposed rule is appropriate under *Rapanos* both as a legal matter and as a scientific matter based on available science and the agencies’ professional judgment and field expertise. The agencies conclude based on their scientific and technical expertise that tributaries, as defined in the proposed regulation, in a watershed are similarly situated and have a significant nexus alone or in combination with other tributaries to the chemical, physical or biological integrity of traditional navigable waters, interstate waters or the territorial seas.

#### a. Legal Basis for Defining All Tributaries as Waters of the United States

In *Rapanos*, both the plurality opinion and Justice Kennedy’s opinion discussed the Court’s prior opinion in *Riverside Bayview* to begin their analysis of the scope of the CWA. Justice Scalia stated “In *Riverside Bayview*, we stated that the phrase [“waters of the United

States”] in the Act referred primarily to “rivers, streams, and other *hydrographic features more conventionally identifiable as ‘waters’* ” than the wetlands adjacent to such features. 474 U. S., at 131 (emphasis added).” *Rapanos*, 547 U.S. at 734. Justice Kennedy began, “As the plurality points out, and as *Riverside Bayview* holds, in enacting the Clean Water Act Congress intended to regulate at least some waters that are not navigable in the traditional sense.” *Ante,* at 12; *Riverside Bayview,* 474 U. S., at 133; see also *SWANCC*, *supra*, at 167. This conclusion is supported by “the evident breadth of congressional concern for protection of water quality and aquatic ecosystems.” *Riverside Bayview*, *supra*, at 133; see also *Milwaukee* v. *Illinois,* 451 U. S. 304, 318 (1981) (describing the Act as “an all-encompassing program of water pollution regulation”). In *Rapanos,* Justice Kennedy established a standard for determining whether 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. While Justice Kennedy focused on adjacent wetlands in light of the facts of the cases before him, it is reasonable to utilize the same standard for tributaries. In addition, 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.” 547 U.S. at 780-81. As discussed in this preamble, based on a detailed examination of the scientific literature, the agencies conclude that tributaries as they propose to define them perform the requisite functions identified by Justice Kennedy for them to be considered, as a category, to be waters of the United States. Assertion of jurisdiction over tributaries with a bed and banks and OHWM is also consistent with *Rapanos* because five Justices did not question the current regulations, which assert jurisdiction over non-navigable tributaries of traditional navigable waters and interstate waters.

The Report analyzes the scientific literature to determine whether tributaries to traditional navigable waters, interstate waters, or the territorial seas have a sufficient 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, as a category. We provide an ecological rationale to demonstrate that tributaries draining to a traditional navigable water, interstate water, or the territorial seas have a significant nexus to such waters, especially because of their ability to transport pollutants to such waters that would impair their chemical, physical, and biological integrity.

One of the primary purposes and functions of the CWA is to prevent the dumping of petroleum wastes and other chemical wastes, biological and medical wastes, and all other forms of pollutants into the "waters of the United States," because such pollutants endanger the nation's public health, drinking water supplies, shellfish, fin fish, recreation areas, etc. Because the entire tributary system of the navigable and interstate waters is interconnected, pollutants that are dumped into any part of the tributary system eventually are washed downstream to navigable or interstate waters, where those pollutants endanger public health and the environment. The CWA regulates and controls pollution at its source, in part because most pollutants do not remain at the site of the discharge, but instead flow and are washed downstream through the tributary system to endanger drinking water supplies, fisheries, and recreation areas. These fundamental facts about the movement of pollutants and the interconnected nature of the tributary system demonstrate why all tributaries of the traditional navigable waters and interstate waters have a significant nexus with those downstream waters. The significant nexus relating to pollution control between all tributaries of navigable and interstate waters and their downstream waters in and of itself justifies this rulemaking's assertion of CWA jurisdiction by rule over all tributaries.

### b. The Agencies Conclude that Tributaries, as Defined in the Proposed Rule, Have a Significant Nexus

The finding of significant nexus is based on the chemical, physical, and biological interrelationship between a water, the tributary network, and traditional navigable waters, interstate waters, and territorial seas. Based on their scientific and technical expertise, the agencies conclude that tributaries, as defined in today's proposed rule, "are likely, in the majority of cases, to perform important functions for an aquatic system incorporating navigable waters." *Rapanos,* 547 U.S. at 781-2. (For more discussion, see Appendix A).

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

Physical connections between tributaries and traditional navigable waters, interstate waters, and the territorial seas result from the hydrologic transport of numerous materials, including water, sediment and organic matter (e.g., leaves, wood) from tributaries to downstream waters. This transport affects the physical characteristics of downstream waters. Tributaries, even when seasonally dry, are the dominant source of water in most rivers, rather than direct precipitation or groundwater input to main stem river segments.

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 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 demonstrate physical alteration of river structure and function by headwater streams.

Tributaries have vitally important effects on the physical integrity of (a) (1) through (a) (3) waters, contributing not only the majority of the flow in these waters but affecting the structure of the waters. These effects occur even when the tributaries flow infrequently (such as ephemeral tributaries) and even when the tributaries are significant distances from the (a) (1) through (a) (3) water (such as some headwater tributaries). Tributaries provide flow to downstream rivers necessary to support navigation. The agencies conclude that these have a significant effect on the integrity of downstream waters.

### (2) Tributaries Significantly Affect the Chemical Integrity of (a)(1) through (a)(3) Waters

Tributaries also influence the chemical composition of downstream waters, through the transport of chemical elements and compounds, such as nutrients, ions, dissolved and particulate organic matter, pollutants, and contaminants. Ecosystem processes in tributaries transform, remove, and transport these substances to downstream waters. In turn, these chemical compounds can influence water quality, sediment deposition, nutrient availability, and biotic functions in rivers. Because water flow is the primary mechanism by which chemical substances are transported downstream, chemical effects are closely related to hydrological connectivity. Long-distance movement of contaminants provides another line of evidence for chemical connectivity between tributaries and traditional navigable waters, interstate waters or the territorial seas and significantly affect (a)(1), (a)(2) or (a)(3) waters.

Within tributaries, there are processes that occur that transform and export nutrients and carbon to downstream waters, serving important source functions that 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.

Tributaries have important effects on the chemical integrity of (a)(1) through (a)(3) waters, acting as both sinks and sources of chemical substances and have a large effect on the chemical integrity of the (a)(1) through (a)(3) waters. They provide sink functions by trapping chemicals through absorption to sediments in the stream substrate (e.g., phosphorous adsorption to clay particles). They provide source functions by transporting chemicals to downstream (a)(1) through (a)(3) waters as chemicals dissolved in the waters or as chemicals attached to suspended sediments.

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

Tributaries, including intermittent and ephemeral streams, are critical in the life cycles of many organisms capable of moving throughout river networks. In fact, many organisms, such as anadromous salmon, have complex life cycles which involve migration through the river network, from headwaters to downstream rivers and oceans and back, over the course of their lives. Anadromous fish spend the majority of their life cycles in saltwater, but migrate upstream to inland freshwater systems in order to spawn and reproduce. In addition to providing critical habitat for complex life cycle completion, tributaries provide refuge from predators and adverse physical conditions in rivers and they are reservoirs of genetic- and species-level diversity. These connections between tributaries and (a)(1) through (a)(3) waters influence the biologic integrity of these waters.

Tributaries have important effects on the biological integrity of (a)(1) through (a)(3) waters, contributing materials to downstream food networks and supporting populations for aquatic species, including economically important species such as salmon, etc., and other essential habitat needs for species that utilize both tributaries and downstream (a)(1) through (a)(3) waters. These effects occur even when the tributaries flow infrequently (such as ephemeral tributaries) and even when the tributaries are large distances from the (a)(1) through (a)(3) water (such as some headwater tributaries).

#### (4) Tributaries Significantly Affect the Chemical, Physical, and Biological Integrity of (a)(1) through (a)(3) Waters

As discussed above, the agencies conclude that tributaries, including headwaters, intermittent, and ephemeral streams, have a significant nexus to traditional navigable waters, interstate waters or the territorial seas based on their contribution to the chemical, physical, and biological integrity of (a)(1) through (a)(3) waters. Tributaries, including headwater streams, within a watershed draining to a traditional navigable water, interstate water, or the territorial seas collectively shape the chemical, physical, and biological integrity of (a)(1) through (a)(3) waters.

Tributaries that are small, flow infrequently, or are a substantial distance from the nearest (a)(1) through (a)(3) water (*e.g.*, headwater perennial, intermittent, and ephemeral tributaries) are essential components of the tributary network and have important effects on the chemical, physical, and biological integrity of (a)(1) through (a)(3) waters, contributing many of the same functions downstream as larger streams. When their functional contributions to the chemical, physical, and biological conditions of downstream waters are considered at a watershed scale, the scientific evidence supports a legal determination that they meet the “significant nexus” standard articulated by Justice Kennedy in *Rapanos*.

#### (5) Tributary Lakes, Ponds, and Wetlands Significantly Affect the Chemical, Physical, and Biological Integrity of (a)(1) through (a)(3) Waters

Although the above discussion refers primarily to stream tributaries, lake, pond and wetland tributaries also have the same or similar connections and functions that significantly affect (a)(1) through (a)(3) waters. Lakes and ponds that contribute surface water to downstream (a)(1) through (a)(3) waters satisfy the agencies’ definition of tributary. They may be at the headwaters of the tributary network (*e.g.* a lake with no stream inlets that has an outlet to the tributary network) or located outside of the headwaters, or farther downstream from the headwaters (*e.g.*, a lake with both a stream inlet and a stream outlet to the tributary network). Similarly, wetland tributaries are wetlands that are located within the stream channel itself or that form the start of the stream channel, such as channel-origin wetlands that are part of the headwaters of the tributary network.

Tributary lakes and ponds serve many important functions that affect the chemical, physical, and biological conditions downstream. Lakes can store floodwaters, sediment, and nutrients, as these materials have the opportunity to settle out, at least temporarily, as water moves through the lake downstream. Lakes, as with other tributaries, can also contribute flow, nutrients, sediment, and other materials downstream.

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

Today's proposal expressly states that a tributary, including wetlands, can be a natural, man-altered, or man-made water body and includes waters such as rivers, streams, lakes, impoundments, canals, and ditches not excluded from the definition of "waters of the United States" by paragraph (b) of the proposed rule. The agencies' proposed rule clarifies that man-made and man-altered tributaries are waters of the United States because man-made and man-altered tributaries perform many of the same functions as natural tributaries, especially the conveyance of water that carries nutrients, pollutants, and other substances to traditional navigable waters, interstate waters, or the territorial seas. Man-made and man-altered tributaries also provide corridors for movement of organisms between headwaters and traditional navigable waters, interstate waters, or the territorial seas. 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 recognizes that features that convey water, whether they are natural, man-made, or man-altered, provide the connectivity between streams and downstream rivers.

Tributary ditches and other man-made or man-altered waters, if they meet the definition of "tributary," have a significant nexus to (a)(1) through (a)(3) waters due to their effects on the chemical, physical, or biological integrity of those downstream waters. As described above, tributaries of all flow regimes have a significant nexus to downstream (a)(1) through (a)(3) waters. 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. Due to their often channelized nature, ditches are very effective at transporting water and these materials, including nitrogen, downstream. It is the agencies' position that ditches that meet the definition of tributary (and are not excluded under (b)(4) or (b)(5)) provide the same physical, chemical, and/or biological functions as other waterbodies defined as tributaries under the proposed rule.

### IIIG. Adjacent Waters

The agencies propose to revise the existing jurisdictional category of "adjacent wetlands," which currently limits consideration to only wetlands. The proposed "adjacent waters" category would replace "adjacent wetlands" and would include wetlands and other waterbodies that meet the proposed definition of adjacent, including "neighboring." It would be necessary to determine that a wetland or other waterbody meets the definition of "adjacent" water under proposed paragraph (a)(6) to establish jurisdiction. An adjacent water or wetland has a chemical, physical, and/or biological function that is integrally related to a regulated waterbody.

The proposed rule makes several changes to the existing rule. First, it proposes to change "adjacent wetlands" to "adjacent waters" so that waterbodies such as ponds and oxbow lakes, as well as wetlands, adjacent to jurisdictional waters are "waters of the United States" by regulation. Second, the proposed rule adds a definition of the term "neighboring," which appears in the definition of "adjacent." The agencies propose a definition for "neighboring" to identify those adjacent waters that the agencies concluded have a significant nexus to (a)(1) through (a)(3) waters. To bring greater clarity to the meaning of "neighboring," the proposed rule adds two additional scientifically-based definitions for the terms "riparian area" and "floodplain" to explain the lateral reach of the term "neighboring." The proposed definitions of those two terms are set out below. The proposed rule reads in relevant part:

> (a)(6) All waters, including wetlands, adjacent to a water identified in paragraphs (1) through (5) of this section;
>
> (c) Definitions
>
> (1) *Adjacent:* The term *adjacent* means bordering, contiguous or neighboring. Waters, including 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 waters."
>
> (2) *Neighboring*: The term neighboring, for purposes of the term "adjacent" in this section, includes waters located within the riparian area or floodplain of a water identified in paragraphs (a)(1) through (a)(5) of this section, or waters with a surface or shallow subsurface hydrologic connection to such a jurisdictional water.
>
> (3) *Riparian area:* The term *riparian area* means an area bordering a water where surface or subsurface hydrology influence the ecological processes and plant and animal community structure in that area. Riparian areas are transitional areas between aquatic and terrestrial ecosystems that influence the exchange of energy and materials between those ecosystems.
>
> (4) *Floodplain:* The term *floodplain* means an area bordering inland or coastal waters that was formed by sediment deposition from such water

under present climatic conditions and is inundated during periods of moderate to high water flows.

### 1. What are "adjacent waters" under the proposed rule?

As explained in more detail below, "adjacent waters" are wetlands, ponds, lakes and similar water bodies that provide similar functions which, in concert with the functions provided by the tributaries to which they are adjacent, have a significant nexus to traditional navigable waters, interstate waters, and the territorial seas. In other words, tributaries and their adjacent waters function as a system that significantly affects the chemical, physical, and biological integrity of traditional navigable waters, interstate waters, and the territorial seas. This also includes waters and wetlands that are themselves adjacent to traditional navigable waters, interstate waters, and the territorial seas. The inclusion of adjacent waters in this category is supported by the Report, the collective body of scientific literature, the agencies' growing body of scientific and technical knowledge and practical expertise addressing the connectivity and ecological interactions of these waters on downstream (a)(1) through (a)(3) waters, and by the determination made in this rulemaking that, in the aggregate, all adjacent waters have a significant nexus with their downstream traditional navigable waters or interstate waters.

Under the existing rule, only *wetlands* adjacent to "waters of the United States" are defined as "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. Prior to *SWANCC,* adjacent non-wetland waters were often found jurisdictional under the "other waters," or "(a)(3)" provision of the existing regulations. Waters, including wetlands, that meet the proposed definition of adjacency, including the new proposed definition of neighboring, have a significant nexus to (a)(1) through (a)(3) waters, and under this proposed rule would include all adjacent waters, including wetlands, as "waters of the United States" by rule.

The existing definition of "adjacent" would be generally retained under today's proposal, with a clarification. The proposed rule states: "[t]he term *adjacent* means bordering, contiguous or neighboring. Waters, including 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 waters.'" The rule also proposes for the first time a definition of the term "neighboring.' Even if bordering, contiguous or neighboring waters are separated from an (a)(1) through (a)(5) water by natural or man-made features such as berms or other barriers or the like, the waters are "adjacent" and thus "waters of the United States" under proposed paragraph (a)(6). Within the definition of "adjacent," the terms bordering and contiguous are well understood, and for continuity and clarity the agencies would continue to interpret and implement those terms consistent with existing policy and practice. Note that the lateral limits of an adjacent water, other than wetlands or tributaries, is determined by the presence of an OHWM without the need for a bed and banks. (33 CFR Section 328.3(e)).

The term "neighboring" has generally been interpreted broadly. The agencies provide a regulatory definition of "neighboring" that captures those waters that in practice the agencies have identified as having a significant effect on the chemical, physical and biological integrity of traditional navigable waters, interstate waters or the territorial seas. "Neighboring" is defined as including, "waters located within the riparian area or floodplain of a water identified in paragraphs (a)(1) through (a)(5) of this section, or waters with a surface or shallow subsurface hydrologic connection to such a jurisdictional water." The terms "riparian area" and "floodplain" are also defined to further clarify how we interpret the term "neighboring." Those new terms are found at subsection (c)(1) through (c)(4) of the proposed rule.

Under the proposed definition for "neighboring," waters, including wetlands, that are located within the riparian area or floodplain of an (a)(1) through (a)(5) water would be jurisdictional without a case-specific significant nexus analysis. Most waters, including wetlands, that are bordering or contiguous to a waterbody are found within its riparian zone or floodplain. However, there are some bordering or contiguous waters that might be located outside of the riparian zone or floodplain, such as wetlands immediately next to a highly incised and manipulated stream that no longer has a riparian area or a floodplain. Waters, including wetlands, determined to have a surface or shallow subsurface hydrologic connection to an (a)(1) through (a)(5) water would also be waters of the United States by definition. In circumstances where a particular waterbody is outside of the floodplain and riparian area of a tributary, but is connected by surface or shallow subsurface hydrology with such tributary, the agencies will also assess the distance between the waterbody and tributary in determining whether or not the waterbody is adjacent. The scientific literature, supplemented by agency practice, leads to a recognition of the role of hydrologic connections in supporting a substantial chemical, physical, and biological relationship between waterbodies, but this relationship can be reduced as the distance between waterbodies increases. The agencies recognize that in specific circumstances, the distance between waterbodies may be sufficiently far that even the presence of a hydrologic connection may not support an adjacency determination.

Both surface and shallow subsurface connections are forms of direct hydrologic connections between adjacent waters and (a)(1) through (a)(5) waters. Examples of surface connections would include small conveyances, swales or non-jurisdictional ditches, such as the two categories listed in paragraph (b)(3), that connect the two water bodies. A shallow subsurface hydrologic connection is lateral water flow through a shallow subsurface layer, such as can be found in steeply sloping forested areas with shallow soils, or soils with a restrictive horizon that impedes the vertical flow of water or, in karst systems, especially karst pans. A shallow subsurface connection also exists, for example, when the adjacent water and neighboring (a)(1) through (a)(5) water are in contact with the same shallow aquifer. These connections would provide evidence of a water body being adjacent, even if those connections would not be considered "waters of the United States" in and of themselves.

Application of the terms "riparian area," "floodplain," and "hydrologic connection" would be based in part on best professional judgment and experience applied to the definitions contained in this rule. The new definitions of riparian area and floodplain are designed to provide greater consistency, clarity, and certainty in determining the circumstances where the proximity and location of a particular water meet the term adjacent. The addition of these two terms is based on the scientific literature and agencies' knowledge of and expertise on river systems, which shows that water bodies such as wetlands, ponds, and oxbow lakes located within the riparian areas and floodplains of (a)(1) through (a)(5) waters generally have substantial hydrologic and ecologic connections with the waters that they neighbor. These proposed definitions are adapted from scientific definitions using the concepts that are most relevant and useful in the context of the CWA. *See, e.g., Id.* When determining whether a water is located in a floodplain, the agencies will use best professional judgment to determine which flood interval to use (for example, 10 to 20 year flood interval zone).

Finally, the agencies are also proposing to delete the parenthetical from the existing "adjacent wetlands" regulatory provision: "Wetlands adjacent to waters (other than waters that are themselves wetlands) identified in paragraphs (a) through (f) of this definition."  The phrase "other than waters that are themselves wetlands" was intended to preclude asserting CWA jurisdiction over wetlands that were simply adjacent to another wetland (such as an "isolated" wetland, as opposed to a wetland adjacent to a tributary).  However, in practice some wetlands that were indeed adjacent to a tributary were found to not meet the definition of "adjacent" simply because another adjacent wetland was located between the adjacent wetland and the tributary.  With this proposed change, the agencies intend to ensure that all waters that meet the proposed definition of "adjacent" are "waters of the United States," regardless of whether or not another adjacent water is located between those waters and the tributary.  If, for example, one wetland is in the riparian area of a "tributary" as defined in today's proposed rule, and a different wetland is in the floodplain of that tributary, both wetlands would meet the definition of "adjacent" and be "waters of the United States," even if the riparian wetland is located between the floodplain wetland and the tributary. Each wetland's jurisdictional status in this example is based on a case-specific determination of whether it meets the definition of "adjacent." Waters located near an adjacent water but which are not themselves (independently) adjacent to a tributary would, under the proposed rule, not be regulated under (a) (6).  However, waters, including wetlands, that are adjacent to a wetland that *meets the definition of a tributary* would be considered adjacent waters.

### 2. Why do the agencies conclude that adjacent waters are waters of the United States?

#### a. Legal Basis for Defining All Adjacent Waters as Waters of the United States

For those wetlands adjacent to (a)(1) through (a)(3) waters, Justice Kennedy stated 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 all other adjacent waters, including adjacent wetlands, Justice Kennedy has provided 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.'" 547 U.S. at 780. 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 the touchstone for CWA jurisdiction. Justice Kennedy also provided that the agencies could through regulation or adjudication identify categories of waters that "are likely, in the majority of cases, to perform important functions for an aquatic system incorporating navigable waters." 547 U.S. at 780-81.

Adjacent waters as defined in today's proposed rule, alone or in combination with other adjacent waters in a watershed that drains to a traditional navigable water, interstate water or the territorial seas, do significantly affect the chemical, physical and biological integrity of those waters. 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 in which those waters flow into, are an integrated ecological system, and discharges of pollutants, including discharges of dredged or fill material, into these components of that ecological system, must be regulated under the CWA to restore and maintain the chemical, physical, or biological integrity of these waters.

The agencies' proposed regulation is consistent with the statute, the Supreme Court's decisions, the best available science, and scientific and technical expertise, see both Appendices A and B.

### b. Adjacent waters under this proposed rule have a significant nexus to downstream (a)(1) through (a)(3) waters.

The agencies' proposal to determine "adjacent waters" jurisdictional is supported by the substantial chemical, physical, and biological relationship between adjacent waters, alone or in combination with similarly situated waters, and (a)(1) through (a)(5) waters. Adjacent wetlands and other adjacent waters such as ponds and oxbow lakes perform important functions for the nearby streams and lakes, and these functions are significant for the chemical, physical, and biological integrity of adjacent and downstream waters. See Appendix A.

One reason why the EPA and the Corps determined in this rulemaking that all adjacent waters have a significant nexus with their downstream navigable or interstate waters is closely related to a primary reason (explained above) why all tributaries of navigable and interstate waters have a significant nexus with those downstream waters. That is, all adjacent waters should be jurisdictional by rule because the discharge of many pollutants (such as petroleum wastes and other toxic pollutants) discharged into adjacent waters often would flow downstream into and thereby pollute the navigable or interstate waters.

Based on science and agency expertise, the agencies concluded that adjacent waters, as defined in the proposed rule, "are likely, in the majority of cases, to perform important functions for an aquatic system incorporating navigable waters." *Rapanos*, 547 U.S. at 781-82 The agencies identified the characteristics of adjacent waters that as a class have a significant nexus to (a)(1) through (a)(3) waters: they are waters that are bordering to or are contiguous with (a)(1) through (a)(5) waters, including wetlands; they are waters that lie within the riparian area or floodplain of a (a)(1) through (a)(5) waters; or they are waters that have a surface or shallow subsurface connection with such (a)(1) through (a)(5) waters. These characteristics ensure that the adjacent waters are part of "an aquatic system incorporating navigable waters," 547 U.S. at 781-82; and that they perform important functions to maintain the chemical, physical, or biological integrity of an (a)(1) through (a)(3) water.

In showing chemical, biological, and physical connections between adjacent waters and other jurisdictional waters, adjacent waters, including wetlands, may be separated by land or other features not regulated under the CWA, but those intervening uplands do not eliminate or impede the functional interactions between (a)(1) through (a)(5) waters and the waters, including wetlands, that are adjacent to them. For instance, two waters may be separated by upland but be connected through surface or shallow subsurface connections with water and chemicals readily exchanging between them. Similarly, uplands separating two waters may not act as a barrier to animals that regularly move between the two waters. Therefore, this proposed rule reflects an understanding that adjacent waters affect the chemical, physical, and biological integrity of waters to which they are adjacent and to (a)(1) through (a)(3) waters even where the two waters may be separated by features that are not jurisdictional, such as uplands, berms, roads, levees, and similar features. The presence of these features does not extinguish jurisdiction, a conclusion contained in the agencies' existing regulation at 33 CFR 328.3 (c).

### (1) Riparian and Floodplain Waters Significantly Affect the Chemical, Physical, and Biological Integrity of (a)(1) through (a)(3) Waters

Riparian and floodplain waters, including wetlands, that are adjacent to (a)(1) through (a)(3) waters play an integral role in maintaining the chemical, physical, and biological integrity of those waters. In addition, riparian and floodplain waters, including wetlands, that are adjacent to (a)(4) and (a)(5) waters and those (a)(4) and (a)(5) waters themselves, should be considered together as a functional ecosystem, and as such provide an important role in maintaining the chemical, physical, and biological integrity of traditional navigable waters, interstate waters, or the territorial seas. Riparian areas are often located within the floodplains of waterbodies.

### (2) Waters, Including Wetlands, Determined to Have a Surface or Shallow Subsurface Hydrologic Connections Significantly Affect the Chemical, Physical, and Biological Integrity of (a)(1) through (a)(3) Waters.

The proposed rule includes as adjacent those waters that are "neighboring" because they possess a surface or shallow subsurface hydrologic connection to a jurisdictional water, and therefore can exchange water, along with chemicals and organisms within that water, with an (a)(1) through (a)(5) water, and subsequently have a significant effect on the chemical, physical, and biological integrity of a downstream traditional navigable water, interstate water, or territorial sea. Surface connections that provide a pathway for water to be exchanged between the potentially adjacent wetland or water, and an (a)(1) through (a)(5) water present the clearest evidence of a hydrologic connection. Shallow subsurface connections are equally important, yet are more difficult to identify and document. Relevant evidence shows that waters, including wetlands, located outside of the riparian area or flood plain, but which still have a surface or shallow subsurface hydrologic connection to an (a)(1) through (a)(5) water, will have a significant nexus to downstream (a)(1) through (a)(3) waters. Note that nothing under this proposed rule would cause the shallow subsurface connections themselves to become jurisdictional.

Examples of surface water hydrologic connections are swales, gullies, or rills. The frequency, duration, and volume of flow associated with these connections can vary greatly depending largely on factors such as precipitation, snowmelt, landforms, soil types, and water table elevation. It is the presence of this hydrologic connection which provides the opportunity for neighboring waters to influence the chemical, physical, or biological integrity of (a)(1) through (a)(5) waters.

In circumstances where a particular water is outside of the floodplain and riparian area of a jurisdictional waterbody, a connection can be established by surface or shallow subsurface hydrology that makes the water neighboring, and thus adjacent. The scientific literature recognizes the role of hydrologic connections in supporting a substantial chemical, physical, and biological relationship between waterbodies, but this relationship can be reduced as the distance between waterbodies increases because of various factors, such as soil characteristics, geology, climate, precipitation patterns, etc. The distance between waterbodies may be sufficiently great that even the presence of an apparent hydrologic connection may not support an adjacency determination. The greater the distance, the less likelihood that there is an actual surface or shallow subsurface hydrologic connection, because of the greater potential for the water to infiltrate the soil to deeper groundwater, or for transmission losses in any gully or swale (for example) that may appear to be hydrologic connections. A determination of adjacency based on surface or shallow subsurface hydrologic connection outside the riparian area or floodplain requires clear documentation.

### IIIH. "Other Waters"

The "other waters" section of the proposed regulation is at (a)(7), and provides that "On a case-specific basis, other waters, including wetlands, provided that the water alone, or in combination with other similarly situated waters located in the same region, has a significant nexus to a water identified in paragraphs (1) through (3) of this section." To be clear, these "other waters" are not jurisdictional as a single category; rather, as the proposed rule language states, " other waters" are jurisdictional provided that they are found, on a case-specific basis, to have a significant nexus to an (a)(1) through (a)(3) water. Thus, the introductory phrase "on a case-specific basis" is designed to signal clearly that this provision of the definition of "waters of the United States" does not mean "other waters" are waters of the United States by definition, in contrast to those defined in proposed paragraphs (a)(1) through (a)(6). "Other waters" will be evaluated individually or as a group of waters in a single landscape unit if they are located sufficiently close together or close to a jurisdictional water. How these "other waters" are aggregated for a case-specific significant nexus analysis depends on their spatial arrangement within the "region" or watershed. "Other waters" generally have similar functions, so it is the landscape position within the watershed (i.e., the "region") that is the determinative factor for the significant nexus analysis, which will focus on the degree to which the functions provided by those "other waters" affect the chemical, physical, or biological integrity of (a)(1) through (a)(3) waters.

Significant nexus is then proposed to be defined at (c)(7) of the regulations and provides that "The term significant nexus means a more than speculative or insubstantial effect that a water (including wetlands), either alone or in combination with other similarly situated waters in the region (i.e., the watershed that drains to a water identified in paragraphs (a)(1) through (3) of this section), on the chemical, physical or biological integrity of a water identified in paragraphs (a)(1) through (3) of this section. “Other waters” (including wetlands) are similarly situated when they perform similar functions and are located sufficiently close together or close to a “water of the U.S.” so that they can be evaluated as a single landscape unit with regard to their effect on the physical, chemical, or biological integrity of a water identified in paragraphs (a)(1) through (a)(3) of this section.” Together, these two provisions allow for the possibility of establishing jurisdiction over waters that do not fit within the definition of another of the proposed categories of waters of the United States and are not excluded from the definition of waters of the United Stated under proposed (b).

The proposed regulation also provides the agencies’ interpretation of significant nexus. Accordingly, a significant nexus analysis may be based on a particular water alone or based on the effect that the water has in combination with other similarly situated waters in the region. The agencies are proposing to interpret the region to identify similarly situated waters as the watershed that drains to a water identified in paragraphs (a)(1) through (a)(3). For purposes of analyzing whether an “other water” has a significant nexus, the agencies are proposing that “other waters” are similarly situated if they perform similar functions and they are either (1) located sufficiently close together so that they can be evaluated as a single landscape unit with regard to their effect on the chemical, physical, or biological integrity of a water identified in paragraphs (a)(1) through (a)(3), or (2) located sufficiently close to a “water of the U.S.” for such an evaluation of their effect. These criteria are explained in a subsequent section.

Consistent with Justice Kennedy’s opinion in *Rapanos*, the agencies propose today to establish a case-specific analysis of whether “other waters,” including wetlands, that do not meet the criteria for any of the proposed jurisdictional categories in (a)(1) through (a)(6) and are not proposed to be excluded by rule under paragraph (b) of the rule, have a significant nexus to a traditional navigable water, an interstate water or the territorial seas, and therefore, are waters of the United States. The agencies specifically considered whether sufficient information existed about certain subcategories of "other waters" to support a conclusion that the particular waters, alone or in combination, had a significant nexus to waters identified in paragraphs (a)(1) through (a)(3), but concluded that there is not sufficient scientific information or practical knowledge at this time to support establishing such subcategories of "other waters" as jurisdictional *per se*, Therefore, at this time the agencies are not proposing to identify any other category or categories of waters over which to assert jurisdiction.

### 1. Significant Nexus Analysis for "Other Waters"

#### a. "Other Waters"

As noted earlier, "other waters" are those waters, including wetlands, that do not meet the criteria of any of the categories of waters in (a)(1) through (a)(6) and also are not one of the features excluded from the definition of waters of the United States, and thus are subject to a case specific significant nexus determination. In the existing regulation, there is a non-exclusive list of the types of "other waters" which may be found to be waters of the United States: "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 agencies are not proposing to re-promulgate this list of "other waters" because the list does not seem necessary and because it could cause confusion because some have read it as an exclusive list. Of more concern was that the existing descriptive list of types of "other waters" includes some waters that would be jurisdictional under one of the proposed categories of waters of the

United States that would be jurisdictional by rule. The agencies want to be clear, for example, that an intermittent stream that meets the definition of tributary does not also need a separate significant nexus analysis. By removing that list of water types for clarity, the agencies do not intend to imply that any of the waters listed in the existing regulation are not jurisdictional. When one of the waters on the enumerated list does not fall under another proposed category (for example, adjacent waters under (a)(6) or tributaries under (a)(5)), those waters would be jurisdictional if found to have a significant nexus under this proposed section on a case-specific basis.

### b. Significant Nexus

The agencies recognize that Supreme Court decisions in *SWANCC* and *Rapanos* identified limitations on the geographic scope of "other waters" that may be determined to be jurisdictional.  Therefore, the agencies' proposal today provides that waters not covered by any other regulatory category are jurisdictional only if they are determined on a case-specific basis to have a significant nexus to a traditional navigable water, an interstate water, or the territorial seas.

Justice Kennedy explained the *SWANCC* decision in his concurring opinion in *Rapanos*: "In *Solid Waste Agency of Northern Cook Cty. v. Army Corps of Engineers,* 531 U.S. 159 (2001) (*SWANCC*), the Court held, under the circumstances presented there, 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." 547 U.S. at 759. Since the Court in *SWANCC* was considering the validity of the Corps' assertion of jurisdiction over ponds and mudflats under (a)(3) of the existing Corps' regulations (33 CFR 328.3), the agencies interpret the significant nexus standard to apply to the "other waters" of the existing regulation.

The “other waters” or “(a)(3) waters” provision of EPA’s and the Corps existing regulations includes:

> “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 ….”

To comport with the *SWANCC* and *Rapanos* decisions, the agencies are proposing to delete the requirement that an “other water” be one “the use, degradation or destruction of which could affect interstate or foreign commerce” and to replace it with the requirement that the “other water” meet Justice Kennedy’s significant nexus standard. The current regulations assert jurisdiction more broadly than what is proposed today. With this proposed regulation, the agencies are limiting regulation of “other waters” to only those that are determined on a case-specific basis to have a significant nexus to an (a)(1) through (a)(3) water. For the purpose of assessing whether an “other water” has a significant nexus, the agencies are also proposing a definition of significant nexus. See Appendix B, Legal Analysis.

For purposes of 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, the agencies are proposing to define each of the elements of the significant nexus standard in the definition of “significant nexus.”

### i. In the Region

The agencies propose to interpret the phrase “in the region” to mean the watershed that drains into the nearest traditional navigable water, interstate water or the territorial seas through a single point of entry. That concept is established in the definition of “significant nexus” at (c)(7): "... in the region (i.e., the watershed that drains to a water identified in paragraphs (a)(1) through (3) of this section) . . ." Justice Kennedy did not define the "region." The agencies 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 a reasonable and technically appropriate scale on which to identify waters that together may have an effect on the physical, chemical or biological integrity of a particular (a)(1), (a)(2) or (a)(3) water, consistent with Justice Kennedy's standard. See Appendix A, Scientific Analysis.

The point of entry watershed is the drainage basin within whose boundaries all precipitation ultimately flows to a single traditional navigable water. The watershed includes all lands, streams, wetlands, lakes, and other waters within its boundaries.

In light of the scientific literature, the longstanding approach of the agencies to implementation of the CWA, and the statutory goals underpinning Justice Kennedy's significant nexus framework, the watershed draining to an (a)(1) through (a)(3) water is the appropriate "region" for a significant nexus analysis.

#### ii. Similarly Situated

The agencies' proposed regulation would apply Justice Kennedy's significant nexus test in determining whether "other waters" are waters of the United States. The "other waters" section of the proposed regulation is at (a)(7), and provides that such waters, including wetlands, are waters of the United States when "[o]n a case-specific basis, other waters, including wetlands, provided that the water alone, or in combination with other similarly situated waters located in the same region, has a significant nexus to a water identified in paragraphs (a)(1) through (a)(3) of this section." The proposed regulation at (c)(7) further clarifies that "other waters, including wetlands, are similarly situated when they perform similar functions and are located sufficiently close together or close to a water of the United States so that they can be evaluated as a single landscape unit with regard to their effect on the chemical, physical, or biological integrity of a water identified in paragraphs (a)(1) through (a)(3) of this section" (i.e., traditional navigable waters, interstate waters or the territorial seas). This portion of the regulation allows for determining jurisdiction over waters that are not contained within the definition of another of the proposed categories of waters of the United States and are not excluded from the definition of waters of the United States under (b).

Justice Kennedy provided guidance to the agencies that establishing a significant nexus requires examining whether a water "alone or in combination with similarly situated [waters] in the region, significantly affect[s] the chemical, physical, and biological integrity of other covered waters more readily understood as 'navigable.'" 547 U.S. at 780. The proposed rule adopts the concept of aggregating certain waters to determine whether such waters meet the "alone or in combination with similarly situated waters" test.

The proposed rule requires that waters perform similar functions and be located sufficiently close together or close to a water of the U.S so that they can be evaluated as a single landscape unit with regard to their effects. This combination of functionality and proximity to each other or to a water of the United States meets the guidance provided by Justice Kennedy. Examining both functionality and proximity also limits the "other waters" that can be aggregated for purposes of determining jurisdiction. The science contained in the Report supports a conclusion that there is insufficient information at this time to determine that entire categories of "other waters" should be determined to be jurisdictional by rule. This is in contrast to the conclusion in the proposed rule that tributaries possess the requisite significant nexus to be determined jurisdictional as a category.

It is appropriate to analyze the chemical, physical, or biological effects "other waters" perform individually or together with all similarly situated "other waters" in the same region. Today, the agencies are proposing to identify factors to apply in the determination of when "other waters" should be considered either individually or as a single landscape unit for purposes of a significant nexus analysis. The agencies' proposed rule defines "similarly situated" "other waters" as waters that perform similar functions and are located in the landscape either sufficiently close to each other or close to a water of the United States that it is appropriate to consider their combined effects on the chemical, physical, or biological integrity of a traditional navigable water, interstate water, or territorial sea. The agencies recognize not all "other waters" within the region should be considered similarly situated for the purposes of assessing whether a significant nexus exists. As a result, the agencies propose to define "similarly situated" to require an evaluation of either a single water or group of waters (i.e., a single landscape unit) in the region that can reasonably be expected to function together in their effect on the chemical, physical, or biological integrity of downstream traditional navigable waters, interstate waters or territorial seas.

In addition, the agencies propose that "other waters" located close to a jurisdictional water are more likely to influence such waters and therefore, to affect the integrity of downstream (a)(1) through (a)(3) waters. These "other waters," which do not meet the proposed definition of adjacent waters, may be assessed together when determining on a case-specific basis whether a significant nexus exists, because of their similar functions and similar location in the landscape.

Agencies will conduct case-specific analyses of "other waters" at the project site and within the single point of entry watershed in which these "other waters" are located to determine whether a significant nexus exists between these "other waters" and the nearest (a)(1) through (a)(3) water. "Other waters," including wetlands, are similarly situated when they perform similar functions and are located sufficiently close together or close to a "water of the U.S." so that they can be evaluated as a single landscape unit within that watershed. Similarly situated waters may be identified as sufficiently close together for purposes of this section of the proposed regulation when they are within a contiguous area of land with relatively homogeneous soils, vegetation and landform (e.g., plain, mountain, valley, etc.). As a general matter, it would be inappropriate, for example, to consider "other waters" as "similarly situated" if these "other waters" are located in different landforms, have different elevation profiles, or have different soil and vegetation characteristics, unless the "other waters" are located similarly near a "water of the U.S.," which may allow such "other waters" to more consistently and collectively function to effect an (a)(1) through (a)(3) water. However, the agencies may also consider: the hydrologic and ecological bases for establishing a grouping as a single landscape unit; the geographic distribution of these "other waters;" the distance between these waterbodies and their proximity to jurisdictional waters within the watershed; the functions performed by the "other waters," such as habitat, water storage, sediment retention, and pollution sequestration; and hydrologic connectivity with jurisdictional waters. These and other relevant considerations should be used by the agencies to document the hydrologic, geomorphic and ecological characteristics and circumstances. Examples include: documentation of physical, chemical and biological interactions of the similarly situated "other waters"; aerial photography; topographical or terrain maps and information; other available GIS data; National Wetland Inventory Maps; and state and local information. The evaluation should use any available site information and pertinent field observations where available, relevant scientific studies or data, or other relevant jurisdictional determinations that have been completed in the region. The agencies generally use available mapping tools that are based on the National Hydrography Dataset (NHD) to demarcate boundaries of the single point of entry watershed. This point of entry approach identifies a group of waters that flow to a single location and represents the scientifically appropriate sized area for conducting a significant nexus evaluation in most cases. 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 resource intensive to demarcate watershed boundaries and all relevant waters in the watershed. Under those circumstances, for practical administrative purposes the agencies could use the NHD mapping tool to demarcate catchments surrounding the water to be evaluated that, in combination, are roughly the size of the typical nearby 10-digit hydrologic unit code (HUC-10) watershed. This combination of catchments would be used for conducting a significant nexus evaluation. Such an approach can help resolve some practical concerns of using available mapping tools on very large single point of entry watersheds in the arid West. Under the proposed rule, the agencies would assess the combined effects of similarly situated "other waters" in the same region on the chemical, physical, or biological integrity of (a)(1), (a)(2) and (a)(3) waters in conducting a significant nexus analysis. The factors identified above would be used by the agencies in determining "other waters" in the region that are similarly situated and should, therefore, be considered together in conducting a significant nexus analysis.

The agencies identified a number of factors relevant to determining whether "other waters" are similarly situated for conducting a significant nexus analysis. However, the agencies recognize that consideration of these factors will often limit aggregation of "other waters" for purposes of assessing significant nexus or will require that "other waters" be considered individually with no aggregation.  The agencies request public comment on this approach and whether alternative approaches may be more consistent with the best available science and Justice Kennedy's opinion in *Rapanos*.

### iii. Significant Nexus

The agencies propose to define the term "significant nexus" consistent with language in *SWANCC* and *Rapanos.*  The proposed definition of "significant nexus" at (c)(7) relies most importantly 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 proposed regulations.   Justice Kennedy was clear that the requisite nexus must be more than "speculative or insubstantial," *Rapanos*, at 780, in order to be significant and the agencies propose to define significant nexus in precisely those terms.  It is important to note that in *Rapanos*, Justice Kennedy did not conclude that the wetlands adjacent to ditches in the cases before the Court were not waters of the United States.  Rather, Justice Kennedy concluded that the proper inquiry to determine their jurisdictional status - whether or not the wetlands had a "significant nexus" - had not been made by the Corps or the courts below.  In fact, Justice Kennedy stated that in both the consolidated cases before the Court the record contained the types of evidence relevant to the determination of a significant nexus according to the principles he identified. Justice Kennedy stated "[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*.  Thus, 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." See Appendix B, Legal Analysis.

The agencies will determine whether the water they are evaluating, in combination with other similarly situated waters in the watershed, has a significant nexus to the nearest traditional navigable water or interstate water. Functions of waters that might demonstrate a significant nexus include sediment trapping, nutrient recycling, pollutant trapping and filtering, retention or attenuation of flood waters, runoff storage, and provision of aquatic habitat. A hydrologic connection is not necessary to establish a significant nexus, because in some cases the lack of a hydrologic connection would be a sign of the water's function in relationship to the traditional navigable water or interstate water, such as retention of flood waters or pollutants that would otherwise flow downstream to the traditional navigable water or interstate water.

### I. Waters that are not Waters of the United States

The agencies' longstanding regulations exclude waste treatment systems designed to meet the requirements of the CWA and prior converted cropland from the definition of waters of the United States. The agencies propose no changes to these exclusions and therefore they are restated as a part of this rulemaking. The agencies also propose to codify longstanding practices that have generally considered certain features and types of waters not to be waters of the United States. Under today's proposal, the waters identified in the regulation would clearly not be waters of the United States.

The agencies propose to take some ministerial actions with respect to the placement of the two existing exemptions for waste treatment systems and prior converted cropland. They will be in proposed new subsection (b). In addition, the agencies propose to delete a cross-reference in the existing waste treatment system exclusion to an EPA regulation that is no longer in the Code of Federal Regulations. The parenthetical to be deleted states: "(other than cooling ponds as defined in 40 CFR 423.11(m) which also meet the criteria of this definition)." The agencies do not propose any substantive changes to this exclusion. In fact, the agencies do not propose to make conforming changes to ensure that each of the existing definitions of the waters of the United States for the various CWA programs have the exact same language with respect to the waste treatment system exclusion. The regulations implementing the various CWA programs were promulgated and amended at different times and therefore there are some differences in language. For example, EPA's regulations for the Section 402 program state:

> 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. This exclusion applies only to manmade bodies of water which neither were originally created in waters of the United States (such as disposal area in wetlands) nor resulted from the impoundment of waters of the United States. [See Note 1 of this section.]
>
> Note: At 45 FR 48620, July 21, 1980, the Environmental Protection Agency suspended until further notice in §122.2, the last sentence, beginning "This exclusion applies . . ." in the definition of "Waters of the United States." This revision continues that suspension.[i] [i] Editorial Note: The words "This revision" refer to the document published at 48 FR 14153, Apr. 1, 1983.

40 C.F.R. 122.2.

The Corps' regulations implementing Section 404 state: "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." 33 C.F.R. 328.3. The agencies do not propose to address the substance of the waste treatment system exclusion and thus will leave each regulation as is with the exception of deleting the cross-reference.

In addition, this regulation does not address or change in any way the many statutory exemptions from CWA requirements. Thus, the proposed rule does not affect any of the exemptions from CWA sections 402 and 404 permitting requirements provided by CWA section 404(f), including those for normal agriculture, forestry and ranching practices. CWA section 404(f); 40 C.F.R. § 232.3; 33 C.F.R. § 323.4. The proposed rule also does not address the statutory and regulatory exemptions from NPDES permitting requirements for agricultural stormwater discharges and return flows from irrigated agriculture. CWA section 402(l)(1) ("The Administrator shall not require a permit under this section for discharges composed entirely of return flows from irrigated agriculture. . . ."); CWA section 502(14)("[The] term [point source] does not include agricultural stormwater discharges and return flows from irrigated agriculture."); 40 C.F.R. § 122.3(f) (return flows from irrigated agriculture are excluded from the NPDES program); 40 C.F.R. § 122.2 (The term "point source" "does not include return flows from irrigated agriculture or agricultural storm water runoff.").

Finally, in new paragraphs (b)(3) through (b)(5), the agencies propose to, for the first time by rule, exclude some waters and features that the agencies have by longstanding practice generally considered not to be waters of the United States. Specifically, the agencies propose that the following are not waters of the United States:

(3) Artificially irrigated areas that would revert to upland should application of irrigation water to that area cease; artificial lakes or ponds created by excavating

and/or diking dry land and used exclusively for such purposes as stock watering, irrigation, settling basins, or rice growing; artificial reflecting pools or swimming pools created by excavating and/or diking dry land; small ornamental waters created by excavating and/or diking dry land for primarily aesthetic reasons; water-filled depressions created incidental to construction activity; groundwater drained through subsurface drainage systems; gullies and rills; non-wetland swales;  and puddles;

(4) Ditches that are excavated wholly in uplands, drain only uplands or non-jurisdictional waters, and have no more than ephemeral flow; and

(5) Ditches that do not contribute flow, either directly or through other waterbodies, to a water identified in paragraphs (a)(1) through (a)(3) of this section.

Most of these features and waters have been identified by the agencies as generally not waters of the United States in previous preambles or guidance documents.  The agencies' have always preserved the authority to determine in a particular case that one of these waters was a water of the United States.  One of the agencies' goals in this proposed rule is to increase clarity and certainty about the scope of waters of the United States.  To that end, the agencies propose not simply that these features and waters are "generally" not waters of the United States, but that they are expressly not waters of the United States by rule.  Under this proposal, the agencies would not retain the authority to determine that one of these waters was a water of the United States by, for example, finding that the water had a significant nexus pursuant to the other waters provision at (a)(7).  These waters would not be jurisdictional by definition.

A similar list of waters and features not generally waters of the United States was provided by the Corps in a 1986 preamble to the existing rule defining waters of the United States ( 51 Fed. Reg. 41206, 41217 (November 13, 1986)) and by the EPA in a 1988 preamble (53 FR 20764 (June 6, 1988)). In today's proposed rule, the agencies have clarified and added to the list in order to provide a full description of the waters that will not be waters of the United States.

Today's proposed rule states that waters of the United States do not include "artificially irrigated areas that would revert to upland should application of irrigation water to that area cease." In the 1986 and 1988 preambles, the agencies stated that they "...generally do not consider the following waters to be "Waters of the United States" . . . (b) Artificially irrigated areas which would revert to upland if the irrigation ceased." The Corps also addressed this issue in a regulatory guidance letter. RGL 07-02 at 3 n.1.

The next few items in this proposed rule are features that Congress did not intend to protect under the CWA: "artificially irrigated areas that would revert to upland should application of irrigation water to that area cease; artificial lakes or ponds created by excavating and/or diking dry land and used exclusively for such purposes as stock watering, irrigation, settling basins, or rice growing; artificial reflecting pools or swimming pools created by excavating and/or diking dry land; small ornamental waters created by excavating and/or diking dry land for primarily aesthetic reasons; water-filled depressions created incidental to construction activity; groundwater drained through subsurface drainage systems; gullies and rills; non-wetland swales; and puddles" The agencies have generally not considered these to be hydrologic features and therefore not "waters of the United States" in preambles or in .

Gullies are 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.,* N.C. Brady and R.R. Weil, *The Nature and Properties of Soils*, 13th Edition (Upper Saddle River, NJ: Prentice Hall, 2002). Rills are formed by overland water flows eroding the soil surface during rain storms. *See, e.g.,* L.B. Leopold, *A View of the River* (Cambridge: Harvard University Press, 1994). Rills are less permanent on the landscape than streams and typically lack an OHWM, whereas gullies are younger than streams in geologic age; time has shaped streams into geographic features distinct from gullies and rills. *See, e.g.,* American Society of Civil Engineers, Task Committee on Hydrology Handbook, *Hydrology Handbook* (ASCE Publications, 1996). 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 characterized by the presence of bed and banks as compared to typical erosional features that are more deeply incised. It should be noted that some features that are named "gullies" are in fact ephemeral streams; such features where they are tributaries as defined by this rule would be considered "waters of the United States."

Non-wetland natural and man-made swales would not be waters of the United States under this proposal. In certain circumstances, however, swales include areas that meet the regulatory definition of "wetlands." Swales generally are considered wetlands when they meet the applicable criteria in the Corps of Engineers Wetland Delineation Manual and the appropriate regional supplement to that Wetland Delineation Manual. Wetland swales would be evaluated as adjacent waters under proposed (a)(6) or as "other waters" under proposed (a)(7) depending upon whether they meet the proposed definition of adjacent.

Finally, under paragraphs (b)(4) and (b)(5), the agencies are proposing to clearly exempt from the definition of waters of the United States two types of ditches: "ditches that are excavated wholly in uplands, drain only uplands or non-jurisdictional waters, and have no more than ephemeral flow" and "ditches that do not contribute flow, either directly or through other waterbodies, to a water identified in paragraphs (a)(1) through (a)(3) of this section." The agencies have long distinguished between ditches that are waters of the United States and ditches that will generally not be treated as waters of the United States. With this proposal, the agencies would clearly establish, by rule, that certain ditches are not waters of the United States. Other ditches, if they meet the new proposed definition of "tributary" would continue to be waters of the United States, as they have been under the agencies longstanding implementation of the statute and regulations.

The first type of ditches that are excluded need to meet all three criteria: (1) they are excavated wholly in uplands; (2) they drain only uplands or non-jurisdictional waters; and (3) they have no more than ephemeral flow, that is, do not intersect groundwater. Ditches that are excavated wholly in uplands means ditches that at no point along their length are excavated in a jurisdictional wetland (or other water). Members of the public should consider whether a wetland is jurisdictional before constructing a ditch that would drain the wetland and connect either directly or through other waterbodies to an (a)(1) through (a)(3) water. The ditch must also contain no more than ephemeral flow to be excluded under this proposed provision.

Ephemeral flow means that the flow in the ditch occurs only during, or for a short duration after, precipitation events because it does not intersect groundwater. This exclusion is generally consistent with agency policy for decades and as articulated in the 2008 *Rapanos* guidance which stated that the agencies generally would not assert jurisdiction over "ditches (including roadside ditches) excavated wholly in and draining only uplands and that do not carry a relatively permanent flow of water."

The other type of ditch that would not be a water of the United States is ditches that do not contribute flow, either directly or through other waterbodies, to a water identified in paragraphs (a)(1) through (a)(3) of this section. Essentially, ditches that do not contribute flow to the tributary system of a traditional navigable water, interstate water or territorial sea would not be waters of the United States.

It is important to note, however, that even when not jurisdictional waters, these non-wetland swales and specific types of ditches may still be a surface hydrologic connection for purposes of the proposed definition of adjacent under section (a)(6). For example, a wetland may be a "water of the United States," meeting the proposed definition of "neighboring" because it is connected to a tributary by a non-jurisdictional ditch. In addition, these geographic features may function as "point sources" (i.e., "discernible, confined and discrete conveyance[s]" under CWA section 502(14)), such that discharges of pollutants to waters through these features would be subject to other CWA regulations (e.g., CWA section 402).

## IV. Related Acts of Congress, Executive Orders, and Agency Initiatives

### A. Executive Order 12866: Regulatory Planning and Review and Executive Order 13563:

## Improving Regulation and Regulatory Review

Under Executive Order 12866 (58 FR 51735, October 4, 1993), this action is a "significant regulatory action" because it raises novel legal or policy issues. Accordingly, the EPA and the Corps submitted this action to the Office of Management and Budget (OMB) for review under Executive Orders 12866 and 13563 (76 FR 3821, January 21, 2011) and any changes made in response to OMB recommendations have been documented in the docket for this action.

In addition, the EPA and the Corps of Engineers prepared an analysis of the potential costs and benefits associated with this action. This analysis is contained in "Economic Analysis of Proposed Revised Definition of Waters of the United States." A copy of the analysis is available in the docket for this action. The costs and benefits incurred of this proposed action are considered indirect because the action involves a definitional change to a term that is used in the implementation of a variety of CWA programs. Each of these programs subsequently imposes direct or indirect costs as a result of implementation of their specific regulations. The definition of "waters of the U.S. ," by itself, imposes no direct costs.

## B. Paperwork Reduction Act

This action does not impose any information collection burden under the provisions of the Paperwork Reduction Act, 44 U.S.C. 3501 et seq. Burden is defined at 5 CFR 1320.3(b). An Agency may not conduct or sponsor, and a person is not required to respond to, a collection of information unless it displays a currently valid OMB control number. The OMB control numbers for EPA's CWA section 402 program may be found at 40 CFR pt. 9.1. (OMB Control No. 2040-0004, EPA ICR No. 0229.19). For the CWA section 404 regulatory program, the current OMB approval number for information requirements is maintained by the Corps of Engineers (OMB approval number 0710–0003, expires August 31, 2012). However, there are no new approval or application processes required as a result of this rulemaking that necessitate a new ICR.

## C. Regulatory Flexibility Act

The Regulatory Flexibility Act (RFA) generally requires an agency to prepare a regulatory flexibility analysis of any rule subject to notice-and-comment rulemaking requirements under the APA or any other statute unless the agency certifies that the rule will not have a significant economic impact on a substantial number of small entities. Small entities include small businesses, small organizations, and small governmental jurisdictions.

For purposes of assessing the impacts of this final action on small entities, "small entity" is defined as: (1) a small business that is a small industrial entity as defined in the U.S. SBA size standards (see 13 CFR 121.201); (2) a small governmental jurisdiction that is a government of a city, county, town, school district, or special district with a population of less than 50,000; or (3) a small organization that is any not-for-profit enterprise that is independently owned and operated and is not dominant in its field.

After considering the economic impacts of this proposed rule on small entities, I certify that this proposed rule will not have a significant economic impact on a substantial number of small entities. See, e.g., *Cement Kiln Recycling Coalition v. EPA*, 255 F.3d 855 (D.C. Cir. 2001); *Michigan v. EPA*, 213 F.3d 663 (D.C. Cir. 2000); *Am. Trucking Ass'n v. EPA*, 175 F.3d 1027 (D.C. Cir. 1999); *Mid-Tex Elec. Co-op, Inc. v. FERC*, 773 F.2d 327 (D.C. Cir. 1985).

Under the RFA, the impact of concern is any significant adverse economic impact on small entities, because the primary purpose of the initial regulatory flexibility analysis is to identify and address regulatory alternatives “which minimize any significant economic impact of the rule on small entities.” 5 U.S.C. 603. The scope of regulatory jurisdiction in this proposed rule is narrower than that under the existing regulations. See 40 CFR 122.2 (defining “waters of the United States”). Because fewer waters will be subject to the CWA under the proposed rule than are subject to regulation under the existing regulations, this action will not affect small entities to a greater degree than the existing regulations. As a consequence, this action if promulgated will not have a significant adverse economic impact on a substantial number of small entities, and therefore no regulatory flexibility analysis is required.

The proposed rule contemplated here is not designed to “subject” any entities of any size to any specific regulatory burden. Rather, it is designed to clarify the statutory scope of “the waters of the United States, including the territorial seas” (33 U.S.C. 1362(7)), consistent with Supreme Court precedent. This question of CWA jurisdiction will be informed by the tools of statutory construction and the geographical and hydrological factors identified in *Rapanos v. United States*, 547 U.S. 715 (2006), which are not factors readily informed by the RFA.

Nevertheless, the scope of the term “waters of the United States” is a question that has continued to generate substantial interest, particularly within the small business community, because permits must be obtained for many discharges of pollutants into those waters. In light of this interest, the EPA and the Corps determined to seek early and wide input from representatives of small entities while formulating a proposed definition of this term that reflects the intent of Congress consistent with the mandate of the Supreme Court’s decisions. Such outreach, although voluntary, is also consistent with the President’s January 18, 2011 Memorandum on Regulatory Flexibility, Small Business, and Job Creation, which emphasizes the important role small businesses play in the American economy. This process has enabled the agencies to hear directly from these representatives, at a very preliminary stage, about how they should approach this complex question of statutory interpretation, together with related issues that such representatives of small entities may identify for possible consideration in separate proceedings.

### D. Unfunded Mandates Reform Act

This proposed rule contains no Federal mandates (under the regulatory provisions of Title II of the Unfunded Mandates Reform Act of 1995 (UMRA), 2 USC 1531-1538 for state, local, or tribal governments or the private sector. This proposed rule does not directly regulate or affect any entity and, therefore, is not subject to the requirements of sections 202 and 205 of UMRA.

The Agencies determined that this proposed rule contains no regulatory requirements that might significantly or uniquely affect small governments. Moreover, the proposed definition of “waters of the U.S.” applies broadly to CWA programs and the subsequently affected entities, which are not uniquely applicable to small governments. Thus, this proposed rule is not subject to the requirements of section 203 of UMRA.

### E. Executive Order 13132: Federalism

This action does not have federalism implications. It will not have substantial direct effects on the States, on the relationship between the national government and the States, or on the distribution of power and responsibilities among the various levels of government. This proposed rule seeks to clarify the definition of the extent of CWA jurisdiction established by statute. State and local governments have well-defined and long-standing relationships in implementing affected CWA programs and these relationships will not be altered. Thus, Executive Order 13132 does not apply to this action. In the spirit of Executive Order 13132, and consistent with EPA and Corps policy to promote communications between the agencies and State and local governments, the agencies specifically solicit comment on this proposed action from State and local officials.

## F. Executive Order 13175: Consultation and Coordination With Indian Tribal Governments

Subject to the Executive Order (EO) 13175 (65 FR 67249, November 9, 2000) Agencies may not issue a regulation that has tribal implications, that imposes substantial direct compliance costs, and that is not required by statute, unless the Federal government provides the funds necessary to pay the direct compliance costs incurred by tribal governments, or the Agencies consult with tribal officials early in the process of developing the proposed regulation and develops a tribal summary impact statement. This action does not have tribal implications as specified in EO 13175.

In the spirit of EO 13175, and consistent with EPA and Corps policy to promote communications between the agencies and tribal governments, the agencies specifically solicit additional comment on this proposed action from tribal officials.

## G. Executive Order 13045: Protection of Children From Environmental Health and Safety Risks

Executive Order 13045 (62 FR 19885, April 23, 1997) applies only to those regulatory actions concerning health or safety risks where the analysis required under section 5-501 of the EO has the potential to influence the regulation. This action is not subject to EO 13045 because the environmental health or safety risks addressed by this action do not present a disproportionate risk to children.

## H. Executive Order 13211: Actions Concerning Regulations That Significantly Affect Energy Supply, Distribution, or Use

This action is not a "significant energy action" as defined in Executive Order 13211 (66 FR 28355 (May 22, 2001)), because it is not likely to have a significant adverse effect on the supply, distribution or use of energy.

## I. National Technology Transfer and Advancement Act

Section 12(d) of the National Technology Transfer and Advancement Act of 1995 ("NTTAA"), Public Law No. 104-113, 12(d) (15 U.S.C. 272 note) directs federal agencies to use voluntary consensus standards in its regulatory activities unless to do so would be inconsistent with applicable law or otherwise impractical. Voluntary consensus standards are technical standards (e.g., materials specifications, test methods, sampling procedures, and business practices) that are developed or adopted by voluntary consensus standards bodies. NTTAA directs federal agencies to provide Congress, through OMB, explanations when the Agency decides not to use available and applicable voluntary consensus standards.

This proposed rulemaking does not involve technical standards. Therefore, the agencies are not considering the use of any voluntary consensus standards.

## J. Executive Order 12898: Federal Actions To Address Environmental Justice in Minority Populations and Low-Income Populations

Executive Order (EO) 12898 (59 FR 7629 (Feb. 16, 1994)) establishes federal executive policy on environmental justice. Its main provision directs federal agencies, to the greatest extent practicable and permitted by law, to make environmental justice part of their mission by identifying and addressing, as appropriate, disproportionately high and adverse human health or environmental effects of their programs, policies, and activities on minority populations and low-income populations in the United States.

The agencies have determined that this proposed rule will not have disproportionately high and adverse human health or environmental effects on minority or low-income populations. The proposed rule defines the scope of waters protected under the CWA. The increased clarity regarding the definition of “waters of the United States” will be of benefit to all regulators, stakeholders, and interested parties. However, in the spirit of Executive Order 12898, we specifically request comment regarding potential environmental justice issues raised by the proposed rule, and will fully consider those comments when preparing the final rule.

### K. Environmental Documentation

The U.S. Army Corps of Engineers has prepared a draft environmental assessment in accordance with the National Environmental Policy Act (NEPA). The Corps has made a preliminary determination that the Section 404 aspects of today's proposed rule does not constitute a major Federal action significantly affecting the quality of the human environment, and thus preparation of an Environmental Impact Statement (EIS) will not be required. The proposed rule will increase and make more efficient the protection of the aquatic environment. Additionally, the Corps complies with NEPA programmatically for general permits, and specifically for each and every standard individual permit application before making final permit decisions.

The implementation of the procedures prescribed in this proposed regulation would not authorize anyone (e.g., any landowner or permit applicant) to perform any work involving regulated activities in “waters of the U.S.” without first seeking and obtaining an appropriate CWA authorization, which concurrently documents compliance with all applicable environmental laws.

# Appendix A

# Scientific Evidence

## Overview of Scientific Literature on Aquatic Resource Connectivity and Downstream Effects

In preparation for this proposal, more than a thousand peer-reviewed scientific papers and other data that address connectivity of aquatic resources and effects on downstream waters were reviewed and considered. EPA's Office of Research and Development (ORD) has prepared a draft 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, *Connectivity of Streams and Wetlands to Downstream Waters: A Review and Synthesis of the Scientific Evidence*, (Washington, D.C.: U.S. Environmental Protection Agency, 2013), hereinafter, "Report"). This draft Report similarly has been considered in the development of this proposal. The Report is currently undergoing peer review led by EPA's Scientific Advisory Board (SAB) and is available at http://yosemite.epa.gov/sab/sabproduct.nsf/fedrgstr_activites/Watershed%20Connectivity%20Report?OpenDocument. The Report summarizes and assesses much of the currently available scientific literature that is part of the administrative record for this proposal. The agencies anticipate that additional data and information will become available during the rulemaking process, including that provided during the public comment process, and by additional research, studies, and investigations that take place before the rulemaking process is concluded. At the conclusion of the rulemaking process, the agencies will review the entirety of the completed administrative record, including the final Report reflecting SAB review, and will make any adjustments to the final rule deemed to be appropriate at that time. The Report is under review by the Science Advisory Board, and the rule will not be finalized until that review and the final report are complete. Part I of this Appendix provides the conclusions of the review and synthesis. Part II provides additional detail of the scientific literature and the agencies' reasoning in support of this proposal.

## Part I: Synthesis of Peer-Reviewed Scientific Literature

### Background

The draft Report prepared by ORD 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 understanding about these connections, the factors that influence them, and the mechanisms by which connected waters, singly or in aggregate, affect the function or condition of downstream waters. The focus of the Report is on surface and shallow subsurface connections from small or temporary streams, non-tidal wetlands, and certain open-waters. Specific types of connections considered in the 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.

The draft Report prepared by ORD consists of six chapters. Following an executive summary and an introduction to the Report, chapter 3 presents a conceptual framework describing the hydrologic elements of a watershed, the types of chemical, physical, and biological connections that link them, and watershed and climatic factors that influence connectivity at various temporal and spatial scales. It also provides background on the structure and function of streams and wetlands viewed from an integrated watershed perspective.  In a discussion of connectivity, the watershed scale is the appropriate context for interpreting technical evidence about individual watershed components, reviewed in subsequent chapters. Chapter 4 surveys the literature on stream networks (lotic systems) in terms of chemical, physical, and biological connections between upstream and downstream habitats. Two case studies from the literature examine in greater detail longitudinal connectivity and downstream effects in prairie streams and arid streams of the Southwest. Chapter 5 reviews the literature on connectivity and effects of non-tidal wetlands and certain open-waters (lentic systems) on downstream waters.  This chapter is further subdivided into two broad categories of landscape settings based on directionality of hydrologic flows: *bidirectional settings*, in which wetlands and open-waters can have two-way hydrologic exchanges with other water bodies (e.g., riparian and floodplain wetlands and open-waters), and *unidirectional settings*, in which water flows only from the wetland or open-water towards the downstream water (e.g., most wetlands and open-waters outside of riparian areas and floodplains). Directionality of hydrologic flow was selected as an organizational principle for this section because it has a dominant role in determining the types of connectivity and downstream effects (if any) of wetlands.  However, the use of these landscape settings for hydrologic directionality should not be construed as suggesting directionality of geochemical or biological flows.  Also, the terms “unidirectional” and “bidirectional” describe the landscape setting in which wetlands and open-waters occur, and do not refer to wetland type or class. Four case studies from the literature examine evidence pertaining to connectivity and downstream effects of oxbow lakes, Carolina and Delmarva bays, prairie potholes, and vernal pools in greater detail.

Chapter 6 presents and discusses key findings and major conclusions of the review, which also are included at the end of each review section and in this executive summary.

**Summary of Major Conclusions**

Based on the review and synthesis of more than a thousand publications from the peer-reviewed scientific literature, the available evidence supports three major conclusions:

1. The scientific literature demonstrates that streams, individually and cumulatively, exert a strong influence on the character and functioning of downstream waters. All tributary streams, including perennial, intermittent, and ephemeral streams, are chemically, physically, and biologically connected to downstream rivers via channels and associated alluvial deposits where water and other materials are concentrated, mixed, transformed, and transported. Headwater streams (headwaters) are the most abundant stream-type in most river networks, and supply most of the water in rivers. In addition to water, streams supply sediment, wood, organic matter, nutrients, chemical contaminants, and many of the organisms found in rivers. Streams are biologically connected to downstream waters by the dispersal and migration of aquatic and semi-aquatic organisms, including fish, amphibians, plants, microorganisms, and invertebrates, that use both up- and downstream habitats during one or more stages of their life cycles, or provide food resources to downstream communities. Chemical, physical, and biological connections between streams and downstream waters interact via processes such as nutrient spiraling, in which stream

communities assimilate and chemically transform large quantities of nitrogen and other nutrients that would otherwise increase nutrient loading downstream.

2. Wetlands and open-waters in landscape settings that have bidirectional hydrologic exchanges with streams or rivers (e.g., wetlands and open-waters in riparian areas and floodplains) are chemically, physically, and biologically connected with rivers via the export of channel-forming sediment and woody debris, temporary storage of local groundwater that supports baseflow in rivers, and transport of stored organic matter. They remove and transform excess nutrients such as nitrogen and phosphorus. They provide nursery habitat for breeding fish, colonization opportunities for stream invertebrates, and maturation habitat for stream insects. Moreover, wetlands in this landscape setting serve an important role in the integrity of downstream waters because they also act as sinks by retaining floodwaters, sediment, nutrients, and contaminants that could otherwise negatively impact the condition or function of downstream waters.
3. Wetlands in landscape settings that lack bidirectional hydrologic exchanges with downstream waters (e.g., many prairie potholes, vernal pools, and playa lakes) provide numerous functions that can benefit downstream water quality and integrity. These functions include storage of floodwater; retention and transformation of nutrients, metals, and pesticides; and re-charge of groundwater sources of river baseflow. The functions and effects of this diverse group of wetlands, which the Report refers to as “unidirectional wetlands,” affect the condition of downstream waters if there is a surface or shallow subsurface water connection to the river network. In unidirectional wetlands that are not connected to the river network

> through surface or shallow subsurface water, the type and degree of connectivity varies geographically within a watershed and over time. Because such wetlands occur on a gradient of connectivity, it is difficult to generalize about their effects on downstream waters. Generalization for this class is further complicated because, for certain functions (e.g., sediment removal and water storage), downstream effects are due to wetland isolation, rather than connectivity. The literature reviewed does not provide sufficient information to evaluate or generalize about the degree of connectivity (absolute or relative) or the downstream effects of wetlands in unidirectional landscape settings. However, evaluations of individual geographically isolated wetlands or groups of geographically isolated wetlands could be possible through case-by-case analysis. Further, while the review did not specifically address other unidirectional water bodies, the conclusions apply to these water bodies (e.g., ponds and lakes that lack surface water inlets) as well, since the same principles govern hydrologic connectivity between these water bodies and downstream waters.

Section 3 below provides an overview of the conceptual framework, with further discussion of the key findings for streams, riparian and floodplain areas, and unidirectional wetlands.

### 1. Conceptual Framework Overview

Connectivity is a foundational concept in hydrology and freshwater ecology. The structure and function of downstream waters are highly dependent on the constituent materials contributed by and transported through water bodies located elsewhere in the watershed. Most of the materials in a river, including water, sediment, wood, organic matter, nutrients, chemical contaminants, and certain organisms, originate outside of the river, from upstream tributaries, wetlands, or other components of the river system, and are transported to the river by water movement, wind, or other means. Therefore, streams and wetlands fundamentally affect river structure and function by altering transport of various types of materials to the river. This alteration of material transport depends on two key factors: (1) connectivity (or isolation) between streams, wetlands and rivers that enables (or prevents) the movement of materials between the system components; and (2) functions within streams and wetlands that supply, remove, transform, provide refuge for, or delay transport of materials.

The ORD Report defines connectivity as the degree to which components of a system are joined, or connected, by various transport mechanisms. Connectivity is determined by the characteristics of both the physical landscape and the biota of the specific system. Isolation is the opposite of connectivity; or the degree to which system components are not joined. Both connectivity and isolation have important effects on downstream waters. For example, stream channels convey water and channel-forming sediment to rivers, whereas wetlands that lack output channels can reduce flooding and store excess sediment. Materials transport connects different ecosystem types, at multiple spatial and temporal scales. For example, streams flowing into and out of wetlands or between lakes form continuous or seasonal connections across ecosystem boundaries. Similarly, aquatic food webs connect terrestrial ecosystems, streams, wetlands, and downstream waters.

Water movement through the river system is the primary, but certainly not the only, mechanism providing physical connectivity within river networks. It provides a “hydraulic highway” that transports chemical, physical, and biological materials associated with the water (e.g., sediment, woody debris, contaminants, organisms). Because the movement of water is fundamental to understanding watershed connectivity, Chapter 3 begins with a review and an explanation of the hydrologic foundation of river systems, and terms and concepts used throughout the Report are defined.

Numerous factors influence watershed connectivity. Climate, watershed topography, soil and aquifer permeability, the number and types of contributing waters, their spatial distribution in the watershed, interactions among aquatic organisms, and human alteration of watershed features, among other things, can act individually or in concert to influence stream and wetland connectivity to, and effects on, downstream waters. For example, all else being equal, materials traveling shorter distances could enter the river with less transformation or dilution, thus increasing a beneficial or harmful effect. In other cases, sequential transformations such as nutrient spiraling (defined and discussed below) connect distant water bodies and produce beneficial effects on downstream waters. Infrequent events that temporarily connect nearby or distant streams or wetlands to rivers also can have large, long-lasting effects. Most of the major changes in sediment load and river channel structure that are critical to maintaining river health—including meanders of rivers in floodplains and creation of oxbow lakes—are a result of large floods that provide infrequent, intense connections with more distant streams and riparian or floodplain waters.

Based on a review of the peer-reviewed scientific literature, the Report identifies five functions by which streams, wetlands, and open-waters influence material transport into 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
- Lags: the delayed or regulated release of materials, such as storm water

These functions are not static or mutually exclusive (e.g., a wetland can be both a source of organic matter and a sink for nitrogen) and can change over time (e.g., one wetland can be a water sink when evapotranspiration is high and a water source when evapotranspiration is low). Further, some functions work in conjunction with others. For example, a lag function can include transformation of materials prior to their delayed release. In a particular stream, wetland, or open-water, the presence or absence of these functions depends upon the biota, hydrology, and environmental conditions in the watershed.

When considering effects on downstream waters, it is helpful to distinguish between *actual function* and *potential function* of a stream, wetland, or open-water. For example, a wetland with appropriate conditions for denitrification is a *potential* sink for nitrogen, a nutrient that can be a contaminant when present in high concentrations. This function is conditional; if nitrogen were to enter a wetland (from agricultural runoff, for example), the wetland has the capacity to remove this nitrogen from the water. The wetland will not serve this function, however, if no nitrogen enters the wetland. Even if a stream or wetland is not currently serving an *actual* function, it has the *potential* to provide that function when a new material enters it, or when environmental conditions change. Thus, potential functions play a critical role in protecting those waters from future impacts.

## 2. Discussion of Major Conclusions

## A. Streams

The scientific literature clearly demonstrates that streams, individually or cumulatively, exert a strong influence on the character and functioning of downstream waters. All tributary streams, including perennial, intermittent, and ephemeral streams, are chemically, physically, and biologically connected to downstream rivers via channels and associated alluvial deposits where water and other materials are concentrated, mixed, transformed, and transported. Headwater streams (headwaters) are the most abundant stream-type in most river networks, and supply most of the water in rivers. In addition to water, streams supply sediment, wood, organic matter, nutrients, chemical contaminants, and many of the organisms found in rivers. Streams are biologically connected to downstream waters by dispersal and migration of aquatic and semi-aquatic organisms, including fish, amphibians, plants, microorganisms, and invertebrates, that use both up- and downstream habitats during one or more stages of their life cycles, or provide food resources to downstream communities. Physical, chemical, and biological connections between streams and downstream waters interact via processes such as nutrient spiraling, in which stream communities assimilate and chemically transform large quantities of nitrogen and other nutrients that would otherwise increase nutrient loading downstream.

Key findings:

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

b. Headwaters convey water into local storage compartments such as ponds, shallow aquifers, or river banks and into regional and alluvial aquifers. These local storage compartments are important sources of water for baseflow in rivers. The ability of streams to keep flowing even during dry periods typically depends on the delayed (lagged) release of local groundwater, also referred to as shallow groundwater, originating from these water sources, especially 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 by intermittent and ephemeral streams, is a major source of annual flow in rivers.

c. Even infrequent flows through ephemeral or intermittent channels influence fundamental biogeochemical processes by connecting the channel and shallow groundwater with other landscape elements. 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 provide substrate, habitat for aquatic organisms, and slow the flow of water through channels.

d. Connectivity between streams and rivers provides opportunities for materials, including nutrients and chemical contaminants, to be sequentially altered as they are transported downstream. Although highly efficient at transport of water and other physical materials, streams are not pipes. They are dynamic ecosystems with permeable beds and banks that interact with terrestrial and aquatic ecosystems above and below the surface. The connections formed by surface and subsurface streamflows act as a series of complex chemical, physical, 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 greater the distance a material travels between a particular stream reach and the river, the greater the opportunity for that material to be altered in intervening stream reaches, which can allow for uptake, assimilation, or beneficial transformation. One example of sequential alteration with significant beneficial effects on downstream waters is the process of nutrient spiraling, in which nutrients entering headwater streams are transformed by various aquatic organisms and chemical reactions as they are transported downstream by streamflow. Nutrients which enter the 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 to the stream via excretion and decomposition, 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.

e. The literature review found strong evidence that headwater streams function as nitrogen sources (export) and sinks (uptake and transformation) for river networks. One study estimated that rapid nutrient cycling in small streams that were free from 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 create conditions leading to eutrophication and hypoxia, in which oxygen concentrations fall below the level necessary to sustain most within and near-bed animal life. Thus, the role of streams in influencing nutrient loads can have significant repercussions for hypoxic areas in downstream waters.

f. Headwaters provide critical habitat during one or more life cycle stages of many organisms capable of moving throughout river networks. This review found strong evidence that headwaters provide habitat for complex life-cycle completion, refuge from predators or adverse physical conditions in rivers, and reservoirs of genetic- and species-level diversity. Use of headwater streams as habitat is especially obvious 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), and the presence of these species within river networks provides robust evidence of biological connections between headwaters and larger rivers. In prairie streams, many fishes swim upstream into tributaries to release eggs, which develop as they are transported downstream. Small 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.

B. Riparian/Floodplain Waters

Wetlands and open-waters in landscape settings that have bidirectional hydrologic exchanges with streams or rivers (e.g., wetlands and open-waters in riparian areas and floodplains) are chemically, physically, and biologically connected with rivers via the export of channel-forming sediment and woody debris, temporary storage of local groundwater that supports baseflow in rivers, and transport of stored organic matter. They remove and transform excess nutrients such as nitrogen and phosphorus. They provide nursery habitat for breeding fish, colonization opportunities for stream invertebrates, and maturation habitat for stream insects. Moreover, wetlands in this landscape setting serve an important role in the integrity of downstream waters because they also act as sinks by retaining floodwaters, sediment, nutrients, and contaminants that could otherwise negatively impact the condition or function of downstream waters.

Key Findings:

a. Riparian areas act as buffers that are among the most effective tools for mitigating nonpoint source pollution. The wetland literature shows that collectively, riparian wetlands improve water quality through assimilation, transformation, or sequestration of nutrients, sediment and other pollutants—such as pesticides and metals—that can affect downstream water quality. These pollutants enter wetlands via various pathways that include various sources such as dry and wet atmospheric deposition, some runoff from upland agricultural and urban areas, spray drift, and subsurface water flows, as well as point sources such as outfalls, pipes, and ditches.

b. Riparian and floodplain areas connect upland and aquatic environments through both surface and subsurface hydrologic flow paths. These areas are therefore uniquely situated in watersheds to receive and process waters that pass over densely vegetated areas and through subsurface zones before reaching streams and rivers. When contaminants reach a riparian or floodplain area, such materials can be sequestered in sediments, assimilated into the wetland plants and animals, transformed into less harmful forms or compounds, or lost to the atmosphere. Wetland potential for biogeochemical transformations (e.g., denitrification) that can improve the quality of water entering streams and rivers is influenced by factors present in riparian areas and floodplains, including anoxic conditions, shallow water tables, slow organic matter decomposition, wetland plant communities, permeable soils, and complex topography.

c. Riparian and floodplain areas can reduce flood peaks by storing and desynchronizing floodwaters. They also can contribute to maintenance of flow by recharging alluvial aquifers. Many studies have documented the ability of riparian and floodplain areas 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 gauging stations on the Cache River in Arkansas were reduced 10–20% primarily due to floodplain water storage.

d. Riparian and floodplain areas store large amounts of sediment and organic matter from upland areas before those sediments enter the stream. For example, riparian areas have been shown to filter 80–90% of sediments leaving agricultural fields in North Carolina.

e. Ecosystem function within a river system is driven by interactions between the physical environment and the diverse biological communities living within the river system. Movements of organisms connect aquatic habitats and populations in different locations through several processes 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 results in an exchange of matter and organisms, including fish populations that are adapted to use floodplain habitat for feeding and spawning during high water. Refuge populations of 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 in many parts of the country commonly use both streams and wetlands, including wetlands in riparian and floodplain areas, to hunt, forage, overwinter, rest, or hide from predators.

### C. Unidirectional Wetlands

Wetlands in landscape settings that lack bidirectional hydrologic exchanges with downstream waters (e.g., many prairie potholes, vernal pools, and playa lakes) provide numerous functions that can benefit downstream water quality and integrity. These functions include storage of floodwater; retention and transformation of nutrients, metals, and pesticides; and recharge of groundwater sources of river baseflow. The functions and effects of this diverse group of wetlands, hereafter referred to as “unidirectional wetlands,” clearly affect the condition of downstream waters if there is a surface or shallow subsurface water connection to the river network. In unidirectional wetlands that are not connected to the river network through surface or shallow subsurface water, the type and degree of connectivity varies geographically within a watershed and over time. Because such wetlands occur on a gradient of connectivity, it is difficult to generalize about their effects on downstream waters. This evaluation is further complicated because, for certain functions (e.g., sediment removal and water storage), downstream effects arise from wetland isolation, rather than connectivity. The literature reviewed does not provide sufficient information to evaluate or generalize about the degree of connectivity (absolute or relative) or the downstream effects of wetlands in unidirectional landscape settings. However, evaluations of connectivity of individual wetlands or groups of wetlands could be possible through case-by-case analysis. Further, while the review did not specifically address other unidirectional water bodies, the conclusions apply to these water bodies (e.g., ponds and lakes that lack surface water inlets) as well, since the same principals govern hydrologic connectivity between these water bodies and downstream waters.

Key Findings:

a. 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 drain to Devils Lake indicate that increasing the volume of pothole storage across the sub-basin 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 potholes to modulate streamflow may be widespread across portions of the prairie pothole region. This work also indicates that reducing wetland water storage capacity 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. In many agricultural areas already crisscrossed by extensive drainage systems, total streamflow and baseflow are enhanced by directly connecting 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 examples, 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.

b. Unidirectional wetlands act as sinks and transformers for various pollutants, especially nutrients, which pose a serious pollution problem in the United States. In one study, sewage wastewaters were applied to forested unidirectional wetlands in Florida for a period of 4.5 years. More than 95% of the phosphorus, nitrate, ammonium, and total nitrogen were removed by the wetland during the study period, and 66-86% of the nitrate removed was attributed to the process of denitrification. In another study, sizeable phosphorus retention occurred in unidirectional marshes that comprised only 7% of the lower Lake Okeechobee basin area in Florida. A unidirectional 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 unidirectional 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 on-site removal of nutrients by unidirectional wetlands is significant and geographically widespread. The effects of this removal on rivers are generally not reported in the literature.

c. Biological connectivity can occur between unidirectional wetlands and downstream waters through movement of amphibians, aquatic seeds, macroinvertebrates, reptiles, and mammals. 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 unidirectional wetlands and river networks. Unidirectional wetlands can be hydrologically connected directly to river networks through channels, non-channelized surface flow, or subsurface flows. 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 hydrological and biological connections to downstream waters.

d. Unidirectional 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 isolated wetlands that have minimal hydrologic connection to other water bodies (but which could include surface and subsurface connections to other wetlands). The existence of this gradient among wetlands of the same type or in the same geographic region can make it difficult to determine or generalize, from the literature alone, the degree to which particular wetlands (individually or as classes), including geographically isolated wetlands, are hydrologically connected.

e. A related issue is that spatial scale must be considered when determining geographic isolation. Individual wetlands that are geographically isolated could be connected to downstream waters when considered as a complex (a group of interacting wetlands). This principle was demonstrated in a recent study that examined a depressional wetland complex on the Texas coastal plain. These wetlands have been considered as a type of geographically isolated wetlands. Collectively, however, they are geographically and hydrologically connected 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 as surface runoff through an intermittent stream to a nearby waterway, the Armand Bayou. Thus, wetland complexes could have connections to downstream waters through stream channels even when the individual wetland components are geographically isolated.

### 3. Closing comments

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 discussion above, it is clear that streams and rivers are much more than a system of physical channels for conveying water and other materials downstream, but the presence of physical channels is one strong 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-bank structures, which may 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 down gradient from such disruptions is evidence of the surface connection with the channel that is up gradient of the perceived disruption.

The structure and function of rivers are highly dependent on the constituent materials that are stored in and transported through them. Most of these materials, broadly defined here as any physical, chemical, or biological entity, including, but not limited to, 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. The control 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.

Absence of channels does not, however, mean that a wetland or open-water is isolated or only infrequently connected to downstream waters. Areas that are infrequently flooded by surface water can be connected more regularly through shallow groundwater or through dispersal among biological populations and communities. Such wetlands and open-waters also can reduce flood peaks by storing flood waters, filter large amounts of sediment and nutrients from upland areas, influence stream geomorphology by providing woody debris and sediment, and regulate stream temperature. They also serve as sources of food for river biota and sources of genetic diversity for populations of stream invertebrates.

Unidirectional wetlands can reduce and attenuate floods through water storage, and can recharge groundwater, thereby contributing to stream and river baseflow. These wetlands also affect nutrient delivery and improve water quality by functioning as sources of food and as sinks for metals, pesticides, excess nutrients. Biological connectivity can also occur between unidirectional wetlands and downstream waters, through movement of amphibians, aquatic insects, aquatic reptiles, migratory birds, and riverine mammals that require or opportunistically use both river and wetland or open-water habitats. However, given a geographically isolated wetland for which a surface water connection cannot be observed, it is difficult to assess its degree of connectivity with the river network without site-specific data.

Additionally, caution should be used in interpreting connectivity for wetlands based on their being designated as "geographically isolated" since (a) the term can be mistakenly applied to a heterogeneous group of wetlands that can include wetlands that are not geographically isolated, (b) 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 (c) wetland complexes could have connections to downstream waters through stream channels even if individual wetlands within the complex are geographically isolated. Thus, the term "geographically isolated" should only be applied to groups of wetlands if they fit the technical definition (i.e., they are surrounded by uplands). Further, even geographically isolated wetlands can be connected to other wetlands and downstream waters through groundwater connections, occasional spillage, or biological connections. Thus, the term "geographically isolated" should not be used to infer lack of hydrologic, chemical, or biological connectivity.

Lastly, to understand the health, behavior, and sustainability of downstream waters, effects of small water bodies in a watershed need to be considered in aggregate. The contribution of material by a particular stream and wetland 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. For example, 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, and in which the hydrology and ecology are tightly coupled with the local and regional geological processes that formed them. The vernal pool basins, swales, and seasonal streams are part of a single surface water and shallow groundwater system connected to the river network when seasonal precipitation exceeds storage capacity of the wetlands. Since rivers develop and respond over time and are functions of the whole watershed, understanding the integration of contributions and effects over time is also necessary to have an accurate understanding of the system, taking into account the duration and frequency of material export and delivery to downstream waters. In addition, when considering the effect of an individual stream or wetland, it is important to include the cumulative effect of all materials that originate from it, rather than each material individually, to understand that water body's influence on downstream waters.

## Part II: Additional Scientific Support

### i. Tributaries

The agencies propose that all waters that meet the proposed 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 have a significant nexus with traditional navigable waters, interstate waters, and/or the territorial seas. EPA's 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 relationship between waters.

Tributaries have a substantial impact on the chemical, physical, and 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, 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 below.

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. It is necessary to regulate the entire tributary system to fulfill the objective of the CWA, because discharges of pollutants into the tributary system adversely affects the physical, chemical, and biological integrity of these waters. 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. M.C. Freeman, *et al.*, "Hydrologic Connectivity and the Contribution of Stream Headwaters to Ecological Integrity at Regional Scales," *Journal of the American Water Resources Association* 43:5-14. (2007); M.S. Wipfli., *et al.*, "Ecological Linkages between Headwaters and Downstream Ecosystems: Transport of Organic Matter, Invertebrates, and Wood Down Headwater Channels," *Journal of the American Water Resources Association* 43:72-85 (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. In order to protect traditional navigable waters, interstate waters, and the territorial seas it is also critically important to protect tributaries as defined in today’s proposal that are upstream from those waters.

### A. The Agencies Have Concluded that Tributaries, as Defined in the Proposed Rule, 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. 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 and 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 or man-altered tributaries, such as 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 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 downstream waters in a watershed. While the agencies define as “waters of the United States” tributaries only in watersheds which drain to a traditional navigable water, interstate water, or the territorial seas, that distinction does not affect the conclusions of the scientific literature with respect to the effects of tributaries on downstream waters.

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

Tributaries, even when seasonally dry, are the dominant source of water in most rivers, rather than direct precipitation or groundwater input to main stem river segments. *See, e.g., Report* at 4-3 (citing T.C. Winter, 2007, “The role of groundwater in generating streamflow in headwater areas and in maintaining base flow,” *Journal of the American Water Resources Association* 43:15-25; P.A. Bukaveckas, “Rivers,” in G.E. Likens, ed., *Encyclopedia of Inland Waters*, Vol. 1 (Elsevier: Oxford, 2009)). Distant headwaters with stronger connections to groundwater or consistently higher precipitation levels than downstream reaches contribute more water to downstream rivers. 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 R.B. Alexander, *et. al.,* “The role of headwater streams in downstream water quality,” *Journal of the American Water Resources Association* 43:41-59 (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 Rio 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 Rio Grande. *See, e.g., id.* at 4-5 (citing E.R. Vivoni, *et. al.*, "Analysis of a Monsoon Flood Event in an Ephemeral Tributary and Its Downstream Hydrologic Effects," *Water Resources Research* 42:W03404 (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. Hydrologic dispersion of connected tributaries influence the timing and volume of water reaching a river network outlet. *See, e.g., id.* at 4-5 to 4-6 (citing P. M. Saco and P. Kumar, "Kinematic dispersion in stream networks coupling hydraulics and network geometry," *Water Resources Research* 38:1244 (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 4-8 (citing S.K. Hamilton, *et al.*, "Persistence of Aquatic Refugia between Flow Pulses in a Dryland River System (Cooper Creek, Australia)," *Limnology and Oceanography* 50:743-754 (2005); J.F. Costelloe, *et.al.*, "Determining Loss Characteristics of Arid Zone River Waterbodies," *River Research and Applications* 23:715-731 (2007)).

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

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. *Report* at 4-10, 4-14. 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.,* J.L. Florsheim, *et al.*, "Bank Erosion as a Desirable Attribute of Rivers," *Bioscience* 58: 519-29 (2008); *Report* at 4-9 (citing M. Church, "Bed material transport and the morphology of alluvial river channels," *Annual Review of Earth and Planetary Sciences*: 325-354 (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. *Report* at 4-9 (citing P.J. Wood and P.D. Armitage, "Biological Effects of Fine Sediment in the Lotic Environment," *Environmental Management* 21:203-217 (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 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. *See Report* at 4-10, 4-12 (citing L.E. Benda, and T. W. Cundy, "Predicting deposition of debris flows in mountain channels," *Canadian Geotechnical Journal* 27:409-417 (1990); T. Gomi and R. C. Sidle, "Bed load transport in managed steep-gradient headwater streams of southeastern Alaska," *Water Resources Research* 39:1336 (2003); L.E. Benda, et al., "Geomorphology of steepland headwaters: The transition from hillslopes to channels," *Journal of the American Water Resources Association* 41:835-851 (2005); P.E. Bigelow, *et al*., "On Debris Flows, River networks, and the Spatial Structure of Channel Morphology," *Forest Science* 53:220-238 (2007); J.P.R. Gooderham, *et al.*, "Upstream Heterogeneous Zones: Small Stream Systems Structured by a Lack of Competence?" *Journal of the North American Benthological Society* 26:365-374 (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 4-13 (citing J.D. Allan, *Stream Ecology – Structure and Function of Running Waters* (New York, NY: Chapman & Hall, 1995)). For instance, water temperature controls metabolism and level of activity in cold-blooded species like fish, amphibians, and aquatic invertebrates. *See, e.g.*, G.G. Ice, "Chapter 3: Stream Temperature and Dissolved Oxygen," *in* J.D. Stednick, ed., *Hydrologic and Biological Responses to Forest Practices* (Springer, 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., Report* at 4-13 (citing S. Knispel, and E.

Castella, “Disruption of a Longitudinal Pattern in Environmental Factors and Benthic Fauna by a Glacial Tributary,” *Freshwater Biology* 48:604-618 (2003); S.P. Rice, *et al*., “The Ecological Importance of Tributaries and Confluences,” *in* S.P. Rice, *et al*., ed., *River Confluences, Tributaries and the Fluvial Network*, (Chichester, UK: John Wiley & Sons, 2008), pp. 209-242)). In particular, tributaries provide both cold and warmwater refuge habitats that are critical for protecting aquatic life. *Id.* at 4-32. 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 G. Power, *et al*., “Groundwater and Fish: Insights from Northern North America,” *Hydrological Processes* 13:401-422 (1999)). Thus tributaries provide organisms with both warmwater and coldwater refuges at different times of the year. *Id*. (citing R.A. Curry, *et al*., “Use of Small Streams by Young Brook Trout Spawned in a Lake,” *Transactions of the American Fisheries Society* 126:77-83 (1997); C.V. Baxter, and F.R. Hauer, “Geomorphology, Hyporheic Exchange and Selection of Spawning Habitat by Bull Trout (*Salvelinus confluentus*),” *Canadian Journal of Fisheries and Aquatic Sciences* 57: 1470-1481 (2000); T.R. Labbe, and K. D. Fausch, “Dynamics of Intermittent Stream Habitat Regulate Persistence of a Threatened Fish at Multiple Scales,” *Ecological Applications* 10:1774-1791 (2000); M.J. Bradford, *et al*., “Ecology of Juvenile Chinook Salmon in a Small Non-natal Stream of the Yukon River Drainage and the Role of Ice Conditions on Their Distribution and Survival,” *Canadian Journal of Zoology-Revue Canadienne De Zoologie* 79:2043-2054 (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; M.A. Cairns, *et al*., “Influence of Summer Stream Temperatures on Black Spot Infestation of Juvenile Coho Salmon in the Oregon Coast Range," *Transactions of the American Fisheries Society* 134:1471-1479 (2005)). Tributaries also help buffer temperatures in downstream waters. *Id.* at 4-13 to 4-14 (citing D. Caissie, "The thermal regime of rivers: A review," *Freshwater Biology* 51:1389-1406 (2006). Temperatures in tributaries affect downstream water temperature many kilometers away. *Id*. at 4-14 (citing B. Gardner, and P.J. Sullivan, "Spatial and Temporal Stream Temperature Prediction: Modeling Nonstationary Temporal Covariance Structures," *Water Resources Research* 40:W01102 doi (2004); B.R. Johnson, *et al*., "Use of Spatially Explicit Physicochemical Data to Measure Downstream Impacts of Headwater Stream Disturbance," *Water Resources Research* 46:W09526 (2010)).

### D. Tributaries Significantly Affect the Chemical Integrity of (a)(1) through (a)(3) 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.*, *Report* at 4-22 (citing S.G. Fisher and G.E. Likens, "Energy Flow in Bear Brook, New Hampshire: An Integrative Approach to Stream Ecosystem Metabolism," *Ecological Monographs* 43: 421-439 (1973); J.L. Meyer, "The Microbial Loop in Flowing Waters," *Microbial Ecology* 28:195-199 (1994); J.B. Wallace, *et al.* "Multiple Trophic Levels of a Forest Stream Linked to Terrestrial Litter Inputs," *Science* 277:102-104 (1997); R.O. Hall and J.L. Meyer, "The Trophic Significance of Bacteria in a Detritus-Based Stream Food Web," *Ecology* 79:1995-2012 (1998); R.O. Hall, *et al*., "Organic Matter Flow in Stream Food Webs with Reduced Detrital Resource Base," *Ecology* 81:3445-3463 (2000); C. Augspurger*, et al*., "Tracking Carbon Flow in a 2-Week-Old and 6-Week-Old Stream Biofilm Food Web," *Limnology and Oceanography* 53:642-650 (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.

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; it is widely-recognized that this phenomenon has resulted in the devastation of commercial and recreational fisheries in the northern Gulf of Mexico. Committee on Environment and Natural Resources, *Integrated Assessment of Hypoxia in the Northern Gulf of Mexico* (Washington, D.C.: National Science and Technology Council, 2000). 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. *Report* at 4-16 (citing R.G. Alexander, *et al.*, "Effect of Stream Channel Size on the Delivery of Nitrogen to the Gulf of Mexico," *Nature* 403:758-761(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 4-18 (citing P.J. Mulholland, *et al*., "Stream Denitrification across Biomes and Its Response to Anthropogenic Nitrate Loading," *Nature* 452:202-205 (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. D. Goolsby, et al., *Topic Report 3, Flux and Sources of Nutrients in the Mississippi-Atchafalaya River Basin* (Washington, D.C.: National Science and Technology Council Committee on Environment and Natural Resources, 1999). The export of nutrients from streams in the Mississippi River Basin has an effect on anoxia, or low oxygen levels, in the Gulf. *Report* at 4-17 (citing N.N. Rabalais, *et al*., "Gulf of Mexico Hypoxia, a.k.a. 'the Dead Zone,'" *Annual Review of Ecology and Systematics* 33:235-263 (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 (EPA), Region III, Chesapeake Bay Program Office, *Setting and Allocating the Chesapeake Bay Basin Nutrient and Sediment Loads: The Collaborative Process, Technical Tools and Innovative Approaches*, EPA 903-R-03-007 (Washington, D.C.: EPA, 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. *Report* at 4-19 to 4-20, 6-3 to 6-4 (citing J.R.Webster, and B.C. Patten, "Effects of watershed perturbation on stream potassium and calcium dynamics," *Ecological Monographs* 49:51-72 (1979); J.D. Newbold, *et al*., "Measuring nutrient spiralling in streams," *Canadian Journal of Fisheries and Aquatic Sciences* 38:860-863 (1981); J. Elwood, *et al.*, "Resource spiraling: An operational paradigm for analyzing lotic ecosystems," *in* T.D. Fontaine and S.M. Bartell, ed., *Dynamics of Lotic Ecosystems* (Ann Arbor, MI: Ann Arbor Science, 1983), pp. 3-23; S.H. Ensign, and M.W. Doyle, "Nutrient Spiraling in Streams and River Networks," *Journal of Geophysical Research-Biogeosciences* 111:G04009 (2006)). In addition, some of the nutrient that is taken up as readily available inorganic forms is released back to the water as organic forms that are less available for biotic uptake. *Id*. at 4-20 (citing P.J. Mulholland, *et al*., "Production of Soluble, High Molecular Weight Phosphorus and Its Subsequent Uptake by Stream Detritus," *Verhandlungen des Internationalen Verein Limnologie* 23:1190-1197 (1988); S.P. Seitzinger, *et al*., "Bioavailability of DON from Natural and Anthropogenic Sources to Estuarine Plankton," *Limnology and Oceanography* 47:353-366 (2002)). Similarly, nutrient incorporated into particulates is not entirely regenerated, but accumulates in longitudinally increasing particulate loads (i.e. increases moving downstream). *Id*. at 4-20 (citing J.L Merriam, *et al*., "Characterizing Nitrogen Dynamics, Retention and Transport in a Tropical Rainforest Stream Using an in situ N-15 Addition," *Freshwater Biology* 47:143-160 (2002); M.R. Whiles, and W.K. Dodds, "Relationships between Stream Size, Suspended Particles, and Filter-Feeding Macroinvertebrates in a Great Plains Drainage Network," *Journal of Environmental Quality* 31:1589-1600 (2002); R.O. Hall, *et al*.,  "Hydrologic Control of Nitrogen Removal, Storage, and Export in a Mountain Stream," *Limnology and Oceanography* 54:2128-2142 (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 P.J. Mulholland, and W.R. Hill, "Seasonal Patterns in Streamwater Nutrient and Dissolved Organic Carbon Concentrations: Separating Catchment Flow Path and In-Stream Effects," *Water Resources Research* 33:1297-1306 (1997); P.J. Mulholland, "The Importance of In-stream Uptake for Regulating Stream Concentrations and Outputs of N and P from a Forested Watershed: Evidence from Long-Term Chemistry Records for Walker Branch Watershed," *Biogeochemistry* 70:403-426 (2004)). Such variations have been demonstrated to affect downstream productivity. *Id*. (citing P.J. Mulholland, *et al*., "Longitudinal Patterns of Nutrient Cycling and Periphyton Characteristics in Streams: a Test of Upstream-Downstream Linkage," *Journal of the North American Benthological Society* 14:357-370 (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*. (citing Newbold, *et al*., "Phosphorus Dynamics in a Woodland Stream Ecosystem: a Study of Nutrient Spiralling," *Ecology* 64:1249-1265 (1983); S.C. Chapra, *Surface Water Quality Modeling* (McGraw-Hill, 1996); E.S. Bernhardt, *et al*., "Whole-system Estimates of Nitrification and Nitrate Uptake in Streams of the Hubbard Brook Experimental Forest," *Ecosystems* 5:419-430 (2002)). Denitrification, the removal of nitrate from streamwater through transformation to atmospheric nitrogen, is widespread among headwater streams; research indicates that small, unimpacted tributaries can reduce up to 40% of downstream nitrogen delivery through denitrification. *Id.* at 4-20 to 4-21 (citing P.J. Mulholland, *et al*., "Stream Denitrification across Biomes and Its Response to Anthropogenic Nitrate Loading," *Nature* 452:202-205 (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.* at 4-21 (citing J.L. Meyer, "The Role of Sediments and Bryophytes in Phosphorus Dynamics in a Headwater Stream Ecosystem," *Limnology and Oceanography* 24:365-375 (1979)). This is particularly beneficial to downstream chemical integrity where phosphorus sorbs to contaminants such as metal hydroxide precipitates. *Id.* (citing J.A. Simmons, "Phosphorus Removal by Sediment in Streams Contaminated with Acid Mine Drainage," *Water Air and Soil Pollution* 209:123-132 (2010)).

Tributaries also store significant amounts of nutrients and carbon, functioning as important sinks (lags) for river networks so that they do not reach downstream traditional navigable waters, interstate waters, or tributary streams. 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 4-18 (citing B.J. Peterson, *et al.*, "Control of Nitrogen Export from Watersheds by Headwater Streams," *Science* 292: 86-90 (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, for instance substances like metals, sodium, and even dead fish carcasses that adversely affect organisms when occurring at excessive or elevated concentrations to reduce the amounts that reach downstream traditional navigable waters, interstate waters, or tributary streams. The transport of contaminants to downstream waters can impact water quality downstream, if they are not stored in tributaries. *See, e.g., id.* at 4-26 (citing X. Wang, *et al*., "Water Quality Changes as a Result of Coalbed Methane Development in a Rocky Mountain Watershed," *Journal of the American Water Resources Association* 43:1383-1399 (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 133-134 (citing W.L. Graf, *Plutonium and the Rio Grande: Environmental Change and Contamination in the Nuclear Age* (New York: Oxford University Press, 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 4-26 to 4-27 (citing E.V. Axtmann, and S.N. Luoma, "Large-scale Distribution of Metal Contamination in the Fine-grained Sediments of the Clark Fork River, Montana, USA," *Applied Geochemistry* 6:75-88 (1991); B.A. Kimball, *et al*., "Effects of Colloids on Metal Transport in a River Receiving Acid Mine Drainage, Upper Arkansas River, Colorado, USA," *Applied Geochemistry* 10:285-306 (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 flows into the Rio Grande at the Los Alamos National Laboratory, New Mexico. *Id.* at 4-28 (citing W.L. Graf, *Plutonium and the Rio Grande: Environmental Change and Contamination in the Nuclear Age* (New York: Oxford University Press, 1994); S.L. Reneau, *et al.*, "Geomorphic Controls on Contaminant Distribution along an

Ephemeral Stream," *Earth Surface Processes and Landforms* 29:1209-1223 (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.* (citing Graf 1994).

### E. 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., Report* at 4-29 (citing J.L. Meyer and J.B. Wallace, "Lost Linkages and Lotic Ecology: Rediscovering Small Streams," Pages 295-317 *in* M. C. Press, N. J. Huntly, and S. Levin, editors. Ecology*: Achievement and Challenge* (Oxford, UK: Blackwell Science, 2001); A. Meyer *et al*., "The Effect of Low Flow and Stream Drying on the Distribution and Relative Abundance of the Alien Amphipod, *Echinogammarus berilloni* (Catta, 1878) in a Karstic Stream System (Westphalia, Germany)," *Crustaceana* 77:909-922 (2004); A.D. Huryn *et al*., "Landscape Heterogeneity and the Biodiversity of Arctic Stream Communities: A Habitat Template Analysis," *Canadian Journal of Fisheries and Aquatic Sciences* 62:1905-1919 (2005)). Use of tributaries by salmon and other anadramous 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 4-31 (citing O.T. Gorman, "Assemblage Organization of Stream Fishes: The Effects of Rivers on Adventitious Streams," *American Naturalist* 128(4): 611-616 (1986); A. L. Sheldon, "Conservation of Stream Fishes: Patterns of Diversity, Rarity, and Risk," *Conservation Biology* 2:149-156 (1988); N.P. Hitt and P.L. Angermeier, "Evidence for Fish Dispersal from Spatial Analysis of Stream Network Topology," *Journal of the North American Benthological Society* 27:304-320 (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 4-29 (citing D.J. Progar and A.R. Modenke, "Insect Production from Temporary and Perennially Flowing Headwater Streams in Western Oregon," *Journal of Freshwater Ecology* 17:391-407 (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 S. Nakano and M. Murakami, "Reciprocal Subsidies: Dynamic Interdependence between Terrestrial and Aquatic Food Webs," Proceedings *of the National Academy of Sciences USA* 98:166-170 (2001); M.S. Wipfli and D.P. Gregovich, "Export of Invertebrates and Detritus from Fishless Headwater Streams in Southeastern Alaska: Implications for Downstream Salmonid Production," *Freshwater Biology* 47:957-969 (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 local extinction. *Id.* at 4-33 (citing R. Lande and S. Shannon, "The role of genetic variation in adaptation and population persistence in a changing environment," *Evolution* 50:434-437 (1996)). Genetic connectivity exists at multiple scales and can extend beyond one a single river catchment, and for species capable of long distance movement (such as salmon), reveals complex interactions among spatially distant populations of aquatic organisms *Id.* (citing J. M. Hughes, *et al.*, "Genes in Streams: Using DNA to Understand the Movement of Freshwater Fauna and Their Riverine Habitat,"*Bioscience* 59:573-583 (2009); C.D. Anderson, "Considering spatial and temporal scale in landscape-genetic studies of gene flow," *Molecular Ecology* 19:3565-3575 (2010)).

### F. Headwater Tributaries Significantly Affect the Chemical, Physical, and Biological Integrity of (a)(1) through (a)(3) Waters

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, and 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 4-2 (citing T.L. Nadeau and M.C. Rains, "Hydrological connectivity between headwater streams and downstream waters: How science can inform policy," *Journal of the American Water Resources Association* 43:118-133 (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 1-7 to 1-8, 4-1.  For example, headwater streams reduce the amount of sediment delivered to downstream waters by trapping sediment from water and runoff. *See, e.g.,* M. Dieterich and N.H. Anderson, "Dynamics of Abiotic Parameters, Solute Removal and Sediment Retention in Summer-Dry Headwater Stream of Western Oregon," *Hydrobiologia* 379: 1-15 (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., Report* at 4-18 (citing B.J. Peterson, *et al.*, "Control of Nitrogen Export from Watersheds by Headwater Streams," *Science* 292: 86-90 (2001)).  A close connection exists between the water quality of these streams and the water quality of TNWs, IW, and TS. *See, e.g.,* State of Ohio Environmental Protection Agency, *Nonpoint Source Impacts on Primary Headwater Streams* (Columbus, OH: 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.,* F.M. Dunnivant and E. Anders, *A Basic Introduction To Pollutant Fate and Transport: An Integrated Approach With Chemistry, Modeling, Risk Assessment, and Environmental Legislation* (Hoboken, NJ: John Wiley & Sons, Inc., 2006).

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 1-8; J.L. Meyer, *et al*., "The Contribution of Headwater Streams to Biodiversity in River Networks," *Journal of the American Water Resources Association* 43(1): 86-103 (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 4-14 (citing J.L. Ebersole, *et. al.*, "Cold water patches in warm streams: Physicochemical characteristics and the influence of shading," *Journal of the American Water Resources Association* 39:355-368 (2003); B. Gardner, and P.J. Sullivan, "Spatial and temporal stream temperature prediction: Modeling nonstationary temporal covariance structures," *Water Resources Research* 40:1-9 (2004); B.R. Johnson, *et al.*, "Use of spatially explicit physicochemical data to measure downstream impacts of headwater stream disturbance," *Water Resources Research* 46:W09526 (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 4-32 (citing J.C. Scrivener, *et al.*, "Juvenile Chinook salmon (Oncorhynchus tshawytscha) utilization of Hawks Creek, a small and nonnatal tributary of the Upper Fraser River," *Canadian Journal of Fisheries and Aquatic Sciences* 51:1139-1146 (1994); R.A. Curry, *et al.*, "Use of small streams by young brook trout spawned in a lake," *Transactions* *of the American Fisheries Society* 126:77-83 (1997); A.M. Pires, *et al.*, "Seasonal changes in fish community structure of intermittent streams in the middle reaches of the Guadiana basin, Portugal," *Journal of Fish Biology* 54:235-249 (1999); M.J Bradford, *et al*., "Ecology of juvenile Chinook salmon in a small nonnatal stream of the Yukon River drainage and the role of ice conditions on their distribution and survival," *Canadian Journal of Zoology-Revue Canadienne De Zoologie* 79:2043-2054 (2001); M.A. Cairns, *et al.*, "Influence of summer stream temperatures on black spot infestation of juvenile coho salmon in the Oregon Coast Range," *Transactions of the American Fisheries Society* 134:1471-1479 (2005); Wigington, P. J., *et al.*, "Coho salmon dependence on intermittent streams," *Frontiers in Ecology and the Environment* 4:513-518 (2006)). 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, 4-24 (citing S.G., Fisher, and G. E. Likens, "Energy flow in Bear Brook, New Hampshire: An integrative approach to stream ecosystem metabolism," *Ecological Monographs* 43:421-439 (1973); J.L. Meyer, "The microbial loop in flowing waters," *Microbial Ecology* 28:195-199 (1994); J.B. Wallace, *et al.*, "Multiple trophic levels of a forest stream linked to terrestrial litter inputs," *Science* 277:102-104 (1997); R.O. Hall, and J.L. Meyer, "The trophic significance of bacteria in a detritus-based stream food web," *Ecology* 79:1995-2012 (1998); R.O. Hall, *et al.*, "Organic matter flow in stream food webs with reduced detrital resource base," *Ecology* 81:3445-3463 (2000); T. Gomi, *et al.*, "Understanding processes and downstream linkages of headwater systems," *Bioscience* 52:905-916 (2002); C. Augspurger, *et al.*, "Tracking carbon flow in a 2-week-old and 6-week-old stream biofilm food web," *Limnology and Oceanography* 53:642-650 (2008)). Disruptions in these biological processes affect the ecological functions of the entire downstream system. *See, e.g.*, L.A. Kaplan, *et al.*, "Patterns of Dissolved Organic Carbon in Transport," *Limnology and Oceanography* 25: 1034-1043 (1980); R.L. Vannote, *et. al.*, "The River Continuum Concept," *Canadian Journal of Fisheries and Aquatic Sciences* 37: 130-37 (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., Report* at 4-4, 4-66 (citing P.D. Brooks, and M.M. Lemon, "Spatial variability in dissolved organic matter and inorganic nitrogen concentrations in a semiarid stream, San Pedro River, Arizona," *Journal of Geophysical Research-Biogeosciences* 112:G03S05.D (2007); Tetzlaff, and C. Soulsby, "Sources of baseflow in larger catchments – using tracers to develop a holistic understanding of runoff generation," *Journal of Hydrology* 359:287-302 (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.,* United States, U.S. EPA and USDA/ARS Southwest Watershed Research Center, EPA/600/R-08/134, ARS/2330462008: *The Ecological and Hydrological Significance of Ephemeral and Intermittent Streams in the Arid and Semi-arid American Southwest* (Washington, D.C.: U.S. EPA and USDA/ARS Southwest Watershed Research Center, Levick *et al.*, 2008) (Levick *et al.* 2008).

Tributaries do not need to flow perennially to have a significant nexus to downstream waters. 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 4-16 (citing H.M. Valett, *et. al.,* "Biogeochemical and Metabolic Responses to the Flood Pulse in a Semiarid Floodplain," *Ecology* 86(1): 220-234 (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 4-10 (citing M.A. Hassan, "Observations of Desert Food Bores," *Earth Surface Processes and Landforms* 15:481-485 (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.,* S.H. Duncan, *et al.*, "Transport of Road-Surface Sediment through Ephemeral Stream Channels," *Water Resources Bulletin*

23(1): 113-119 (1987). This temporary storage of sediment thus helps maintain the chemical and biologic integrity of downstream waters.

The Report provides case studies of prairie streams and Southwest intermittent and ephemeral streams, two stream types whose jurisdictional status has been called into question in the past. These case studies highlight the importance of these streams to downstream waters, despite their small size and ephemeral or intermittent flow regime. 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. *Report* at 4-40 (citing W.J. Matthews, "North American Prairie Streams as Systems for Ecological Study," *Journal of the North American Benthological Society* 7:387-409 (1988); A.V. Zale *et al*., "The Physicochemistry, Flora, and Fauna of Intermittent Prairie Streams: A Review of the Literature," *United States Fish and Wildlife Service Biological Report* 89:1-44 (1989); N.L. Poff, "A Hydrogeography of Unregulated Streams in the United States and an Examination of Scale Dependence in Some Hydrological Descriptors," *Freshwater Biology* 36:71-91 (1996); W.K. Dodds, *et al*., "Life on the Edge: The Ecology of Great Plains Prairie Streams," *Bioscience* 54:205-216 (2004)). Prairie streams typically represent a collection of spring-fed, perennial pools and reaches, embedded within larger, intermittently flowing segments. *Id.* at 4-55 (citing T.R. Labbe, and K.D. Fausch, "Dynamics of Intermittent Stream Habitat Regulate Persistence of a Threatened Fish at Multiple Scales," *Ecological Applications* 10:1774-1791 (2000)). These 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.* (citing W.J. Matthews, and H.W. Robinson, "Influence of Drainage

Connectivity, Drainage Area and Regional Species Richness on Fishes of the Interior Highlands in Arkansas," *American Midland Naturalist* 139:1-19 (1998); W.K. Dodds, *et al*., "Life on the Edge: the Ecology of Great Plains Prairie Streams," *Bioscience* 54:205-216 (2004)). The most notable connections are via flood propagation, contaminated sediment transport, nutrient retention, and the extensive transport and movement of fish species (including eggs and larvae) throughout these networks. *Id.* at 4-55 (citing H.F. Matthai, *Floods of June 1965 in South Platte River Basin, Colorado*, Water Supply Paper 1850-B (Washington, D.C.: U.S. Geological Survey, 1969); A.J. Horowitz, *et al*., "The Effect of Mining on the Sediment-trace Element Geochemistry of Cores from the Cheyenne River Arm of Lake Oahe, South Dakota, USA," *Chemical Geology* 67:17-33 (1988); D.C. Marron, "The Transport of Mine Tailings as Suspended Sediment in the Belle Fourche River, West-central South Dakota, USA," *International Association of Hydrologic Sciences* 184:19-26 (1989); W.K. Dodds, *et al*., "Nitrogen Transport from Tallgrass Prairie Watersheds," *Journal of Environmental Quality* 25:973-981 (1996a); K.D. Fausch, and K.R. Bestgen, "Ecology of Fishes Indigenous to the Central and Southwestern Great Plains," *in* F.L. Knopf and F.B. Samson, ed., *Ecology and Conservation of Great Plains Vertebrates*, (New York, NY: Springer-Verlag, 1997), pp. 131-166; S.P. Platania, and C.S. Altenbach, "Reproductive Strategies and Egg Types of Seven Rio Grande Basin Cyprinids," *Copeia* 1998:559-569 (1998); K.M. Fritz, and W.K. Dodds, "Resistance and Resilience of Macroinvertebrate Assemblages to Drying and Flood in a Tallgrass Prairie Stream System," *Hydrobiologia* 527:99-112 (2004); K.M. Fritz, and W.K. Dodds, "Harshness: Characterization of Intermittent Stream Habitat over Space and Time," *Marine and Freshwater Research* 56:13-23 (2005); N.R. Franssen, *et al*., "Effects of Floods on Fish Assemblages in an Intermittent Prairie Stream," *Freshwater Biology* 51:2072-2086 (2006); R.B. Alexander, *et al*., "Differences in

Phosphorus and Nitrogen Delivery to the Gulf of Mexico from the Mississippi River Basin," *Environmental Science & Technology* 42:822-830 (2008); J.S. Perkins, and K.B. Gido, "Stream Fragmentation Thresholds for a Reproductive Guild of Great Plains Fishes," *Fisheries* 36:371-383 (2011)).

Southwestern intermittent and ephemeral streams exert strong influences on the structure and function of downstream waters, and the case study (included in the 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. The chemical, physical, and biological connections of Southwestern intermittent and ephemeral streams highlighted in the case study are summarized below. 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 4-60, 4-67 (citing D.C. Goodrich, *et al*., "Linearity of Basin Response as a Function of Scale in a Semiarid Watershed," *Water Resources Research* 33:2951-2965 (1997); F. Yuan, and S. Miyamoto, "Characteristics of Oxygen-18 and Deuterium Composition in Waters from the Pecos River in American Southwest," *Chemical Geology* 255:220-230 (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 4-68 to 4-69 (citing K.R. John, "Survival of Fish in Intermittent Streams of the Chirichua Mountains, Arizona" *Ecology* 45:112-119 (1964); T.R. Labbe, and K.D. Fausch, "Dynamics of Intermittent Stream Habitat Regulate Persistence of a Threatened Fish at Multiple Scales," *Ecological*

*Applications* 10:1774-1791 (2000); J.N. Rinne, and D. Miller, "Hydrology, Geomorphology and Management: Implications for Sustainability of Native Southwestern Fishes," *Reviews in Fisheries Science* 14:91-110 (2006); D.A. Lytle, *et al*., "Evolution of Aquatic Insect Behaviors across a Gradient of Disturbance Predictability," *Proceedings of the Royal Society - Series B* 275:453-462 (2008)). Ephemeral tributaries in the Southwest also supply water to mainstem river alluvial aquifers, which aids in the sustaining river baseflows downstream. *Id*. at 4-64 (citing D.C. Goodrich, *et al*., "Linearity of Basin Response as a Function of Scale in a Semiarid Watershed," *Water Resources Research* 33:2951-2965 (1997); J.B. Callegary, *et al*., "Rapid Estimation of Recharge Potential in Ephemeral-Stream Channels using Electromagnetic Methods, and Measurements of Channel and Vegetation Characteristics," *Journal of Hydrology* 344:17-31 (2007)). Ephemeral tributaries export sediment downstream during major hydrologic events; the sediment, in turn, contributes to materials that comprise alluvial aquifers and shape the fluvial geomorphology (the science of how rivers and streams form given the landscape setting) of downstream waters. *Id.* at 4-65 (citing G.C. Nanson, and J.C. Croke, "A Genetic Classification of Floodplains," *Geomorphology* 4:459-486 (1992)). 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 4-18, 4-66 (citing P.D. Brooks, and M.M. Lemon, "Spatial Variability in Dissolved Organic Matter and Inorganic Nitrogen Concentrations in a Semiarid Stream, San Pedro River, Arizona," *Journal of Geophysical Research-Biogeosciences* 112:G03S05 (2007)). 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 4-65 to 4-66 (citing S.V. Gregory, *et al*., "An Ecosystem Perspective of Riparian Zones: Focus on Links between Land and Water," *Bioscience* 41:540-551 (1991); R.J. Naiman, *et al*., *Riparia: Ecology, Conservation, and Management of Streamside Communities* (Burlington, MA: Elsevier, Inc., 2005); J.C. Stromberg, *et al*., "Effects of Stream Flow Intermittency on Riparian Vegetation of a Semiarid Region River (San Pedro River, Arizona)," *River Research and Applications* 21:925-938 (2005), M. Baillie, *et al*., "Quantifying Water Sources to a Semiarid Riparian Ecosystem, San Pedro River, Arizona," *Journal of Geophysical Research* 112:G03S02 (2007); National Research Council, *Riparian Areas: Functions and Strategies for Management* (Washington, D.C.: National Academy Press, 2002)).

### G. Tributary Lakes, Ponds, and Wetlands Significantly Affect the Chemical, Physical, and Biological Integrity of (a)(1) through (a)(3) Waters

As discussed elsewhere in this preamble, riparian and floodplain wetlands have a significant nexus to downstream waters, and wetlands that are tributaries are a subset of such wetlands. The fact that a wetland tributary is in-stream often enhances its ability to filter pollutants and contaminants that would otherwise make it downstream; in-stream wetlands also attenuate floodwaters. Lakes and ponds serve many important functions that affect the chemical, physical, and biological conditions downstream. Lake tributaries 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.*, R.W. Phillips, *et al.*, "Connectivity and Runoff Dynamics in Heterogeneous Basins," *Hydrological Processes* 25(19): 3061-3075 (2011). The attenuation of floodwaters can also maintain stream flows downstream. *Id.* Lakes, as with other tributaries, can also act as sources, contributing flow, nutrient, 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, *Phosphorus Control Action Plan and Total Maximum Daily (Annual Phosphorous) Load Report, Daigle Pond, New Canada, Aroostook County, Maine*, Daigle Pond PCAP – TMDL Report, Maine DEPLW – 0789 (Maine DEP, 2006); U.S. Environmental Protection Agency, "Section 6 Echo Park Lake TMDLs," *Los Angeles Area Lakes TMDLs, January 2011 Revised Draft* (2011). 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. S.B. Adams, *et al.*, "Geography of Invasion in Mountain Streams: Consequences of Headwater Lake Fish Introductions," Ecosystems 4(4): 296-307. 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.*, J.B. Dunham, *et al.*, "Alien Invasions in Aquatic Ecosystems: Toward an Understanding of Brook Trout Invasions and Potential Impacts on Inland Cutthroat Trout in Western North America," *Reviews in Fish Biology and Fisheries* 12(4): 373-391 (2002). For example, non-native trout were introduced in headwater tributary 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. R.A. Knapp, and K.R. Matthews, "Effects on Nonnative Fishes on Wilderness Lake Ecosystems in the Sierra Nevada and Recommendations for Reducing Impacts," in D. N. Cole, *et al.*, ed., *Wilderness Science in a Time of Change Conference, Volume 5: Wilderness Ecosystems, Threats, and Management, Missoula, Montana, May 23-27, 1999*, Proceedings RMRS-P-15-

VOL-5 (Ogden, UT: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, 2000), 312-317. These studies demonstrate the ability of organisms to travel from tributary 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 wetlands located in-stream are unidirectional wetlands that are connected to the river network through a channel (e.g., wetlands that serve as stream origins; a definition of "unidirectional wetlands" can be found in part I section 4.B above). These tributary wetlands are generally exemplary of tributary wetlands as a whole, and because the Report focuses in part on these wetlands, they are discussed here in further detail. These are wetlands from which a stream channel originates. *Report* at 5-1 to 5-2. They are part of the stream network itself, and along with first- and second-order streams, form the headwaters of the river network. Such wetlands have a direct hydrologic connection to the tributary network via unidirectional flow from wetland to the headwater stream. Channel origin wetlands 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 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 5-41.

Wetlands that serve as stream origins connect via perennial, intermittent, or ephemeral drainages to river networks. *Id.* at 5-22 to 5-23 (citing M.C. Rains, *et al*., "The Role of Perched

Aquifers in Hydrological Connectivity and Biogeochemical Processes in Vernal Pool Landscapes, Central Valley, California," *Hydrological Processes* 20:1157-1175 (2006); M.C. Rains, *et al*., "Geological Control of Physical and Chemical Hydrology in California Vernal Pools," *Wetlands* 28:347-362 (2008); T.R. Morley, *et al*., "The Role of Headwater Wetlands in Altering Streamflow and Chemistry in a Maine, USA Catchment," *Journal of the American Water Resources Association* 47:337-349 (2011)). Regardless of the permanence of flow, such wetlands have an impact on downstream water. *Id.* at 5-1 to 5-2. Wetland seeps, for example, can form where groundwater discharges from breaks in slope. *Id.* at 5-21 (citing B.R. Hall, *et al*., "Environmental Influences on Plant Species Composition in Ground-water Seeps in the Catskill Mountains of New York," *Wetlands* 21:125-134 (2001); M.A. O'Driscoll, and D.R. DeWalle, "Seeps Regulate Stream Nitrate Concentration in a Forested Appalachian Catchment," *Journal of Environmental Quality* 39:420-431 (2010)). They often have perennial connections to the stream, providing important sources of water downstream, particularly during summer baseflow. *Id.* at 5-22 (citing T.R. Morley, *et al*., "The Role of Headwater Wetlands in Altering Streamflow and Chemistry in a Maine, USA Catchment," *Journal of the American Water Resources Association* 47:337-349 (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. For example, California vernal pools spill water a great number of days during the years via channels, providing water downstream. *Id*. (citing M.C. Rains, *et al*., "The Role of Perched Aquifers in Hydrological Connectivity and Biogeochemical Processes in Vernal Pool Landscapes, Central Valley, California," *Hydrological Processes* 20:1157-1175 (2006); M.C. Rains, *et al*., "Geological Control of Physical and Chemical Hydrology in California Vernal Pools," *Wetlands* 28:347-362 (2008)). In addition to surface water connections, groundwater flow can wetlands that serve as stream origins with the stream network. *Id.* at 5-23.

The hydrologic connection of the wetland to the stream can affect streamflow by altering baseflow or storm flow through several mechanisms, including surface storage and groundwater recharge. *Id.* at 5-25. Studies at the larger scale have shown that wetlands, by storing water, reduce peak streamflows and, thus, downstream flooding. *Id.* (citing J. Jacques, and D. L. Lorenz, *Techniques for Estimating the Magnitude and Frequency of Floods of Ungauged Streams in Minnesota*, Report 87-4170 (Washington, D.C.: U.S. Geological Survey, 1988); Vining, K.C., *Simulation of Streamflow and Wetland Storage, Starkweather Coulee Subbasin, North Dakota, Water Years 1981-98*, Water-Resources Investigations Report 02-4113 (Bismarck, ND: U.S. Geological Survey, 2002), 33 p.; P. McEachern, *et al*., "Landscape Control of Water Chemistry in Northern Boreal Streams of Alberta," *Journal of Hydrology* 323:303-324 (2006); R.A. Gleason, *et al*. *Estimating Water Storage Capacity of Existing and Potentially Restorable Wetland Depressions in a Subbasin of the Red River of the North*, U.S. Geological Survey Open-File Report 2007-1159 (Reston, VA: U.S. Geological Survey, 2007), 36 p.). 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.* at 227 (citing Bay, R., "Runoff from Small Peatland Watersheds," *Journal of Hydrology* 9:90-102 (1969); A. Bullock, and M. Acreman, "The Role of Wetlands in the Hydrological Cycle," *Hydrology and Earth System Sciences* 7:358-389 (2003)). This is because the wetland soil, if completely saturated, cannot store any additional water, making the wetland enable to store floodwater.

Wetlands that serve as stream origins have important chemical connections to downstream waters that affect the integrity of those waters. These wetlands contain diverse microbial populations that perform various chemical transformations, acting as source of compounds and influencing the water quality downstream. *Id.* at 5-28 (citing K.R. Reddy, and R.D. DeLaune, *Biogeochemistry of Wetlands: Science and Applications*, 774 p. (2008)). Sulfate-reducing bacteria found in some headwater wetlands produce methylated mercury, which is then transported downstream by surface flows. *Id.* (citing O.K. Linqvist, *et al.*, "Mercury in the Swedish Environment - Recent Research on Causes, Consequences, and Remedial Measures," *Water Air and Soil Pollution* 55:xi-xiii (1991); G. Mierle, and R. Ingram, "The Role of Humic Substances in the Mobilization of Mercury from Watersheds," *Water Air and Soil Pollution* 56:349-357 (1991); C.T. Driscoll, *et al.*, "The Role of Dissolved Organic Carbon in the Chemistry and Bioavailability of Mercury in Remote Adirondack Lakes," *Water Air and Soil Pollution* 80:499-508 (1995); B.A. Branfireun, *et al.*, "In situ Sulphate Stimulation of Mercury Methylation in a Boreal Peatland: Toward a Link Between Acid Rain and Methylmercury Contamination in Remote Environments," *Global Biogeochemical Cycles* 13:743-750 (1999)). Wetlands, including those that serve as stream origins, are the principle sources of dissolved organic carbon (DOC) in forests to downstream waters. *Id.* (citing P.J. Mulholland, and E.J. Kuenzler, "Organic Carbon Export from Upland and Forested Wetland Watersheds," *Limnology and Oceanography* 24:960-966 (1979); N.R. Urban, *et al.*, "Export of Dissolved Organic Carbon and Acidity from Peatlands," *Water Resources Research* 25:1619-1628 (1989); B.W. Eckhardt and T.R. Moore, "Controls on Dissolved Organic Carbon Concentrations in Streams of Southern Quebec," *Canadian Journal of Fisheries and Aquatic Sciences* 47:1537-1544 (1990); J.-F. Koprivnjak and T.R. Moore, "Sources, Sinks, and Fluxes of Dissolved Organic Carbon in

Subarctic Fen Catchments," *Arctic and Alpine Research* 24:204-210 (1992); P. Kortelainen, "Content of Total Organic Carbon in Finnish Lakes and Its Relationship to Catchment Characteristics," *Canadian Journal of Fisheries and Aquatic Sciences* 50:1477-1483 (1993); T.A. Clair, *et al*., "Exports of Carbon and Nitrogen from River Basins in Canada's Atlantic Provinces," *Global Biogeochemical Cycles* 8:441-450 (1994); D. Hope, *et al*., "A Review of the Export of Carbon in River Water: Fluxes and Processes," *Environmental Pollution* 84:301-324 (1994); P.J. Dillon and L.A. Molot, "Effects of Landscape Form on Export of Dissolved Organic Carbon, Iron, and Phosphorus from Forested Stream Catchments," *Water Resources Research* 33:2591-2600 (1997); S.E. Gergel, *et al*., "Dissolved Organic Carbon as an Indicator of the Scale of Watershed Influence on Lakes and Rivers," *Ecological Applications* 9:1377-1390 (1999)). Export of DOC to downstream waters supports primary productivity, effects pH and buffering capacity, and regulates exposure to UV-B radiation. *Id.* at 5-29 (citing K.N. Eshelman and H.F. Hemond, "The Role of Organic Acids in the Acid-base Status of Surface Waters at Bickford Watershed, Massachusetts," *Water Resources Research* 21:1503-1510 (1985); L.O. Hedin, *et al*., "Patterns of Nutrient Loss from Unpolluted Old-growth Temperate Forests: Evaluation of Biogeochemical Theory," *Ecology* 76:493-509 (1995); D.W. Schindler and P.J. Curtis, "The Role of DOC in Protecting Freshwaters Subjected to Climate Warming and Acidification from UV Exposure," *Biogeochemistry* 36:1-8 (1997); J.C. Nuff and G.P. Asner, "Dissolved Organic Carbon in Terrestrial Ecosystems: Synthesis and a Model," *Ecosystems* 4:29-48 (2001)).

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.* (citing K.C. Ewel and H.T. Odum, *Cypress Swamps* (Gainesville, FL:

University Presses of Florida, 1984); S.J. Nixon and V.J. Lee, *Wetlands and Water Quality: A Regional Review of Recent Research in the United States on the Role of Freshwater and Saltwater Wetlands as Sources, Sinks, and Transformers of Nitrogen, Phosphorus, and Various Heavy Metals*, Technical Report Y-86-2 (Vicksburg, MS: U.S. Army Corp of Engineers, Waterways Experiment Station, 1986); C. Johnston, "Sediment and Nutrient Retention by Freshwater Wetlands: Effects on Surface Water Quality," *Critical Reviews in Environmental Control* 21:491-565 (1991); K.R. Reddy, *et al*., "Phosphorus Retention in Streams and Wetlands: A Review," *Critical Reviews in Environmental Science and Technology* 29:83-146 (1999); W.J. Mitsch and J.G. Gosselink, *Wetlands*, 4th edition (Hoboken, NJ: John Wiley & Sons Inc., 2007); K.R. Reddy, and R.D. DeLaune, *Biogeochemistry of Wetlands: Science and Applications* (Boca Raton, FL: CRC Press, 2008); R.H. Kadlec and S.D. Wallace, *Treatment Wetlands*, 2nd edition (Boca Raton, FL: CRC Press, 2009)). Specifically, wetlands reduce phosphorus, nitrate, and ammonium by large percentages. *Id.* at 5-30 (citing F.E. Dierberg and P.L. Brezonik, "Nitrogen and Phosphorus Mass Balances in a Cypress Dome Receiving Wastewater," *in* K.C. Ewel and H.T. Odum, ed., *Cypress Swamps* (Gainesville, FL: University Presses of Florida, 1984), pp. 112-118; E.J. Dunne, *et al*., "Phosphorus Release and Retention by Soils of Natural Isolated Wetlands," *International Journal of Environment and Pollution* 28:496-516 (2006); T.E. Jordan, *et al*., "Comparing Functional Assessments of Wetlands to Measurements of Soil Characteristics and Nitrogen Processing," *Wetlands* 27:479-497 (2007)). These processes are important for protecting downstream waters from pollutants from agricultural runoff. Wetland microbial processes reduce other pollutants, such as pesticides, hydrocarbons, heavy metals, and chlorinated solvents. *Id.* (citing R.R. Brooks, *et al*., "Cobalt and Nickel Uptake by the *Nyssaceae*," *Taxon* 26:197-201 (1977); C.M. Kao, *et al*., "Non-point Source Pesticide Removal by a Mountainous Wetland," *Water Science and Technology* 46:199-206 (2002); P.I. Boon, "Biogeochemistry and Bacterial Ecology of Hydrologically Dynamic Wetlands," *in* D. P. Batzer and R. R. Sharitz, ed., *Ecology of Freshwater and Estuarine Wetlands* (Berkeley, CA: University of California Press, 2006), pp. 115-176).

Tributary wetlands have important biological connections downstream that impact the integrity of (a)(1) through (a)(3) waters. Emergent and aquatic vegetation found in wetlands disperse by water, wind, and hitchhiking on migratory animals from tributary wetlands downstream. *Id.* at 5-31 (citing M.B. Soons and G.W. Heil, "Reduced Colonization Capacity in Fragmented Populations of Wind-Dispersed Grassland Forbs," *Journal of Ecology* 90:1033-1043 (2002); M.B. Soons, "Wind Dispersal in Freshwater Wetlands: Knowledge for Conservation and Restoration," *Applied Vegetation Science* 9:271-278 (2006); C. Nilsson, *et al.*, "The Role of Hydrochory in Structuring Riparian and Wetland Vegetation," *Biological Reviews* 85:837-858 (2010)). Similarly, fish move between the river network and wetlands during times of surface water connections, and tributary wetlands by definition are connected on the surface to downstream waters. *Id.* at 5-32 (citing J.W. Snodgrass, *et al*., "Factors affecting the occurrence and structure of fish assemblages in isolated wetlands of the upper coastal plain, USA," *Canadian Journal of Fisheries and Aquatic Sciences* 53:443-454 (1996); K.D. Zimmer, *et al*., "Effects of fathead minnow colonization and removal on a prairie wetland ecosystem," *Ecosystems* 4:346-357 (2001); M.J. Baber, *et al*., "Controls on fish distribution and abundance in temporary wetlands," *Canadian Journal of Fisheries and Aquatic Sciences* 59:1441-1450 (2002); M.A. Hanson, *et al*., "Biotic interactions as determinants of ecosystem structure in prairie wetlands: An example using fish," *Wetlands* 25:764-775 (2005);, B.R. Herwig, *et al*., "Factors influencing fish distributions in shallow lakes in prairie and prairie-parkland regions of

Minnesota, USA," *Wetlands* 30:609-619 (2010)). Mammals that can disperse overland can also contribute to connectivity. *Id.* (citing C.E. Shanks and G.C. Arthur, "Muskrat movements and population dynamics in Missouri farm ponds and streams," *Journal of Wildlife Management* 16:138-148 (1952); W.R. Clark, "Ecology of muskrats in prairie wetlands," *in* H.R. Murkin, *et al.*, ed., *Prairie Wetland Ecology: The Contribution of the Marsh Ecology Research Program*, (Ames, IA: Iowa State University Press, 2000), pp. 287-313). Insects also hitchhike on birds and mammals from tributary wetlands to the stream network, which can then serve as a food source for downstream waters. *Id*. (citing J. Figuerola and A.J. Green, "Dispersal of Aquatic Organisms by Waterbirds: A Review of Past Research and Priorities for Future Studies," *Freshwater Biology* 47:483-494 (2002); J. Figuerola, *et al*., "Invertebrate Eggs Can Fly: Evidence of Waterfowl-Mediated Gene Flow in Aquatic Invertebrates," *American Naturalist* 165:274-280 (2005)). Insects that are flight-capable also use both stream and tributary wetlands, moving from the stream to the wetland to find suitable habitat for overwintering, refuge from adverse conditions, hunting, foraging, or breeding. *Id*. at 5-33 (citing D.D. Williams, "Environmental Constraints in Temporary Fresh Waters and Their Consequences for the Insect Fauna," *Journal of the North American Benthological Society* 15:634-650 (1996); A.J. Bohonak and D.G. Jenkins, "Ecological and Evolutionary Significance of Dispersal by Freshwater Invertebrates," *Ecology Letters* 6:783-796 (2003)). Amphibians and reptiles, including frogs, toads, and newts, also move between streams or rivers and tributary wetlands to satisfy part of their life history requirements, feed on aquatic insects, and avoid predators. *Id*. (citing V.S. Lamoureux and D.M. Madison, "Overwintering Habitats of Radio-Implanted Green Frogs, *Rana clamitans*," *Journal of Herpetology* 33:430-435 (1999); K.J. Babbitt, *et al*., "Patterns of Larval Amphibian Distribution Along a Wetland Hydroperiod Gradient," *Canadian Journal of Zoology-Revue*

*Canadienne De Zoologie* 81:1539-1552 (2003); S.B. Adams, *et al.*, "Instream Movements by Boreal Toads (*Bufo boreas boreas*)," *Herpetological Review* 36:27–33 (2005); D.M. Green, "*Bufo americanus*, American Toad," *in* M. Lannoo, ed., *Amphibian Declines: The Conservation Status of United States Species* (Berkeley, CA: University of California Press, 2005) , pp. 692-704; T.W. Hunsinger and M.J. Lannoo, "Notophthalmus viridescens, Eastern Newt," in M. Lannoo, ed., *Amphibian Declines: The Conservation Status of United States Species* (Berkeley, CA: University of California Press, 2005), pp. 912-914; J.W. Petranka and C.T. Holbrook, "Wetland Restoration for Amphibians: Should Local Sites Be Designed to Support Metapopulations or Patchy Populations?," *Restoration Ecology* 14:404-411 (2006); A.L. Subalusky, *et al*., "Ontogenetic Niche Shifts in the American Alligator Establish Functional Connectivity between Aquatic Systems," *Biological Conservation* 142:1507-1514 (2009)).

Lake, pond, and wetland tributaries, including wetlands that serve as stream origins, have important chemical, physical, and biological connections downstream that affect (a)(1) through (a)(3) waters and rivers. 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 flow is perennial, intermittent, or ephemeral. Thus, lake, pond, and wetland tributaries serve the same important functions as stream 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.

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

The agencies' proposed rule clarifies that man-made and man-altered tributaries as defined in the proposed 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, and the like. Ditches and canals are wide-spread across the United States. Ditches may have been streams that were channelized. They are 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, and 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.

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 physical, chemical, and biological connections with downstream waters that substantially impact those waters. Tributary ditches and canals can have perennial, intermittent, or ephemeral flow. As described above, tributaries of all flow regimes have a significant nexus to downstream (a)(1) through (a)(3) waters. 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. Due to their often channelized nature, ditches are very effective at transporting water and these materials, including nitrogen, downstream. *See, e.g.*, J.P. Schmidt, *et al.*, "Nitrogen Export from Coastal Plain Field Ditches," *Journal of Soil and Water Conservation* 62(4):235-243; J.S. Strock, *et al.*, "Managing Natural Processes in Drainage Ditches for Nonpoint Source Nitrogen Control." *Journal of Soil and Water Conservation* 62(4): 188-196 (2007). Ditches provide habitat for fish and other aquatic organisms. *See, e.g.*, P.C. Smiley, Jr., *et al.*, "Contribution of Habitat and Water Quality to the Integrity of Fish Communities in Agricultural Drainage Ditches," *Journal of Soil and Water Conservation* 63(6):218A-219A (2008). Fish and other aquatic organisms utilize canals and ditches to move to different habitats, sometimes over long distances. F.J. Rahel, "Biogeographic Barriers, Connectivity and Homogenization of Freshwater Faunas: It's a Small World after All," *Freshwater Biology* 52(4): 696-710 (2007).

These significant connections and functions continue even where the tributary has a natural or man-made break in its channel, bed and bank, or OHWM. The presence of a channel, bed and bank, and OHWM upstream or downstream of the break is an indication that connections still exist. 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 bank or ordinary high watermark is broken for the length of the wetland. As discussed in Part II, section 1.G. of this appendix, in-stream 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 bank or OHWM, but these systems continue to have a significant nexus downstream. These are just illustrative examples of break in ordinary high watermark; there are several other types, all of which do not break the significant nexus between a tributary and the downstream (a)(1) to (a)(3) water.

There are more than 80,000 dams in the United States, with over 6,000 exceeding 15 meters in height. *Report* at 3-48 (citing U.S. Army Corps of Engineers, *National Inventory of Dams* (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 *http://www.damsafety.org/layout/subsection.aspx?groupid=14&contentid=47*. 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. Department of the Army, U.S. Army Corps of Engineers, *Engineering and Design – Design, Construction and Maintenance of Relief Wells,* EM 1110-2-1914 (Washington, D.C.: Department of the Army, 1992), p. 1-1. Thus waters behind a dam still maintain a hydrologic connection to downstream waters.

Numerous studies have shown that dams impede biotic movements, reducing biological connectivity between upstream and downstream locations. *Report* at 3-48 (citing E.A. Greathouse, *et al.*, "Indirect Upstream Effects Of Dams: Consequences Of Migratory Consumer Extirpation In Puerto Rico," *Ecological Applications* 16: 339-352 (2006); C.J. Hall, *et al.*, "The Historic Influence of Dams on Diadromous Fish Habitat with a Focus on River Herring and Hydrologic Longitudinal Connectivity," *Landscape Ecology* 26: 95-107(2011)). Dams alter but typically do not sever the hydrologic connection between upstream and downstream waters. (See Part II, section 2.C. of this appendix ). Upstream of large dams riparian areas are permanently inundated, increasing hydrological connectivity. Downstream, peak flows and the potential for overbank lateral flow are reduced; however, dams may also reduce flow variability downstream, resulting in higher minimum flows and reduced flow intermittency and thereby increasing hydrological (and potentially biological) connectivity. *Id.* (citing N.L. Poff, *et al.*, "Homogenization of Regional River Dynamics by Dams and Global Biodiversity Implications," *Proceedings of the National Academy of Sciences of the United States of America* 104: 5732-5737 (2007)). Where an impoundment does stop flow, it also has significant effects on downstream waters. For example, the downstream segments have a reduced quantity of waters, less sediment, and reduced species biological connectivity with upstream refugia.

Because dams reduce the amount of sediment delivered downstream, the reservoirs behind dams are actually very effective at retaining sediment, which can 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. M.D. Blum, and H. H. Roberts, "Drowning of the Mississippi Delta Due to Insufficient Sediment Supply and Global Sea-Level Rise," *Nature Geoscience* 2(7): 488-491 (2009).

Man-made or man-altered tributaries continue to have physical, chemical 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.

### ii. Adjacent Waters

Adjacent waters, including adjacent wetlands, alone or in combination with other adjacent waters in the watershed, have a substantial impact on the chemical, physical, and 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 Report supports these conclusions, as discussed in greater detail below.

### 1. Adjacent waters under this proposed rule have a significant nexus to (a)(1) through (a)(3) waters.

The discussion below summarizes the key points made in the Report and explains the technical basis for supporting a conclusion that adjacent waters, as defined in this proposed rule, have a significant nexus to waters identified in paragraphs (a)(1) – (a)(3) of the proposed rule. The geographic position of an "adjacent" water relative to the stream 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 territorial seas.

#### a. Riparian and Floodplain Waters Significantly Affect the Chemical, Physical, and Biological Integrity of (a)(1) through (a)(3) Waters

Waters, including wetlands, often lie within landscape settings that have bidirectional hydrological exchange with (a)(1) through (a)(5) waters (e.g., wetlands and open waters in riparian areas and flood plains). Such waters play an integral role in the chemical, physical, and biological integrity of the waters to which they are adjacent. Riparian areas and floodplains often describe the same geographic region. *Report* at 3-4. 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.*, Report at 31. Waters including wetlands in riparian areas significantly influence exchanges of energy and matter with aquatic ecosystems. See, *e.g.*, *id.* (citing National Research Council, *Riparian Areas: Functions and Strategies for Management* (Washington, D.C.: The National Academies Press, 2002).

Floodplains are low gradient areas bordering stream or river channels, lakes, and impoundments that were formed by sediment deposition from those waters under present climatic conditions. These natural geomorphic features are inundated during moderate to high water events. *Id.* (citing L.B. Leopold, *A View of the River* (Cambridge, MA: Harvard University Press, 1994); W.R. Osterkamp, *Annotated Definitions of Selected Geomorphic Terms and Related Terms of Hydrology, Sedimentology, Soil Science and Ecology,* USGS Open File Report 2008-1217 (Reston, VA: U.S. Department of the Interior, U.S. Geological Survey, 2008)). By "present climactic conditions," the agencies mean that currently or recently active floodplains will be used to help determine whether wetlands or waters are adjacent to waters of the United States. The proposed definition is limited to the present climactic conditions in order to best represent the floodplain that has an active and significant relationship with the stream or river channel. Historic floodplains that played a role in the river or lake dynamics in the past only will not be used to determine whether a water is adjacent. Floodplains formed under different climactic conditions that no longer connect to the stream channel that formed them are terraces. *Id*. It should be noted that "floodplain" as defined in today's proposed rule does not necessarily equate to the 100-year floodplain as defined by the Federal Emergency Management Agency (FEMA). However, the FEMA defined floodplain may often coincide with the current definition proposed in this rule. 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). Flood insurance rate maps are not based on an ecological definition of the term "floodplain," and therefore do not have any use in identifying adjacent wetlands and waters for the purposes of CWA jurisdiction. 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.

Riparian waters take many different forms. Some may be wetlands, which are defined in paragraph (c)(6) of the proposed rule. Others may be ponds, oxbow lakes, or other types of open waters. Oxbow lakes, commonly found in floodplains, are formed when river meanders are cutoff from the rest of the river. *Id.* at 5-42.

### b. Riparian and Floodplain 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 territorial seas.

Riparian and floodplain wetlands are important for the reduction or delay of floods. *Id.*at 3-22 (citing A. Bullock and M. Acreman, "The Role of Wetlands in the Hydrological Cycle," *Hydrology and Earth System Sciences* 7:358-389 (2003)). 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 5-6. One study found that peak flows in the Cache River in Arkansas decreased by 10-20% mainly because of floodplain water storage. *Id.* (citing R. Walton, *et al*., "Hydrology of the Black Swamp Wetlands on the Cache River, Arkansas," *Wetlands* 16:279-287 (1996). Research has shown that floodplain wetlands in Ohio store about 40% of the flow of small streams. *Id.* at 5-6 to 5-7 (citing D.E. Gamble, *et al.*, *An Ecological and Functional Assessment of Urban Wetlands in Central Ohio. Columbus, Ohio*, EPA Technical Report WET/ 2007-3B, (Columbus, OH: Ohio Environmental Protection Agency, Wetland Ecology Group, Division of Surface Water, 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 waterbodies, 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 5-38, Table 5-3. These connections in part determine stream flow volume and duration. Waters, including wetlands, in riparian areas connect to neighboring waterbodies through various surface and subsurface connections. See, *e.g.*, *id.* at 3-4 (citing National Research Council, *Riparian Areas: Functions and Strategies for Management* (Washington, D.C.: National Academy Press, 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 3-14 (citing J.A. Stanford and J. V. Ward, "An Ecosystem Perspective of Alluvial Rivers: Connectivity and the Hyporheic Corridor," *Journal of the North American Benthological*

*Society* 12:48-60 (1993); C. Amoros and G. Bornette, "Connectivity and Biocompexity in Waterbodies of Riverine Floodplains," *Freshwater Biology* 47:761-776 (2002); G.C. Poole, *et al.*, "Multiscale Geomorphic Drivers of Groundwater Flow Paths: Subsurface Hydrologic Dynamics and Hyporheic Diversity," *Journal of the North American Benthological Society* 25:288-303 (2006)). Riparian and floodplain wetlands are frequently contiguous with streams and other waterbodies and significantly influence the hydrology of such waterbodies. *Id.* at 5-6 (citing R.J. Naiman, *et al.*, *Riparia: Ecology, Conservation, and Management of Streamside Communities* (Burlington, MA: Elsevier Academic Press, 2005); P. Vidon, *et al*., "Hot Spots and Hot Moments in Riparian Zones: Potential for Improved Water Quality Management," *Journal of the American Water Resources Association* 46:278-298 (2010)). Floodplain wetlands are important for the reduction or delay of floods. *Id.* (citing A. Bullock and M. Acreman, "The Role of Wetlands in the Hydrological Cycle," *Hydrology and Earth System Sciences* 7:358-389 (2003)). Oxbow lakes also retain flood waters. *Id.* at 5-44. Adjacent ponds generally function similarly to oxbow lakes.

Waters in riparian areas filter sediment washed down from uplands and collect sediment from overbank flow as the river or stream floods. *Id.* at 5-7. For example, riparian areas were observed to collect 80-90% of the sediment from farmlands in a study in North Carolina. *Id.* (citing A. Cooper, *et al*., "Riparian Areas as Filters for Agricultural Sediment," *Soil Science Society of America Proceedings* 51:416-420 (1987); R.B. Daniels and J.G. Gilliam, "Sediment and Chemical Load Reduction by Grass and Riparian Filters," *Soil Science Society of America Journal* 60:246-251 (1996); R.J. Naiman and H. Decamps, "The Ecology of Interfaces: Riparian Zones," *Annual Review of Ecology and Systematics* 28:621-658 (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 P.J. Wood and P.D. Armitage, "Biological Effects of Fine Sediment in the Lotic Environment," *Environmental Management* 21:203-217 (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 5-42 (citing K.O. Winemiller, *et al*., "Fish Assemblage Structure in Relation to Environmental Variation among Brazos River Oxbow Lakes," *Transactions of the American Fisheries Society* 129:451-468 (2000), K. Glinska-Lewczuk, "Water Quality Dynamics of Oxbow Lakes in Young Glacial Landscape of NE Poland in Relation to Their Hydrological Connectivity," *Ecological Engineering* 35:25-37 (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 from river to lake and lake to river). *Id.* at 5-43 to 5-44. Oxbow lakes generally have an important influence on the condition and function of rivers. *Id.* at 5-48 to 5-49. 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 waterbodies.

Because adjacent waters support riparian vegetation, they affect the capacity of riparian vegetation to influence stream flow, morphology, and habitat provided in the nearby waterbody. 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 3-22, 5-7 (citing P. Meyboom, "Three Observations on Streamflow Depletion by Phreatophytes," *Journal of Hydrology* 2:248-261 (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 5-8 (citing C.E. Beeson and P. F. Doyle, "Comparison of Bank Erosion at Vegetated and Non-Vegetated Channel Bends," *Journal of the American Water Resources Association* 31:983-990 (1995)).  In addition, inputs of woody debris from aquatic vegetation into waters make important contributions to the channel's geomorphology and the stream's aquatic habitat value. *Id.* (citing N.H. Anderson and J. R. Sedell, "Detritus Processing by Macroinvertebrates in Stream Ecosystems," *Annual Review of Entomology* 24:351-377 (1979); M.E. Harmon, *et al.*, "Ecology of Coarse Woody Debris in Temperature Ecosystems," *Advances in Ecological Research* 15:133-302 (1986); F. Nakamura and F. J. Swanson, "Effects of Coarse Woody Debris on Morphology and Sediment Storage of a Mountain Stream System in Western Oregon," *Earth Surface Processes and Landforms* 18:43-61 (1993); T.E. Abbe and D. R. Montgomery, "Large Woody Debris Jams, Channel Hydraulics and Habitat Formation in Large Rivers," *Regulated Rivers: Research & Management* 12:201-221 (1996); R.J. Naiman and H. Decamps, "The Ecology of Interfaces: Riparian Zones," *Annual Review of Ecology and Systematics* 28:621-658 91997); A.M. Gurnell, *et al*., "Large Wood and

Fluvial Processes," *Freshwater Biology* 47:601-619 (2002)). 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 5-9 (citing S.V. Gregory, *et al.*, "An Ecosystem Perspective of Riparian Zones: Focus on Links between Land and Water," *Bioscience* 41:540-551 (1991); E.C. Volkmar and R.A. Dahlgren, "Biological Oxygen Demand Dynamics in the Lower San Joaquin River, California," *Environmental Science & Technology* 40:5653-5660 (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. The biological consequences of this dissolved organic carbon are discussed in more detail below. The presence of dissolved organic carbon can affect how light penetrates the water, an important factor in the growth of plants, algae, and other primary producers, and can protect aquatic organisms from the harmful effects of UV-B radiation. *Id.* at 5-28 to 5-29 (citing K.N. Eshelman and H.F. Hemond, "The role of organic acids in the acid-base status of surface waters at Bickford Watershed, Massachusetts," *Water Resources Research* 21:1503-1510 (1985); J.E. Hobbie and R.G. Wetzel, "Microbial control of dissolved organic carbon in lakes: Research for the future," *Hydrobiologia* 229:169-180 (1992); D.W. Schindler and P.J. Curtis, "The role of DOC in protecting freshwaters subjected to climate warming and acidification from UV exposure," *Biogeochemistry* 36:1-8 (1997); K.R. Reddy and R.D. DeLaune, *Biogeochemistry of Wetlands: Science and Applications*, (Boca Raton, FL: CRC Press, 2008)).

### c. Riparian and Floodplain 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 navigable or interstate waters, 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, non-point sources, 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 5-10 (citing S.W. Nixon and V.J. Lee, *Wetlands and Water Quality: A Regional Review of Recent Research in the United States on the Role of Freshwater and Saltwater Wetlands as Sources, Sinks, and Transformers of Nitrogen, Phosphorus, and Various Heavy Metals,* Technical Report Y-86-2, (Vicksburg, MS: U.S. Army Corp of Engineers, Waterways Experiment Station, 1986); D.F. Whigham and T.E. Jordan, "Isolated Wetlands and Water Quality," *Wetlands* 23:541-549 (2003); S.L.Whitmire and S.K. Hamilton, "Rates of Anaerobic Microbial Metabolism in Wetlands of Divergent Hydrology on a Glacial Landscape," *Wetlands* 28:703-714 (2008)). Throughout the stream network, but especially in headwater streams and their adjacent wetlands, chemicals are sequestered, assimilated, transformed, or lost to the atmosphere by microbes, fungi, algae, and macrophytes present in riparian waters and soils. *Id.* (citing S.W. Nixon and V.J. Lee, *Wetlands and Water Quality: A Regional Review of Recent Research in the United States on the Role of Freshwater and Saltwater Wetlands as Sources, Sinks, and Transformers of Nitrogen, Phosphorus, and Various Heavy Metals,* Technical Report Y-86-2, (Vicksburg, MS: U.S. Army Corp of Engineers, Waterways Experiment Station, 1986); C. Johnston, "Sediment and Nutrient Retention by Freshwater Wetlands: Effects on Surface Water Quality," *Critical Reviews in Environmental Control* 21:491-565 (1991); P.I. Boon, "Biogeochemistry and Bacterial Ecology of Hydrologically Dynamic Wetlands," *in* D.P. Batzer and R.R. Sharitz, ed., *Ecology of Freshwater and Estuarine Wetlands* (Berkeley, CA: University of California Press, 2006), pp. 115-176; W.J. Mitsch and J.G. Gosselink, *Wetlands,* 4th edition, (Hoboken, NJ: John Wiley & Sons Inc., 2007); K.R., Reddy and R.D. DeLaune, *Biogeochemistry of Wetlands: Science and Applications* (Boca Raton, FL: CRC Press, 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 waters. Nutrients are necessary to support aquatic life, but the presence of excess nutrients can lead to eutrophication and the depletion of oxygen nearby waters and in waters far downstream. See, *e.g.*, *id.* at 1-8. Eutrophication is a large problem in waters across the United States including such significant ecosystems as the Chesapeake Bay and Lake Spokane in Washington. W.M. Kemp, *et al.*, “Eutrophication of Chesapeake Bay: Historical Trends and Ecological Interactions,” *Marine Ecology Progress Series* 303(21):1-29 (2005); D.J. Moore and J. Ross, *Spokane River and Lake Spokane Dissolved Oxygen Total Maximum Daily Load: Water Quality Improvement Report*, Publication No. 07-10-073 (Spokane, WA: Washington State Department of Ecology, 2010); R.R. Murphy, *et al.*, “Long-Term Trends in Chesapeake Bay Seasonal Hypoxia, Stratification, and Nutrient Loading,” *Estuaries and Coasts* 34(6):1293-1309 (2011). Eutrophication is the process by which plants and algae grow in waters to such an extent that the abundance of vegetation monopolizes the available oxygen, detrimentally affecting other aquatic organisms. *Id.* Oxbow lakes also have high mineralization rates, suggesting that similar to adjacent wetlands they process and trap nutrients from runoff. *Report* at 5-45 to 5-46 (citing K.O. Winemiller, *et al.*, “Fish Assemblage Structure in Relation to Environmental Variation among Brazos River Oxbow Lakes,” *Transactions of the American Fisheries Society* 129:451-468

(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 5-11 (citing P. Vidon, *et al*., "Hot Spots and Hot Moments in Riparian Zones: Potential for Improved Water Quality Management," *Journal of the American Water Resources Association* 46:278-298 (2010)). Denitrification in surface and subsurface flows is highest where there is high organic matter and/or anoxic conditions. *Id.* Denitrification occurs in wetland soils where there is high organic matter, low oxygen, denitrifying microbes, and saturated soil conditions, and rates increase with proximity to streams. *Id.* (citing S.V. Gregory, *et al*., "An Ecosystem Perspective of Riparian Zones: Focus on Links between Land and Water," *Bioscience* 41:540-551 (1991); P. Vidon, *et al*., "Hot Spots and Hot Moments in Riparian Zones: Potential for Improved Water Quality Management," *Journal of the American Water Resources Association* 46:278-298 (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 also accounts for large quantities of nitrogen removal. Riparian forests have been found to remove 75% of dissolved nitrate transported from agricultural fields in Maryland. *Id.* (citing P. Vidon, *et al*., "Hot Spots and Hot Moments in Riparian Zones: Potential for Improved Water Quality Management," *Journal of the American Water Resources Association* 46:278-298 (2010)). Likewise, riparian forests in Georgia remove 65% of nitrogen and 30% of phosphorus from agricultural sources. *Id.* at 5-11 to

5-12 (citing Vidon, *et al.* 2010). A Pennsylvania forest removed 26% of the nitrate from the subsurface. *Id.* at 5-12 (citing J.D. Newbold, *et al*., "Water Quality Functions of a 15-Year-Old Riparian Forest Buffer System," *Journal of the American Water Resources Association* 46:299-310 (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.* (citing T.A. Dillaha and S.P. Inamdar, "Buffer Zones as Sediment Traps or Sources," *in* N.E. Haycock, T.P. Burt, K.W.T. Goulding, and G. Pinay, ed., *Buffer Zones: Their Processess and Potential in Water Protection,* Proceedings of the International Conference on Buffer Zones, September 1996 (Hertfordshire, UK: Quest Environmental, 1997), pp. 33-42; A.N. Sharpley and S. Rekolainen, "Phosphorus in Agriculture and Its Environmental Implications," *in* H. Tunney, *et al*., ed., *Phosphorus Losses from Soil to Water* (Cambridge, UK: CAB International, 1997), pp. 1-54; G.C. Carlyle and A.R. Hill, "Groundwater Phosphate Dynamics in a River Riparian Zone: Effects of Hydrologic Flowpaths, Lithology, and Redox Chemistry," *Journal of Hydrology* 247:151-168 (2001)). Biogeochemical processes, sedimentation, and plant uptake account for high rates of removal of particulate phosphorus in riparian areas. *Id.* (citing C.C. Hoffmann, *et al*., "Phosphorus Retention in Riparian Buffers: Review of Their Efficiency," *Journal of Environmental Quality* 38:1942-1955 (2009)). The amount of contact the water has with nearby soils determines the ability of the riparian area to remove phosphorus. *Id.* This function of upstream riparian waters 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.

### d. Riparian and Floodplain Waters Significantly Affect the Biological Integrity of (a)(1) through (a)(3) Waters

Waters and wetlands located in both riparian areas and floodplains 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, and vertebrates, and provide feeding, refuge, and breeding areas for invertebrates and fish. Seeds, plants, and animals move between waters in the riparian zone and floodplains and the adjacent streams, and from there colonize or utilize downstream waters, including traditional navigable waters.

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. *Id.* at 5-13 (citing J.L. Tank, *et al*., "A Review of Allochthonous Organic Matter Dynamics and Metabolism in Streams," *Journal of the North American Benthological Society* 29:118-146 (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 macroinvertebrates 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 G.W. Minshall, "Role of Allochthonous Detritus in the Tropic Structure of a Woodland Springbrook Community," *Ecology* 48:139-149 (1967); J.B. Wallace, *et al*., "Multiple Trophic Levels of a Forest Stream Linked to Terrestrial Litter Inputs," *Science* 277:102-104 (1997); J.L. Meyer, *et al*., "Leaf Litter as a Source of Dissolved Organic Carbon in Streams," *Ecosystems* 1:240-249 (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 also benefit from the movement of fish and other species that contribute to the food web of larger streams and rivers.

Floodplain water bodies, including oxbow lakes, accumulate organic carbon, an important function influenced by the size and frequency of floods from adjacent rivers. *See, e.g.*, *id.* at 5-45 (citing A. Cabezas, *et al*., "Changing Patterns of Organic Carbon and Nitrogen Accretion on the Middle Ebro Floodplain (NE Spain)," *Ecological Engineering* 35:1547-1558 (2009)). These stored chemicals are available for exchange with river water when hydrological connections form. 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 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 5-14 (citing P. Vidon, *et al*., "Hot Spots and Hot Moments in Riparian Zones: Potential for Improved Water Quality Management," *Journal of the American Water Resources Association* 46:278-298 (2010). Microbes near plant roots break down these pesticides. *See, e.g.*, *id.* (citing G. Voos, and P.M. Groffman, "Relationships between microbial biomass and dissipation of 2,4-D and dicamba in soil," *Biology and Fertility of Soils* 24:106-110 (1996)). Uptake by aquatic plants has also been shown to be an important mechanism of removal of the pesticides alachlor and atrazine. *Id.* (citing K.G. Paterson and J.L. Schnoor, "Fate of Alachlor and Atrazine in a Riparian Zone Field Site," *Water Environment Research* 64:274-283 (1992)). Riparian waters also trap and hold pesticide contaminated runoff preventing it from harming neighboring waters.

Riparian areas are dynamic places that support a diversity of aquatic, amphibious, and terrestrial species adapted to the unique habitat created by periodic flooding events. *Id.* at 5-15 (citing W.J. Junk, *et al*., "The flood pulse concept in river-floodplain systems," *in* D.P. Dodge, ed., *Proceedings of the International Large River Symposium Ottawa* (Ottawa, Canada: Canadian Special Publication of Fisheries and Aquatic Sciences 106, 1989), pp. 110-127; K. Tockner, *et al*., "An Extension of the Flood Pulse Concept," *Hydrological Processes* 14:2861-2883 (2000); C.T. Robinson, *et al*., "The Fauna of Dynamic Riverine Landscapes," *Freshwater Biology* 47:661-677 (2002)). Plants, invertebrates, and vertebrates use waters, including wetlands, in the riparian areas for habitat, nutrients, and breeding. As a result, the waters, including wetlands, in the riparian areas 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 greatly increase the area of aquatic habitats and species diversity. *Id.* at 5-15 to 5-16 (citing W.J. Junk *et al*. 1989; R. Jansson, *et al*., "Hydrochory Increases Riparian Plant Species Richness: A Comparison between a Free-Flowing and a Regulated River," *Journal of Ecology* 93:1094-1103 (2005)). Aquatic animals, including amphibians and fish, take advantage of the waters present in riparian areas, either inhabiting them or moving between the riparian water and neighboring waters. *Id.* at 5-15, 5-17, 5-19 (citing G.H. Copp, "The habitat diversity and fish reproductive function of floodplain ecosystems," *Environmental Biology of Fishes* 26:1-27 (1989); L.A. Smock, *et al*., "Lotic macroinvertebrate production in three dimensions: Channel surface, hyporheic, and floodplain environments," *Ecology* 73:876-886 (1992); L.A. Smock, "Movements of invertebrates between stream channels and forested floodplains," *Journal of the North American Benthological Society* 13:524-531 (1994); C. T. Robinson, *et al.*, "The fauna of dynamic riverine landscapes," *Freshwater Biology* 47:661-677 (2002); J.S. Richardson, *et al*., "Riparian communities associated with Pacific Northwest headwater streams: Assemblages, processes, and uniqueness," *Journal of the American Water Resources Association* 41:935-947 (2005); C. Ilg, *et al.*, "Long-term reactions of plants and macroinvertebrates to extreme floods in floodplain grasslands," *Ecology* 89:2392-2398 (2008); D.E. Shoup, and D. H. Wahl, "Fish diversity and abundance in relation to interannual and lakespecific variation in abiotic characteristics of floodplain lakes of the lower Kaskaskia River, Illinois," *Transactions of the American Fisheries Society* 138:1076-1092 (2009)). Likewise, seeds, plant fragments, and whole plants move between riparian and floodplain waters and the river network. *Id.* at 5-15 (citing R.L. Schneider, and R.R. Sharitz, "Hydrochory and regeneration in a bald cypress water tupelo swamp forest," *Ecology* 69:1055-1063 (1988); B. Middleton, "Hydrochory, seed banks, and regeneration dynamics along the landscape boundaries of a forested wetland," *Plant Ecology* 146:169-184 (2000); C. Nilsson, *et al*., "The role of hydrochory in structuring riparian and wetland vegetation," *Biological Reviews* 85:837-858 (2010)).

Hydrological connections are often drivers of biological connections, and flooding events enhance the existing connections between 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 5-15 to 5-17, 5-20 (citing J.R. Thomas, *et al.*, "A landscape perspective of the stream corridor invasion and habitat characteristics of an exotic (Dioscorea oppositifolia) in a pristine watershed in Illinois," *Biological Invasions* 8:1103-1113 (2006); L.M. Tronstad, *et al*., "Aerial colonization and growth: Rapid invertebrate responses to temporary aquatic habitats in a river floodplain," *Journal of the North American Benthological Society* 26:460-471 (2007); A. Gurnell, *et al*., "Propagule deposition along river margins: Linking hydrology and ecology," *Journal of Ecology* 96:553-565 (2008)). Waters within floodplains act as sinks of seeds, plant fragments, and invertebrate eggs, allowing for cross-breeding and resulting gene flow across time. *Id.* at 5-19 to 5-21 (citing K.M. Jenkins, and A.J. Boulton, "Connectivity in a dryland river: Short-term aquatic microinvertebrate recruitment following floodplain inundation," *Ecology* 84:2708-2723 (2003); D. Frisch, and S.T. Threlkeld, "Flood-mediated dispersal versus hatching: Early recolonisation strategies of copepods in floodplain ponds," *Freshwater Biology* 50:323-330 (2005); B. Vanschoenwinkel, *et al*., "Wind mediated dispersal of freshwater invertebrates in a rock pool metacommunity: Differences in dispersal capacities and modes," *Hydrobiologia* 635:363-372 (2009)). Micro- and macroinvertebrates colonize nutrient rich waters within floodplains during periods of inundation, facilitating an increase in population and sustaining them though times of limited resources and population decline. *Id.* at 5-19 (citing W.J. Junk, *et al*., "The flood pulse concept in river-floodplain systems," *in* D.P. Dodge, ed., *Proceedings of the International Large River Symposium Ottawa* (Ottawa, Canada: Canadian Special Publication of Fisheries and Aquatic Sciences 106, 1989), pp. 110-127; B.  Malmqvist, "Aquatic invertebrates in riverine landscapes," *Freshwater Biology* 47:679-694 (2002); C. Ilg, *et al*., "Long-term reactions of plants and macroinvertebrates to extreme floods in floodplain grasslands," *Ecology* 89:2392-2398 (2008)). Such animals are adapted to high floods, desiccation (drying out), or other stresses that come with these regular, systemic fluctuations. *Id.* at 5-20 (citing Jenkins and Boulton 2003). Floodplain waters therefore maintain various biological populations, which periodically replenish adjacent jurisdictional waters, serving to maintain their biological integrity.

Plants and animals use waters, including wetlands, in the 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 5-17 (citing D.E. Shoup and D.H. Wahl, "Fish Diversity and Abundance in Relation to Interannual and Lake- Specific Variation in Abiotic Characteristics of Floodplain Lakes of the Lower Kaskaskia River, Illinois," *Transactions of the American Fisheries Society* 138:1076-1092 (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 5-19 (citing W.J. Junk, *et al*., "The Flood Pulse Concept in River-Floodplain Systems," *in* D. P. Dodge, ed., *Proceedings of the International Large River Symposium Ottawa* (Ottawa, Canada: Canadian Special Publication of Fisheries and Aquatic Sciences 106, 1989), pp. 110-127; C. Ilg, *et al*., "Long-term Reactions of Plants and Macroinvertebrates to Extreme Floods in Floodplain Grasslands," *Ecology* 89:2392-2398 (2008)). Riparian waters also form an integral part of the food web, linking primary producers and plants to higher animals. *Id.* (citing B. Malmqvist, "Aquatic Invertebrates in Riverine Landscapes," *Freshwater Biology* 47:679-694 (2002); G.U.Y. Woodward and A.G. Hildrew, "Food Web Structure in Riverine Landscapes," *Freshwater Biology* 47:777-798 (2002), T.K. Stead, *et al*., "Secondary Production of a Stream Metazoan Community: Does the Meiofauna

Make a Difference?," *Limnology and Oceanography* 50:398-403 (2005), D.J. Woodford and A.R. McIntosh, "Evidence of Source-Sink Metapopulations in a Vulnerable Native Galaxiid Fish Driven by Introduced Trout," *Ecological Applications* 20:967-977 (2010)). Likewise, floodplains are important foraging, hunting, and breeding sites for fish and amphibians. *Id.* at 5-15 (citing G.H. Copp, "The Habitat Diversity and Fish Reproductive Function of Floodplain Ecosystems," *Environmental Biology of Fishes* 26:1-27 (1989); J.S. Richardson, *et al*., "Riparian Communities Associated with Pacific Northwest Headwater Streams: Assemblages, Processes, and Uniqueness," *Journal of the American Water Resources Association* 41:935-947 (2005)).

Plants and animals move back and forth between riparian or floodplain 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 5-17 (citing C.H. Wharton, *et al*., *The Ecology of Bottomland Hardwood Swamps of the Southeast: A Community Profile,* FWS/OBS-81/37 (Washington, D.C.: U.S. Department of the Interior, Fish and Wildlife Service, Biological Services Program, 1982); M.P. Matheney and C.F. Rabeni, "Patterns of Movement and Habitat Use by Northern Hogsuckers in an Ozark Stream," *Transactions of the American Fisheries Society* 124:886-897 (1995); A.A. Pease, *et al*., "Habitat and Resource Use by Larval and Juvenile Fishes in an Arid-Land River (Rio Grande, New Mexico)," *Freshwater Biology* 51:475-486 (2006); J.A. Henning, *et al.*, "Use of Seasonal Freshwater Wetlands by Fishes in a Temperate River Floodplain," *Journal of Fish Biology* 71:476-492 (2007); C.A. Jeffres, *et al*., "Ephemeral Floodplain Habitats Provide Best Growth Conditions for Juvenile Chinook Salmon in a California River," *Environmental Biology of Fishes* 83:449-458 (2008)). Seeds ingested by animals such as carp are dispersed in stream channels and associated waters. See, *e.g.*, *id.* at 5-16 (citing B.J.A. Pollux, *et al*., "Consequences of Intraspecific Seed-Size Variation in *Sparganium emersum* for Dispersal by Fish," *Functional Ecology* 21:1084-1091 (2007)). Also, phytoplankton move between floodplain wetlands and the river network. *Id.* at 5-17 (citing D.G. Angeler, *et al*., "Phytoplankton community similarity in a semiarid floodplain under contrasting hydrological connectivity regimes," *Ecological Research* 25:513-520 (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.* (citing P.W. Lehman, *et al*., "The Influence of Floodplain Habitat on the Quantity and Quality of Riverine Phytoplankton Carbon Produced During the Flood Season in San Francisco Estuary," *Aquatic Ecology* 42:363-378 (2008)). This influx of carbon into the river system nourishes the downstream waters, for example, supporting fisheries.

However, even when hydrological connections are absent, some organisms can move between riparian waters and their neighboring tributaries by overland movement in order to complete their life cycle. River-dwelling mammals, such as river otters, move from the river to riparian wetlands. *Id.* at 5-18 (citing D.G. Newman and C.R. Griffin, "Wetland Use by River Otters in Massachusetts," *Journal of Wildlife Management* 58:18-23 (1994)). Several species of amphibians and reptiles including frogs, snakes and turtles use both streams and neighboring waters. *Id.* at 1-10, 5-4 to 5-5 (Table 5-1), 5-15 (citing J.S. Richardson, *et al*., "Riparian Communities Associated with Pacific Northwest Headwater Streams: Assemblages, Processes, and Uniqueness," *Journal of the American Water Resources Association* 41:935-947 (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 5-15, 5-20 (citing R.L. Schneider and R.R. Sharitz, "Hydrochory and Regeneration in a Bald Cypress Water Tupelo Swamp Forest," *Ecology* 69:1055-1063 (1988); B. Middleton, "Hydrochory, Seed Banks, and Regeneration Dynamics Along the Landscape Boundaries of a Forested Wetland," *Plant Ecology* 146:169-184 (2000); A.M. Gurnell, "Analogies Between Mineral Sediment and Vegetative Particle Dynamics in Fluvial Systems," *Geomorphology* 89:9-22 (2007); A. Gurnell, *et al*., "Propagule Deposition Along River Margins: Linking Hydrology and Ecology," *Journal of Ecology* 96:553-565 (2008); C. Nilsson, *et al*., "The Role of Hydrochory in Structuring Riparian and Wetland Vegetation," *Biological Reviews* 85:837-858 (2010); L.M. Tronstad, *et al*., "Aerial Colonization and Growth: Rapid Invertebrate Responses to Temporary Aquatic Habitats in a River Floodplain," *Journal of the North American Benthological Society* 26:460-471 (2007)). Animals, particularly migratory fish, may 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 neighboring 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 5-46 (citing C. Baranyi, *et al*., "Zooplankton Biomass and Community Structure in a Danube River Floodplain System: Effects of Hydrology," *Freshwater Biology* 47:473-482 (2002); S. Keckeis, *et al*., "The Significance of

Zooplankton Grazing in a Floodplain System of the River Danube," *Journal of Plankton Research* 25:243-253 (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 5-46 to 5-47 (citing W. Reckendorfer, *et al*., "Floodplain Restoration by Reinforcing Hydrological Connectivity: Expected Effects on Aquatic Mollusc Communities," *Journal of Applied Ecology* 43:474-484 (2006); K. Obolewski, *et al.*, "Effect of Hydrological Connectivity on the Molluscan Community Structure in Oxbow Lakes of the Lyna River," *Oceanological and Hydrobiological Studies* 38:75-88 (2009).

### 2. Surface and Shallow Subsurface Hydrologic Connections Significantly Affect the Chemical, Physical, and Biological Integrity of (a)(1) through (a)(3) waters.

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. Many such connections are through a shallow subsurface hydrologic connection. *Report* at 3-7, 5-23. A shallow subsurface hydrologic connection is lateral water flow through a shallow subsurface layer, such as can be found in steeply sloping areas with shallow soils and soils with a restrictive horizon that prevents vertical water flow, or in karst systems. K.J. Devito, *et al.*, "Groundwater-Surface Water Interactions in Headwater Forested Wetlands of the Canadian Shield," *Journal of Hydrology* 181:127-47 (1996); M.A. O'Driscoll and R.R. Parizek, "The Hydrologic Catchment Area of a Chain of Karst Wetlands in Central Pennsylvania, USA," *Wetlands* 23:171-79 (2003); B.J. Cook and F.R. Hauer, "Effects of Hydrologic Connectivity on Water Chemistry, Soils, and Vegetation Structure and Function in an Intermontane Depressional Wetland Landscape," *Wetlands* 27:719-38 (2007). Shallow subsurface connections may be found below the ordinary root zone (below 12 inches), where other wetland delineation factors may not be present. The presence of an aquiclude (impervious layer) near the surface leads to shallow subsurface flows through the soil, which favors local groundwater flowpaths that connect to nearby wetlands or streams. *Report* at 3-38.

Wetlands with shallow subsurface connections can affect the physical integrity of waters to which they connect. In general, the volume and sustainability of streamflow within river networks depends on contributions from groundwater, especially in areas with shallow groundwater tables and pervious (meaning water can easily pass through) subsurfaces. *Id.* at 3-12 (citing J.J. de Vries, "Seasonal Expansion and Contraction of Stream Networks in Shallow Groundwater Systems," *Journal of Hydrology* 170:15-26 (1995); T.C. Winter, "The Role of Groundwater in Generating Streamflow in Headwater Areas and in Maintaining Base Flow," *Journal of the American Water Resources Association* 43:15-25 (2007); G.R. Kish, *et al*., "A Geochemical Mass-Balance Method for Base-Flow Separation, Upper Hillsborough River Watershed, West-Central Florida, 2003-2005 and 2009," *USGS Scientific Investigations Report 2010–5092* (Washington, D.C.: U.S. Department of the Interior, U.S. Geological Survey, 2010). Because wetlands with shallow subsurface connections to streams and rivers provide some of these groundwater contributions, they influence the flow regime. Wetlands connected via shallow subsurface connections also can act as water sinks when evapotranspiration is high, but as water sources when evapotranspiration is low. *Id.* at 3-25. As a result, these adjacent waters moderate peak flows, reduce downstream flooding, and provide runoff to help maintain baseflow for streams during times of low flows.

Wetlands and other waters with shallow subsurface connections affect the chemical and biological integrity of downstream waters in ways similar to wetlands with surface connections.

The distance between these wetlands and jurisdictional waters may influence the connectivity since wetlands with shorter distances to the stream network will have higher hydrological and biological connectivity than wetlands located further from the same network. *Id.* at 3-43. The distance between the wetland and water may also influence whether waters are connected via surface or shallow subsurface hydrologic connections. For wetlands connected to tributaries through groundwater flows, less distant wetlands/waters are generally connected through shallower flowpaths, assuming similar soil and geologic properties. *Id.* at 3-11 (Figure 3-5), 3-42. These shallower groundwater flows have the greatest interchange with surface waters and travel between points in the shortest amount of time. *Id.* at 3-42.

### 3. Adjacent Waters, Including Wetlands, Separated from Other Waters of the United States by Man-made Dikes or Barriers, Natural River Berms, Beach Dunes and the Like Significantly Affect the Chemical, Physical, and Biological Integrity of (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. S.B. Franklin, *et al.*, "Complex Effects of

Channelization and Levee Construction on Western Tennessee Floodplain Forest Function," *Wetlands* 29(2): 451-464 (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. Department of the Army, U.S. Army Corps of Engineers, Engineering and Design – Design and Construction of Levees, EM 1110-2-1913 (Washington, D.C., Department of the Army, 2000), p. 1-1.

Man-made berms and the like are fairly common along streams and rivers across the United States and often accompany stream channelization. S.B. Franklin, *et al*., "Complex Effects of Channelization and Levee Construction on Western Tennessee Floodplain Forest Function," *Wetlands* 29(2): 451-464 (2009). One study conducted in Portland, Oregon found that 42% of surveyed wetlands had dams, dikes, or berms. M. Kentula, *et al*., "Tracking Changes in Wetlands with Urbanization: Sixteen Years of Experience in Portland, Oregon, USA," *Wetlands* 24(4):734-743 (2004). Likewise, over 90% of the tidal freshwater wetlands of the Sacramento-San Joaquin Delta have been diked or leveed. C. Simenstad, *et al*., "Preliminary Results from the Sacramento-San Joaquin Delta Breached Levee Wetland Study," *Interagency Ecological Program for the Sacramento-San Joaquin Estuary Newsletter* 12(4):15-21 (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. S.E. Gergel, *et al*., "Consequences of Human-altered Floods: Levees, Floods, and Floodplain Forests along the Wisconsin River," *Ecological Applications* 12(6): 1755-1770 (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 as 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, Factsheet on Investigating Leaks through Dams and Reservoirs, http://www.tc.iaea.org/tcweb/publications/factsheets/sheet20dr.pdf ; U.S. Bureau of Reclamation, Provo Office, Safety of Dams, http://www.usbr.gov/uc/provo/progact/damsafety.html; Federal Energy Regulatory Commission (FERC), "Chapter 14: Dam Safety Performance Monitoring Program," Engineering Guidelines for the Evaluation of Hydropower Projects (FERC, 2005), pp. 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. D.A.Kovacic, *et al*., "Effectiveness of Constructed Wetlands in Reducing Nitrogen and Phosphorus Export from Agricultural Tile Drainage," *Journal of Environmental Quality* 29(4): 1262-1274 (2000); Federal Energy Regulatory Commission (FERC), "Chapter 14: Dam Safety Performance Monitoring Program," Engineering Guidelines for the Evaluation of Hydropower Projects (FERC, 2005), pp. 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, Seepage Through Earth Dams (2002), http://www.michigan.gov/deq/0,1607,7-135-3313_3684_3723-9515--,00.html. All earth and rock-fill dams are subject to seepage through the embankment, foundation, and abutments. Department of the Army, U.S. Army Corps of Engineers, Seepage Analysis and Control for Dams, EM 1110-2-1901, (Washington, D.C.: Department of the Army, Original 1986 – Revised 1993), Page 1-1; Department of the Army, U.S. Army Corps of Engineers, Engineering and Design: General Design and Construction Considerations for Earth and Rock-filled Dams, EM 1110-2-2300 (Washington, D.C.: Department of the Army, 2004), pp. 6-1 to 6-7. Concrete gravity and arch dams similarly are subject to seepage through the foundation and abutments. Department of the Army, U.S. Army Corps of Engineers, Seepage Analysis and Control for Dams, EM 1110-2-1901 (Washington, D.C.: Department of the Army, Original 1986 – Revised 1993), Page 1-1. Levees and the like are subject to breaches and breaks during times of floods. C. Nilsson, *et al*., "Fragmentation and Flow Regulation of the World's Large River Systems," *Science* 308(5720):405-408 (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. J.W. Day, *et al*., "Restoration of the Mississippi Delta: Lessons from Hurricanes Katrina and Rita," *Science* 315(5819): 1679-1684 (2007). 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.*; D.A.Kovacic, *et al*., "Effectiveness of Constructed Wetlands in Reducing Nitrogen and Phosphorus Export from Agricultural Tile Drainage," *Journal of Environmental Quality* 29(4): 1262-1274 (2000); U.S. Department of the Interior, Bureau of Reclamation, Upper Colorado Region, see http://www.usbr.gov/uc/provo/progact/damsafety.html; International Atomic Energy Agency, Investigating Leaks through Dams and Reservoirs, see http://www-tc.iaea.org/tcweb/publications/factsheets/sheet20dr.pdf; California Division of Safety of Dams, Embankment Design, see http://damsafety.water.ca.gov/guidelines/embankment.htm.

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. Department of the Army, U.S. Army Corps of Engineers, Construction Control for Earth and Rock-filled Dams, EM 1110-2-1911, September 30, 1995, Washington, D.C., 20314-1000, Page 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 Through Earth Dams (2002), http://www.michigan.gov/deq/0,1607,7-135-3313_3684_3723-9515--,00.html. 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. Michigan Department of Environmental Quality, Seepage Through Earth Dams (2002), http://www.michigan.gov/deq/0,1607,7-135-3313_3684_3723-9515--,00.html.

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.*, Department of the Army, U.S. Army Corps of Engineers, Seepage Analysis and Control for Dams, EM 1110-2-1901, (Washington, D.C.: Department of the Army, Original 1986 – Revised 1993), Page 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. Department of the Army, U.S. Army Corps of Engineers, Engineering and Design: Design Guidance for Levee Underseepage, ELT 1110-2-569, Washington, D.C.: Department of the Army, 2005), pp. 1-9. These surface strata constitute impervious or semipervious blankets when considered in connection with seepage. Principle 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. Department of the Army, U.S. Army Corps of Engineers, Engineering and Design – Design and Construction of Levees, EM 1110-2-1913 (Washington, D.C., Department of the Army, 2000), p. 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.*, http://www.damsafety.org/layout/subsection.aspx?groupid=14&contentid=47. 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. 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. C.A. Johnston, *et al.*, “Nutrient Dynamics in Relation to Geomorphology of Riverine Wetlands,” *Soil Science Society of America Journal* 65(2):557-577 (2001). Every flowing watercourse transports not only water, but sediment—eroding and rebuilding its banks and floodplains continually. Federal Interagency Stream Restoration Working Group, *Stream*

*Corridor Restoration: Principles, Processes and Practices*, USDA National Engineering Handbook Part 653 (1999). 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.*, C.A. Johnston, *et al*., "The Potential Role of Riverine Wetlands as Buffer Zones," *in* N.E. Haycock, *et al.*, ed., *Buffer Zones Their Processes and Potential in Water Protection* (Quest International, 1997), pp.155-170. 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.,* L.B. Leopold, *et al*., *Fluvial Processes in Geomorphology* (Toronto: General Publishing Co. Ltd., 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. C.A. Johnston, *et al*., "Nutrient Dynamics in Relation to Geomorphology of Riverine Wetlands," *Soil Science Society of America Journal* 65(2): 557-577 (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 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 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.,* R.E. Turner, et al., "Wetland Sedimentation from Hurricanes Katrina and Rita," *Science* 314(5798): 449-452 (2006); P.A. Keddy, *et al*., "The Wetlands of Lakes Pontchartrain and Maurepas: Past, Present and Future," *Environmental Reviews* 15: 43-77 (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, *Stream Corridor Restoration: Principles, Processes and Practices*, USDA National Engineering Handbook Part 653 (1999). 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.,* L.L. Osborne and D.A. Kovacic, "Riparian Vegetated Buffer Strips in Water-Quality Restoration and Stream Management," *Freshwater Biology* 29(2): 243-258 (1993); D.A. Kovacic, *et al*., "Effectiveness of Constructed Wetlands in Reducing Nitrogen and Phosphorus Export from Agricultural Tile Drainage," *Journal of Environmental Quality* 29(4): 1262-1274 (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. E.J. Kuenzler, *et al*., "Distributions and Budgets of Carbon, Phosphorus, Iron and Manganese in a Floodplain Swamp Ecosystem," *Water Resources Research Institute Report 157* (Chapel Hill, NC: University of North Carolina, 1980); C.A. Johnston, *et al*., "Nutrient Dynamics in Relation to Geomorphology of Riverine Wetlands," *Soil Science Society of America Journal* 65(2): 557-577 (2001). The presence of manmade levees can actually increase denitrification rates, meaning that the adjacent waters can more quickly transform nitrogen. S.E. Gergel, *et al*., "Do Dams and Levees Impact Nitrogen Cycling? Simulating the Effects of Flood Alterations on Floodplain Denitrification," *Global Change Biology* 11(8): 1352-1367 (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.*; J.L. Florsheim and J.F. Mount, “Changes in Lowland Floodplain Sedimentation Processes: Pre-disturbance to Post-rehabilitation, Cosumnes River, CA,” *Geomorphology* 56(3-4):305-323 (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.,* R.E. Turner, *et al*., “Wetland Sedimentation from Hurricanes Katrina and Rita,” *Science* 314(5798):449-452 (2006); P.A. Keddy, *et al*., “The Wetlands of Lakes Pontchartrain and Maurepas: Past, Present and Future,” *Environmental Reviews* 15:43-77 (2007). Sediment deposition over levees is particularly enhanced by extreme events like hurricanes. *Id.*; D.J. Reed, *et al*., “Reducing the Effects of Dredged Material Levees on Coastal Marsh Function: Sediment Deposition and Nekton Utilization,” *Environmental Management* 37(5):671-685 (2006). Wetlands behind berms, where the system is extensive, can help reduce the impacts of storm surges caused by hurricanes. J.W. Day, *et al*., “Restoration of the Mississippi Delta: Lessons from Hurricanes Katrina and Rita,” *Science* 315(5819):1679-1684 (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.*, G.S. Butcher, and B. Zimpel, "Habitat Value of Isolated Waters to Migratory Birds," Prepared by Cornell Laboratory of Ornithology and The Cadmus Group, Inc. for U.S. Environmental Protection Agency Office of Wetlands Protection, (Washington, D.C.: Cornell and Cadmus, 1991); M.F. Willson and K.C. Halupka, "Anadromous Fish as Keystone Species in Vertebrate Communities," *Conservation Biology* 9(3):489-497 (1995); C.J. Cederholm, *et al*., "Pacific Salmon Carcasses: Essential Contributions of Nutrients and Energy for Aquatic and Terrestrial Ecosystems," *Fisheries* 24(10):6-15 (1999); S.S. Schwartz and D.G. Jenkins, "Temporary Aquatic Habitats: Constraints and Opportunities," *Aquatic Ecology* 34:3-8 (2000); D.T. Bilton, *et al*., "Dispersal in Freshwater Invertebrates," *Annual Review of Ecology and Systematics* 32:159-81 (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. W.E. Odum, "Non-Tidal Freshwater Wetlands in Virginia," *Virginia Journal of Natural Resources Law* 7: 421-434 (1988); D.A. Albert, *Borne of the Wind: An Introduction to the Ecology of Michigan Sand Dunes* (Lansing, MI: Michigan Natural Features Inventory, 2000), 63 pp.; D.A. Albert, *Between Land and Lake: Michigan's Great Lakes Coastal Wetlands*, Bulletin E-2902 (East Lansing, MI: Michigan Natural Features Inventory, Michigan State University Extension, 2003), 96 pp; D.A. Albert, *Natural Community Abstract for*

*Interdunal Wetland* (Lansing, MI: Michigan Natural Features Inventory, 2007), 6 pp. 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) and/or (a)(3) waters. Their proximity to one another and to the (a)(1) and/or (a)(3) waters indicates a close physical relationship between interdunal wetland systems and the TNWs or territorial seas. Despite the presence of the beach dunes, interdunal wetlands have physical, chemical, and biological connections that greatly influence the integrity of the nearby (a)(1) and/or (a)(3) waters. The wetlands are hydrologically connected to these (a)(1) and/or (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) and/or (a)(3) waters are important for the dynamics of the wetlands. D.A. Albert, *Between Land and Lake: Michigan's Great Lakes Coastal Wetlands*, Bulletin E-2902 (East Lansing, MI: Michigan Natural Features Inventory, Michigan State University Extension, 2003), 96 pp. The wetlands provide floodwater storage and attenuation, retaining and slowly releasing floodwaters before they reach the nearby (a)(1) and/or (a)(3) waters. Like other adjacent wetlands, interdunal wetlands also have important chemical connections to the nearby (a)(1) and/or (a)(3) waters, as they serve important water quality benefits. The wetlands store sediment and pollutants that would otherwise reach the surrounding (a)(1) and/or (a)(3) waters. The wetlands are biologically connected to the surrounding (a)(1) and/or (a)(3) waters. For instance, they provide critical habitats for species that utilize both the wetlands and the nearby (a)(1) and/or (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. D.A. Albert, *Borne of the Wind: An Introduction to the Ecology of Michigan Sand Dunes* (Lansing, MI: Michigan Natural Features Inventory, 2000), 63 pp.; S.M. Smith, *et al*., "Development of Vegetation in Dune Slack Wetlands of Cape Cod National Seashore (Massachusetts, USA)," *Plant Ecology* 194(2): 243-256 (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) and/or (a)(3) waters, although some interdunal wetlands are brackish in nature. *See, e.g.*, C.M. Heckscher and C.R. Bartlett, "Rediscovery and Habitat Associations of Photuris Bethaniensis McDermott (Coleoptera: Lampyridae)," *The Coleopterists Bulletin* 58(3): 349-353 (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. R.D. Smith and C.V. Klimas, *A Regional Guidebook for Applying the Hydrogeomorphic Approach to Assessing Wetland Functions of Selected Regional Wetland Subclasses, Yazoo Basin, Lower Mississippi River Alluvial Valle*, Prepared for the U.S. Army Corps of Engineers, ERDC/EL TR-02-4 (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.* at 47. 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.

### 4. Conclusions Regarding Adjacent Waters

The scientific literature documents that waters which are adjacent to (a)(1) through (a)(5) waters, including wetlands, 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 permanent surface features 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.

Adjacent waters, as defined, alone or in combination with other adjacent waters in a watershed, significantly affect the chemical, physical and biological integrity of traditional navigable waters, interstate waters, or the territorial seas. Based on studies of waters in riparian areas, flood plains, and hydrologic connections to 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.

### iii. “Other Waters”

The Report includes a focused evaluation of the connections and effects to downstream waters for several regional types of streams and wetlands: prairie streams, southwest intermittent and ephemeral streams, oxbow lakes, Carolina and Delmarva bays, prairie potholes, and vernal pools. These regional types were chosen for evaluation 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. Most prairie streams and southwest intermittent and ephemeral streams are likely to be considered tributaries to (a)(1) to (a)(3) waters (with the exception of streams, for example, located in closed basins, which lack an (a)(1) to (a)(3) water or a connection thereto); similarly, most oxbow lakes are likely to be considered adjacent to (a)(1) to (a)(5) waters. Carolina and Delmarva bays, prairie potholes, and vernal pools may or may not be considered adjacent to (a)(1) to (a)(5) waters. Where waters are not considered tributaries (e.g. waters in a solely intrastate closed basin that does not contain a traditional navigable water, interstate water, or a territorial sea, or a connection thereto) or where waters, including wetlands, do not meet the proposed regulatory definition of adjacent, they should be evaluated to determine whether they are (a)(7) waters. While the peer-reviewed published literature and the Report contain documentation of functions provided by these “other waters,” as well as local factors that influence their degree of downstream connectivity, the agencies are not currently proposing to establish any categories of “other waters” that are jurisdictional by rule without the necessity of a case-specific significant nexus standard.

The term “other waters” refers to waters that cannot be considered “adjacent” to downstream jurisdictional waters and that are not tributaries of such waters. “Other waters” are found outside the riparian zone and the floodplain, as waters within these areas are considered to be “adjacent.” As such, wetlands that are “other waters” typically will have unidirectional flow. As mentioned in Part II, section 2.B. above, many unidirectional wetlands are considered adjacent and interact with downstream jurisdictional waters through channels, shallow subsurface flow, or by providing additional functions such as storage and mitigating peak flows. Unidirectional wetlands that lack a surface connection to downstream waters and are surrounded by uplands will typically fall under the definition of “other waters,” and are often referred to in scientific literature and policy as “geographically isolated waters.” The term “geographically isolated” should not be used to implicate the lack of connectivity to downstream waters, as these wetlands are often connected to downstream waters through shallow subsurface flow, biological connections, or spillage. 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. *Report* at 3-43, 5-2.

For purposes of 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, the agencies are proposing to define each of the elements of Justice Kennedy’s significant nexus standard in the definition of “significant nexus.”

### A. In the Region

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 a reasonable and technically appropriate interpretation of Justice Kennedy's standard. *See, e.g.*, D.R. Montgomery, "Process Domains and the River Continuum," *Journal of the American Water Resources Association* 35:397-410 (1999).

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.,* J.M. Omernik and R.G. Bailey, "Distinguishing Between Watersheds and Ecoregions," *Journal of the American Water Resources Association* 33.5: 939-40 (1997); D.R. Montgomery, "Process Domains and the River Continuum," *Journal of the American Water Resources Association* 35: 397-410 (1999); T.C. Winter "The Concept of Hydrologic Landscapes," *Journal of the American Water Resources Association* 37: 335-49 (2001); J.S. Baron, *et al*., "Meeting Ecological and Societal Needs for Freshwater," *Ecological Applications* 12: 1247-60 (2002); J.D. Allan, "Landscapes and Riverscapes: The Influence of Land Use on Stream Ecosystems," *Annual Review of Ecology Evolution and Systematics* 35: 257-84 (2004); United States, EPA 841-B-08-002: U.S. Environmental Protection Agency, *Handbook for Developing Watershed Plans to Restore and Protect Our Waters: Planning & Implementation Steps* (Washington D.C.: U.S. EPA, March 2008); P.J. Wigington, *et al.*, "Oregon Hydrologic Landscapes: A Classification Framework," *Journal of the American Water Resources Association* 49.1:163-82 (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. United States, U.S. EPA and

USDA/ARS Southwest Watershed Research Center, EPA/600/R-08/134, ARS/2330462008: *The Ecological and Hydrological Significance of Ephemeral and Intermittent Streams in the Arid and Semi-arid American Southwest* (Washington, D.C.: U.S. EPA and USDA/ARS Southwest Watershed Research Center, Levick *et al.*, 2008) (Levick, *et. al.*). 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 waterbody (the "target" waterbody), 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 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. This is because, from a water quality management perspective, the (a)(1), (a)(2) or (a)(3) water is the downstream affected river or lake whose water quality that 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 river or lake, it is standard practice to evaluate the condition of the waters that are in the contributing watersheds 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 or interstate water, and then using that point of entry watershed to conduct a significant nexus evaluation. P.E. Black, "Watershed Functions," *Journal of the American Water Resources Association* 33.1:1-11 (1997).

The Corps is organized based on watersheds and has used framework approaches for water sources, 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. U.S. Environmental Protection Agency, *The Watershed Protection Approach Framework* (Oct. 1991). 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. For example, EPA is allowing States that are reorganizing programs to function on a watershed basis to have short-term backlogs on CWA Section 402 National Pollution Discharge Elimination System (NPDES) permit review -- without penalty. This flexibility gives States time to synchronize the reissuance of major and minor permits within a watershed. By managing NPDES permits on a watershed basis, all the permits for discharges to the waterbody can be coordinated and the most efficient and equitable allocation of pollution control responsibility can be made. U.S. Environmental Protection Agency, *Why Watersheds?*, EPA 800-F-96-001 (February 1996). Applying a watershed approach continues to be a priority of EPA, and is one of the three key strategies the agency is using to drive progress toward the Agency’s health and environmental goals over the next five years. U.S Environmental Protection Agency, *FY 2011-2015 Strategic Plan: Achieving Our Vision*, 2010.

## B. Similarly Situated

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.*, R.J. Stevenson and F.R. Hauer, "Integrating Hydrogeomorphic and Index of Biotic Integrity Approaches for Environmental Assessment of Wetlands," *Journal of the North American Benthological Society* 21(3): 502-513 (2002); S.G. Leibowitz, "Isolated Wetlands and Their Functions: An Ecological Perspective," *Wetlands* 23:517-531 (2003); D. Gamble, *et al*., *An Ecological and Functional Assessment of Urban Wetlands in Central Ohio*, Ohio EPA Technical Report WET/2007-3B (Columbus, OH: Ohio Environmental Protection Agency, 2007); C.R. Lane and E. D'Amico, "Calculating the Ecosystem Service of Water Storage in Isolated Wetlands using LiDAR in North Central Florida, USA," *Wetlands* 30:967–977 (2010); B.P. Wilcox, *et al.*, "Evidence of Surface Connectivity for Texas Gulf Coast Depressional Wetlands," *Wetlands* 31(3):451-8 (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 Report consistently documents 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.

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 same region and are performing like functions that combine to influence downstream waters. *See, e.g.,* A. Jansson *et al*., "Quantifying the Nitrogen Retention Capacity of Natural Wetlands in the Large-Scale Drainage Basin of the Baltic Sea," *Landscape Ecology*

13:249-262 (1998); W.J. Mitsch *et al*., "Reducing Nitrogen Loading to the Gulf of Mexico from the Mississippi River Basin: Strategies to Counter a Persistent Ecological Problem," *BioScience* 51(5): 373-388 (2001); M.G. Forbes, *et al.*, "Nutrient Transformation and Retention by Coastal Prairie Wetlands, Upper Gulf Coast, Texas," *Wetlands* 32(4):705-15 (2012). Cumulatively, many small wetlands can hold a large amount of snowmelt and precipitation, reducing the likelihood of flooding downstream. *Report* at 5-25 (citing D.E. Hubbard and R.L. Linder, "Spring Runoff Retention in Prairie Pothole Wetlands," *Journal of Soil and Water Conservation* 41(2):122-125 (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. M.M. Brinson, *A Hydrogeomorphic Classification for Wetlands* (Washington, D.C.: U.S. Army Corps of Engineers, 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.

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. *Report* at 5-26 (citing A. Bullock and M. Acreman, "The Role of Wetlands in the Hydrological Cycle," *Hydrology and Earth System Sciences* 7:358-389 (2003)). Some of the important factors which influence the variability of their functions and connectivity include the topography, geology, soil features, antecedent moisture conditions, and seasonal position of the water table relative to the wetland. *Report* at 5-25.

When proposing that "other waters" are sufficiently close and should be considered similarly situated, it is recognized that they are more likely to have similar influence with regard to their effect on the chemical, physical, or biological integrity of a downstream water identified in paragraphs (a)(1) through (a)(3)). If a water is a great distance from a group of similar "other waters," 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 5-2, 5-41.

Consideration of the aggregate effects of wetlands and other waters often gives the most complete information about how such waters influence the chemical, physical, and 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, *Wetlands: Characteristics and Boundaries* (Washington, D.C.: National Academy Press, 1995), p. 38. For an individual wetland, this is most pronounced where it lies immediately upstream of a drinking water intake, for example. *See, e.g.,* C.A. Johnston, *et al.*, “The Cumulative Effect of Wetlands on Stream Water Quality and Quantity,” *Biogeochemistry* 10:105-141 (1990).

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. *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.

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.

### C. Significant Nexus

The scientific literature regarding "other waters" documents their functions, including the chemical, physical, and biological impact they can have downstream. Available literature indicates that "other 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 "other water" and downstream waters. *Report* at 6-1. "Other waters" generally fit into the category of unidirectional waters as described in the Report. However, there are some unidirectional waters that are in fact adjacent under (a)(6) to (a)(1) through (a)(5) waters (*e.g.*, neighboring waters that are outside of the riparian area and/or floodplain but that have a surface or shallow subsurface hydrologic connection to (a)(1) through (a)(5) waters). Connectivity of "other waters" to downstream waters that do not meet the definition of adjacent will vary within a watershed and over time, which is why a case-specific significant nexus determination for "other waters" is necessary under (a)(7). *See*, *e.g.*, *id.* at 6-2. The types of chemical, physical, and biological connections between "other waters" and downstream waters are described below for illustrative purposes. As described in the preamble above, when the agencies are conducting a case-specific determination for significant nexus under (a)(7), 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 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 “other waters” to downstream waters occurs on a gradient and can include 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 5-1. The connectivity of “other waters” to downstream waters will vary within a watershed as a function of local factors (e.g. position, topography, and soil characteristics). *Id.* at 3-41 to 3-43. Connectivity also varies over time, as the tributary network and water table expand and contract in response to local climate. *Id.* at 3-31 to 3-33. 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 3-29, 3-31.

The physical effect that “other 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 “other 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. T.C. Winter and J.W. LaBaugh, “Hydrologic Considerations in Defining Isolated Wetlands,” *Wetlands* 23:532-540 (2003) at 538. For example, “other waters” that overspill into downstream waterbodies during times of abundant precipitation are connected over the long term. *Id*. at 539. Wetlands that lack surface connectivity in a particular season or year can, nonetheless, be highly connected in wetter seasons or years. *Report* at 5-22 to 5-25. Many “other waters” interact with groundwater, either by receiving groundwater discharge (flow of groundwater to the "other water"), contributing to groundwater recharge (flow of water from the "other water" to the groundwater), or both. *Id.* at 5-23 (citing R.F. Lide, *et al.*, "Hydrology of a Carolina Bay Located on the Upper Coastal Plain of Western South Carolina," *Wetlands* 15:47-57 (1995); K.J. Devito, *et al*., "Groundwater Surface-Water Interactions in Headwater Forested Wetlands of the Canadian Shield," *Journal of Hydrology* 181:127-47 (1996); R.K. Matheney and P.J. Gerla, "Environmental Isotopic Evidence for the Origins of Ground and Surface Water in a Prairie Discharge Wetland," *Wetlands* 16:109-120 (1996); D.O. Rosenberry and T.C. Winter, "Dynamics of Water-Table Fluctuations in an Upland between Two Prairie-Pothole Wetlands in North Dakota," *Journal of Hydrology* 191:266-289 (1997); J.E. Pyzoha, *et al.*, "A Conceptual Hydrologic Model for a Forested Carolina Bay Depressional Wetland on the Coastal Plain of South Carolina, USA," *Hydrological Processes* 22:2689-2698 (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 5-24 (citing P.J. Phillips and R.J. Shedlock, "Hydrology and Chemistry of Groundwater and Seasonal Ponds in the Atlantic Coastal-Plain in Delaware, USA," *Journal of Hydrology* 141:157-78 (1993); R.J. Shedlock, *et al.*, "Interactions between Ground-Water and Wetlands, Southern Shore of Lake-Michigan, USA," *Journal of Hydrology* 141:127-55 (1993); D.O. Rosenberry and T.C. Winter, "Dynamics of Water-Table Fluctuations in an Upland Between two Prairie-Pothole Wetlands in North Dakota," *Journal of Hydrology* 191:266-89 (1997); J.E. Pyzoha, *et al.*, "A Conceptual Hydrologic Model for a Forested Carolina Bay Depressional Wetland on the Coastal Plain of South Carolina, USA," *Hydrological Processes* 22: 2689-98 (2008)). 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 waterbodies (*i.e.*, the hydraulic conductivity of the material). *Id.* at 5-24. Surface and groundwater hydrological connections are those generating the capacity for "other waters" to affect downstream waters, as water from the "other water" may contribute to baseflow or stormflow through groundwater recharge. *Id*. at 5-25. 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 5-36.

The chemical effects that "other 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 "other waters" are hydrologically connected to downstream waters via surface or groundwater connections, most "other waters" can affect water quality downstream (although these connections do not meet the definition of adjacency). D.F. Whigham and T. E. Jordan, "Isolated Wetlands and Water Quality," *Wetlands* 23:541-549 (2003) at 542. "Other waters" can act as sinks and transformers for nitrogen and phosphorus, metals, pesticides, and other contaminants that could otherwise negatively impact downstream waters. *Report* at 5-30 (citing R.R. Brooks, *et al*., "Cobalt and Nickel Uptake by the Nyssaceae," *Taxon* 26:197-201 (1977); H.F. Hemond, "Biogeochemistry of Thoreau's Bog, Concord, Massachusetts," *Ecological Monographs* 50:507-526 (1980); C.B. Davis, *et al*., "Prairie Pothole Marshes as Traps for Nitrogen and Phosphorus in Agricultural Runoff," *in* B. Richardson, ed., *Selected Proceedings of the Midwest Conference on Wetland Values and Management, June 17-19, 1981, St. Paul, MN,* (St. Paul, MN: The

Freshwater Society, 1981), pp. 153-163; H.F. Hemond, "The Nitrogen Budget of Thoreau's Bog," *Ecology* 64:99-109 (1983); K.C. Ewel and H.T. Odum, ed., *Cypress Swamps*, (Gainesville, Florida: University of Florida Press, 1984); J.T. Moraghan, "Loss and Assimilation of 15N-nitrate Added to a North Dakota Cattail Marsh," *Aquatic Botany* 46:225-234 (1993); C.M. Kao, *et al*., "Non-point Source Pesticide Removal by a Mountainous Wetland," *Water Science and Technology* 46:199-206 (2002); P.I. Boon, "Biogeochemistry and Bacterial Ecology of Hydrologically Dynamic Wetlands," *in* D.P. Batzer and R.R. Sharitz, ed., *Ecology of Freshwater and Estuarine Wetlands* (Berkeley, CA: University of California Press, 2006), pp. 115-176; E.J. Dunne, *et al*., "Phosphorus Release and Retention by Soils of Natural Isolated Wetlands," *International Journal of Environment and Pollution* 28:496-516 (2006); T.E. Jordan, *et al*., "Comparing Functional Assessments of Wetlands to Measurements of Soil Characteristics and Nitrogen Processing," *Wetlands* 27:479-497 (2007); S.L. Whitmire and S.K. Hamilton, "Rates of Anaerobic Microbial Metabolism in Wetlands of Divergent Hydrology on a Glacial Landscape," *Wetlands* 28:703-714 (2008)). Also *see, e.g.*, T.M. Isenhart, *Transformation and Fate of Nitrate in Northern Prairie Wetlands,* Ph.D. Dissertation (Ames, Iowa: Iowa State University, 1992). The body of published scientific literature and the Report indicate that sink removal of nutrients and other pollutants by "other waters" is significant and geographically widespread. *Report* at 5-30. Water quality characteristics of "other waters" are highly variable, depending primarily on the sources of water, characteristics of the substrate, and land uses within the watershed. D.F. Whigham and T.E. Jordan, "Isolated Wetlands and Water Quality," *Wetlands* 23:541-549 (2003) at 541. These variables inform whether an "other water" has a significant nexus to an (a)(1) to (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.* at 543.

"Other waters" can be biologically connected to each other and to downstream waters through the movement of seeds, macroinvertebrates, amphibians, reptiles, birds, and mammals. *Report* at 5-31 to 5-33; S.G. Leibowitz, "Isolated Wetlands and Their Functions: An Ecological Perspective," *Wetlands* 23:517-531 (2003) at 519. The movement of organisms between "other waters" and downstream waters is governed by many of the same factors that affect movement of organisms between adjacent wetlands and downstream waters (See Part II Section 2.A.d.). *Report* at 5-31. Generally, "other 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 5-31 (citing S.M. Galatowitsch and A.G. van der Valk, "The Vegetation of Restored and Natural Prairie Wetlands,"*Ecological Applications* 6:102-112 (1996); H.R. Murkin and P.J. Caldwell, "Avian Use of Prairie Wetlands," *in* H.R. Murkin, *et al*., ed., *Prairie Wetland Ecology: The Contribution of the Marsh Ecology Research Program*, (Ames, IA: Iowa State University Press, 2000), pp. 249-286; J.M. Amezaga, *et al*., "Biotic Wetland Connectivity - Supporting a New Approach for Wetland Policy," *Acta Oecologica-International Journal of Ecology* 23:213-222 (2002); J. Figuerola and A.J. Green, "Dispersal of Aquatic Organisms by Waterbirds: a Review of Past Research and Priorities for Future Studies," *Freshwater Biology* 47:483-494 (2002); M.B. Soons and G.W. Heil, "Reduced Colonization Capacity in Fragmented Populations of

Wind-Dispersed Grassland Forbs," *Journal of Ecology* 90:1033-1043 (2002); M.B. Soons, "Wind Dispersal in Freshwater Wetlands: Knowledge for Conservation and Restoration," *Applied Vegetation Science* 9:271-278 (2006); C. Nilsson, *et al.*, "The Role of Hydrochory in Structuring Riparian and Wetland Vegetation," *Biological Reviews* 85:837-858 (2010)). Mammals that disperse overland can also contribute to connectivity and can act as transport vectors for hitchhikers such as algae. *Id.* at 5-32 (citing C.E. Shanks and G.C. Arthur, "Muskrat Movements and Population Dynamics in Missouri Farm Ponds and Streams," *Journal of Wildlife Management* 16:138-148 (1952); J.P. Roscher, "Alga Dispersal by Muskrat Intestinal Contents," *Transactions of the American Microscopical Society* 86:497-498 (1967); W.R. Clark, "Ecology of Muskrats in Prairie Wetlands," *in* H. R. Murkin, *et al.*, ed., 2000, pp. 287-313)). Invertebrates also utilize birds and mamals to hitchhike, and these hitchhikers can be an important factor structuring invertebrate metapopulations in "other waters" and in aquatic habitats separated by hundreds, or potentially, thousands of kilometers. *Id.* (citing J. Figuerola and A.J. Green, "Dispersal of Aquatic Organisms by Waterbirds: A Review of Past Research and Priorities for Future Studies," *Freshwater Biology* 47:483-494 (2002); J. Figuerola, *et al.*, "Invertebrate Eggs Can Fly: Evidence of Waterfowl-Mediated Gene Flow in Aquatic Invertebrates," *American Naturalist* 165:274-280 (2005); M.R. Allen, "Measuring and Modeling Dispersal of Adult Zooplankton," *Oecologia* 153:135-143 (2007); D. Frisch, *et al.*, "High Dispersal Capacity of a Broad Spectrum of Aquatic Invertebrates Via Waterbirds," *Aquatic Sciences* 69:568-574 (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 5-33 (citing D.D. Williams, "Environmental Constraints in Temporary Fresh Waters and Their Consequences for the Insect Fauna," *Journal of the North American Benthological Society* 15:634-650 (1996); A.J. Bohonak and D.G. Jenkins, "Ecological and Evolutionary Significance of Dispersal by Freshwater Invertebrates," *Ecology Letters* 6:783-796 (2003)). Amphibians and reptiles also move between "other waters" and downstream waters to satisfy part of their life history requirements. *Id*. at 5-33. 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 A.L. Subalusky, *et al*., "Ontogenetic Niche Shifts in the American Alligator Establish Functional Connectivity between Aquatic Systems," *Biological Conservation* 142:1507-1514 (2009); A.L. Subalusky, *et al*., "Detection of American Alligators in Isolated, Seasonal Wetlands," *Applied Herpetology* 6:199-210 (2009)). 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.* (citing V.S. Lamoureux and D.M. Madison, "Overwintering Habitats of Radio-Implanted Green Frogs, *Rana clamitans*," *Journal of Herpetology* 33:430-435 (1999); K.J. Babbitt, *et al*., "Patterns of Larval Amphibian Distribution along a Wetland Hydroperiod Gradient," *Canadian Journal of Zoology-Revue Canadienne De Zoologie* 81:1539-1552 (2003); S.B. Adams, *et al*., "Instream Movements by Boreal Toads (*Bufo boreas boreas*)," *Herpetological Review* 36:27–33 (2005); D.M. Green, "*Bufo americanus*, American Toad," *in* M. Lannoo, ed., *Amphibian Declines: The Conservation Status of the United States Species* (Berkeley, CA: University of California Press, 2005), pp. 692-704; T.W. Hunsinger and M. J. Lannoo, "*Notophthalmus viridescens*, Eastern Newt," *in* M. Lannoo, ed., 2005, pp. 912-914; J.W. Petranka and C.T. Holbrook, "Wetland Restoration for Amphibians: Should Local Sites Be

Designed to Support Metapopulations or Patchy Populations?," *Restoration Ecology* 14:404-411 (2006)).

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. *Id.* at 5-22 to 5-25. 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 are not adjacent may be hydrologically disconnected most of the time but connected to the stream network during rare high-flow events. The lack of a hydrologic connection also allows for water storage in "other waters," attenuating peak streamflows, and, thus, downstream flooding, and also reducing nutrient and soil pollution in downstream waters. *Report* at 5-25 to 5-26, 5-36. Prairie potholes a great distance from any tributary, for example, are thought to store significant amounts of runoff. *Id.* at 5-36 (citing R.P. Novitzki, "Hydrologic Characteristics of Wisconsin's Wetlands and Their Influence on Floods," *in* P. Greeson, *et al.*, ed., *Wetland Functions and Values: The Status of Our Understanding*, Proceedings of the National Symposium on Wetlands (Minneapolis, MN: American Water Resources Association, 1979), pp. 377-388; D.E. Hubbard and R.L. Linder, "Spring Runoff Retention in Prairie Pothole Wetlands," *Journal of Soil and Water Conservation* 41:122-125 (1986); J. Jacques and D.L. Lorenz, "Techniques for Estimating the Magnitude and Frequency of Floods in Minnesota," *Water Resources Investigations Report* 87-4170, (St. Paul, MN: U.S. Geological Survey, 1988); K.C. Vining, "Simulation of Streamflow and Wetland Storage, Starkweather Coulee Subbasin, North Dakota, Water Years 1981-98," *Water-Resources Investigations Report* 02-4113 (Bismarck, North Dakota: U.S.

Geological Survey, 2002); R.A. Gleason, *et al*., *Estimating Water Storage Capacity of Existing and Potentially Restorable Wetland Depressions in a Subbasin of the Red River of the North*, U.S. Geological Survey Open-File Report 2007-1159 (Reston, VA: U.S. Geological Survey, 2007); D.L. Lorenz, *et al*., "Techniques for Estimating the Magnitude and Frequency of Peak Flows on Small Streams in Minnesota Based on Through Water Year 2005," *USGS Scientific Investigations Report* 2009-5250, (Reston, VA: U.S. Geological Survey, 2010)). 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.,* C.A. Johnston, *et al*., "The Cumulative Effect of Wetlands on Stream Water Quality and Quantity," *Biogeochemistry* 10:105-141 (1990); A.L. Moscrip and D.R. Montgomery, "Urbanization, Flood Frequency, and Salmon Abundance in Puget Lowland Streams," *Journal of the American Water Resources Association* 33:1289-1297 (1997); N.E. Detenbeck, *et al*., "Evaluating Perturbations and Developing Restoration Strategies for Inland Wetlands in the Great Lakes Basin," *Wetlands* 19(4): 789-820 (1999); N.E. Beck, *et al*., "Relationship of Stream Flow Regime in the Western Lake Superior Basin to Watershed Type Characteristics," *Journal of Hydrology* 309(1-4): 258-276 (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, *Wetlands: Characteristics and Boundaries* (Washington, D.C.: National Academy Press, 1995), p. 38.

As examples, the Report includes case studies of the chemical, physical, and biological connections that Carolina and Delmarva Bays, prairie potholes, and vernal pools have with downstream waters. These waters may fit into the category of "other waters" where they do not qualify as either tributary waters or adjacent waters. A brief summary of the findings of each case study follows below.

Carolina and Delmarva bays are elliptical-shaped, ponded depressional wetlands located along the Atlantic Coastal Plain from Northern Florida to New Jersey. *Report* at 5-49 (citing W.F. Prouty, "Carolina Bays and Their Origin," *Bulletin of the Geological Society of America* 63:167-224 (1952); D.D. Williams, "Environmental Constraints in Temporary Fresh Waters and Their Consequences for the Insect Fauna," *Journal of the North American Benthological Society* 15:634-650 (1996); T.W. Hunsinger and M.J. Lannoo, "*Notophthalmus viridescens*, Eastern Newt," *in* M.J. Lannoo, ed., *Amphibian Declines: The Conservation Status of United States Species* (Berkeley, CA: University of California Press, 2005), pp. 912-914). Bays typically are in close proximity to each other or to streams, and are surrounded by very flat land, which is thought to likely result in surface water connections in large rain events. *Id.* at 5-49. Amphibians and reptiles use bays extensively for breeding and rearing young; these animals can disperse many meters on the landscape and possibly enter or be food in downstream waters. Similarly, bays foster abundant insects that have the ability to become part of the downstream food chain for fish.

Prairie potholes are a complex of glacially-formed wetlands and waterbodies, usually occurring in depressions that lack permanent natural outlets, and are located in the north-central United States and southern Canada, the area commonly known as the Prairie Pothole Region (PPR). *Report* at 5-58 (citing H.A. Kantrud, *et al.*, *Prairie Basin Wetlands of the Dakotas: A Community Profile*, Biological Report 85(7.28) (Washington, D.C.: U.S. Department of the Interior, Fish and Wildlife Service and U.S. Environmental Protection Agency, 1989)). The clay that underlies potholes allows for the collection and temporary retention of water. Precipitation in the form of spring snowmelt runoff and/or direct summer rainfall is the primary source of water inflows, though some potholes also receive groundwater discharge. *Id*. at 5-58 (citing T.C. Winter and D.O. Rosenberry, "Hydrology of Prairie Pothole Wetlands during Drought and Deluge: A 17-year Study of the Cottonwood Lake Wetland Complex in North Dakota in the Perspective of Longer Term Measured and Proxy Hydrological Records," *Climatic Change* 40:189-209 (1998); R. Carroll, *et al*., "Simulation of a Semipermanent Wetland Basin in the Cottonwood Lake Area, East-Central North Dakota," *Journal of Hydrologic Engineering* 10:70-84 (2005)). Water outflow occurs mostly through evapotranspiration and also through shallow or regional groundwater recharge. *Id*. (citing R. Carroll, *et al*. 2005; G. van der Kamp and M. Hayashi, "Groundwater-Wetland Ecosystem Interaction in the Semiarid Glaciated Plains of North America," *Hydrogeology Journal* 17:203-214 (2009)). The degree to which potholes are connected or have the ability to be connected to downstream waters is dependent on many factors such as  distance to rivers and streams, topography, precipitation, climate cycles (seasonal and on longer time scales),  biotic community composition, and man-made drainage.  *Id.* at 5-66. Within the PPR, distance to rivers and streams is strongly influenced by the three major physiographic regions (Red River Valley, Drift Prairie, and Missouri Coteau), which vary in number of potholes and stream density, among other factors with relevance to connectivity. *Id.* at 5-59, 5-66. Potholes in the Red River Valley, in particular, because of the wetter climatic condition and the predominant soil type, may be a region with strong connectivity to downstream waters.  *Id.* at 5-61, 5-62 (citing S.G. Leibowitz, and K.C. Vining, "Temporal connectivity in a prairie pothole complex," *Wetlands* 23:13-25 (2003)). Hydrologic sink and/or source functions of potholes can physically and chemically impact downstream waters in the PPR, including multiple aspects of flow and associated transport of nutrients, sediment and pesticides.  *Id.* at 5-

66. In turn, these features affect river geomorphology and biological communities, thus having an impact on physical and biological integrity of downstream waters. Additionally, potholes may have direct biological effects on downstream river networks via connectivity of resident populations, although these effects are less well-known and studied. *Id.* Some prairie potholes also discharge through overland flow when they have reached their capacity to hold water, often spilling over into downstream waters. *Id.* at 5-62 (citing Winter and Rosenberry 1998; Leibowitz and Vining 2003; S.N. Kahara, *et al*., "Spatiotemporal patterns of wetland occurrence in the prairie pothole region of eastern South Dakota," *Wetlands* 29:678-689 (2009)).

Vernal pools are typically shallow seasonal wetlands that accumulate water during colder, wetter months and gradually dry down during warm, dryer months. *Id.* at 5-66. Vernal pools are generally separated into two categories: western vernal pools (located in coastal areas of the Western states) and northern vernal pools (located in glaciated areas of Northeastern and Midwestern states), which the case study examines separately. *Id.* at 5-67 (citing P.H. Zedler, "Vernal Pools and the Concept of 'Isolated Wetlands,'" *Wetlands* 23:597-607 (2003)). In the aquatic phase, some western vernal pools are filled to capacity in most years, creating conditions under which water can flow from pools into downstream waters, thus providing a seasonal hydrologic connection to downstream waters. *Id*. at 5-22, 5-70 to 5-71 (citing T. Hanes, and L. Stromberg, "Hydrology of vernal pools on non-volcanic soils in the Sacramento Valley," *in* C.W. Witham, *et al.*, ed., *Ecology, Conservation, and Management of Vernal Pool Ecosystems – Proceedings from a 1996 Conference* (Sacramento, CA: California Native Plant Society, 1998), pp. 38-49; C.R. Pyke, "Simulating vernal pool hydrologic regimes for two locations in California, USA," *Ecological Modelling* 173:109-127 (2004); M.C. Rains, *et al*., "Geological control of physical and chemical hydrology in California vernal pools," *Wetlands* 28:347-362

(2008)). Indirect evidence indicates that Northern vernal pools without perched aquifers are hydrologically connected to downstream waters via surface and sub-surface flows. *Id.* at 5-71 to 5-72 (citing R.B. Boone, *et al.*, "Simulating Vernal Pool Hydrology in Central Minnesota, USA," *Wetlands* 26:581-592 (2006)). Although individually small, temporary storage of heavy rainfall and snowmelt in vernal pool systems can attenuate flooding, provide a reservoir for adjacent vegetation during the spring growth period, and increase nutrient availability, particularly when vernal pools are considered in the aggregate with similarly situated vernal pools. *See, e.g.*, *id.* at 5-72 (citing W.A. Hobson and R.A. Dahlgren, "Soil Forming Processes in Vernal Pools of Northern California, Chico Area," *in* C. W. Witham, *et al.*, ed., *Ecology, Conservation, and Management of Vernal Pool Ecosystems – Proceedings from a 1996 Conference,* (Sacramento, CA: California Native Plant Society, 1998), pp. 24-37). During the seasonal period of inundation, aquatic species depend on vernal pools for completion of their life cycles. *Id.* at 5-67 (citing P.H. Zedler, "Vernal Pools and the Concept of 'Isolated Wetlands,'" *Wetlands* 23:597-607 (2003)). Many insects and amphibians that can live in streams or more permanent pools opportunistically use Northern vernal pools as alternative breeding habitat, refuge from predators or environmental stressors, hunting or foraging habitat, or stepping-stone corridors for dispersal and migration, providing biological connections between pools and downstream waters. *Id.* at 5-73 (citing R.D. Semlitsch and J.R. Bodie, "Are Small, Isolated Wetlands Expendable?," *Conservation Biology* 12:1129-1133 (1998); R.T. Brooks, "Annual and Seasonal Variation and the Effects of Hydroperiod on Benthic Macroinvertebrates of Seasonal Forest ('Vernal') Ponds in Central Massachusetts, USA," *Wetlands* 20:707-715 (2000); J.W. Gibbons, *et al.*, "Remarkable Amphibian Biomass and Abundance in an Isolated Wetland: Implications for Wetland Conservation," *Conservation Biology* 20:1457-1465 (2006)). As stated previously, nonglaciated vernal pools in western states are periodically connected downstream and have functioned as refuges of plants and animal diversity since the Mesozoic era; they are currently reservoirs of biodiversity and are possibly genetically connected to other locations and aquatic habitats through continuing dispersal. *Id.* at 5-72 (citing J.L. King, *et al.*, "Species Richness, Endemism and Ecology of Crustacean Assemblages in Northern California Vernal Pools," *Hydrobiologia* 328:85-116 (1996); E.T. Bauder and S. McMillan, "Current Distribution and Historical Extent of Vernal Pools in Southern California and Northern Baja California, Mexico," *in* C. W. Witham, *et al.*, ed., (1998), pp. 56-70; J.E. Keeley and P.H. Zedler, "Characterization and Global Distribution of Vernal Pools," *in* C.W. Witham, *et al.*, ed., (1998), pp. 1-14; P.H. Zedler, "Vernal Pools and the Concept of 'Isolated Wetlands,'" *Wetlands* 23:597-607 (2003)). Organisms, including invertebrates and zooplankton may be flushed from Western pools into downstream waters (sometimes over long distances) during the seasonal periods of overflow, carried by animal vectors (including humans), or dispersed by wind, further supporting a biological connection between western pools and downstream waters. *Id.* at 5-73 (citing B. Vanschoenwinkel, *et al.*, "Wind Mediated Dispersal of Freshwater Invertebrates in a Rock Pool Metacommunity: Differences in Dispersal Capacities and Modes," *Hydrobiologia* 635:363-372 (2009)).

The evidence in the literature regarding Carolina and Delmarva bays, prairie potholes, and vernal pools is illustrative of the literature regarding "other waters" that are not (a)(1) through (a)(6) waters. Scientific literature to date has infrequently had as the main objective of the study to evaluate the connectivity to downstream waters, though this is a topic of increasing interest to scientists. S.G. Leibowitz and T.-L. Nadeau, "Isolated Wetlands: State-of-the-Science and Future Directions," *Wetlands* 23:517-531 (2003). Nevertheless, the relevant information in the literature may, at some future date when it is more mature, support the existence or the likelihood of the existence of a connection between these aquatic resources and downstream waters. S*ee, e.g., id.* at 5-57, 6-7 . The agencies do not propose to define any of these waters categorically as "waters of the United States" such that a case-specific significant nexus determination is not required. The agencies seek comment, data, and information on whether there are subcategories of "other waters" or specific combinations of characteristics that are "likely, in the majority of cases, to perform important functions for an aquatic ecosystem incorporating navigable waters," and, thus, should be *per se* jurisdictional. For example, if there are additional studies addressing the connectivity of prairie potholes in the Red River Valley, including the factors influencing that connectivity and how it is important to particular downstream waters, that would be relevant information.

Under today's proposal, on a case-specific basis, "other waters" that have a significant nexus to an (a)(1) through (a)(3) water are waters of the United States under (a)(7). Tthe scientific literature and data in the Report and elsewhere support that some "other 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).

Though much of the literature cited in the Report relates to "other waters" that are wetlands, the 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 5-25 (citing J.

Jacques and D.L. Lorenz, *Techniques for Estimating the Magnitude and Frequency of Floods of Ungauged Streams in Minnesota*, USGS Water-Resources Investigations Report 84-4170 (Washington, D.C.: U.S. Geological Survey, 1988); D.L. Lorenz, *et al*., *Techniques for Estimating the Magnitude and Frequency of Peak Flows on Small Streams in Minnesota Based on Data through Water Year 2005*, U.S. Geological Survey Scientific Investigations Report 2009-5250 (Reston, VA: U.S. Geological Survey, 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 5-33 (citing K.J. Babbitt *et al*., “Patterns of Larval Amphibian Distribution along a Wetland Hydroperiod Gradient,” *Canadian Journal of Zoology-Revue Canadienne De Zoologie* 81:1539-1552 (2003); D.M. Green, “*Bufo americanus*, American Toad,” *in* M. Lannoo, ed., *Amphibian Declines: The Conservation Status of United States Species*, (Berkeley, CA: University of California Press, 2005), pp. 692-704; T.W. Hunsinger and M.J. Lannoo, “*Notophthalmus viridescens*, Eastern Newt,” *in* M. Lannoo, ed., *Amphibian Declines: The Conservation Status of United States Species*, (Berkeley, CA: University of California Press, 2005), pp. 912-914; J.W. Petranka and C.T. Holbrook, “Wetland Restoration for Amphibians: Should Local Sites Be Designed to Support Metapopulations or Patchy Populations?,” *Restoration Ecology* 14:404-411 (2006)). Additionally, stream networks that are not part of the tributary system (*e.g.*, streams in closed basins without an (a)(1) to (a)(3) water or losing streams and other streams that cease to flow before reaching downstream (a)(1) to (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.

# Appendix B

## Legal Analysis

### 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) "to restore and maintain the chemical, physical, and biological integrity of the Nation's waters." 33 U.S.C. 1251(a).[2] 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.

The issue of "waters of the United States" was addressed again by the Supreme Court in *Solid Waste Agency of Northern Cook County (SWANCC) v. U.S. Army Corps of Engineers*, 531

---

[2] The 1972 legislation extensively amended the Federal Water Pollution Control Act (FWPCA), which was originally enacted in 1948. Further amendments to the FWPCA enacted in 1977 changed the popular name of the statute to the Clean Water Act. See Pub. L. No. 95-217, 91 Stat. 1566; 33 U.S.C. 1251 note.

U.S. 159 (2001). In *SWANCC*, the Court addressed the question of CWA jurisdiction over isolated intrastate ponds that had formed on a proposed solid waste balefill site in Illinois. In 1986, the Corps explained in preamble language that the agencies interpreted the CWA to protect intrastate waters: (a) which are or would be used as habitat by birds protected by Migratory Bird Treaties; or (b) which are or would be used as habitat by other migratory birds which cross state lines; or (c) which are or would be used as habitat for endangered species; or (d) are used to irrigate crops sold in interstate commerce. 51 Fed. Reg. 41, 217 (1986). This interpretation came to be known as the "Migratory Bird Rule." The Corps of Engineers had asserted jurisdiction over the ponds as "other waters" under 33 C.F.R. § 328.3(a)(3) based solely on the presence of migratory birds. In a 5-4 opinion, the Court held that "33 C.F.R. Section 328.3(a)(3) as clarified and applied to petitioner's balefill site pursuant to the 'Migratory Bird Rule' … exceeds the authority granted to [the Corps] under 404 of the CWA." *SWANCC* at 174. 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 172. *SWANCC* did not invalidate (a)(3) or other parts of the regulatory definition of "waters of the United States."

Five years after *SWANCC*, the U.S. Supreme Court addressed the scope of CWA protection for wetlands adjacent to tributaries of traditional navigable waters. *Rapanos v. United States*, 547 U.S. 715 (2006). In June 2006, the Justices issued five opinions with no single opinion commanding a majority of the Court. The plurality opinion, authored by Justice Scalia, stated that "waters of the United States" extended beyond traditional navigable waters to include "relatively permanent, standing or flowing bodies of water." *Id*. at 739. Justice Scalia indicated that the phrase "relatively permanent" includes "seasonal rivers" but not "streams whose flow is 'coming and going at intervals … broken, fitful … or existing only, or no longer than, a day." *Id*. at 732 n. 5. The plurality also concluded that only wetlands with a continuous surface connection to other jurisdictional waters are protected by the CWA. Justice Kennedy's concurring opinion took a different approach than Justice Scalia's. Justice Kennedy concluded that "waters of the United States" includes 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 concluded that wetlands have the requisite significant nexus where 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. Kennedy's opinion notes that such a relationship with navigable waters must be more than "speculative or insubstantial." *Id*. at 780. Neither the plurality nor Kennedy opinion invalidated any of the regulatory provisions defining "waters of the United States."

The Circuit Courts of Appeal are not uniform as to the controlling test for "waters of the United States" under *Rapanos*. The First,Third and Eighth Circuits have concluded that CWA jurisdiction exists if <u>either</u> Justice Kennedy's or the plurality's standard is met. *United States v. Johnson*, 467 F.3d 56, 66 (1st Cir. 2006), petition for certiorari denied Oct. 9, 2007; *U.S. v. Donovan,*661 F.3d. 174 (3rd Cir. 2012); *U.S. v. Bailey*, 571 F.3d 791, 798-99 (8th Cir. 2009). The Seventh and Ninth Circuits limited their holdings that the Kennedy standard applied to the facts of the cases before them, and did not foreclose the possibility that in some cases the plurality's standard might apply. *N. Cal. River Watch v. City of Healdsburg*, 496 F.3d 993, 999-1000 (9th Cir. 2007), petition for certiorari denied Feb. 19, 2008; *United States v. Gerke Excavating, Inc.,* 464 F.3d 723, 725 (7th Cir. 2006), petition for certiorari denied Oct. 1, 2007. The Fifth and Sixth Circuits did not choose a controlling standard because the waters at issue satisfied both standards. *United States v. Robert J. Lucas, Jr.*, 516 F.3d 316, 326-27 (5th Cir. 2008), petition for certiorari denied Oct. 15, 2008; United States v. Cundiff, 555 F.3d 200, 210-13 (6th Cir. 2009), petition for certiorari denied Oct. 5, 2009. The Eleventh Circuit has held that only the Kennedy standard determines jurisdiction. *United States v. McWane,* 505 F.3d 1208 (11th Cir. 2007), petition for certiorari denied Dec. 1, 2008. No Circuit Court has held that only the plurality standard applies.

**Traditional Navigable Waters**:

EPA and the Corps are proposing no changes to the existing regulation at paragraph (a)(1) and 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); 40 C.F.R. § 122.2 ("waters of the U.S."(a)); 40 C.F.R. § 110.1(a) ("navigable waters"). 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).

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 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 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 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 are 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." *Id*.

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.

## Interstate Waters:

### 1. Interstate Waters

The agencies’ proposal today makes no change to the interstate waters section of the existing regulations and the agencies would 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.

### 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 Clauses themselves or be connected to water that is navigable for purposes of federal regulation under the Commerce Clauses.[3] The CWA itself 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 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).

---

[3] 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 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). 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.

While the term "navigable waters" is, in general, ambiguous, interstate waters are waters that are clearly covered by the plain language of the definition of "navigable waters."[4] Congress defined "navigable waters" to mean "the waters of the United States, including the territorial seas." Interstate waters are the 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 the primary jurisdictional 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.[5] 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, 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

---

[4] 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).

[5] 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).

> requirements of this 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) of this section.

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 Fed. Reg. 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 the existing water quality standards be "carry[ing] out the purpose of this Act," if only those water quality standards established for interstate waters that are also water that is navigable for purposes of federal regulation under the Commerce Clauses or that connect to water that is navigable for purposes of federal regulation under the Commerce Clauses could be implemented under the Act through, for example, National Pollutant Discharge Elimination System permits under Section 402 of the Act. 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"). Of the two, the Water Pollution Control Act extended federal authority over interstate waters and their tributaries. In contrast, 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.

#### **a. 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: "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 hereby declared to be a public nuisance and subject to abatement as herein provided." (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).[6]

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).[7] 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 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

---

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

[7] 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.

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.[8]

### b. 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[9]) 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 Fed. Reg. 19,627 (Dec. 25, 1970). In 1971, the Corps promulgated regulations establishing the Refuse Act Permit Program. 36 Fed. Reg. 6564, 6565 (April 7, 1971). The regulations made it unlawful 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

---

[8] 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).

[9] 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).

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.

### c. The Federal Water Pollution Control Act 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 water that is 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 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 FWPCA, 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*. In reaching this result, the Court concluded that Congress had elected to exercise its authority under federal law to occupy the field of water pollution regulation. As a result, the Court concluded that there was no basis for maintaining a federal common law of nuisance.

> 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 § 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 §§ 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 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.[10]

### 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, 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

---

[10] 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.

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.[11] 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 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

---

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

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 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 regulatory 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 Fed. Reg. 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 Fed. Reg. 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.[12] 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."[13]

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 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

---

[12] *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)).

[13] *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).

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 S. Ct. 1912, 1924 (1982) (quoting *United States v. Rutherford*, 99 S. Ct. 2470 (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*[14], aroused considerable congressional interest. Hearings on the subject of Section 404 jurisdiction were held in both the House and the Senate.[15] 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 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

---

[14] 40 Fed.Reg. 31320, 31324 (July 25, 1975).

[15] *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).

*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 corps [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 corps 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 alerts 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.[16] 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.

Thus, 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.

---

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

**Tributaries**

The agencies analyzed the science to determine whether an ordinary high water mark provides 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. Justice Kennedy provides an approach for determining what constitutes a "significant nexus" that can serve as a basis for statutory jurisdiction. 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 concludes that *Riverside Bayview* and *SWANCC* "establish the framework for" determining whether an assertion of 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;" "[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 provided further guidance for determining whether 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. While Justice Kennedy focused on adjacent wetlands in light of the facts of the cases before him, it is reasonable to utilize the same standard for tributaries. In addition, 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." 547 U.S. at 780-81. As discussed in the preamble and Appendix A, based on a detailed examination of the scientific literature, the agencies concluded that tributaries as they propose to define them perform the requisite functions identified by Justice Kennedy for them to be considered, as a category, to be waters of the United States.

Assertion of jurisdiction over tributaries with a bed and banks and OHWM is also consistent with *Rapanos* because five Justices did not question the Corps' and EPA's current regulations, which assert jurisdiction over non-navigable tributaries of traditional navigable waters and interstate waters. The four justices joining Justice Stevens' dissenting opinion would have upheld the agencies' regulations as applied as a reasonable interpretation of the CWA. Justice Kennedy's opinion focuses on determining when an adjacent wetland is jurisdictional. Underlying his analysis is the premise that the tributaries to which the wetlands are adjacent are jurisdictional. Indeed, Justice Kennedy also does not question the regulation of tributaries with an OHWM. Therefore, it is reasonable to conclude that five justices would uphold the assertion of jurisdiction over tributaries with an OHWM to a traditional navigable water or interstate water.

First, Justice Kennedy rejected the plurality's approach that only "relatively permanent" tributaries are within the scope of CWA jurisdiction. 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 states that Congress has done "quite the opposite." *Id.* at 2242. Further, Justice Kennedy concludes, based on "a full reading of the dictionary definition" of "water," that "*the Corps can reasonably interpret the Act to cover the paths of such impermanent streams*." *Id.* at 2243 (emphasis added). First, Justice Kennedy notes that the term "waters" can mean "flood or inundation," according to the Webster's Second definition, and that these events are "impermanent by definition." Second, even looking to the plurality's preferred dictionary definition of "waters," *i.e.*, "water as found in streams and bodies forming geographical features such as oceans, rivers, and lakes," Justice Kennedy notes that "intermittent flow can constitute a stream." *Id*. at 2243. And finally, Justice Kennedy notes that the plurality's reference to the statement by the *Riverside Bayview* Court comparing wetlands to "rivers, streams, and other hydrographic features more conventionally identifiable as 'waters' … could just as well refer to intermittent streams." *Id*. (citations omitted). Even in Justice Kennedy's rejection of Justice Steven's dissent it is clear that he only rejects the broad scope of jurisdiction over wetlands without further analysis, not jurisdiction over tributaries regardless of their size or characteristics: "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. The deference owed to the Corps' interpretation of the statute does not extend so far." *Id*. at 2246. Tellingly, in that passage Justice Kennedy expresses concern with the assertion of jurisdiction over the wetlands without a conclusion that they have a significant nexus, but does not question the regulation of the remote "ditch or drain."

Justice Kennedy also discussed in detail the existing regulation of tributaries without concluding that it was inconsistent with the scope of the Act, in direct contrast to his concerns with respect to the regulation of adjacent 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 2248-49. Justice Kennedy concluded that this standard "presumably provides a rough measure of the volume and regularity of flow." *Id.* In addition, if it is applied reasonably consistently, the Corps' existing standard 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." *Id*. at 2249.

Justice Kennedy then goes on to determine the scope of jurisdiction over wetlands, and his conclusions rely on the premise that the tributaries themselves are jurisdictional since his analysis is entirely focused on whether certain adjacent wetlands are jurisdictional. Justice Kennedy concludes that, "[a]s 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." *Id.* (emphasis added). While Justice Kennedy also states that the same reasoning "could apply equally to wetlands adjacent to certain major tributaries[,]" the Corps would need to identify categories of tributaries that are "significant enough" such that *wetlands* adjacent to them are likely to perform important functions relating to an aquatic system containing navigable waters. *Id.* Justice Kennedy makes no such recommendation that the EPA and the Corps need to identify categories of *tributaries* that are likely to perform important functions in order to assert jurisdiction over the tributaries themselves.

Justice Kennedy did express a concern with the Corps's assertion of jurisdiction over tributaries with an OHWM based on a 2004 U.S. Government Accountability Office (GAO) report that found variations in Corps' district practices. 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. The Corps has also issued documents to provide additional technical assistance for problematic OHWM delineations. *See, e.g.*, R.W. Lichvar and S.M. McColley, U.S. Army Corps of Engineers, *A Field Guide to the Identification of the Ordinary High Water Mark (OHWM) in the Arid West Region of the Western United States: A Delineation Manual,* ERDC/CRREL TR-08-12 (2008). Most importantly, the agencies propose today for the first time 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 proposed regulation is clear that a water which otherwise meets the proposed definition of tributary, remains a jurisdictional tributary even if there are natural or man-made breaks in the OHWM. The proposed 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.

**Adjacent Waters**

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 Fed. Reg. 37128 (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. 121, 133 (1985).

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. “Adjacent wetlands may ‘serve significant natural biological functions, including food chain production, general habitat, and nesting, spawning, rearing and resting sites for aquatic . . .

species.'" 474 U.S. 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 134-35. A majority of the Supreme Court which decided *Rapanos* continues to find the agencies' regulatory definition of adjacent wetlands reasonable. 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 §§ 20.4(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.

126 S.Ct at 2245-46.

The four dissenting justices 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.

126 S.Ct. at 2252-53 (citing *Chevron U. S. A. Inc.* v. *Natural Resources Defense Council, Inc.,* 467 U. S. 837, 842-845 (1984)).

For those wetlands adjacent to (a)(1) through (a)(3) 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 all other adjacent waters, including adjacent wetlands, Justice Kennedy provided 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.'" 547 U.S. at 780. 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. 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." 547 U.S. at 780-81.

The significant nexus standard and the category standard of Justice Kennedy's opinion should be read together. The agencies have determined that adjacent waters as defined in today's proposed rule, alone or in combination with other adjacent waters in a watershed that drains to a traditional navigable water, interstate water or the territorial seas, to significantly affect the chemical, physical and biological integrity of those waters. As explained in more detail in Section H, below, the proposed rule interprets the phrase "in the region" to mean the watershed that drains to the nearest traditional navigable water or interstate water through a single point of entry. 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 a reasonable and technically appropriate interpretation of Justice Kennedy's standard.

The agencies have concluded that all waters that meet the proposed 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, when bordering, contiguous or located in the floodplain or riparian area, or when otherwise meeting the definition of "adjacent," provide many similar functions that significantly affect the chemical, physical, or biological integrity of traditional navigable waters, interstate waters, or the territorial seas. Further, because the proposed definition generally focuses on the location of the waters (i.e., those that are located near (a)(1) through (a)(5) waters), interpreting the term "similarly situated" to include all adjacent waters, as defined in the proposed rule, is reasonable and consistent with the science. The geographic position of an "adjacent" water relative to the tributary 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 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.

While Justice Kennedy generally thought that categories of jurisdictional adjacent waters would be most likely based on the flow of the tributary, based on the science, as summarized below, the agencies have concluded that wetlands and waters adjacent to all tributaries that meet the proposed definition of “tributary” provide vital functions for downstream traditional navigable waters, interstate waters or the territorial seas. In particular, the scientific literature supports the conclusion that waters adjacent to all tributaries as defined in section (a)(5) have a significant nexus to waters described in subsections (a)(1) through (3). Because smaller streams, whether perennial, intermittent, or ephemeral, are much more common than larger streams, the volume of a stream’s flow is not the best measure of its contribution to the chemical, physical or biological integrity of downstream waters. *Report* at 48. As discussed in more detail in Appendix A, small streams cumulatively exert a strong influence on downstream waters, partly by collectively providing a substantial amount of the river’s water, *id.* at 52-53, but also by playing unique roles that large streams typically do not, including providing habitat for aquatic macroinvertebrates which help maintain the health of the downstream water. Waters adjacent to those small tributary streams, therefore, also significantly effect (a)(1) through (a)(3) waters through the movement of energy and materials between adjacent waters and those tributaries, resulting ultimately in downstream effects on the chemical, physical, and biological integrity of the (a)(1) through (a)(3) waters.

**“Other Waters”**

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. 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 provided guidance for determining whether these 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. While Justice Kennedy focused on adjacent wetlands in light of the facts of the cases before him; in combination with the Court’s guidance in *SWANCC*, it is reasonable to apply the same standard to other waters such as ponds, lakes and non-adjacent wetlands that may have a significant nexus to a traditional navigable water, interstate water, or the territorial seas.

The proposed rule includes a definition of significant nexus that is consistent with Justice Kennedy’s approach to assess the nexus by focusing on the chemical, physical, and biological roles of waters in supporting the objective and goals of the Act. 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 is reasonable to interpret Justice Kennedy as intending the required nexus to exist when, for example, the pollution or destruction of a wetland, or group of similarly situated wetlands, would impact the integrity of the fish population of a downstream traditional navigable water even if it would have no effect on the physical structure of the downstream water. It is clear that the statute, and thus Justice Kennedy's standard, is intended to protect the integrity of each of the fundamental attributes of the nation's waters and that intent would be subverted if waters were protected under the CWA only if they had effects on every attribute at once of a traditional navigable water, interstate water, or territorial sea. Justice Kennedy's standard is also consistent with basic scientific principles understood about how to restore and maintain the integrity of aquatic ecosystems.

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, runoff storage, and provision of habitat. 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 lack 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.

**Similarly Situated**

For purposes of analyzing the significant nexus of tributaries and adjacent waters, tributaries that meet the proposed definition of "tributary" in a watershed draining to an (a)(1) through (a)(3) water are similarly situated, and adjacent waters that meet the proposed 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. 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. See Appendix A, Scientific Analysis.

"Other waters," on the other hand, constitute a broad range of different types of waters performing different functions. In light of the range and degree of functions performed by waters that are neither tributaries nor adjacent waters under today's proposed rule, the agencies propose a definition of similarly situated which takes into account similarity of functions provided and situation in the landscape. Since the focus of the significant nexus standard is on protecting the chemical, physical and biological integrity of the nation's waters, the agencies propose to interpret the phrase "similarly situated" first in terms of whether the functions provided by the particular other waters are similar and, therefore, whether such "other waters" are collectively influencing the chemical, physical, or biological integrity of downstream waters. There are 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, runoff storage, and provision of habitat. 547 U.S. at 775, 779-80. This approach is consistent not only with the significant nexus standard, but with the science of aquatic systems.

The lack of a hydrologic connection between "other waters" and traditional navigable waters, interstate waters or the territorial seas may demonstrate the presence of a significant nexus between such waters, as Justice Kennedy recognized in his opinion. "Other waters" frequently function alone or cumulatively with similarly situated other waters in the region to capture runoff, rain water, or snowmelt and thereby protect the integrity of downstream waters by reducing potential flooding or trapping pollutants that would otherwise reach a traditional navigable water or interstate water. 547 U.S. at 775. Such waters can be crucial in controlling flooding as well as in maintaining water quality by trapping or transforming pollutants such as excess nutrients or sediment, for example, or retaining precipitation or snow melt, thereby reducing contamination or flooding of traditional navigable waters, interstate waters or the territorial seas.

### Significant Nexus

The agencies propose to define the term "significant nexus" consistent with language in *SWANCC* and *Rapanos.* The proposed 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 proposed regulations. Justice Kennedy was clear that the requisite nexus must be more than "speculative or insubstantial," *Rapanos,* at 780, in order to be significant and the proposed 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. 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." 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. 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 XX

With respect to one of the wetlands at issue in the consolidated *Rapanos* cases, Justice Kennedy stated the record also contained 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." *Id*. 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." *Id.* 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.* Justice Kennedy expressed concern that the "conditional language in these assessments—'potential ability,' 'possible flooding'—could suggest an undue degree of speculation." *Id.*

Justice Kennedy's observations regarding the above case provide guidance as to what it means for a nexus to be more than merely speculative or insubstantial and  inform the proposed definition of "significant nexus."  It is important to note, however, that where Justice Kennedy viewed the language "more than speculative or insubstantial" to suggest an undue degree of speculation, scientists do not equate certain conditional language (such as "may" or "could") with speculation, but rather with the rigorous and precise language of science necessary when applying specific findings in another individual situation or more broadly across a variety of situations. Certain terms used in a scientific context do not have the same implications that they have in a legal or policy context. Scientists use cautionary language, such as "may" or "could," when applying specific findings on a broader scale to avoid the appearance of overstating their research results and to avoid inserting bias into their findings (such that the reader may think the results of one study are applicable in all related studies). Words like "potential" are commonly used in the biological sciences, but when viewed under a legal and policy veil, may seem to mean the same as "speculative" or "insubstantial."  Instead, potential in scientific terms means ability or capability. For example, when the term "potential" is used to describe how a wetland has the potential to act as a sink for floodwater and pollutants, scientists mean that wetlands in general do indeed perform those functions, but whether a particular wetland performs that function is dependent upon the circumstances that would create conditions for floodwater or pollutants in the watershed to reach that particular wetland to retain and transform. That does not mean, however, that this nexus to downstream waters is "speculative;" indeed the wetland would be expected to provide these functions under the proper circumstances.

**List of Subjects**

33 CFR Part 328.3(a)

Administrative practice and procedure, Intergovernmental relations, Environmental protection, Navigation, Water pollution control, Waterways.

40 CFR Part 110.1

Environmental Protection, Water pollution control

40 CFR Part 112.2

Environmental Protection, Water pollution control

40 CFR Part 116.3

Environmental Protection, Water pollution control

40 CFR Part 117.1

Environmental Protection, Water pollution control

40 CFR Part 122.2

Environmental Protection, Water pollution control

40 CFR Part 230.2(s)

Environmental Protection, Water pollution control

40 CFR Part 232.2

Environmental Protection, Water pollution control

40 CFR Part 300.5

Environmental Protection, Water pollution control

40 CFR Part 300 App. E

Environmental Protection, Water pollution control

40 CFR Part 302.3

Environmental Protection, Water pollution control

40 CFR Part 401.11

Environmental Protection, Water pollution control

Dated:

Gina McCarthy,
Administrator
Environmental Protection Agency

Dated:

Jo Ellen Darcy,
Assistant Secretary of the Army
(Civil Works)
Department of the Army

## Proposed Rule

The following text replaces the text at 33 C.F.R. § 328.3(a), (b) and (c).

(a) For purposes of all sections of the Clean Water Act, 33 U.S.C. 1251 *et. seq.* and its implementing regulations, subject to the exclusions in subsection (b) of this section, the term "waters of the United States" means:

(1) All waters which are currently used, 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) The territorial seas;

(4) All impoundments of waters otherwise defined as waters of the United States under this definition;

(5) All tributaries of waters identified in paragraphs (1) through (3) of this section;

(6) All waters, including wetlands, adjacent to a water identified in paragraphs (1) through (5) of this section; and

(7) On a case-specific basis, other waters, including wetlands, provided that those waters alone, or in combination with other similarly situated waters, including wetlands, located in the same region, have a significant nexus to a water identified in paragraphs (1) through (3) of this section.

(b) The following are not "waters of the United States" ––

(1) Waste treatment systems, including treatment ponds or lagoons, designed to meet the requirements of the Clean Water Act.

(2) 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; and,

(3) Artificially irrigated areas that would revert to upland should application of irrigation water to that area cease; artificial lakes or ponds created by excavating and/or diking dry land and used exclusively for such purposes as stock watering, irrigation, settling basins, or rice growing; artificial reflecting pools or swimming pools created by excavating and/or diking dry land; small ornamental waters created by excavating and/or diking dry land for primarily aesthetic reasons; water-filled depressions created incidental to construction activity; groundwater drained through subsurface drainage systems; gullies and rills; non-wetland swales; and puddles;

(4) Ditches that are excavated wholly in uplands, drain only uplands or non-jurisdictional waters, and have no more than ephemeral flow; and

(5) Ditches that do not contribute flow, either directly or through other waterbodies, to a water identified in paragraphs (a)(1) through (a)(3) of this section.

(c) Definitions ––

(1) **Adjacent***:* The term *adjacent* means bordering, contiguous or neighboring. Waters, including 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 waters."

(2) **Neighboring**: The term *neighboring*, for purposes of the term "adjacent" in this section, includes waters located within the riparian area or floodplain of a water identified in paragraphs

(a)(1) through (a)(5) of this section, or waters with a surface or shallow subsurface hydrologic connection to such a jurisdictional water.

(3) **Riparian area***:* The term *riparian area* means an area bordering a water where surface or subsurface hydrology influence the ecological processes and plant and animal community structure in that area. Riparian areas are transitional areas between aquatic and terrestrial ecosystems that influence the exchange of energy and materials between those ecosystems.

(4) **Floodplain***:* The term *floodplain* means an area bordering inland or coastal waters that was formed by sediment deposition from such water under present climatic conditions and is inundated during periods of moderate to high water flows.

(5) **Tributary**: The term tributary means a waterbody physically characterized by the presence of a bed and banks and ordinary high water mark, which contributes flow, either directly or through other waterbodies, to a water identified in paragraphs (a)(1) through (a)(3) of this section. A waterbody 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 man-made breaks (such as bridges, culverts, pipes, or dams), or one or more natural breaks (such as wetlands at the head of or 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 or downstream of the break. In addition, wetlands are tributaries (even if they lack a bed and banks and ordinary high water mark) if they contribute flow, either directly or through other waterbodies to a water identified in paragraphs (a)(1) through (a)(3) of this section. A tributary, including wetlands, can be a natural, man-altered, or man-made water body and includes waters such as rivers, streams, lakes, impoundments, canals, and ditches not excluded in paragraph (b)(4) and (b)(5) of this section.

(6) **Wetlands***:* The term *wetlands* means 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. Wetlands generally include swamps, marshes, bogs and similar areas.

(7) **Significant nexus***:* The term *significant nexus* means a more than speculative or insubstantial effect that a water, including wetlands, either alone or in combination with other similarly situated waters in the region (i.e., the watershed that drains to a water identified in paragraphs (a)(1) through (3) of this section), has on the chemical, physical or biological integrity of a water identified in paragraphs (a)(1) through (3) of this section. Other waters, including wetlands, are similarly situated when they perform similar functions and are located sufficiently close together or close to a "water of the U.S." so that they can be evaluated as a single landscape unit with regard to their effect on the chemical, physical, or biological integrity of a water identified in paragraphs (a)(1) through (a)(3) of this section.

The following text replaces the definition of "navigable waters" at 40 C.F.R. § 110.1:

*Navigable waters* means the waters of the United States, including the territorial seas.

(a) For purposes of all sections of the Clean Water Act, 33 U.S.C. 1251 *et. seq.* and its implementing regulations, subject to the exclusions in subsection (b) of this section, the term "waters of the United States" means:

(1) All waters which are currently used, 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) The territorial seas;

(4) All impoundments of waters otherwise defined as waters of the United States under this definition;

(5) All tributaries of waters identified in paragraphs (1) through (3) of this section;

(6) All waters, including wetlands, adjacent to a water identified in paragraphs (1) through (5) of this section; and

(7) On a case-specific basis, other waters, including wetlands, provided that those waters alone, or in combination with other similarly situated waters, including wetlands, located in the same region, have a significant nexus to a water identified in paragraphs (1) through (3) of this section.

(b) The following are not "waters of the United States" ––

(1) Waste treatment systems, including treatment ponds or lagoons, designed to meet the requirements of the Clean Water Act.

(2) 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; and,

(3) Artificially irrigated areas that would revert to upland should application of irrigation water to that area cease; artificial lakes or ponds created by excavating and/or diking dry land and used exclusively for such purposes as stock watering, irrigation, settling basins, or rice growing; artificial reflecting pools or swimming pools created by excavating and/or diking dry land; small ornamental waters created by excavating and/or diking dry land for primarily aesthetic reasons; water-filled depressions created incidental to construction activity;

groundwater drained through subsurface drainage systems; gullies and rills; non-wetland swales; and puddles;

(4) Ditches that are excavated wholly in uplands, drain only uplands or non-jurisdictional waters, and have no more than ephemeral flow; and

(5) Ditches that do not contribute flow, either directly or through other waterbodies, to a water identified in paragraphs (a)(1) through (a)(3) of this section.

(c) Definitions ––

(1) **Adjacent***:* The term *adjacent* means bordering, contiguous or neighboring. Waters, including 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 waters."

(2) **Neighboring**: The term *neighboring*, for purposes of the term "adjacent" in this section, includes waters located within the riparian area or floodplain of a water identified in paragraphs (a)(1) through (a)(5) of this section, or waters with a surface or shallow subsurface hydrologic connection to such a jurisdictional water.

(3) **Riparian area***:* The term *riparian area* means an area bordering a water where surface or subsurface hydrology influence the ecological processes and plant and animal community structure in that area. Riparian areas are transitional areas between aquatic and terrestrial ecosystems that influence the exchange of energy and materials between those ecosystems.

(4) **Floodplain***:* The term *floodplain* means an area bordering inland or coastal waters that was formed by sediment deposition from such water under present climatic conditions and is inundated during periods of moderate to high water flows.

(5) **Tributary**: The term tributary means a waterbody physically characterized by the presence

of a bed and banks and ordinary high water mark, which contributes flow, either directly or through other waterbodies, to a water identified in paragraphs (a)(1) through (a)(3) of this section. A waterbody 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 man-made breaks (such as bridges, culverts, pipes, or dams), or one or more natural breaks (such as wetlands at the head of or 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 or downstream of the break. In addition, wetlands are tributaries (even if they lack a bed and banks and ordinary high water mark) if they contribute flow, either directly or through other waterbodies to a water identified in paragraphs (a)(1) through (a)(3) of this section. A tributary, including wetlands, can be a natural, man-altered, or man-made water body and includes waters such as rivers, streams, lakes, impoundments, canals, and ditches not excluded in paragraph (b)(4) and (b)(5) of this section.

(6) **Wetlands***:* The term *wetlands* means 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. Wetlands generally include swamps, marshes, bogs and similar areas.

(7) **Significant nexus***:* The term *significant nexus* means a more than speculative or insubstantial effect that a water, including wetlands, either alone or in combination with other similarly situated waters in the region (i.e., the watershed that drains to a water identified in paragraphs (a)(1) through (3) of this section), has on the chemical, physical or biological integrity of a water identified in paragraphs (a)(1) through (3) of this section. Other waters, including wetlands, are similarly situated when they perform similar functions and are located

sufficiently close together or close to a “water of the U.S.” so that they can be evaluated as a single landscape unit with regard to their effect on the chemical, physical, or biological integrity of a water identified in paragraphs (a)(1) through (a)(3) of this section.

The following text replaces the definition of “navigable waters” at 40 C.F.R. §112.2.

*Navigable waters* means the waters of the United States, including the territorial seas.

(a) For purposes of all sections of the Clean Water Act, 33 U.S.C. 1251 *et. seq.* and its implementing regulations, subject to the exclusions in subsection (b) of this section, the term “waters of the United States” means:

(1) All waters which are currently used, 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) The territorial seas;

(4) All impoundments of waters otherwise defined as waters of the United States under this definition;

(5) All tributaries of waters identified in paragraphs (1) through (3) of this section;

(6) All waters, including wetlands, adjacent to a water identified in paragraphs (1) through (5) of this section; and

(7) On a case-specific basis, other waters, including wetlands, provided that those waters alone, or in combination with other similarly situated waters, including wetlands, located in the same region, have a significant nexus to a water identified in paragraphs (1) through (3) of this section.

(b) The following are not “waters of the United States” ––

(1) Waste treatment systems, including treatment ponds or lagoons, designed to meet the requirements of the Clean Water Act.

(2) 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; and,

(3) Artificially irrigated areas that would revert to upland should application of irrigation water to that area cease; artificial lakes or ponds created by excavating and/or diking dry land and used exclusively for such purposes as stock watering, irrigation, settling basins, or rice growing; artificial reflecting pools or swimming pools created by excavating and/or diking dry land; small ornamental waters created by excavating and/or diking dry land for primarily aesthetic reasons; water-filled depressions created incidental to construction activity; groundwater drained through subsurface drainage systems; gullies and rills; non-wetland swales; and puddles;

(4) Ditches that are excavated wholly in uplands, drain only uplands or non-jurisdictional waters, and have no more than ephemeral flow; and

(5) Ditches that do not contribute flow, either directly or through other waterbodies, to a water identified in paragraphs (a)(1) through (a)(3) of this section.

(c) Definitions ––

(1) **Adjacent***:* The term *adjacent* means bordering, contiguous or neighboring. Waters, including 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 waters.”

(2) **Neighboring**: The term *neighboring*, for purposes of the term "adjacent" in this section, includes waters located within the riparian area or floodplain of a water identified in paragraphs (a)(1) through (a)(5) of this section, or waters with a surface or shallow subsurface hydrologic connection to such a jurisdictional water.

(3) **Riparian area***:* The term *riparian area* means an area bordering a water where surface or subsurface hydrology influence the ecological processes and plant and animal community structure in that area. Riparian areas are transitional areas between aquatic and terrestrial ecosystems that influence the exchange of energy and materials between those ecosystems.

(4) **Floodplain***:* The term *floodplain* means an area bordering inland or coastal waters that was formed by sediment deposition from such water under present climatic conditions and is inundated during periods of moderate to high water flows.

(5) **Tributary**: The term tributary means a waterbody physically characterized by the presence of a bed and banks and ordinary high water mark, which contributes flow, either directly or through other waterbodies, to a water identified in paragraphs (a)(1) through (a)(3) of this section. A waterbody 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 man-made breaks (such as bridges, culverts, pipes, or dams), or one or more natural breaks (such as wetlands at the head of or 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 or downstream of the break. In addition, wetlands are tributaries (even if they lack a bed and banks and ordinary high water mark) if they contribute flow, either directly or through other waterbodies to a water identified in paragraphs (a)(1) through (a)(3) of this section. A tributary, including wetlands, can be a natural, man-altered, or man-made water body and includes waters such as rivers, streams,

lakes, impoundments, canals, and ditches not excluded in paragraph (b)(4) and (b)(5) of this section.

(6) **Wetlands***:* The term *wetlands* means 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. Wetlands generally include swamps, marshes, bogs and similar areas.

(7) **Significant nexus***:* The term *significant nexus* means a more than speculative or insubstantial effect that a water, including wetlands, either alone or in combination with other similarly situated waters in the region (i.e., the watershed that drains to a water identified in paragraphs (a)(1) through (3) of this section), has on the chemical, physical or biological integrity of a water identified in paragraphs (a)(1) through (3) of this section. Other waters, including wetlands, are similarly situated when they perform similar functions and are located sufficiently close together or close to a "water of the U.S." so that they can be evaluated as a single landscape unit with regard to their effect on the chemical, physical, or biological integrity of a water identified in paragraphs (a)(1) through (a)(3) of this section.

The following text replaces the definition of "navigable waters" at 40 C.F.R. §116.3. *Navigable waters* is defined in section 502(7) of the Act to mean ‘‘waters of the United States, including the territorial seas."

(a) For purposes of all sections of the Clean Water Act, 33 U.S.C. 1251 *et. seq.* and its implementing regulations, subject to the exclusions in subsection (b) of this section, the term "waters of the United States" means:

(1) All waters which are currently used, 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) The territorial seas;

(4) All impoundments of waters otherwise defined as waters of the United States under this definition;

(5) All tributaries of waters identified in paragraphs (1) through (3) of this section;

(6) All waters, including wetlands, adjacent to a water identified in paragraphs (1) through (5) of this section; and

(7) On a case-specific basis, other waters, including wetlands, provided that those waters alone, or in combination with other similarly situated waters, including wetlands, located in the same region, have a significant nexus to a water identified in paragraphs (1) through (3) of this section.

(b) The following are not "waters of the United States" ––

(1) Waste treatment systems, including treatment ponds or lagoons, designed to meet the requirements of the Clean Water Act.

(2) 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; and,

(3) Artificially irrigated areas that would revert to upland should application of irrigation water to that area cease; artificial lakes or ponds created by excavating and/or diking dry land and used exclusively for such purposes as stock watering, irrigation, settling basins, or rice

growing; artificial reflecting pools or swimming pools created by excavating and/or diking dry land; small ornamental waters created by excavating and/or diking dry land for primarily aesthetic reasons; water-filled depressions created incidental to construction activity; groundwater drained through subsurface drainage systems; gullies and rills; non-wetland swales; and puddles;

(4) Ditches that are excavated wholly in uplands, drain only uplands or non-jurisdictional waters, and have no more than ephemeral flow; and

(5) Ditches that do not contribute flow, either directly or through other waterbodies, to a water identified in paragraphs (a)(1) through (a)(3) of this section.

(c) Definitions ––

(1) **Adjacent***:* The term *adjacent* means bordering, contiguous or neighboring. Waters, including 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 waters."

(2) **Neighboring**: The term *neighboring*, for purposes of the term "adjacent" in this section, includes waters located within the riparian area or floodplain of a water identified in paragraphs (a)(1) through (a)(5) of this section, or waters with a surface or shallow subsurface hydrologic connection to such a jurisdictional water.

(3) **Riparian area***:* The term *riparian area* means an area bordering a water where surface or subsurface hydrology influence the ecological processes and plant and animal community structure in that area. Riparian areas are transitional areas between aquatic and terrestrial ecosystems that influence the exchange of energy and materials between those ecosystems.

(4) **Floodplain***:* The term *floodplain* means an area bordering inland or coastal waters that was formed by sediment deposition from such water under present climatic conditions and is inundated during periods of moderate to high water flows.

(5) **Tributary**: The term tributary means a waterbody physically characterized by the presence of a bed and banks and ordinary high water mark, which contributes flow, either directly or through other waterbodies, to a water identified in paragraphs (a)(1) through (a)(3) of this section. A waterbody 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 man-made breaks (such as bridges, culverts, pipes, or dams), or one or more natural breaks (such as wetlands at the head of or 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 or downstream of the break. In addition, wetlands are tributaries (even if they lack a bed and banks and ordinary high water mark) if they contribute flow, either directly or through other waterbodies to a water identified in paragraphs (a)(1) through (a)(3) of this section. A tributary, including wetlands, can be a natural, man-altered, or man-made water body and includes waters such as rivers, streams, lakes, impoundments, canals, and ditches not excluded in paragraph (b)(4) and (b)(5) of this section.

(6) **Wetlands***:* The term *wetlands* means 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. Wetlands generally include swamps, marshes, bogs and similar areas.

(7) **Significant nexus***:* The term *significant nexus* means a more than speculative or insubstantial effect that a water, including wetlands, either alone or in combination with other

similarly situated waters in the region (i.e., the watershed that drains to a water identified in paragraphs (a)(1) through (3) of this section), has on the chemical, physical or biological integrity of a water identified in paragraphs (a)(1) through (3) of this section. Other waters, including wetlands, are similarly situated when they perform similar functions and are located sufficiently close together or close to a “water of the U.S.” so that they can be evaluated as a single landscape unit with regard to their effect on the chemical, physical, or biological integrity of a water identified in paragraphs (a)(1) through (a)(3) of this section.

The following text replaces the definition of “navigable waters” at 40 C.F.R. §117.1(i).

(i) *Navigable waters* means ‘‘waters of the United States, including the territorial seas.’’

(a) For purposes of all sections of the Clean Water Act, 33 U.S.C. 1251 *et. seq.* and its implementing regulations, subject to the exclusions in subsection (b) of this section, the term “waters of the United States” means:

(1) All waters which are currently used, 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) The territorial seas;

(4) All impoundments of waters otherwise defined as waters of the United States under this definition;

(5) All tributaries of waters identified in paragraphs (1) through (3) of this section;

(6) All waters, including wetlands, adjacent to a water identified in paragraphs (1) through (5) of this section; and

(7) On a case-specific basis, other waters, including wetlands, provided that those waters alone, or in combination with other similarly situated waters, including wetlands, located in the same region, have a significant nexus to a water identified in paragraphs (1) through (3) of this section.

(b) The following are not "waters of the United States" ––

(1) Waste treatment systems, including treatment ponds or lagoons, designed to meet the requirements of the Clean Water Act.

(2) 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; and,

(3) Artificially irrigated areas that would revert to upland should application of irrigation water to that area cease; artificial lakes or ponds created by excavating and/or diking dry land and used exclusively for such purposes as stock watering, irrigation, settling basins, or rice growing; artificial reflecting pools or swimming pools created by excavating and/or diking dry land; small ornamental waters created by excavating and/or diking dry land for primarily aesthetic reasons; water-filled depressions created incidental to construction activity; groundwater drained through subsurface drainage systems; gullies and rills; non-wetland swales; and puddles;

(4) Ditches that are excavated wholly in uplands, drain only uplands or non-jurisdictional waters, and have no more than ephemeral flow; and

(5) Ditches that do not contribute flow, either directly or through other waterbodies, to a water identified in paragraphs (a)(1) through (a)(3) of this section.

(c) Definitions ––

(1) **Adjacent***:* The term *adjacent* means bordering, contiguous or neighboring. Waters, including 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 waters.”

(2) **Neighboring**: The term *neighboring*, for purposes of the term “adjacent” in this section, includes waters located within the riparian area or floodplain of a water identified in paragraphs (a)(1) through (a)(5) of this section, or waters with a surface or shallow subsurface hydrologic connection to such a jurisdictional water.

(3) **Riparian area***:* The term *riparian area* means an area bordering a water where surface or subsurface hydrology influence the ecological processes and plant and animal community structure in that area. Riparian areas are transitional areas between aquatic and terrestrial ecosystems that influence the exchange of energy and materials between those ecosystems.

(4) **Floodplain***:* The term *floodplain* means an area bordering inland or coastal waters that was formed by sediment deposition from such water under present climatic conditions and is inundated during periods of moderate to high water flows.

(5) **Tributary**: The term tributary means a waterbody physically characterized by the presence of a bed and banks and ordinary high water mark, which contributes flow, either directly or through other waterbodies, to a water identified in paragraphs (a)(1) through (a)(3) of this section. A waterbody 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 man-made breaks (such as bridges, culverts, pipes, or dams), or one or more natural breaks (such as wetlands at the head of or 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 or downstream of the

break. In addition, wetlands are tributaries (even if they lack a bed and banks and ordinary high water mark) if they contribute flow, either directly or through other waterbodies to a water identified in paragraphs (a)(1) through (a)(3) of this section. A tributary, including wetlands, can be a natural, man-altered, or man-made water body and includes waters such as rivers, streams, lakes, impoundments, canals, and ditches not excluded in paragraph (b)(4) and (b)(5) of this section.

(6) **Wetlands***:* The term *wetlands* means 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. Wetlands generally include swamps, marshes, bogs and similar areas.

(7) **Significant nexus***:* The term *significant nexus* means a more than speculative or insubstantial effect that a water, including wetlands, either alone or in combination with other similarly situated waters in the region (i.e., the watershed that drains to a water identified in paragraphs (a)(1) through (3) of this section), has on the chemical, physical or biological integrity of a water identified in paragraphs (a)(1) through (3) of this section. Other waters, including wetlands, are similarly situated when they perform similar functions and are located sufficiently close together or close to a “water of the U.S.” so that they can be evaluated as a single landscape unit with regard to their effect on the chemical, physical, or biological integrity of a water identified in paragraphs (a)(1) through (a)(3) of this section.

The following text replaces the definition of “Waters of the United States” at 40 C.F.R. §122.2:

*Waters of the United States* or *waters of the U.S.* means:

(a) For purposes of all sections of the Clean Water Act, 33 U.S.C. 1251 *et. seq.* and its implementing regulations, subject to the exclusions in subsection (b) of this section, the term "waters of the United States" means:

(1) All waters which are currently used, 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) The territorial seas;

(4) All impoundments of waters otherwise defined as waters of the United States under this definition;

(5) All tributaries of waters identified in paragraphs (1) through (3) of this section;

(6) All waters, including wetlands, adjacent to a water identified in paragraphs (1) through (5) of this section; and

(7) On a case-specific basis, other waters, including wetlands, provided that those waters alone, or in combination with other similarly situated waters, including wetlands, located in the same region, have a significant nexus to a water identified in paragraphs (1) through (3) of this section.

(b) The following are not "waters of the United States" ––

(1) Waste treatment systems, including treatment ponds or lagoons, designed to meet the requirements of the Clean Water Act. This exclusion applies only to manmade bodies of water which neither were originally created in waters of the United States (such as disposal area in

wetlands) nor resulted from the impoundment of waters of the United States. [See Note 1 of this section.]

(2) 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; and,

(3) Artificially irrigated areas that would revert to upland should application of irrigation water to that area cease; artificial lakes or ponds created by excavating and/or diking dry land and used exclusively for such purposes as stock watering, irrigation, settling basins, or rice growing; artificial reflecting pools or swimming pools created by excavating and/or diking dry land; small ornamental waters created by excavating and/or diking dry land for primarily aesthetic reasons; water-filled depressions created incidental to construction activity; groundwater drained through subsurface drainage systems; gullies and rills; non-wetland swales; and puddles;

(4) Ditches that are excavated wholly in uplands, drain only uplands or non-jurisdictional waters, and have no more than ephemeral flow; and

(5) Ditches that do not contribute flow, either directly or through other waterbodies, to a water identified in paragraphs (a)(1) through (a)(3) of this section.

(c) Definitions ––

(1) **Adjacent***:* The term *adjacent* means bordering, contiguous or neighboring. Waters, including 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 waters."

(2) **Neighboring**: The term *neighboring*, for purposes of the term "adjacent" in this section,

includes waters located within the riparian area or floodplain of a water identified in paragraphs (a)(1) through (a)(5) of this section, or waters with a surface or shallow subsurface hydrologic connection to such a jurisdictional water.

(3) **Riparian area***:* The term *riparian area* means an area bordering a water where surface or subsurface hydrology influence the ecological processes and plant and animal community structure in that area. Riparian areas are transitional areas between aquatic and terrestrial ecosystems that influence the exchange of energy and materials between those ecosystems.

(4) **Floodplain***:* The term *floodplain* means an area bordering inland or coastal waters that was formed by sediment deposition from such water under present climatic conditions and is inundated during periods of moderate to high water flows.

(5) **Tributary**: The term tributary means a waterbody physically characterized by the presence of a bed and banks and ordinary high water mark, which contributes flow, either directly or through other waterbodies, to a water identified in paragraphs (a)(1) through (a)(3) of this section. A waterbody 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 man-made breaks (such as bridges, culverts, pipes, or dams), or one or more natural breaks (such as wetlands at the head of or 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 or downstream of the break. In addition, wetlands are tributaries (even if they lack a bed and banks and ordinary high water mark) if they contribute flow, either directly or through other waterbodies to a water identified in paragraphs (a)(1) through (a)(3) of this section. A tributary, including wetlands, can be a natural, man-altered, or man-made water body and includes waters such as rivers, streams,

lakes, impoundments, canals, and ditches not excluded in paragraph (b)(4) and (b)(5) of this section.

(6) **Wetlands***:* The term *wetlands* means 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. Wetlands generally include swamps, marshes, bogs and similar areas.

(7) **Significant nexus***:* The term *significant nexus* means a more than speculative or insubstantial effect that a water, including wetlands, either alone or in combination with other similarly situated waters in the region (i.e., the watershed that drains to a water identified in paragraphs (a)(1) through (3) of this section), has on the chemical, physical or biological integrity of a water identified in paragraphs (a)(1) through (3) of this section. Other waters, including wetlands, are similarly situated when they perform similar functions and are located sufficiently close together or close to a "water of the U.S." so that they can be evaluated as a single landscape unit with regard to their effect on the chemical, physical, or biological integrity of a water identified in paragraphs (a)(1) through (a)(3) of this section.

The following text replaces the text at 40 C.F.R. § 230.3(s) and (t).

(s) For purposes of all sections of the Clean Water Act, 33 U.S.C. 1251 *et. seq.* and its implementing regulations, subject to the exclusions in subsection (t) of this section, the term "waters of the United States" means:

(1) All waters which are currently used, 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) The territorial seas;

(4) All impoundments of waters otherwise defined as waters of the United States under this definition;

(5) All tributaries of waters identified in paragraphs (1) through (3) of this section;

(6) All waters, including wetlands, adjacent to a water identified in paragraphs (1) through (5) of this section; and

(7) On a case-specific basis, other waters, including wetlands, provided that those waters alone, or in combination with other similarly situated waters, including wetlands, located in the same region, have a significant nexus to a water identified in paragraphs (1) through (3) of this section.

(t) The following are not "waters of the United States" ––

(1) Waste treatment systems, including treatment ponds or lagoons, designed to meet the requirements of the Clean Water Act.

(2) 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; and,

(3) Artificially irrigated areas that would revert to upland should application of irrigation water to that area cease; artificial lakes or ponds created by excavating and/or diking dry land and used exclusively for such purposes as stock watering, irrigation, settling basins, or rice growing; artificial reflecting pools or swimming pools created by excavating and/or diking dry land; small ornamental waters created by excavating and/or diking dry land for primarily aesthetic reasons; water-filled depressions created incidental to construction activity;

groundwater drained through subsurface drainage systems; gullies and rills; non-wetland swales; and puddles;

(4) Ditches that are excavated wholly in uplands, drain only uplands or non-jurisdictional waters, and have no more than ephemeral flow; and

(5) Ditches that do not contribute flow, either directly or through other waterbodies, to a water identified in paragraphs (s)(1) through (s)(3) of this section.

(u) Definitions ––

(1) **Adjacent***:* The term *adjacent* means bordering, contiguous or neighboring. Waters, including 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 waters.”

(2) **Neighboring**: The term *neighboring*, for purposes of the term “adjacent” in this section, includes waters located within the riparian area or floodplain of a water identified in paragraphs (s)(1) through (s)(5) of this section, or waters with a surface or shallow subsurface hydrologic connection to such a jurisdictional water.

(3) **Riparian area***:* The term *riparian area* means an area bordering a water where surface or subsurface hydrology influence the ecological processes and plant and animal community structure in that area. Riparian areas are transitional areas between aquatic and terrestrial ecosystems that influence the exchange of energy and materials between those ecosystems.

(4) **Floodplain***:* The term *floodplain* means an area bordering inland or coastal waters that was formed by sediment deposition from such water under present climatic conditions and is inundated during periods of moderate to high water flows.

(5) **Tributary**: The term tributary means a waterbody physically characterized by the presence

of a bed and banks and ordinary high water mark, which contributes flow, either directly or through other waterbodies, to a water identified in paragraphs (s)(1) through (s)(3) of this section. A waterbody 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 man-made breaks (such as bridges, culverts, pipes, or dams), or one or more natural breaks (such as wetlands at the head of or 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 or downstream of the break. In addition, wetlands are tributaries (even if they lack a bed and banks and ordinary high water mark) if they contribute flow, either directly or through other waterbodies to a water identified in paragraphs (s)(1) through (s)(3) of this section. A tributary, including wetlands, can be a natural, man-altered, or man-made water body and includes waters such as rivers, streams, lakes, impoundments, canals, and ditches not excluded in paragraph (b)(4) and (b)(5) of this section.

(6) **Wetlands***:* The term *wetlands* means 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. Wetlands generally include swamps, marshes, bogs and similar areas.

(7) **Significant nexus***:* The term *significant nexus* means a more than speculative or insubstantial effect that a water, including wetlands, either alone or in combination with other similarly situated waters in the region (i.e., the watershed that drains to a water identified in paragraphs (s)(1) through (3) of this section), has on the chemical, physical or biological integrity of a water identified in paragraphs (s)(1) through (3) of this section. Other waters, including wetlands, are similarly situated when they perform similar functions and are located

sufficiently close together or close to a "water of the U.S." so that they can be evaluated as a single landscape unit with regard to their effect on the chemical, physical, or biological integrity of a water identified in paragraphs (s)(1) through (s)(3) of this section.

The following text replaces the definition of "Waters of the United States" at 40 C.F.R. §232.2:

*Waters of the United States* or *waters* means:

(a) For purposes of all sections of the Clean Water Act, 33 U.S.C. 1251 *et. seq.* and its implementing regulations, subject to the exclusions in subsection (b) of this section, the term "waters of the United States" means:

(1) All waters which are currently used, 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) The territorial seas;

(4) All impoundments of waters otherwise defined as waters of the United States under this definition;

(5) All tributaries of waters identified in paragraphs (1) through (3) of this section;

(6) All waters, including wetlands, adjacent to a water identified in paragraphs (1) through (5) of this section; and

(7) On a case-specific basis, other waters, including wetlands, provided that those waters alone, or in combination with other similarly situated waters, including wetlands, located in the

same region, have a significant nexus to a water identified in paragraphs (1) through (3) of this section.

(b) The following are not “waters of the United States” ––

(1) Waste treatment systems, including treatment ponds or lagoons, designed to meet the requirements of the Clean Water Act.

(2) 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; and,

(3) Artificially irrigated areas that would revert to upland should application of irrigation water to that area cease; artificial lakes or ponds created by excavating and/or diking dry land and used exclusively for such purposes as stock watering, irrigation, settling basins, or rice growing; artificial reflecting pools or swimming pools created by excavating and/or diking dry land; small ornamental waters created by excavating and/or diking dry land for primarily aesthetic reasons; water-filled depressions created incidental to construction activity; groundwater drained through subsurface drainage systems; gullies and rills; non-wetland swales; and puddles;

(4) Ditches that are excavated wholly in uplands, drain only uplands or non-jurisdictional waters, and have no more than ephemeral flow; and

(5) Ditches that do not contribute flow, either directly or through other waterbodies, to a water identified in paragraphs (a)(1) through (a)(3) of this section.

(c) Definitions ––

(1) **Adjacent***:* The term *adjacent* means bordering, contiguous or neighboring. Waters, including 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 waters."

(2) **Neighboring**: The term *neighboring*, for purposes of the term "adjacent" in this section, includes waters located within the riparian area or floodplain of a water identified in paragraphs (a)(1) through (a)(5) of this section, or waters with a surface or shallow subsurface hydrologic connection to such a jurisdictional water.

(3) **Riparian area***:* The term *riparian area* means an area bordering a water where surface or subsurface hydrology influence the ecological processes and plant and animal community structure in that area. Riparian areas are transitional areas between aquatic and terrestrial ecosystems that influence the exchange of energy and materials between those ecosystems.

(4) **Floodplain***:* The term *floodplain* means an area bordering inland or coastal waters that was formed by sediment deposition from such water under present climatic conditions and is inundated during periods of moderate to high water flows.

(5) **Tributary**: The term tributary means a waterbody physically characterized by the presence of a bed and banks and ordinary high water mark, which contributes flow, either directly or through other waterbodies, to a water identified in paragraphs (a)(1) through (a)(3) of this section. A waterbody 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 man-made breaks (such as bridges, culverts, pipes, or dams), or one or more natural breaks (such as wetlands at the head of or 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 or downstream of the break. In addition, wetlands are tributaries (even if they lack a bed and banks and ordinary high

water mark) if they contribute flow, either directly or through other waterbodies to a water identified in paragraphs (a)(1) through (a)(3) of this section. A tributary, including wetlands, can be a natural, man-altered, or man-made water body and includes waters such as rivers, streams, lakes, impoundments, canals, and ditches not excluded in paragraph (b)(4) and (b)(5) of this section.

(6) **Wetlands***:* The term *wetlands* means 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. Wetlands generally include swamps, marshes, bogs and similar areas.

(7) **Significant nexus***:* The term *significant nexus* means a more than speculative or insubstantial effect that a water, including wetlands, either alone or in combination with other similarly situated waters in the region (i.e., the watershed that drains to a water identified in paragraphs (a)(1) through (3) of this section), has on the chemical, physical or biological integrity of a water identified in paragraphs (a)(1) through (3) of this section. Other waters, including wetlands, are similarly situated when they perform similar functions and are located sufficiently close together or close to a “water of the U.S.” so that they can be evaluated as a single landscape unit with regard to their effect on the chemical, physical, or biological integrity of a water identified in paragraphs (a)(1) through (a)(3) of this section.

The following text replaces the definition of “navigable waters” at 40 C.F.R. §300.5: *Navigable waters* as defined by 40 CFR 110.1, means the waters of the United States, including the territorial seas.

(a) For purposes of all sections of the Clean Water Act, 33 U.S.C. 1251 *et. seq.* and its implementing regulations, subject to the exclusions in subsection (b) of this section, the term "waters of the United States" means:

(1) All waters which are currently used, 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) The territorial seas;

(4) All impoundments of waters otherwise defined as waters of the United States under this definition;

(5) All tributaries of waters identified in paragraphs (1) through (3) of this section;

(6) All waters, including wetlands, adjacent to a water identified in paragraphs (1) through (5) of this section; and

(7) On a case-specific basis, other waters, including wetlands, provided that those waters alone, or in combination with other similarly situated waters, including wetlands, located in the same region, have a significant nexus to a water identified in paragraphs (1) through (3) of this section.

(b) The following are not "waters of the United States" ––

(1) Waste treatment systems, including treatment ponds or lagoons, designed to meet the requirements of the Clean Water Act.

(2) 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; and,

(3) Artificially irrigated areas that would revert to upland should application of irrigation water to that area cease; artificial lakes or ponds created by excavating and/or diking dry land and used exclusively for such purposes as stock watering, irrigation, settling basins, or rice growing; artificial reflecting pools or swimming pools created by excavating and/or diking dry land; small ornamental waters created by excavating and/or diking dry land for primarily aesthetic reasons; water-filled depressions created incidental to construction activity; groundwater drained through subsurface drainage systems; gullies and rills; non-wetland swales; and puddles;

(4) Ditches that are excavated wholly in uplands, drain only uplands or non-jurisdictional waters, and have no more than ephemeral flow; and

(5) Ditches that do not contribute flow, either directly or through other waterbodies, to a water identified in paragraphs (a)(1) through (a)(3) of this section.

(c) Definitions ––

(1) **Adjacent***:* The term *adjacent* means bordering, contiguous or neighboring. Waters, including 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 waters."

(2) **Neighboring**: The term *neighboring*, for purposes of the term "adjacent" in this section, includes waters located within the riparian area or floodplain of a water identified in paragraphs (a)(1) through (a)(5) of this section, or waters with a surface or shallow subsurface hydrologic connection to such a jurisdictional water.

(3) **Riparian area***:* The term *riparian area* means an area bordering a water where surface or subsurface hydrology influence the ecological processes and plant and animal community

structure in that area. Riparian areas are transitional areas between aquatic and terrestrial ecosystems that influence the exchange of energy and materials between those ecosystems.

(4) **Floodplain***:* The term *floodplain* means an area bordering inland or coastal waters that was formed by sediment deposition from such water under present climatic conditions and is inundated during periods of moderate to high water flows.

(5) **Tributary**: The term tributary means a waterbody physically characterized by the presence of a bed and banks and ordinary high water mark, which contributes flow, either directly or through other waterbodies, to a water identified in paragraphs (a)(1) through (a)(3) of this section. A waterbody 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 man-made breaks (such as bridges, culverts, pipes, or dams), or one or more natural breaks (such as wetlands at the head of or 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 or downstream of the break. In addition, wetlands are tributaries (even if they lack a bed and banks and ordinary high water mark) if they contribute flow, either directly or through other waterbodies to a water identified in paragraphs (a)(1) through (a)(3) of this section. A tributary, including wetlands, can be a natural, man-altered, or man-made water body and includes waters such as rivers, streams, lakes, impoundments, canals, and ditches not excluded in paragraph (b)(4) and (b)(5) of this section.

(6) **Wetlands***:* The term *wetlands* means 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. Wetlands generally include swamps, marshes, bogs and similar areas.

(7) **Significant nexus***:* The term *significant nexus* means a more than speculative or insubstantial effect that a water, including wetlands, either alone or in combination with other similarly situated waters in the region (i.e., the watershed that drains to a water identified in paragraphs (a)(1) through (3) of this section), has on the chemical, physical or biological integrity of a water identified in paragraphs (a)(1) through (3) of this section. Other waters, including wetlands, are similarly situated when they perform similar functions and are located sufficiently close together or close to a "water of the U.S." so that they can be evaluated as a single landscape unit with regard to their effect on the chemical, physical, or biological integrity of a water identified in paragraphs (a)(1) through (a)(3) of this section.

The following text replaces the definition of "navigable waters" at 40 C.F.R. § 300, Appendix E to Part 300, 1.5:

*Navigable waters* as defined by 40 CFR 110.1, means the waters of the United States, including the territorial seas.

(a) For purposes of all sections of the Clean Water Act, 33 U.S.C. 1251 *et. seq.* and its implementing regulations, subject to the exclusions in subsection (b) of this section, the term "waters of the United States" means:

(1) All waters which are currently used, 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) The territorial seas;

(4) All impoundments of waters otherwise defined as waters of the United States under this definition;

(5) All tributaries of waters identified in paragraphs (1) through (3) of this section;

(6) All waters, including wetlands, adjacent to a water identified in paragraphs (1) through (5) of this section; and

(7) On a case-specific basis, other waters, including wetlands, provided that those waters alone, or in combination with other similarly situated waters, including wetlands, located in the same region, have a significant nexus to a water identified in paragraphs (1) through (3) of this section.

(b) The following are not "waters of the United States" ––

(1) Waste treatment systems, including treatment ponds or lagoons, designed to meet the requirements of the Clean Water Act.

(2) 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; and,

(3) Artificially irrigated areas that would revert to upland should application of irrigation water to that area cease; artificial lakes or ponds created by excavating and/or diking dry land and used exclusively for such purposes as stock watering, irrigation, settling basins, or rice growing; artificial reflecting pools or swimming pools created by excavating and/or diking dry land; small ornamental waters created by excavating and/or diking dry land for primarily aesthetic reasons; water-filled depressions created incidental to construction activity; groundwater drained through subsurface drainage systems; gullies and rills; non-wetland swales; and puddles;

(4) Ditches that are excavated wholly in uplands, drain only uplands or non-jurisdictional waters, and have no more than ephemeral flow; and

(5) Ditches that do not contribute flow, either directly or through other waterbodies, to a water identified in paragraphs (a)(1) through (a)(3) of this section.

(c) Definitions ––

(1) **Adjacent***:* The term *adjacent* means bordering, contiguous or neighboring. Waters, including 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 waters."

(2) **Neighboring**: The term *neighboring*, for purposes of the term "adjacent" in this section, includes waters located within the riparian area or floodplain of a water identified in paragraphs (a)(1) through (a)(5) of this section, or waters with a surface or shallow subsurface hydrologic connection to such a jurisdictional water.

(3) **Riparian area***:* The term *riparian area* means an area bordering a water where surface or subsurface hydrology influence the ecological processes and plant and animal community structure in that area. Riparian areas are transitional areas between aquatic and terrestrial ecosystems that influence the exchange of energy and materials between those ecosystems.

(4) **Floodplain***:* The term *floodplain* means an area bordering inland or coastal waters that was formed by sediment deposition from such water under present climatic conditions and is inundated during periods of moderate to high water flows.

(5) **Tributary**: The term tributary means a waterbody physically characterized by the presence of a bed and banks and ordinary high water mark, which contributes flow, either directly or through other waterbodies, to a water identified in paragraphs (a)(1) through (a)(3) of this

section. A waterbody 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 man-made breaks (such as bridges, culverts, pipes, or dams), or one or more natural breaks (such as wetlands at the head of or 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 or downstream of the break. In addition, wetlands are tributaries (even if they lack a bed and banks and ordinary high water mark) if they contribute flow, either directly or through other waterbodies to a water identified in paragraphs (a)(1) through (a)(3) of this section. A tributary, including wetlands, can be a natural, man-altered, or man-made water body and includes waters such as rivers, streams, lakes, impoundments, canals, and ditches not excluded in paragraph (b)(4) and (b)(5) of this section.

(6) **Wetlands***:* The term *wetlands* means 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. Wetlands generally include swamps, marshes, bogs and similar areas.

(7) **Significant nexus***:* The term *significant nexus* means a more than speculative or insubstantial effect that a water, including wetlands, either alone or in combination with other similarly situated waters in the region (i.e., the watershed that drains to a water identified in paragraphs (a)(1) through (3) of this section), has on the chemical, physical or biological integrity of a water identified in paragraphs (a)(1) through (3) of this section. Other waters, including wetlands, are similarly situated when they perform similar functions and are located sufficiently close together or close to a “water of the U.S.” so that they can be evaluated as a

single landscape unit with regard to their effect on the chemical, physical, or biological integrity of a water identified in paragraphs (a)(1) through (a)(3) of this section.

The following text replaces the definition of "navigable waters" at 40 C.F.R. § 302.3:

*Navigable waters* means the waters of the United States, including the territorial seas.

(a) For purposes of all sections of the Clean Water Act, 33 U.S.C. 1251 *et. seq.* and its implementing regulations, subject to the exclusions in subsection (b) of this section, the term "waters of the United States" means:

(1) All waters which are currently used, 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) The territorial seas;

(4) All impoundments of waters otherwise defined as waters of the United States under this definition;

(5) All tributaries of waters identified in paragraphs (1) through (3) of this section;

(6) All waters, including wetlands, adjacent to a water identified in paragraphs (1) through (5) of this section; and

(7) On a case-specific basis, other waters, including wetlands, provided that those waters alone, or in combination with other similarly situated waters, including wetlands, located in the same region, have a significant nexus to a water identified in paragraphs (1) through (3) of this section.

(b) The following are not "waters of the United States" ––

(1) Waste treatment systems, including treatment ponds or lagoons, designed to meet the requirements of the Clean Water Act.

(2) 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; and,

(3) Artificially irrigated areas that would revert to upland should application of irrigation water to that area cease; artificial lakes or ponds created by excavating and/or diking dry land and used exclusively for such purposes as stock watering, irrigation, settling basins, or rice growing; artificial reflecting pools or swimming pools created by excavating and/or diking dry land; small ornamental waters created by excavating and/or diking dry land for primarily aesthetic reasons; water-filled depressions created incidental to construction activity; groundwater drained through subsurface drainage systems; gullies and rills; non-wetland swales; and puddles;

(4) Ditches that are excavated wholly in uplands, drain only uplands or non-jurisdictional waters, and have no more than ephemeral flow; and

(5) Ditches that do not contribute flow, either directly or through other waterbodies, to a water identified in paragraphs (a)(1) through (a)(3) of this section.

(c) Definitions ––

(1) **Adjacent***:* The term *adjacent* means bordering, contiguous or neighboring. Waters, including 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 waters."

(2) **Neighboring**: The term *neighboring*, for purposes of the term "adjacent" in this section,

includes waters located within the riparian area or floodplain of a water identified in paragraphs (a)(1) through (a)(5) of this section, or waters with a surface or shallow subsurface hydrologic connection to such a jurisdictional water.

(3) **Riparian area***:* The term *riparian area* means an area bordering a water where surface or subsurface hydrology influence the ecological processes and plant and animal community structure in that area. Riparian areas are transitional areas between aquatic and terrestrial ecosystems that influence the exchange of energy and materials between those ecosystems.

(4) **Floodplain***:* The term *floodplain* means an area bordering inland or coastal waters that was formed by sediment deposition from such water under present climatic conditions and is inundated during periods of moderate to high water flows.

(5) **Tributary**: The term tributary means a waterbody physically characterized by the presence of a bed and banks and ordinary high water mark, which contributes flow, either directly or through other waterbodies, to a water identified in paragraphs (a)(1) through (a)(3) of this section. A waterbody 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 man-made breaks (such as bridges, culverts, pipes, or dams), or one or more natural breaks (such as wetlands at the head of or 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 or downstream of the break. In addition, wetlands are tributaries (even if they lack a bed and banks and ordinary high water mark) if they contribute flow, either directly or through other waterbodies to a water identified in paragraphs (a)(1) through (a)(3) of this section. A tributary, including wetlands, can be a natural, man-altered, or man-made water body and includes waters such as rivers, streams,

lakes, impoundments, canals, and ditches not excluded in paragraph (b)(4) and (b)(5) of this section.

(6) **Wetlands***:* The term *wetlands* means 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. Wetlands generally include swamps, marshes, bogs and similar areas.

(7) **Significant nexus***:* The term *significant nexus* means a more than speculative or insubstantial effect that a water, including wetlands, either alone or in combination with other similarly situated waters in the region (i.e., the watershed that drains to a water identified in paragraphs (a)(1) through (3) of this section), has on the chemical, physical or biological integrity of a water identified in paragraphs (a)(1) through (3) of this section. Other waters, including wetlands, are similarly situated when they perform similar functions and are located sufficiently close together or close to a "water of the U.S." so that they can be evaluated as a single landscape unit with regard to their effect on the chemical, physical, or biological integrity of a water identified in paragraphs (a)(1) through (a)(3) of this section.

The following text replaces the definition of "navigable waters" at 40 C.F.R. § 401.11:

(l) The term *navigable waters* means the waters of the United States, including the territorial seas.

(a) For purposes of all sections of the Clean Water Act, 33 U.S.C. 1251 *et. seq.* and its implementing regulations, subject to the exclusions in subsection (b) of this section, the term "waters of the United States" means:

(1) All waters which are currently used, 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) The territorial seas;

(4) All impoundments of waters otherwise defined as waters of the United States under this definition;

(5) All tributaries of waters identified in paragraphs (1) through (3) of this section;

(6) All waters, including wetlands, adjacent to a water identified in paragraphs (1) through (5) of this section; and

(7) On a case-specific basis, other waters, including wetlands, provided that those waters alone, or in combination with other similarly situated waters, including wetlands, located in the same region, have a significant nexus to a water identified in paragraphs (1) through (3) of this section.

(b) The following are not "waters of the United States" ––

(1) Waste treatment systems, including treatment ponds or lagoons, designed to meet the requirements of the Clean Water Act.

(2) 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; and,

(3) Artificially irrigated areas that would revert to upland should application of irrigation water to that area cease; artificial lakes or ponds created by excavating and/or diking dry land and used exclusively for such purposes as stock watering, irrigation, settling basins, or rice

growing; artificial reflecting pools or swimming pools created by excavating and/or diking dry land; small ornamental waters created by excavating and/or diking dry land for primarily aesthetic reasons; water-filled depressions created incidental to construction activity; groundwater drained through subsurface drainage systems; gullies and rills; non-wetland swales; and puddles;

(4) Ditches that are excavated wholly in uplands, drain only uplands or non-jurisdictional waters, and have no more than ephemeral flow; and

(5) Ditches that do not contribute flow, either directly or through other waterbodies, to a water identified in paragraphs (a)(1) through (a)(3) of this section.

(c) Definitions ––

(1) **Adjacent***:* The term *adjacent* means bordering, contiguous or neighboring. Waters, including 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 waters.”

(2) **Neighboring**: The term *neighboring*, for purposes of the term “adjacent” in this section, includes waters located within the riparian area or floodplain of a water identified in paragraphs (a)(1) through (a)(5) of this section, or waters with a surface or shallow subsurface hydrologic connection to such a jurisdictional water.

(3) **Riparian area***:* The term *riparian area* means an area bordering a water where surface or subsurface hydrology influence the ecological processes and plant and animal community structure in that area. Riparian areas are transitional areas between aquatic and terrestrial ecosystems that influence the exchange of energy and materials between those ecosystems.

(4) **Floodplain***:* The term *floodplain* means an area bordering inland or coastal waters that was formed by sediment deposition from such water under present climatic conditions and is inundated during periods of moderate to high water flows.

(5) **Tributary**: The term tributary means a waterbody physically characterized by the presence of a bed and banks and ordinary high water mark, which contributes flow, either directly or through other waterbodies, to a water identified in paragraphs (a)(1) through (a)(3) of this section. A waterbody 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 man-made breaks (such as bridges, culverts, pipes, or dams), or one or more natural breaks (such as wetlands at the head of or 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 or downstream of the break. In addition, wetlands are tributaries (even if they lack a bed and banks and ordinary high water mark) if they contribute flow, either directly or through other waterbodies to a water identified in paragraphs (a)(1) through (a)(3) of this section. A tributary, including wetlands, can be a natural, man-altered, or man-made water body and includes waters such as rivers, streams, lakes, impoundments, canals, and ditches not excluded in paragraph (b)(4) and (b)(5) of this section.

(6) **Wetlands***:* The term *wetlands* means 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. Wetlands generally include swamps, marshes, bogs and similar areas.

(7) **Significant nexus***:* The term *significant nexus* means a more than speculative or insubstantial effect that a water, including wetlands, either alone or in combination with other

similarly situated waters in the region (i.e., the watershed that drains to a water identified in paragraphs (a)(1) through (3) of this section), has on the chemical, physical or biological integrity of a water identified in paragraphs (a)(1) through (3) of this section. Other waters, including wetlands, are similarly situated when they perform similar functions and are located sufficiently close together or close to a “water of the U.S.” so that they can be evaluated as a single landscape unit with regard to their effect on the chemical, physical, or biological integrity of a water identified in paragraphs (a)(1) through (a)(3) of this section.